U.S. Army Aeromedical Evacuation Standard Medical Operating Guidelines (SMOG)

CY23 Version
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Oldsmar, FL 34677
(727) 748-7141 (office)
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Disclaimer: The Army Medical Department (AMEDD) Aviation Crew-member and Critical Care and Flight Paramedic Course's "US ARMY MEDEVAC CRITICAL CARE FLIGHT PARAMEDIC **STANDARD MEDICAL OPERATING GUIDELINES (SMOG)**" PDF is now available in print in this convenient Spiral-bound Handbook Version by Breakaway Media, LLC. The purpose of the handbook is to provide these medical professionals a printed resource that outlines the latest techniques and procedures used in the US Army MEDEVAC and critical care flight paramedic community.

This handbook is also available as a printed spiral-bound handbook at https://jsom.us/SMOG23

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Summary of Changes Located at End of Document

INTRODUCTION

The CY 2023 SMOG release marks the last year of the current format. The Aeromedical Evacuation community provided developmental feedback leading to a redesign of current written medical guidance and/or policy. Be assured all future changes are a continued result of collaboration between Emergency Medicine professionals, experienced Flight Medics, Aeromedical Physician Assistants, Critical Care Nurses, and Flight Surgeons across the Army. There is close coordination in the development of these guidelines with the Joint Trauma System, and the Defense Committees on Trauma. Our shared goal is to ensure the highest quality enroute care possible and to standardize care across all evacuation and emergency medical pre-hospital units. It is our vision that all these enhancements and improvements will advance enroute care across the services and the Department of Defense.

Unit Medical Trainers, Medical Standardization Instructors, Medical Flight Instructors and Medical Directors will evaluate Critical Care Flight Paramedics (CCFP) ability to follow and execute the medical instructions herein. These medical guidelines are intended to guide CCFPs and prehospital professionals in the response and management of emergencies and the care and treatment of patients in both garrison and combat theater environments. Unit medical providers are not expected to employ these guidelines blindly. Unit medical providers are expected to manipulate and adjust these guidelines to their unit's mission and medical air crew training / experience. Medical directors or designated supervising physicians will endorse these guidelines as a baseline, appropriately adjust components as needed, and responsibly manage individual unit medical missions within the scope of practice of their Critical Care Flight Paramedics, Enroute Critical Care Nurses, and advanced practice aeromedical providers.

CCFPs should administer medications as listed in the guidelines unless their medical director and/or supervising physician orders a deviation. Other medications may be added, so long as the unit supervising physician and/or medical director approves them.

This manual also serves as a reference for physicians providing medical direction and clinical oversight to the CCFP. Treatment direction, which is more appropriate to the patient's condition than the guideline, should be provided by the physician so long as the CCFP scope of practice is not exceeded.

Any medical guideline that is out of date or has been found to cause further harm will be updated or deleted immediately. The Department of Aviation Medicine (DAM) serves as the managing editor of the SMOG and is responsible for content updates, managing the formal review process, and identifying review committee members for the annual review.

The Standard Medical Operating Guidelines are intended to provide medical procedural guidance and is in compliment to other Department of Defense and Department of the Army policies, regulatory and doctrinal guidance. Nothing herein overrides or supersedes laws, rules, regulation or policies of the United States, DoD or DA.

Table of Contents

MEDICATIONS (Continued)

ADMINISTRATIVE

Standard Medical Operating Guidelines are found at the following website:

https://www.milsuite.mil/book/groups/department-school-of-army-aviation-medicine

Also available, along with all fillable evacuation forms and AARs on the Joint Trauma System website:
https://jts.amedd.army.mil/index.cfm/PI_CPGs/cpgs

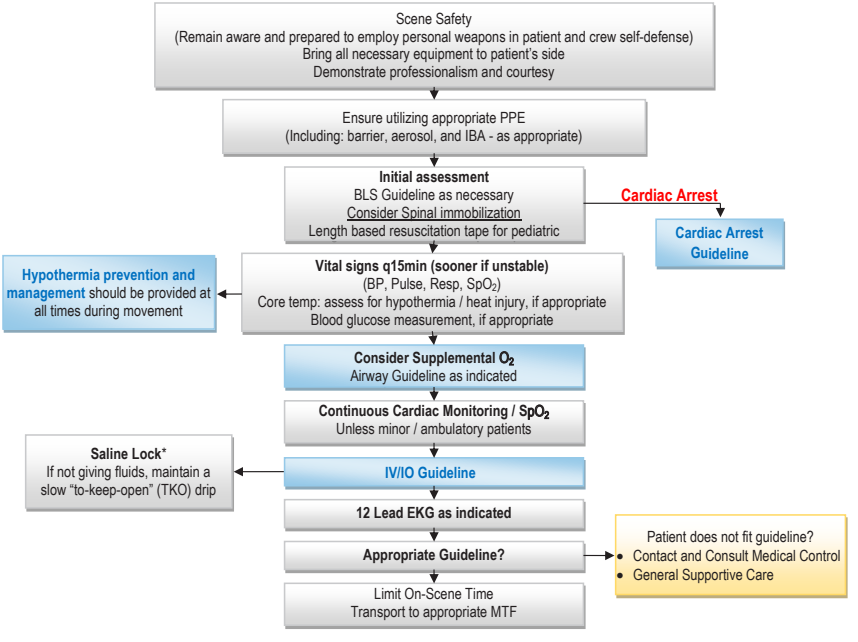
https://jts.amedd.army.mil/index.cfm/documents/forms_after_action

All comments and/or recommendations should be sent to:

medcoesaamoperations@army.mil

with the subject line "CCFP-SMOG"

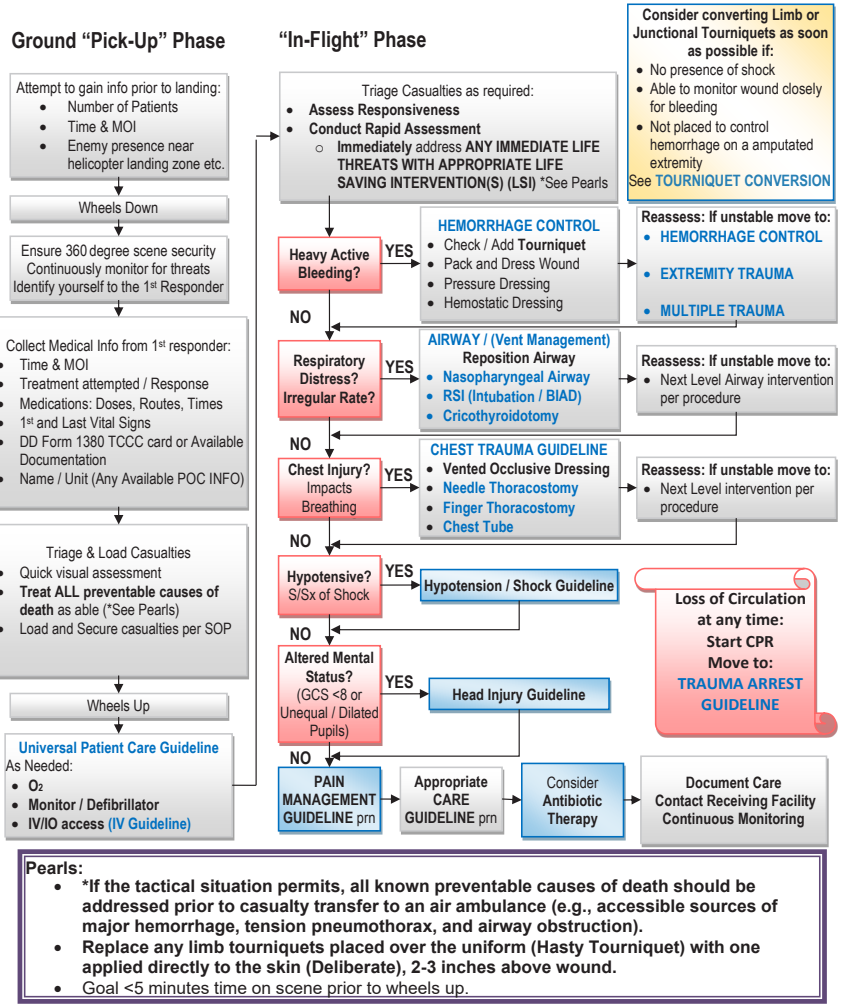
UNIVERSAL PATIENT CARE



Pearls:

- *Blood/Fluid boluses given in trauma victims should be done in accordance with hypotensive resuscitation guidelines – see multiple trauma protocol.
- General supportive measures include: Airway / Respiratory support, continuous hemodynamic monitoring with SpO_2 and $EtCO_2$ as appropriate, Supplemental O_2 prn, IV Fluid boluses, Pain control prn.
- All patients should have complete vital signs recorded.
- All patient encounters should be recorded on appropriate care documentation sheets per theater policies, unit SOPs and/or in accordance with JTS Documentation CPG at end of a patient encounter.
- Any mishaps/errors should be brought to attention of the medical control ASAP.
- Contact medical control for any necessary assistance when feasible.

TACTICAL EVACUATION



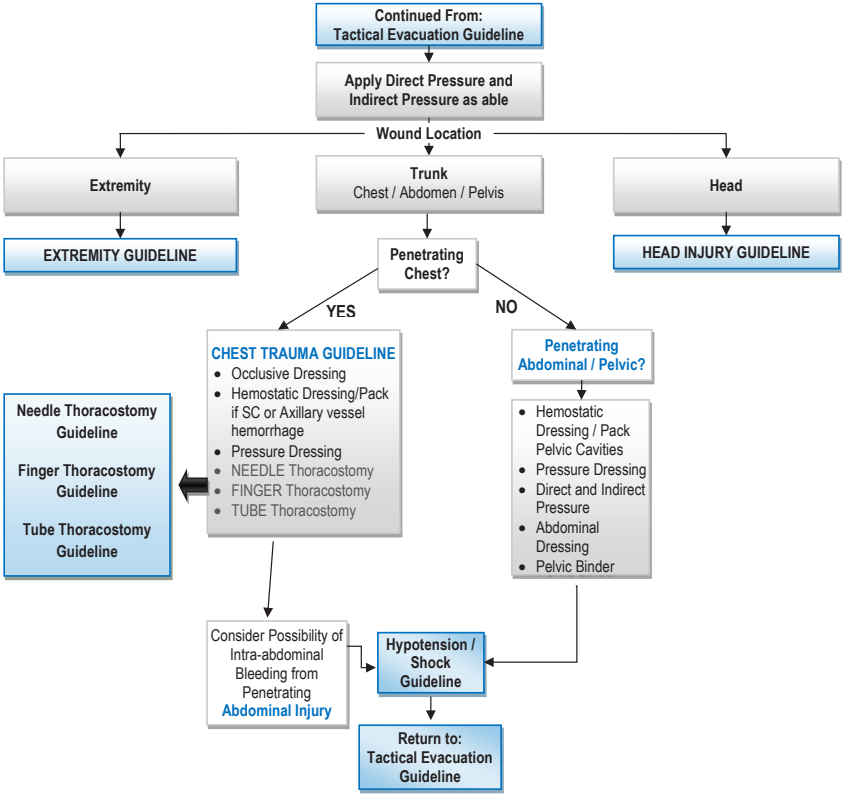
Pearls:

- ***If the tactical situation permits, all known preventable causes of death should be addressed prior to casualty transfer to an air ambulance (e.g., accessible sources of major hemorrhage, tension pneumothorax, and airway obstruction).**
- **Replace any limb tourniquets placed over the uniform (Hasty Tourniquet) with one applied directly to the skin (Deliberate), 2-3 inches above wound.**
- Goal <5 minutes time on scene prior to wheels up.

HEMORRHAGE

Signs and Symptoms in a Trauma Patient

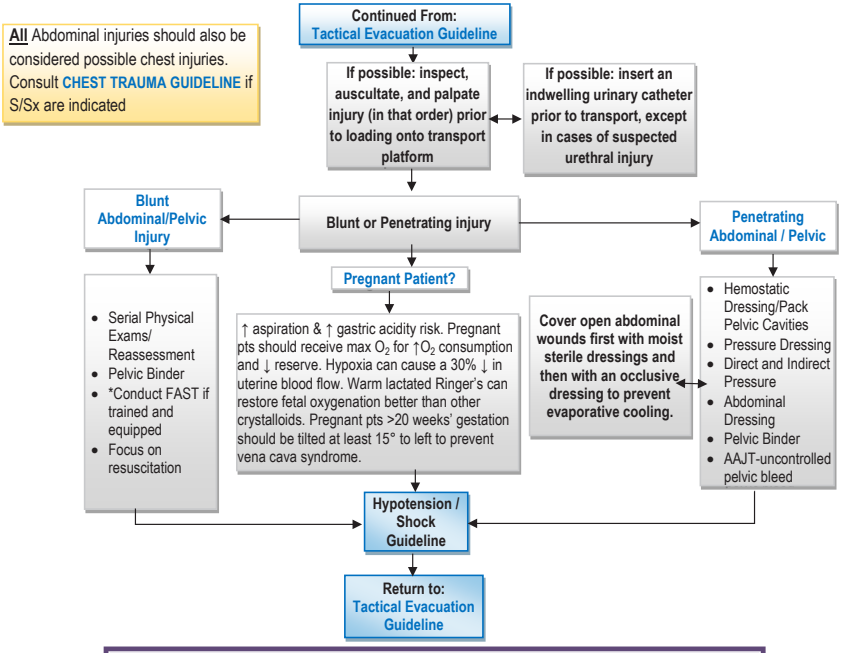
- **Obvious Arterial Bleeding**
- **Blood Pooling / Soaked Bandages**
- **Venous Bleeding from Extensive Penetrating Wounds** (Multiple fragments)
- **Tachycardia**
- **Distended / Tender Abdomen**
- **Shortness of Breath / Difficulty Breathing / Tachypnea**
- **Decreased LOC**
- **Signs / Symptoms Shock**
- **Hypotension**



ABDOMINAL INJURY

Signs and Symptoms

- **Altered mental status**
- **Tachycardia**
- **Absence of palpable pulses**
- **Pale, moist, and mottled skin**
- **Poor peripheral perfusion**
- **Hypotension**
- **Hematuria**
- **Pain, Tenderness, Distention, Dissymmetry**
- **Absent/Diminished bowel sounds**
- **Grey Turner Sign**
- **Cullen Sign**
- **Kehr's Sign**



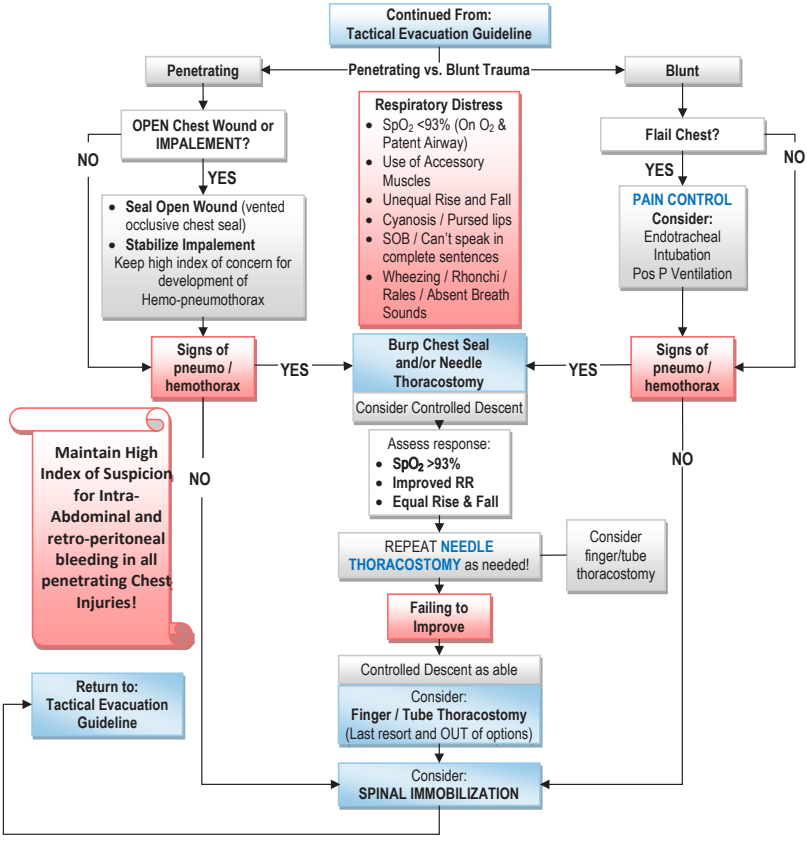
Pearls:

- *FAST Cannot reliably exclude clinically significant injuries, but may provide reasonable indications of intra-abdominal hemorrhage which requires surgical intervention
- **Pain management should not be withheld.
- Lateral contusions (seatbelt sign) associated with a 20% occurrence of internal injury and should alert the CCFP to possible internal injury
- Presence of pregnant uterus should be determined. Traumatic injuries to pregnant patients is further complicated by physiological changes experienced by the patient. Some changes can mimic shock (heart rate can increase by 20 BPM, blood volume increases by 50% during mid-pregnancy, and can experience relative anemia from hemodilution.) Due to the increase in blood flow to the uterus, risk of massive blood loss is greatly increased with trauma to the bony pelvis. At term, the placenta/uterus can perfuse approximately 600-800mL of blood per minute.

CHEST TRAUMA

Signs and Symptoms of Chest Trauma

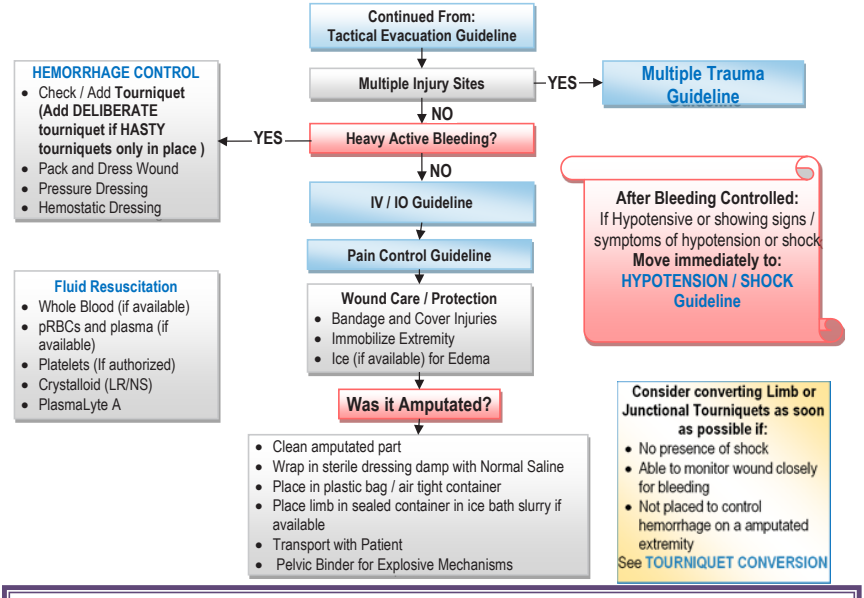
- **Difficulty Breathing:** Cyanosis / Pursing of lips / Accessory muscle involvement
- **Rapid Respirations with SPO_2 decreasing or <93%** (Trauma: In Flight and on O_2)
- **Flail Chest**
- **Unequal Rise and Fall**
- **Open Wound / Impalement Over Thorax**
- **Penetrating Abdominal Wound**
- **Bruising Across Chest or Base of Neck**
- **Subcutaneous Emphysema or Deviated Trachea**



EXTREMITY TRAUMA

Signs and Symptoms:
- Pain / Swelling
- Deformity
- Altered Sensation / Function
- Diminished Pulse / Cap Refill
- Decreased Temperature
- Bleeding

Differential Diagnosis:
- Abrasion
- Contusion
- Multi-trauma
- Fracture
- Dislocation
- Laceration
- Sprain / Strain
- Amputation



Pearls:
- Evaluate and document neurovascular status in all fractures / dislocations.
- Never attempt to reduce an open fracture unless you have a confirmed loss of pulse.
- Blood loss can be severe and concealed in long bone fractures – especially the femur.
- Tourniquets should be used without hesitation to control major bleeding. Use only CoTCCC Approved Tourniquets!
- Limb and junctional tourniquets should be converted to hemostatic or pressure dressings as soon as possible if three criteria are met: the casualty is not in shock; it is possible to monitor the wound closely for bleeding; and the tourniquet is not being used to control bleeding from an amputated extremity. Every effort should be made to convert tourniquets in less than 2 hours if bleeding can be controlled with other means.

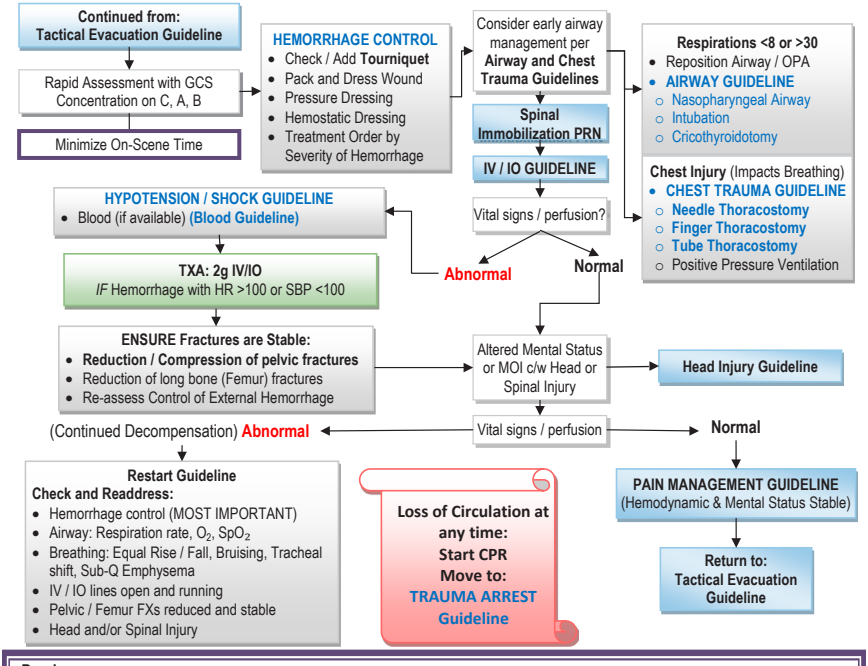
MULTIPLE TRAUMA

Signs and Symptoms:

- **Pain, Swelling, Bleeding, Ecchymosis**
- **Deformity**
- **Altered Mental Status**
- **Respiratory Distress / Failure**
- **Vomiting**
- **Hypotension / Shock**
- **Cardiac Arrest**

Possible Injuries / Diagnoses:

- **Tension Pneumothorax**
- **Flail Chest**
- **Pericardial Tamponade**
- **Open Chest Wound**
- **Hemothorax**
- **Intra-abdominal Injury / Bleeding**
- **Head Injury, HEENT injuries**
- **Extremity Fracture / Dislocation**
- **Hypothermia**
- **Burns**
- **Pelvis / Long-bone Fracture**
- **Spine / Spinal Cord Injury**



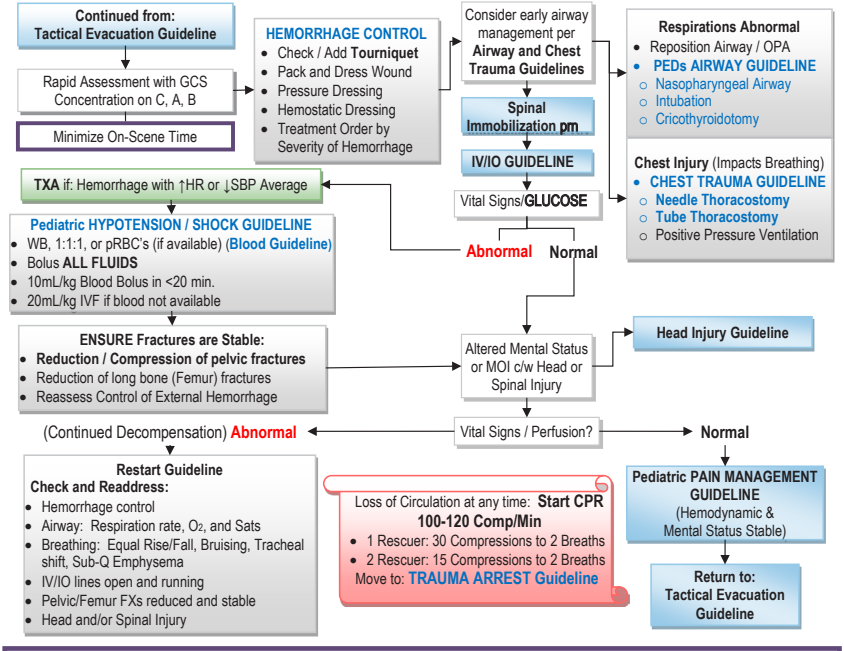
Pearls:

- **Optimize Hemostasis:**
  - **Hemorrhagic trauma with NO significant head injury:** Should target maintaining SBP >100. Casualties able to maintain SBP >100 do not need immediate fluid resuscitation.
  - **Hemorrhagic trauma WITH significant head injury:** should target maintaining SBP >110
  - If SBP falls <100 (with TBI <110), transition to Enroute Damage Control Resuscitation guideline.
  - Narrowed pulse pressure should prompt resuscitation - do not wait for decompensation to ensue.
  - Stabilize pelvic fractures with pelvic splint or sheet / binder and tie feet together. Up to 4-6L of blood can be hidden in the pelvis

Pediatric MULTIPLE TRAUMA

Signs and Symptoms:
- **Pain, Swelling, Bleeding**
- **Ecchymosis**
- **Deformity**
- **Altered Mental Status**
- **Respiratory Distress/Failure**
- **Vomiting**
- **Hypotension/Shock**
- **Cardiac Arrest**

Possible Injuries / Diagnoses:
- **Tension Pneumothorax**
- **Flail Chest**
- **Pericardial Tamponade**
- **Open Chest Wound**
- **Hemothorax**
- **Intra-abdominal Injury/Bleeding**
- **Pelvis/Long-bone Fracture**
- **Spine/Spinal Cord Injury**
- **Head Injury**
- **Extremity Fracture/Dislocation**
- **HEENT Injuries**
- **Hypothermia**
- **Burns**

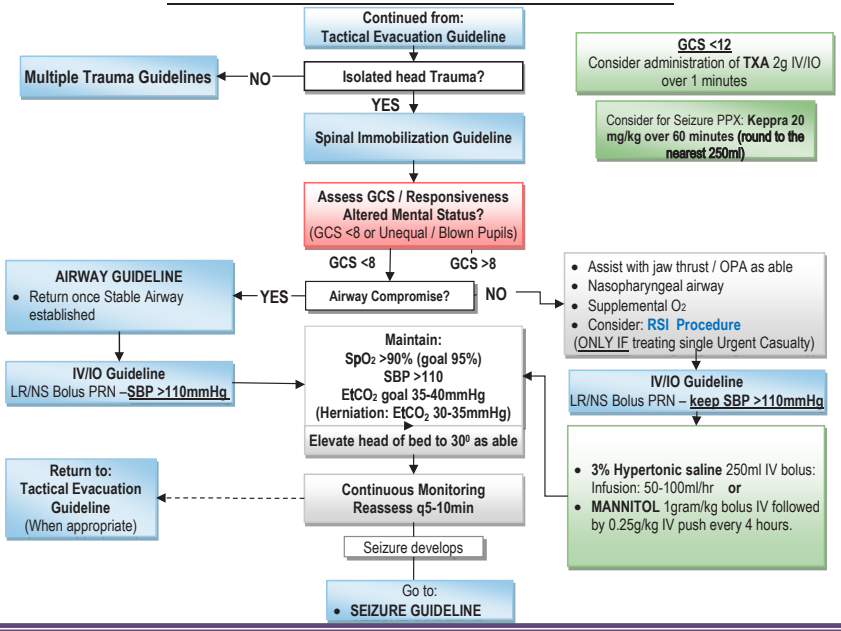


Pearls:
- **Resuscitation: Maintain, SBP to at least [70 + 2 x age (yr)] or to mental status change.**
- **Normotension: [90 + 2 x age (yr)]**
- Narrowed pulse pressure should prompt resuscitation – do not wait for decompensation to ensue.
- Stabilize pelvic fractures with Pelvic Splint or sheet / binder and tie feet together. Up to 80% of blood volume can be hidden in the pelvis.
- Follow Length Based Resuscitation Tape for Pediatric ALS Equipment.

HEAD INJURY/TBI

Signs and Symptoms:
- **Pain, Swelling, Bleeding**
- **Ecchymosis**
- **Deformity**
- **Altered Mental Status**
- **Respiratory Distress / Failure**
- **Vomiting**

Differential Diagnosis:
- **Skull Fracture**
- **Brain Injury**
- **Epidural Hematoma**
- **Subdural Hematoma**
- **Subarachnoid Hemorrhage**
- **Spinal Injury**
- **Abuse**



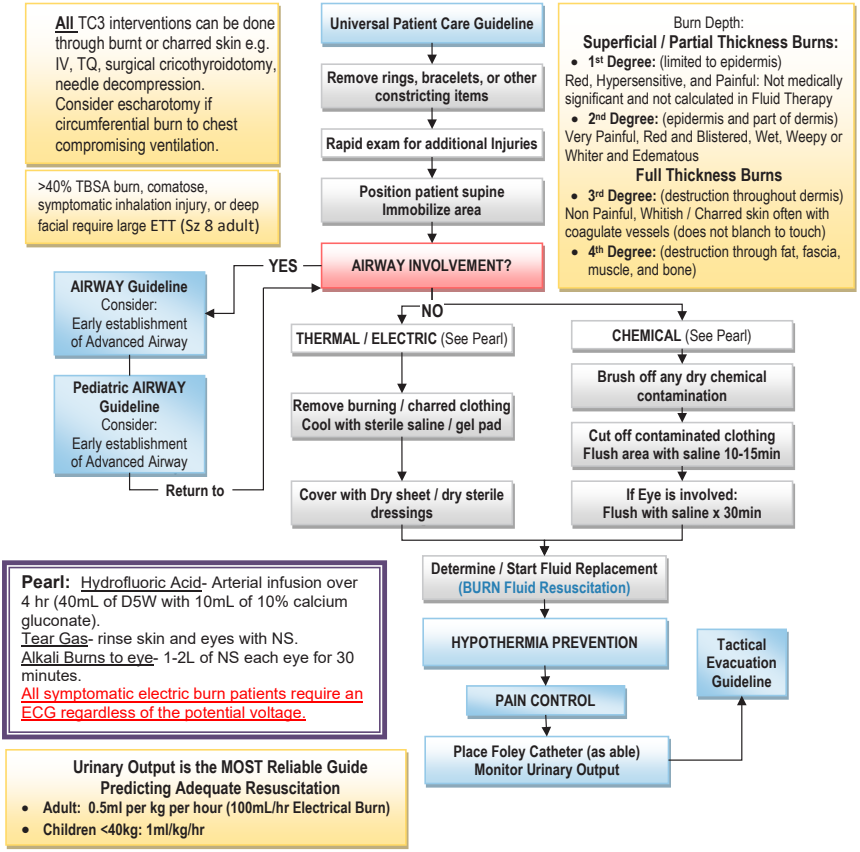
Pearls:

Evidence of Elevated ICP and Herniation: Unilateral or Bilateral Fixed / Sluggish and blown pupils, persistent/repetitive vomiting, decorticate or decerebrate posture, motor abnormalities, Cushing's **Reflex**: (Hypertension & Bradycardia +/- Respiratory depression)

- Prevention of hypoxic insult is key! Maintain PO_2 and maintain cerebral perfusion pressure by preventing hypotension.
  - Target Vital Functions: **SBP >110mmHg, SpO_2 >95%, $EtCO_2$ at 35-40mmHg, MAP 80-110.**
  - It is CRITICALLY IMPORTANT to avoid both hypo-capnea and hyper-capnea. Dedicated and closely managed ventilation is key to optimal patient outcome.
- With clear signs of **herniation,** may consider *temporizing* hyperventilation with 100% O_2 and capnography: **titrate CO_2 to 30-35mmHg**.
- **Mannitol** should be given as boluses – not a constant infusion. Do not use in hypotensive, dehydration, or under-resuscitated patients
- **KETAMINE** Not an absolute contraindicated in ICP with hypertension and/or spontaneous cerebral hemorrhage.

BURNS

Signs and Symptoms:	Differential Diagnosis:
• Burns, Pain, Swelling • Dizziness • Loss of Consciousness • Airway Involvement (e.g., singed nasal hair, carbonaceous sputum) • Hoarseness / Wheezing • Loss of Consciousness	• Superficial Burns (1st degree) • Partial Thickness (2nd degree) • Full Thickness (3rd degree) • Chemical Burns • Thermal Burns • Electrical Burns • Radiation • Secondary Trauma



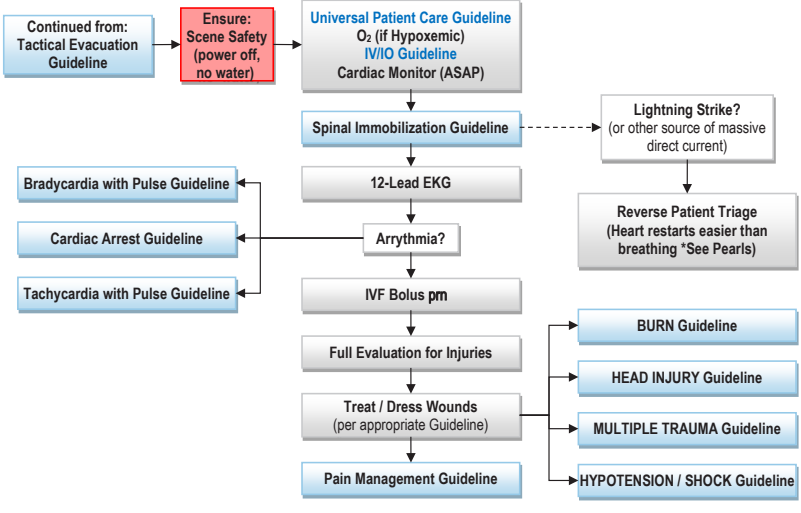
ELECTRICAL INJURY

Signs and Symptoms:

- Burns
- Pain
- Arrhythmia
- Loss of Consciousness
- Entry/Exit Wounds
- Shock/Hypotension
- Cardiac Arrest

Differential Diagnosis:

- Cardiac Arrest
- Environmental Exposure
- Seizure
- Burns
- Multiple Trauma



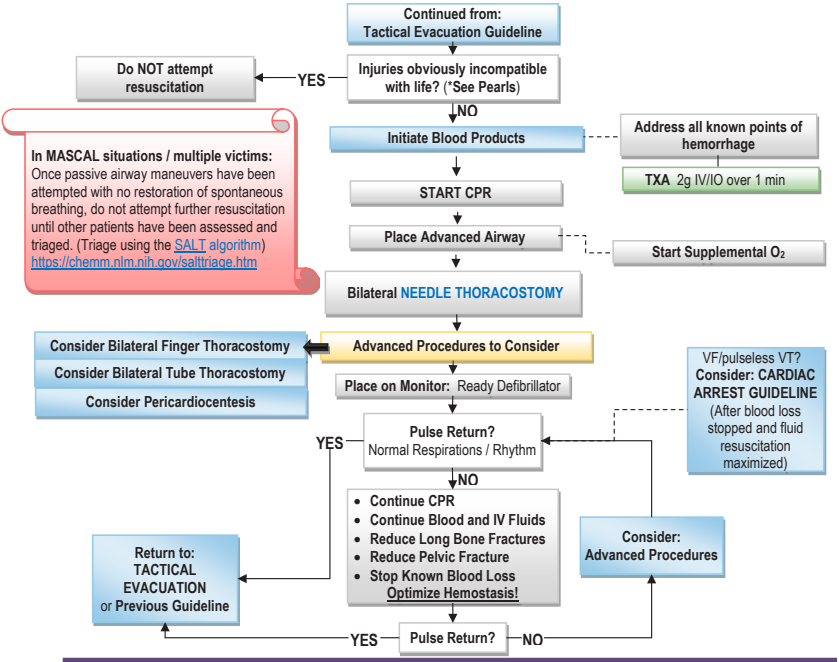
Pearls:

- **Ventricular fibrillation (in AC) and asystole (in DC) are the most common dysrhythmias seen with electrical shock.**
- Damage is often hidden deep as current follows conductive structures (e.g., blood vessels, nerves, muscle).
- **In mass casualty situations where lightning is involved – reverse triage should be performed. Those victims in full arrest should be resuscitated first. The reason for this is the respiratory center of the brain takes longer to recover from the shock than the heart and respiratory support during this period can lead to survival.**
  - Specifically, if there are no spontaneous respirations after airway maneuver, but no other signs of non-survivable injury, administer ventilatory support aggressively as personnel resources allow.
- Do not overlook secondary trauma.
- Electrical shock victims do not "store" electricity and are safe to handle if current is off.
- Many electrical injury patients will also have significant burn injuries – do not overlook fluid resuscitation.

TRAUMATIC ARREST

Signs and Symptoms:
- **Evidence of Trauma with No Pulse**
- **Lack of Response to External Stimuli**

Differential Diagnosis:
- **Medical Cause of Arrest Preceding Trauma***
- **Tension Pneumothorax**
- **Hypovolemia**
- **Cardiac Tamponade**



Pearls:
- **Injuries obviously incompatible with life** include decapitation, massively deforming head/chest injury, traumatic hemi-corpectomy or total body disruption, incineration, lividity/rigor mortis.
- If unsure if arrest due to trauma or medical cause, initiate ALS guideline for any arrhythmias following optimization of hemostasis (in trauma patients, volume loss must be corrected 1st, consider blood admin above all else)
- CPR without addressing massive hemorrhage, blood volume resuscitation, tension pneumothorax, and pericardial tamponade will be ineffective..
- *Consider severe hypocalcemia if blood products have recently been transfused due to calcium chelation and evidence of poor cardiac activity/contractility.

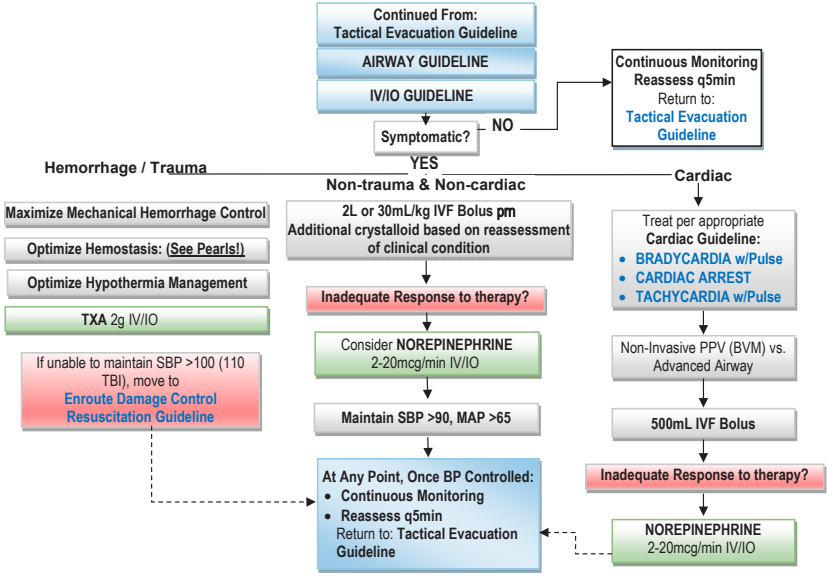
HYPOTENSION / SHOCK

Signs and Symptoms:

- **Restlessness/Confusion**
- **Weakness/Dizziness**
- **Tachycardia**
- **Pale, Cool, Clammy Skin**
- **Delayed Capillary Refill**
- **Hypotension**
- **Bleeding**
- **Nausea/Vomiting**

Differential Diagnosis:

- **Shock: Hypovolemic, Cardiogenic, Septic, Neurogenic, Anaphylactic**
- **Cardiac Arrhythmia**
- **Pulmonary Embolus**
- **Tension Pneumothorax**
- **Medication Effect/OD**
- **Vasovagal Episode**



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  - **Hemorrhagic trauma WITH significant head injury:** should target maintaining SBP >110
  - If SBP falls <100 (with TBI <110), transition to Enroute Damage Control Resuscitation guideline.

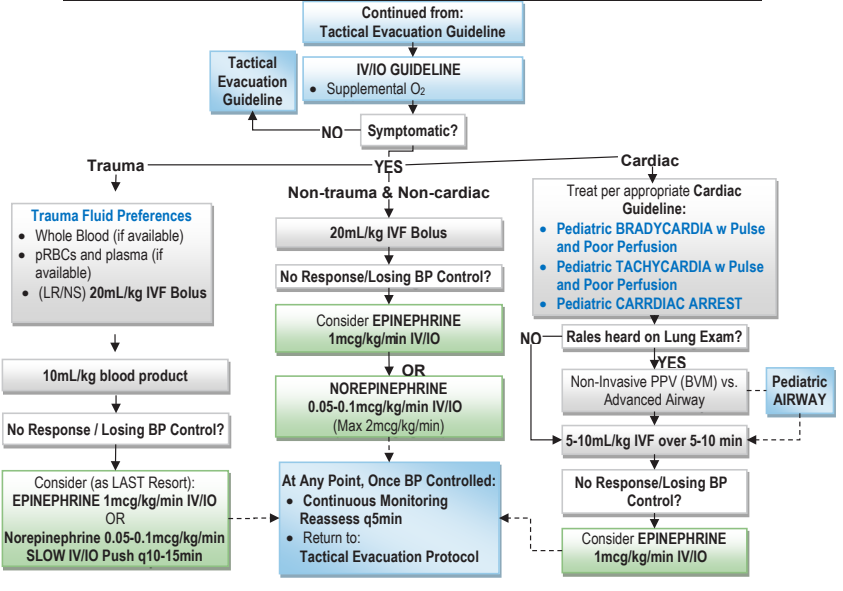
Pediatric HYPOTENSION / SHOCK

Signs and Symptoms:

- **Restlessness/Confusion**
- **Weakness/Dizziness**
- **Tachycardia**
- **Pale, Cool, Clammy Skin**
- **Delayed Capillary Refill**
- **Hypotension**
- **Nausea / Vomiting**
- **Responsiveness / Lethargy**

Differential Diagnosis:

- **Shock: Hypovolemic, Cardiogenic, Septic, Neurogenic, Anaphylactic**
- **Cardiac Arrhythmia**
- **Pulmonary Embolus**
- **Tension Pneumothorax**
- **Medication Effect/OD**
- **Vasovagal Episode**
- **Dehydration**
- **Congenital Heart Disease**



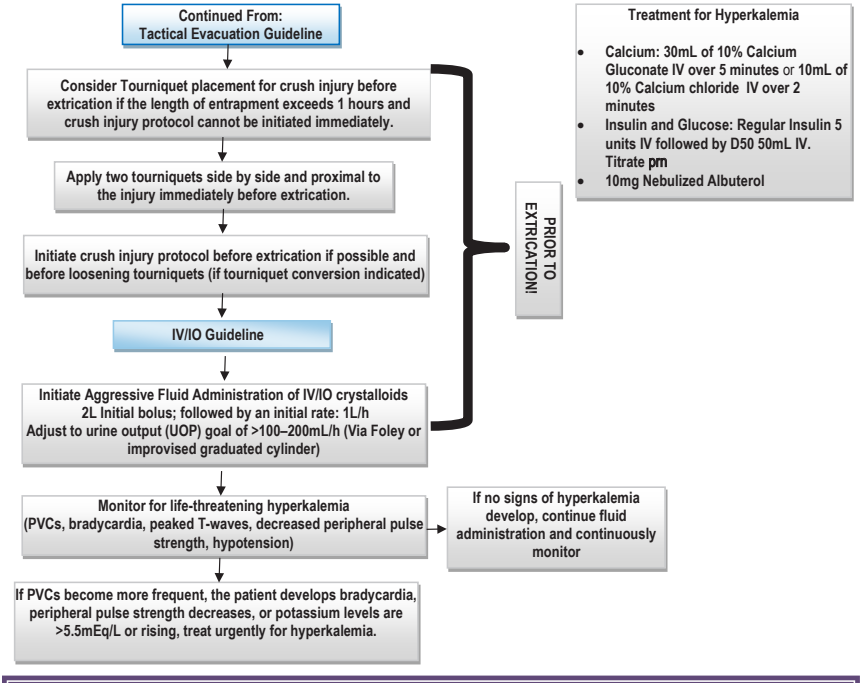
Pearls:

- **Hypotension in pediatric patients is defined as a SBP less than 70 + [2 x age (yr)].**
- Decreasing heart rate with worsening neuro or clinical exam may be a sign of impending collapse in pediatric patients
- Consider all the causes of shock and treat per appropriate protocol.
- Avoid Pressors as able (unless distributive or cardiogenic shock) Continue IVFs for trauma: Optimize hemostasis and correct volume loss.

CRUSH SYNDROME

Signs and Symptoms:
- Entrapped extremity (as little as 1hr)
- Erythema, ecchymosis, abrasion
- Swelling, tense muscle compartment

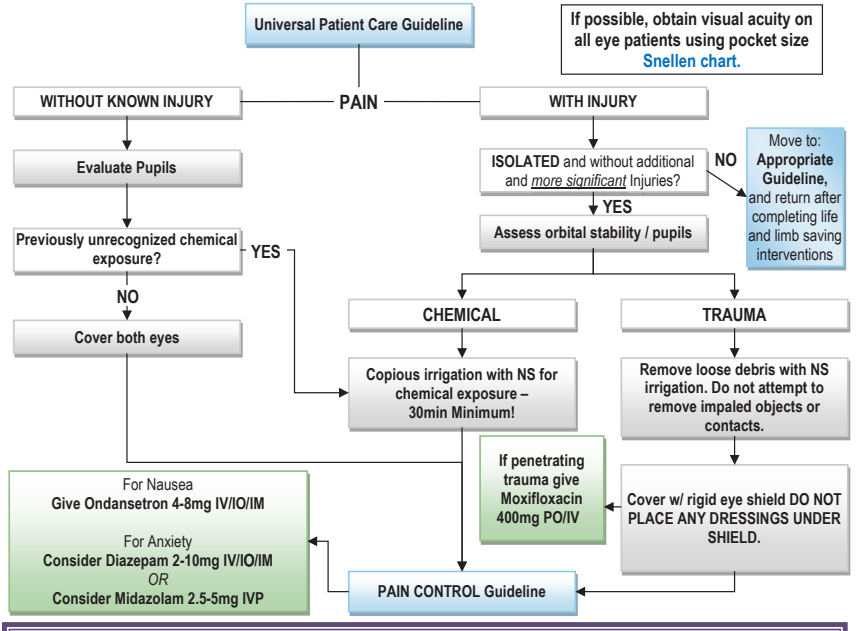
Complications:
- Hyperkalemia
- Hypocalcemia
- Compartment Syndrome
- Rhabdomyolysis
- Arrhythmia
- Hypotension



Pearls:
- Crush syndrome can occur in as little as 1 hour of entrapment
- Tourniquets may delay life-threatening complications if fluid resuscitation and treatment cannot be immediately initiated
- Aggressive fluid resuscitation for Crush injury in the setting of noncompressible hemorrhage may increase hemorrhage. Balance the risk of uncontrolled hemorrhage against cardiotoxic effects of hyperkalemia.

EYE INJURY / PAIN

Signs and Symptoms:	Differential Diagnosis:
• Pain, Swelling, Blood	• Abrasion/Laceration
• Decreased Visual Acuity/Blindness	• Globe Rupture/Orbital fracture
• Deformity/Contusion	• Retinal Detachment
• Foreign Body	• Chemical/Thermal Burn
• Excessive Tearing	• Infection/Iritis
	• CNS Event
	• Glaucoma
	• Retinal Vessel Occlusion



Pearls:

- Antiemetics are essential to prevent increased IOP. Consider Benzo for anxiety.
- Use rigid eye shields, not pads, for traumatic injuries. Can use a soft pad on unaffected eye.
- Patching both eyes to decrease sympathetic eye movements has not been shown to improve visual outcome but may increase anxiety and will render patient unable to move independently.
- If globe is out of socket – do not attempt to replace. Cover with saline soaked gauze
- Copious irrigation is the cornerstone of treatment for chemical eye injuries. 30 min is the minimum amount of time to irrigate. Utilize Morgan lens if available.
  - The use of a nasal cannula across the bridge of the nose attached to 1L of NS will also work.

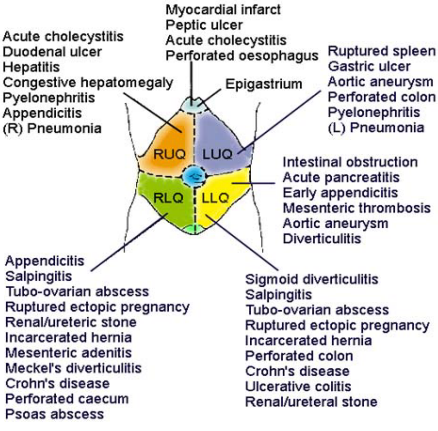
ABDOMINAL PAIN

Signs and Symptoms:

- Pain (RUQ, RLQ, LUQ, LLQ) (Location / Migration / Radiation)
- Tenderness
- Nausea / Vomiting
- Diarrhea (Bloody?)
- Dysuria
- Constipation
- Vaginal Bleeding / Discharge
- Distention
- Guarding / Rigidity

Associated symptoms:

- Fever, Headache, Weakness, Malaise / Fatigue, Myalgia, Cough, Mental Status Changes, Rash



Continued from: Tactical Evacuation Guideline

Universal Patient Care Guideline
O_2 (if Hypoxemic)
IV/IO Guideline
Cardiac Monitor
12 Lead ECG (>40yo)

Consider use of BLOOD PRODUCT for:
- Persistent or Worsening Signs of Hypovolemic Shock (Tachycardia, Hypotension, ↓Pulse Pressure)
- Rigid Distended Abdomen and/or Known: AAA, GI Bleed, or Ruptured Ectopic / Abruption

Tachycardia / Hypotension / Orthostatic BP?
YES → 500mL IVF Bolus (Repeat as Needed) IV/IO Guideline
NO

Significant or Disabling Pain?
YES → Pain Management Guideline; Consider Chest Pain Guideline
NO

Nausea and/or Vomiting?
YES → 500mL IVF Bolus; Promethazine 12.5-25mg IV OR Ondansetron 4-8mg IV
NO

Reassess every 5 minutes

When appropriate, return to: Tactical Evacuation Guideline

Pearls:

- Maintain a high index of suspicion for ectopic pregnancy as a cause of abdominal pain in females of childbearing age.
- Antacids should be avoided in patients with renal disease.
- Patients older than 50 are at increased risk for life-threatening diagnoses (e.g., AAA).
- Appendicitis presents with vague, periumbilical pain that migrates to the RLQ. This classic presentation may not be present in some patients.
- Repeat VS after each intervention. In non-traumatized patients, may repeat fluid bolus prn depending on patient condition and VS. In trauma patients, fluid boluses should be used in accordance with hypotensive resuscitation guidelines (see Multiple Trauma Guideline).
- Choose the lower promethazine dosage for patients likely to experience sedative effects (e.g., elderly).

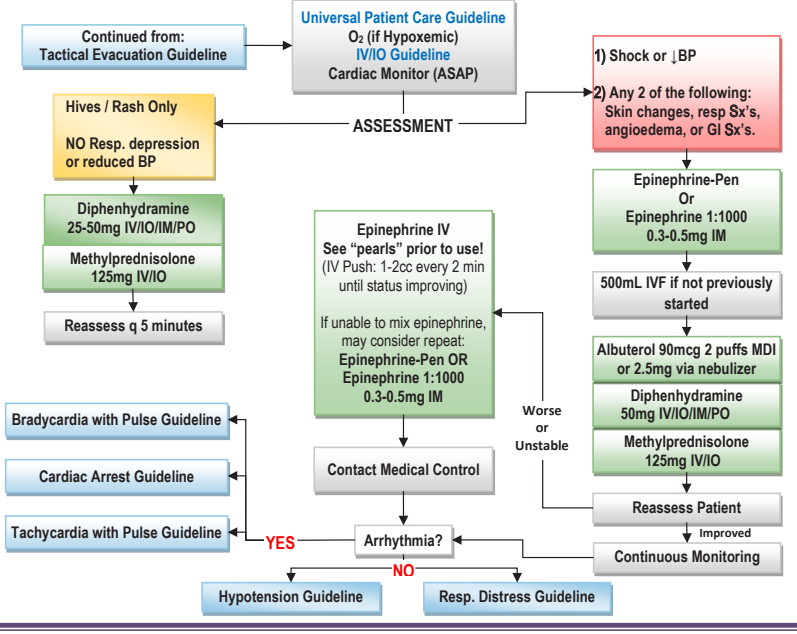
ALLERGIC REACTION

Signs and Symptoms:

- Itching or Hives
- Cough / Wheeze / Resp. Distress
- Chest / Throat Tightness
- Difficulty Swallowing
- Hypotension or Shock
- Edema
- Nausea / Vomiting

Differential Diagnosis:

- Urticaria (rash only)
- Shock (other than anaphylactic)
- Angioedema
- Aspiration / Airway Obstruction
- Asthma or COPD
- Pulmonary Edema / CHF



Pearls:

- Use caution prior to giving epinephrine IV to patients >50yo, pregnant, have a history of cardiac disease, or have HR >150. Epinephrine can precipitate dysrhythmias/ischemia – all patients should be on monitors and have 12-lead ECG.
- **Epinephrine**:
  - IM: 0.3-0.5mg (0.3-0.5 mL 1:1000) or EpiPen®
  - IV Bolus: 100mcg over 5-10 min; mix 0.1mg (0.1mL of 1:1000 in 10mL NS, and infuse over 5-10 min)
  - IV Infusion: Start at 1mcg/min; mix 1mg (1mL of 1:1000 in 500mL NS, and infuse at 0.5mL/min; titrate as needed
- The shorter the interval from contact to symptoms, the more severe the reaction.

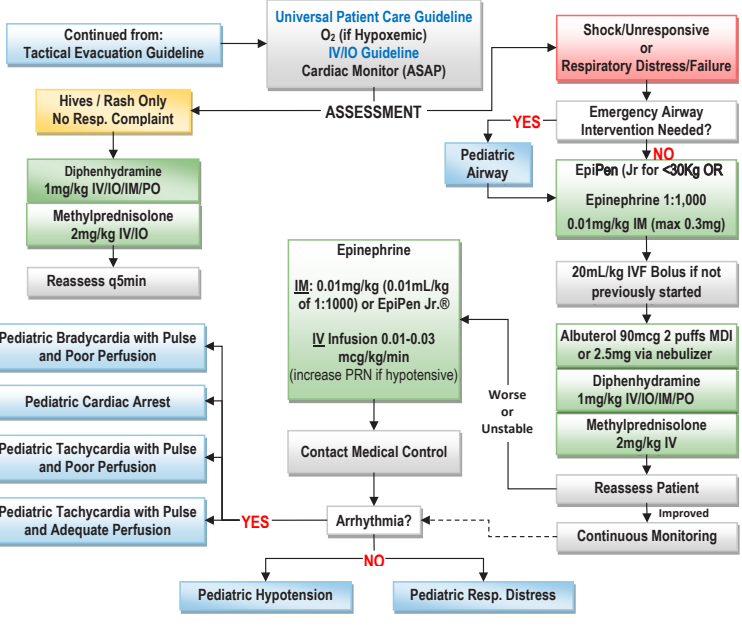
Pediatric ALLERGIC REACTION

Signs and Symptoms:

- Itching or Hives
- Cough/Wheeze/Resp. Distress
- Chest/Throat tightness
- Difficulty Swallowing
- Hypotension or Shock
- Edema
- Nausea/Vomiting

Differential Diagnosis:

- Urticaria (rash only)
- Anaphylaxis (2 or more systems)
- Shock (other than anaphylactic)
- Angioedema
- Aspiration/Airway Obstruction
- Asthma or COPD
- Pulmonary Edema/CHF



Pearls:

- Epinephrine can precipitate dysrhythmias/ischemia – all patients should be on monitors and have 12-lead ECG.
- The shorter the interval from contact to symptoms, the more severe the reaction.

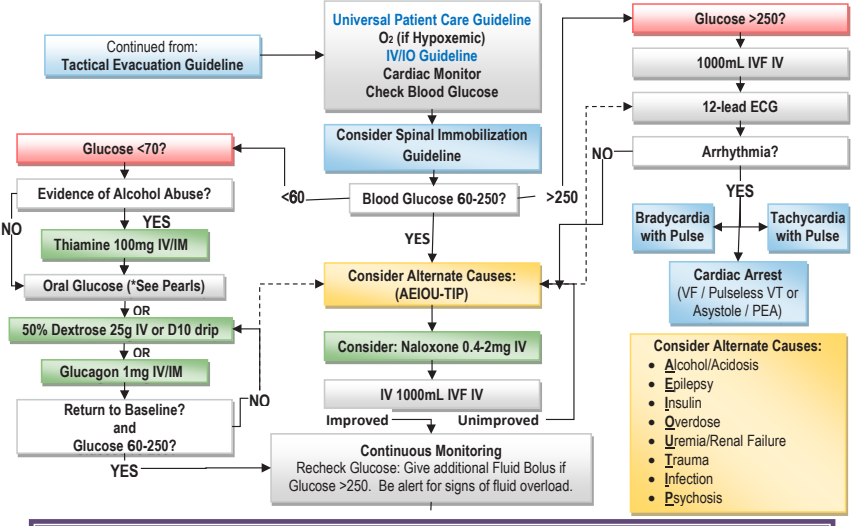
ALTERED MENTAL STATUS

Signs and Symptoms:

- Decreased Mental Status / Coma
- Bizarre Behavior
- Somnolence
- Diaphoresis/Dry, Red Skin
- Polyuria/Polydipsia
- Sweet/Fruity Breath
- Altered Respirations
- Signs of Trauma
- Fever

Differential Diagnosis:

- Head Trauma
- Stroke
- CNS Tumor/Mass/Bleed/Infection
- Thyroid Dysfunction
- Hyperglycemia/Hypoglycemia
- Diabetic Ketoacidosis
- Toxic Exposure
- Environment (Hyperthermia/Hypothermia)
- Hypoxia
- Psychiatric Disorders
- Seizure Disorder
- Sepsis



Pearls:

- Be aware of AMS as a presentation of environmental exposure/toxins/hazmat – use personal protection accordingly/decontamination.
- **Recheck blood glucose after each intervention**.
- ***Oral glucose okay if patient alert, protecting airway, and solution available**. Proteins+complex carbs (e.g., sandwich, granola) are better, longer lasting glucose source than simple sugars.
- EKG should be obtained in all suspected toxin or diabetic ketoacidosis cases – evaluate for tall, peaked T-waves (hyperkalemia) or QRS widening >100ms (toxins).
- Restrain patient as necessary for their safety and crew members safety during flight.
- Glucagon may cause nausea/vomiting–should have anti-emetic prepared.

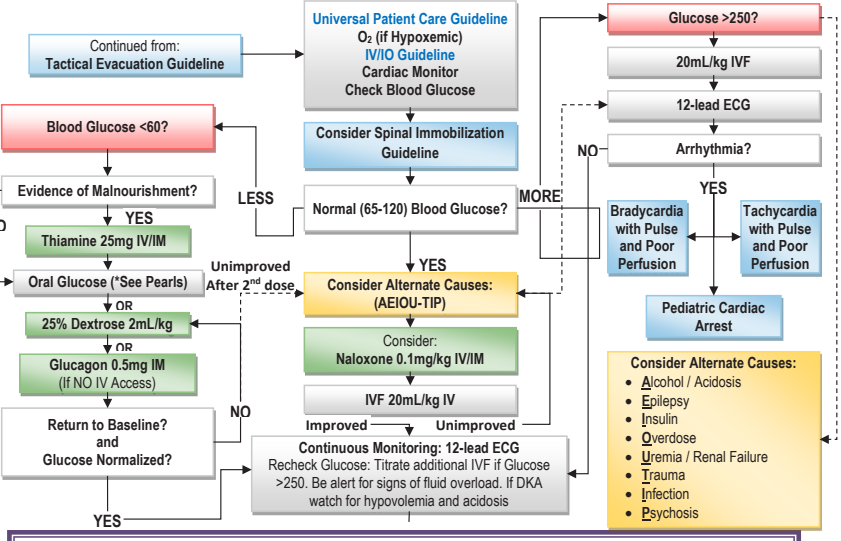
Pediatric AMS

Signs and Symptoms:

- Decreased Mental Status/Coma
- Bizarre Behavior
- Somnolence
- Diaphoresis/Dry, Red Skin
- Polyuria/Polydipsia
- Sweet/Fruity Breath
- Altered Respirations
- Signs of Trauma
- Fever

Differential Diagnosis:

- Head Trauma
- Stroke
- CNS Tumor/Mass/Bleed/Infection
- Thyroid Dysfunction
- Hyperglycemia/Hypoglycemia
- Diabetic Ketoacidosis
- Toxic Ingestion
- Environment (Hyperthermia/Hypothermia)
- Hypoxia
- Psychiatric Disorders
- Seizure Disorder
- Sepsis



Pearls:

- Be aware of Altered Mental Status (AMS) as a presentation of environmental exposure/toxins/hazmat–use personal protection accordingly/decontamination.
- **Recheck blood glucose after each intervention**.
- ***Oral glucose okay if patient alert, protecting airway, and solution available**. Proteins+complex carbs (e.g., sandwich, granola) are better, longer lasting glucose source than simple sugars.
- EKG should be obtained in all suspected toxin or diabetic ketoacidosis cases–evaluate for tall, peaked T-waves (hyperkalemia) or QRS widening >100ms (toxins).
- Glucagon may cause nausea/vomiting–should have anti-emetic prepared.

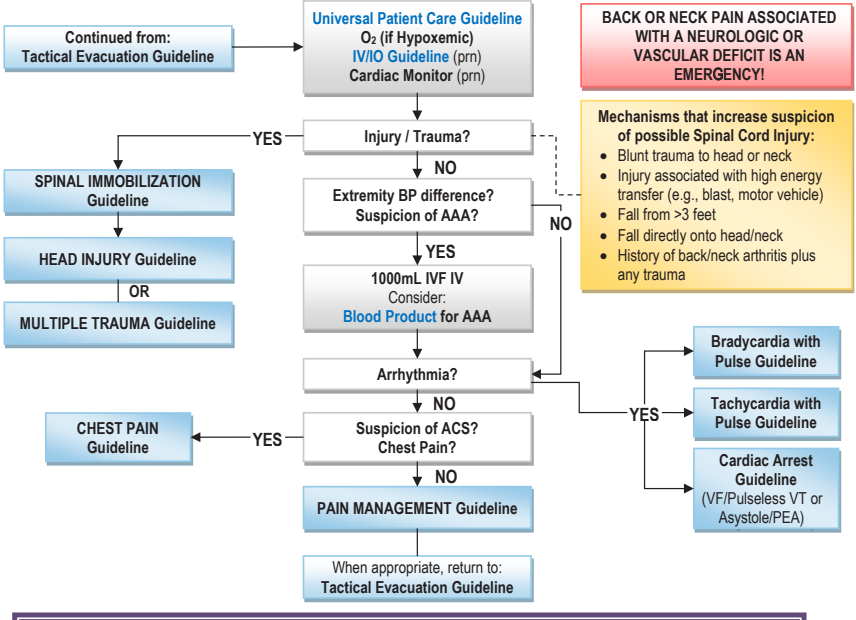
BACK and NECK PAIN

Signs and Symptoms:

- **Pain**
- **Swelling**
- **Pain with Motion**
- **Weakness/Numbness**
- **Bowel/Bladder Dysfunction**

Differential Diagnosis:

- **Muscle Spasm/Strain**
- **Degenerative Disc Disease**
- **Fracture**
- **Kidney Stone/Infection**
- **Abdominal Aortic Aneurysm**
- **Pneumonia/PE**
- **Cauda Equina Syndrome**
- **Tumor/Mass/Infection**
- ***Thoracic Pain:*** **Thoracic or abdominal aortic aneurysm**

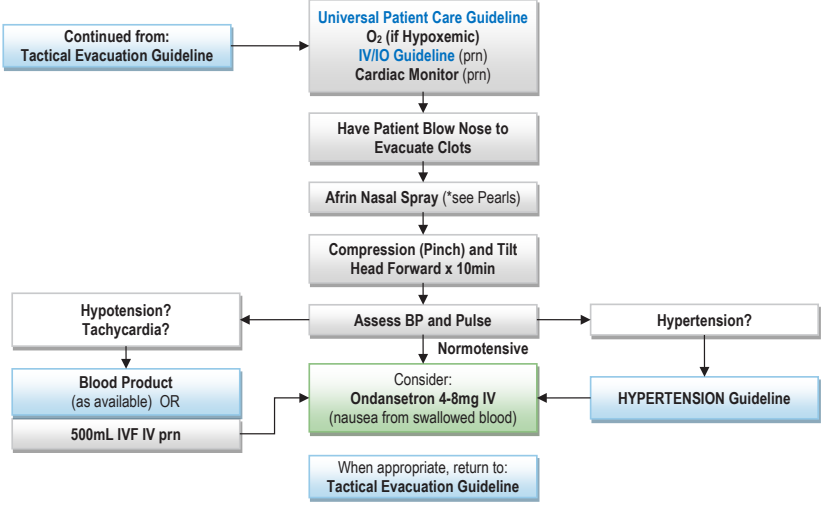


Pearls:

- Examine: mental status, HEENT, neck, chest, lungs, abdomen, back, extremities, neurologic.
- Abdominal aortic aneurysm is a concern in hypertensive/diabetic/>50yo populations–feel for pulsatile abdominal mass. Symptoms may mimic kidney stones.
- Patients with trauma/midline tenderness should be immobilized.
- Any bowel/bladder incontinence is significant and may represent a true surgical emergency (**Cauda Equina Syndrome**).

EPISTAXIS

Signs and Symptoms:	Differential Diagnosis:
• **Bleeding From One or Both Nares**	• **Trauma**
• **Pain**	• **Infection**
• **Nausea/Vomiting**	• **Allergic/Chemical Rhinitis**
• **Nasal Deformity**	• **Nose Picking**
	• **Lesions (Polyp, Ulcer)**
	• **Hypertension**
	• **Anticoagulant Therapy**
	• **Thrombocytopenia (ITP)**



Pearls:

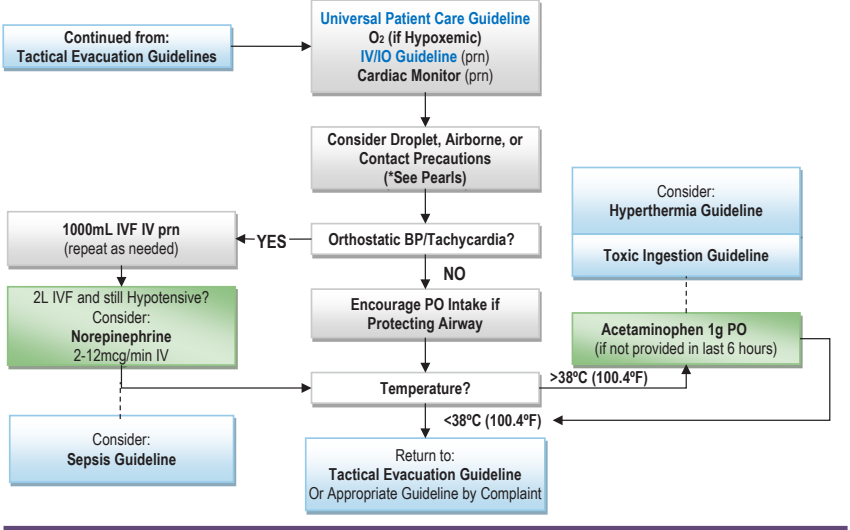
- ***Avoid Afrin in patients who have a diastolic blood pressure >110** or known coronary artery disease.
- It is better to overestimate the amount of blood lost with epistaxis.
- Anticoagulants including aspirin, ibuprofen, and even herbals (ginseng) can lead to increased bleeding.
- Firm pressure should be applied for compression. Pressure should not be applied over the bridge of the nose, but instead under the bony portion to effectively compress vessels. Do not release pressure prior to the 10 minutes mark to check bleeding.
- Hypertensive patients will often not stop bleeding until BP is controlled.
- Re-bleeding is common with epistaxis.

FEVER

Signs and Symptoms:
- **Warm**
- **Flushed**
- **Diaphoretic**
- **Chills**

Associated Symptoms:
- **Myalgias, Cough, Chest Pain, Headache, Dysuria, Abdominal Pain, Mental Status Change, Rash, Stiff Neck**

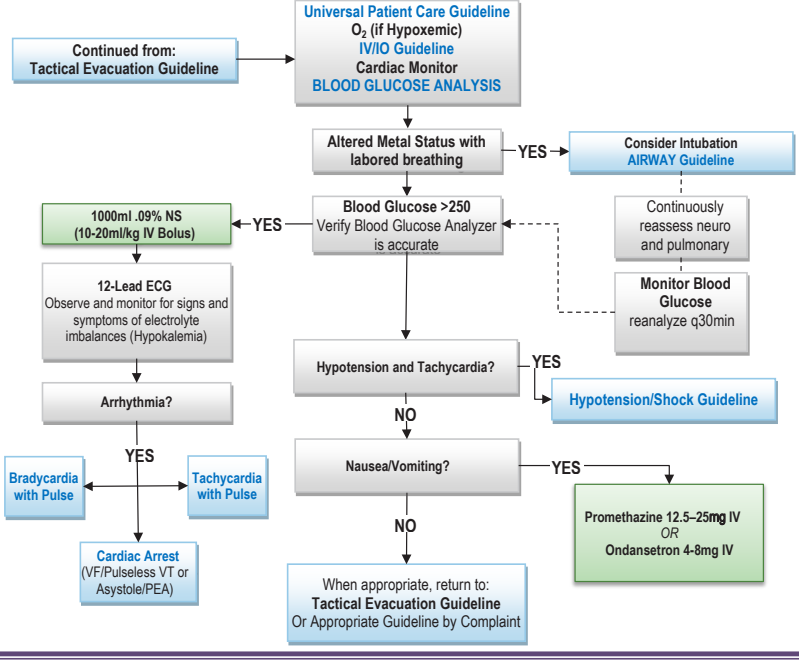
Differential Diagnosis:
- **Infection/Sepsis**
- **Cancer/Tumor/Lymphoma**
- **Medication/Drug Reaction**
- **Connective Tissue Diseases**
- **Hyperthyroidism**
- **Heat Stroke**
- **Meningitis**



Pearls:
- Fever may not be present in immunocompromised, elderly, or those on immunosuppressive drugs.
- All fever is not due to infection–evaluate for environmental/thyroid/toxic etiology.
- *Appropriate precautions should be used for personal protection when transporting patients with contagious disease:
  - Airborne: standard PPE plus N-95 mask and NRB or surgical mask on patient. Used for tuberculosis, measles, varicella, or other infections spread by droplets.
  - Droplet: standard surgical mask for provider and patient. Use with: influenza, meningitis, mumps, streptococcal pharyngitis.
  - Contact: standard PPE with strict hand-washing. (MRSA, scabies, varicella-zoster)
- It is better to use more PPE than is necessary.
- Acetaminophen may also be given PR if suppository form available and patient not tolerant of PO medications.

HYPERGLYCEMIA

Signs and Symptoms:	Differential Diagnosis:
• Polyuria • Polydipsia • Weakness, fatigue • Nausea, vomiting • Change in LOC • Hypotension • Tachycardia • Seizures, coma • Fruity Breath Odor	• DKA (Ketoacidosis) • Hyperosmolar Hyperglycemic Syndrome (HHS) • Head Trauma • Stroke • Hypo/Hyperthermia • Toxic Exposure



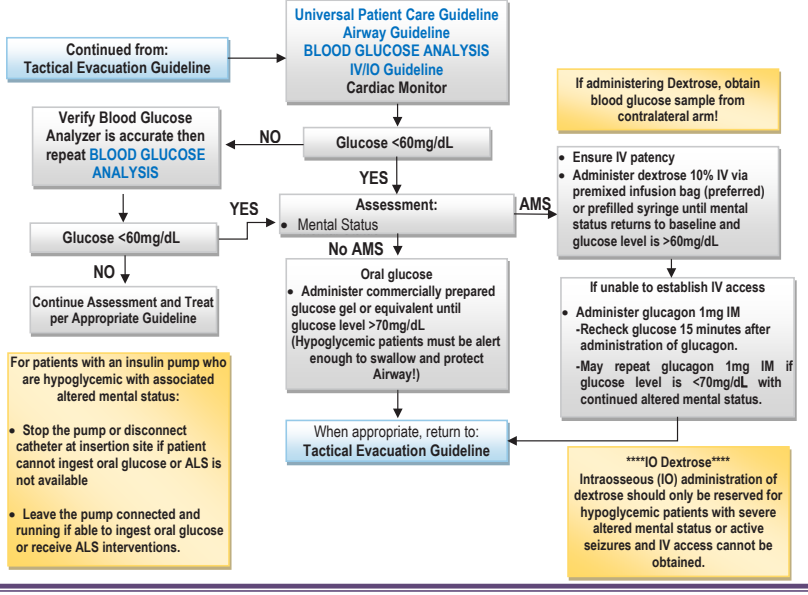
Pearls:

- If insulin is available, treat with low dose infusion, 0.1units/kg/h
- Too rapid drop in blood glucose can cause hypoglycemia.
- Rapid drop in blood glucose levels can lead to shifts extracellular osmolality which can lead to cerebral edema
- The most common electrolyte imbalance is hypokalemia.
- Identify and treat underlying cause (infection, trauma)

HYPOGLYCEMIA

Signs and Symptoms:
- Diaphoresis and pallor
- Neuroglycopenic manifestations/AMS
- Tremor
- Palpitations
- Anxiety

Differential Diagnosis:
- Environmental Exposure
- Postprandial syndrome
- CNS Dysfunction
- Toxic Ingestion
- Metabolic disorders



Pearls:
- There are no statistically significant differences in the median recovery time to a GCS score of 15 following administration of D10% versus D50%. D10% may benefit patients by decreasing the likelihood of post-treatment hyperglycemia and reducing the likelihood of extravasation injury.
- Sulfonylureas (e.g., glyburide, glipizide) have long half-lives ranging from 12–60 hours. Patients with corrected hypoglycemia who are taking these agents are at particular risk for recurrent symptoms and frequently require hospital admission.
- Hypoglycemia may be detrimental to patients at risk for cerebral ischemia, such as victims of stroke, cardiac arrest, and head trauma.
- Oral glucose equivalents include 3–4 glucose tablets, 4oz. fruit juice (e.g. orange juice), non-diet soda, 1T of pure maple syrup, sugar, or honey. Oral glucose okay if patient alert, protecting airway, and solution available. Proteins + complex carbs (e.g., sandwich, granola) are better, longer lasting glucose source than simple sugars.

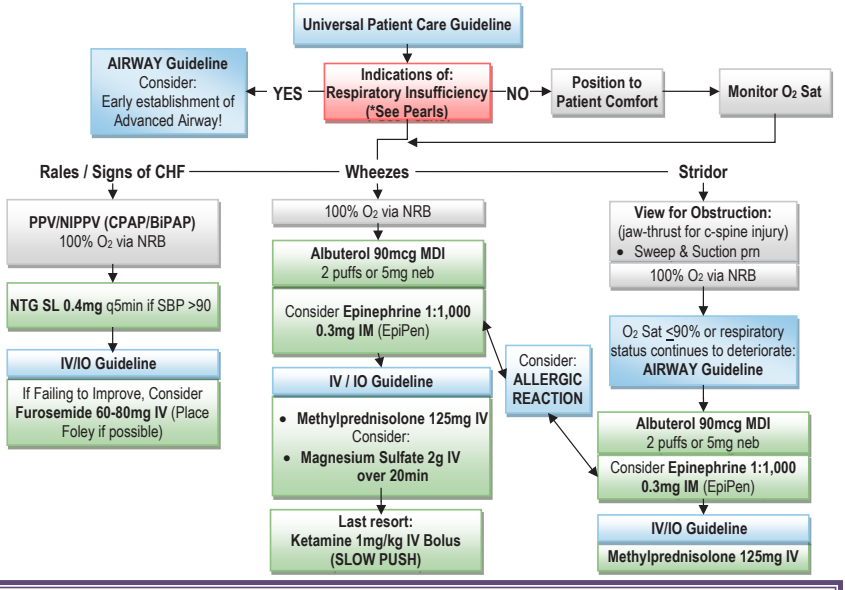
RESPIRATORY DISTRESS

Signs and Symptoms:

- **Shortness of Breath**
- **Pursed Lip Breathing**
- **Decreased Ability to Speak**
- **Tachypnea/Hyperpnea**
- **Wheezing/Rhonchi/Rales**
- **Use Accessory Muscles**
- **Fever/Cough**
- **Tachycardia**
- **Absent Breath Sounds (Emergent)**

Differential Diagnosis:

- **Asthma**
- **Anaphylaxis/Allergy**
- **Aspiration**
- **COPD**
- **Pleural Effusion**
- **Pneumonia**
- **Congestive Heart Failure/Cardiac**
- **Pulmonary Embolus**
- **Pneumothorax**
- **Pericardial Tamponade**
- **Hyperventilation**
- **Toxic Inhalation** (e.g., Cyanide, CO)

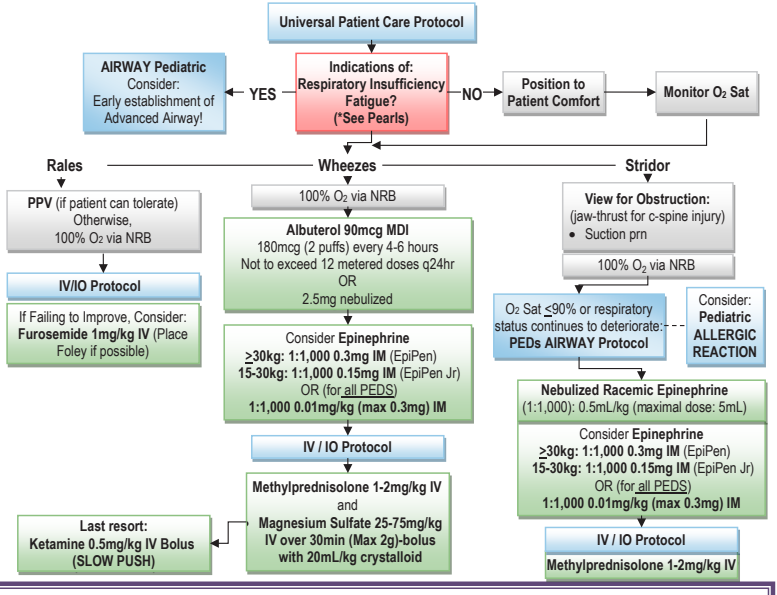


Pearls:

- **Signs of respiratory insufficiency**: Cyanosis, altered mental status/loss of consciousness, fatiguing, inability to speak, or inability to maintain O_2 sat >90% with supplemental O_2.
- Albuterol can be administered with spacer or short (6") section of ventilator tubing to increase delivery if patient unable to perform action appropriately. No max dose of albuterol, repeat as needed for continued wheezing.
- Lack of abnormal breath sounds does not always signify improvement. As respiratory status worsens, there may be inadequate air movement to produce these sounds.

PEDs RESPIRATORY DISTRESS

Signs and Symptoms:	Differential Diagnosis:
• **Shortness of Breath**	• **Asthma**
• **Tri-Pod Position**	• **Anaphylaxis/Allergy**
• **Pursed Lip Breathing**	• **Aspiration**
• **Decreased Ability to Speak**	• **Croup**
• **Tachypnea/Hyperpnea**	• **Pneumonia**
• **Wheezing/Rhonchi/Rales**	• **Epiglottitis**
• **Use Accessory Muscles**	• **Pneumothorax**
• **Fever/Cough**	• **Pericardial Tamponade**
• **Tachycardia**	• **Hyperventilation**
• **Absent Breath Sounds**	• **Toxic Inhalation** (e.g., Cyanide, CO)



Pearls:

- **Signs of respiratory insufficiency**: Cyanosis, altered mental status/loss of consciousness, fatiguing, inability to speak, or inability to maintain O_2 sat >94% with supplemental O_2.
- **Albuterol can be administered with spacer or short (6") section of ventilator tubing to increase delivery if patient unable to perform action appropriately. No max dose of albuterol, repeat as needed for continued wheezing.**
- Lack of abnormal breath sounds does not always signify improvement. As respiratory status worsens, there may be inadequate air movement to produce these sounds. In pediatric patients (especially infants), respiratory insufficiency may be the result of cardiac anatomical anomalies, in addition to standard causes. Peripheral cyanosis is a clue to this condition, and suspicion should be reported to accepting providers upon arrival.

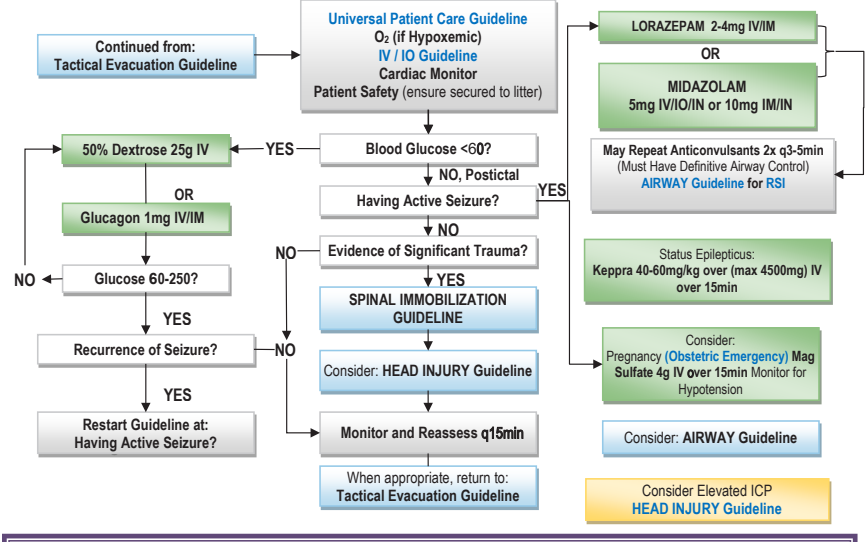
SEIZURE

Signs and Symptoms:

- **Decreased Mental Status**
- **Seizure Activity**
- **Somnolence**
- **Incontinence**
- **Evidence of Trauma**
- **Loss of Consciousness**
- **Oral Injuries (e.g., Tongue, Buccal)**

Differential Diagnosis:

- **CNS Trauma**
- **Tumor/Mass/Infection**
- **Metabolic**
- **Hypoxia**
- **Electrolyte Abnormality**
- **Drugs/Toxins**
- **Alcohol/Benzodiazepine Withdrawal**
- **Stroke**
- **Eclampsia**
- **Hyperthermia**
- **Hypoglycemia**



Pearls:

- Status epilepticus defined as seizure >15min or two or more continuous seizures without a period of consciousness/recovery. This is a real emergency requiring rapid airway control, treatment, and transport to the nearest suitable medical treatment facility.
- **Paralysis for airway control does not stop seizure activity**–only hides it. A seizure is a CNS electrical phenomenon and damage is still being done even when no muscular activity seen due to paralysis.
- Anticipate further seizure activity/recurrence and monitor continually.
- Assess probability of toxin, occult trauma, abuse, or substance use.
- Be prepared to assist with ventilations with the use of midazolam. If airway controlled and ventilating well – may give total of 4 doses of midazolam.
- In **pregnant patients, magnesium should be first line to abort non-epileptic seizures**. Midazolam should only be used if this fails (pregnancy class D).
- Adult alcohol withdrawal or malnutrition (Thiamine 100mg IV)

Pediatric SEIZURE

Signs and Symptoms:

- Decreased Mental Status
- Seizure Activity
- Somnolence
- Incontinence
- Evidence of Trauma
- Loss of Consciousness
- Oral Injuries (e.g., Tongue, Buccal)

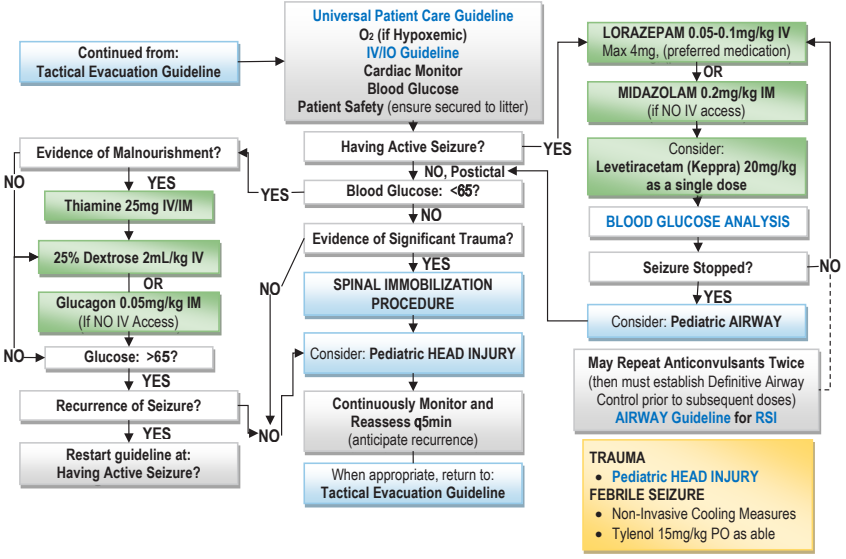
Differential Diagnosis by Age:

Less Than 3 Years Old:

- Trauma
- Fever
- Infection
- Birth Injury
- Drug/Toxin
- Metabolic: Hypoglycemia/Electrolyte Abnormality

More Than 3 Years Old:

- Trauma, Infection, Brain Degenerative Disease



Pearls:

- Status epilepticus defined as seizure >5min or two or more successive seizures without a period of consciousness/recovery. This is a true emergency requiring rapid treatment and transport to nearest suitable medical treatment facility. Ensure adequate airway control is established if medication is administered.
- **Paralysis for airway control does not stop seizure activity**–only hides it. Seizure is a CNS electrical phenomenon and damage is still being done even when no muscular activity seen due to paralysis.
- **Be prepared to assist with ventilations** with the use of Lorazepam/Midazolam. If airway controlled and ventilating well–may give total of 4 doses of Lorazepam.
- MAX DOSES:
  - LORAZEPAM = 4mg/dose, D25 = 25mL/dose, GLUCAGON = 1mg/dose

SEPSIS

History	Signs and Symptoms	Differential Diagnosis:
• **Fever** • **Previous infection** • **Recent surgery** • **Immunocompromised (transplant, HIV, diabetes, cancer, etc.)** • **Wound**	• **Altered Mental Status** • **Hyper or hypothermia** • **Chills** • **Myalgia** • **Rigors** • **Rash** • **Hyperglycemia** • **Decreased urine output**	• **Cardiogenic shock** • **Hypovolemic shock** • **CVA** • **MI** • **Acute renal failure** • **Hypoglycemia** • **Infection not meeting sepsis criteria**

Continued from:
Tactical Evacuation Guidelines

Universal Patient Care Guideline
O_2 (if Hypoxemic)
IV/IO Guideline prn
Cardiac Monitor prn
Check Blood Glucose

1000mL bolus NS or LR
Followed by assessment for pulmonary edema and check BP

Continue fluid resuscitation to target **MAP >65 or 30mL/kg**
STOP for pulmonary edema

Return to:
Tactical Evacuation Guideline
Or Appropriate Guideline by Complaint
Or Differential Diagnosis

Known possible source of infection (History)
AND
Any of the 2 of the following criteria:
- **Altered Mental Status (GCS ≤14)**
- **HR >90**
- **Temp >100.4°F or <96.8°F**
- **SBP <90**
- **RR >20**
- **$EtCO_2$ ≤25mmHg or $PaCO_2$ <32**

NO

YES

Consider:
Antibiotic Therapy

YES

SBP >90
MAP > 65

NO

IVF 100-200mL/hr
Reassess BP q30min
once MAP >65 for 15min
Continue to Monitor
Consider Foley

YES

SBP >90
MAP >65

NO

Norepinephrine 2-20mcg/min IV
Recheck BP, if MAP <65
Add vasopressin 0.03units/min
Recheck BP, if MAP <65
Add epinephrine 2-20mcg/min

Consider
Acetaminophen 1g PO, IV, or PR

Contact Medical Direction

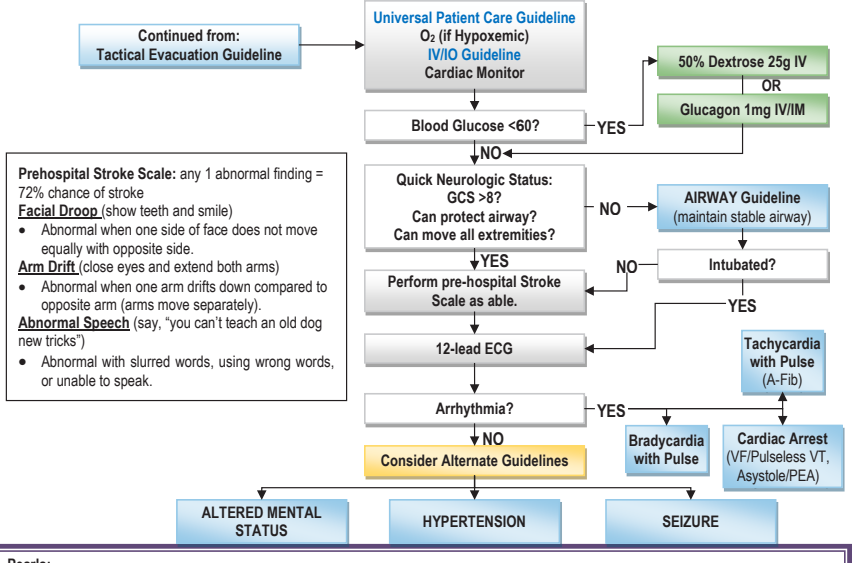
Consider if available:
Ceftriaxone 2g slow IV push or in 100cc NS flow to gravity (immunocompetent)
OR
Cefepime 2g IV in 100cc NS flow to gravity (immunocompromised)

Pearls:
- Early recognition of sepsis allows for attentive care, appropriate fluid resuscitation, vasoactive medications, and early administration of antibiotics.
- Utilize 6-8mL/kg tidal volumes if artificially ventilated.
- Record urine output if foley in place. Decreased urine output is an indicator of patient deterioration.
- Use vasopressin despite less than maximal norepinephrine. Consider adding it when titrating above 8-10mcg/min IV norepinephrine. Continue it once started and decrease norepinephrine to MAP goal.

SUSPECTED STROKE / TIA

Signs and Symptoms:
- **Altered Mental Status**
- **Weakness/Paralysis**
- **Blindness or Other Sensory Loss**
- **Aphasia/Dysarthria**
- **Syncope**
- **Vertigo/Dizziness**
- **Vomiting**
- **Headache**
- **Seizures**

Differential Diagnosis:
- **Transient Ischemic Attack**
- **Stroke**
- **Seizure**
- **Hypoglycemia**
- **CNS Infection/Mass**
- **Trauma**
- **Metabolic**



Prehospital Stroke Scale: any 1 abnormal finding = 72% chance of stroke

Facial Droop (show teeth and smile)
- Abnormal when one side of face does not move equally with opposite side.

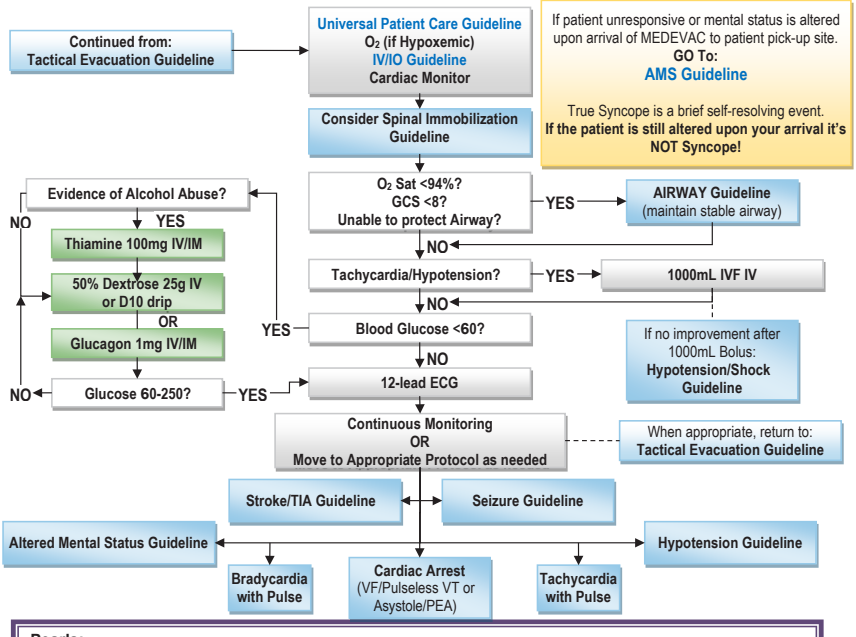
Arm Drift (close eyes and extend both arms)
- Abnormal when one arm drifts down compared to opposite arm (arms move separately).

Abnormal Speech (say, "you can't teach an old dog new tricks")
- Abnormal with slurred words, using wrong words, or unable to speak.

Pearls:
- Duration of symptoms should be determined as accurately as possible. Family members/colleagues can be helpful. If pt awaken with symptoms–onset time est. from last time patient was seen "normal."
- Be alert for airway problem/risk of aspiration. If concerned, request intubation before departure.
- Hypoglycemia can mimic stroke/TIA. May present with focal neurologic deficit, especially in the elderly.
- EKG should be obtained in all patients to evaluate for arrhythmia–especially atrial fibrillation.
- All TIAs should be transferred for evaluation, even if symptoms abated–these patients have a 10% risk of stroke within 30 days.
- **Aspirin should not be given to patients for suspected stroke.** Aspirin use is a contraindication to the use of thrombolytics for stroke.
- All strokes/TIAs are not associated with motor findings. Although uncommon, pure sensory strokes can occur. More frequently, very subtle motor abnormalities are present that the patient may not note.
- **Systolic greater than 185 or Diastolic greater than 110**: give Labetalol **10-20mg IV for 1-2 minutes**. May repeat 1 time.
- **Aim for no more than a 20% reduction in MAP. MAP = [(2xDiastolic)+Systolic]/3**
- For additional info see: ALS Acute Coronary Syndromes and Stroke.

SYNCOPE

Signs and Symptoms:	Differential Diagnosis:
• Loss of Consciousness with Recovery • Lightheadedness/Dizziness • Nausea/Vomiting • Palpitations/Chest Pain • Shortness of Breath • Decreased Pulse Pressure	• Vasovagal Episode • Orthostatic Hypotension • Cardiac Etiology • Psychiatric • Stroke • Hypoglycemia • Seizure • Shock • Toxicologic/Medication



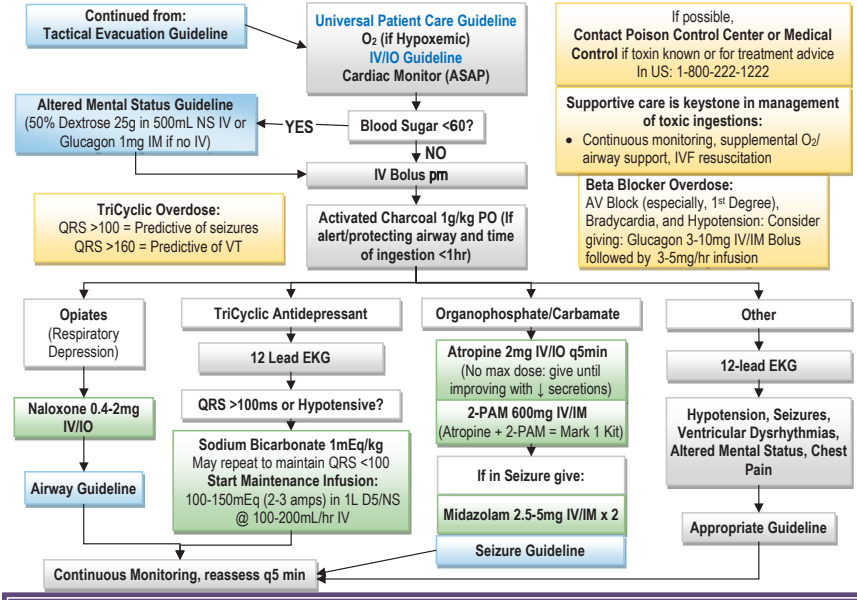
Pearls:

- Assess every patient for signs of trauma if suspected with syncopal event.
- Consider occult bleeding in all cases of syncope: GI bleeding, ruptured ectopic pregnancy, and seizure.
- Prodromal symptoms (e.g., flushing, lightheadedness, diaphoresis, tunnel vision) are often associated with more innocent etiologies, especially if temporally related to standing / rising. Absence of prodrome should raise concern for cardiac/CNS (emergent) etiologies.
- It is uncommon for stroke to cause syncopal episode.
- Patients who sustain trauma to the temporal region of the skull and are now lucid may experience a precipitous loss of consciousness/degeneration due to epidural hematoma.

TOXIC INGESTIONS

Signs and Symptoms:
- **Mental Status Changes**
- **Hypo/Hypertension**
- **Respiratory Depression**
- **Tachycardia/Arrhythmias**
- **Seizure**

Differential Diagnosis:
- **Cyclic Antidepressants**
- **Acetaminophen**
- **Depressants**
- **Stimulants**
- **Anticholinergic**
- **Cardiac Medications**
- **Solvents/Cleaners**
- **Organophosphate/Carbamate**
- **Medical Cause (hyperthyroidism)**

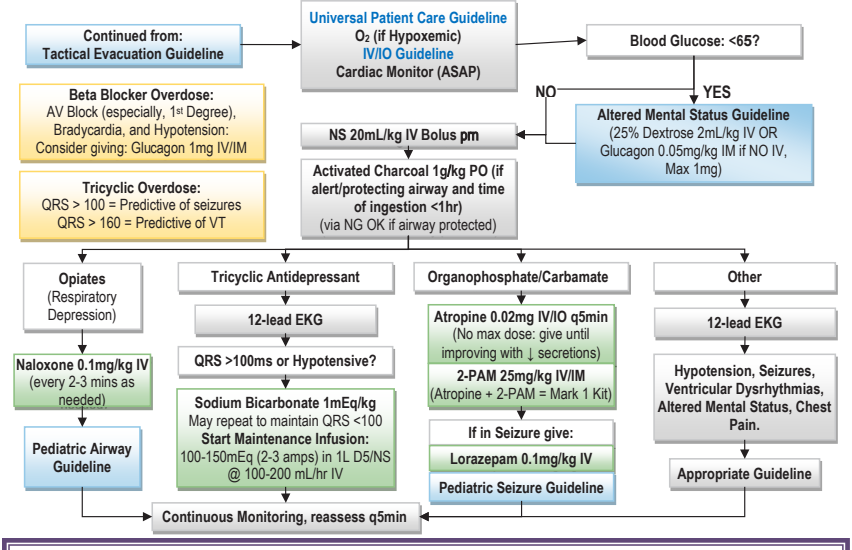


Pearls:
- **Anticholinergic**: Altered mental status (mad as a hatter), Hyperthermia (hot as a hare), mydriasis (blind as a bat), Flushing (red as a beet), anhidrosis (dry as a bone), Full Bladder (full as a flask).
  - Treat as with Tricyclic overdose pathway (including EKG and Sodium Bicarb for prolonged QRS and/or arrhythmias)
  - LORAZEPAM for agitation and seizures and Hyperthermia Guideline if hyperthermic
- **Beta Blocker**: Hypoglycemia.
- **Calcium Channel Blocker:** HypERglycemia.
- **Cyclic Antidepressant:** Hypotension, depressed mental status, respiratory depression, cardiac arrhythmias.
- **Opioid:** Depressed mental status, pinpoint pupils, N/V, respiratory depression, hypotension possible.
- **Organophosphate/Carbamate (Cholinergic):** Salivation, lacrimation, urination, diarrhea, emesis, altered mental status.
- **Sympathomimetic/Stimulant (Methamphetamine/Cocaine)**: Altered mental status, tachycardia, diaphoresis, mydriasis, and hyperthermia. Treat with Benzodiazepine (LORAZEPAM) and prn cooling or Hyperthermia Guideline.

Pediatric TOXIC INGESTIONS

Signs and Symptoms:
- Mental Status Changes
- Hypo/Hypertension
- Respiratory Depression
- Tachycardia/Arrhythmias
- Seizure

Differential Diagnosis:
- Cyclic Antidepressants
- Acetaminophen
- Depressants
- Stimulants
- Anticholinergic
- Cardiac Medications
- Solvents/Cleaners
- Organophosphates/Carbamate
- Medical Cause (hyperthyroidism)



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VOMITING & DIARRHEA

Signs and Symptoms:

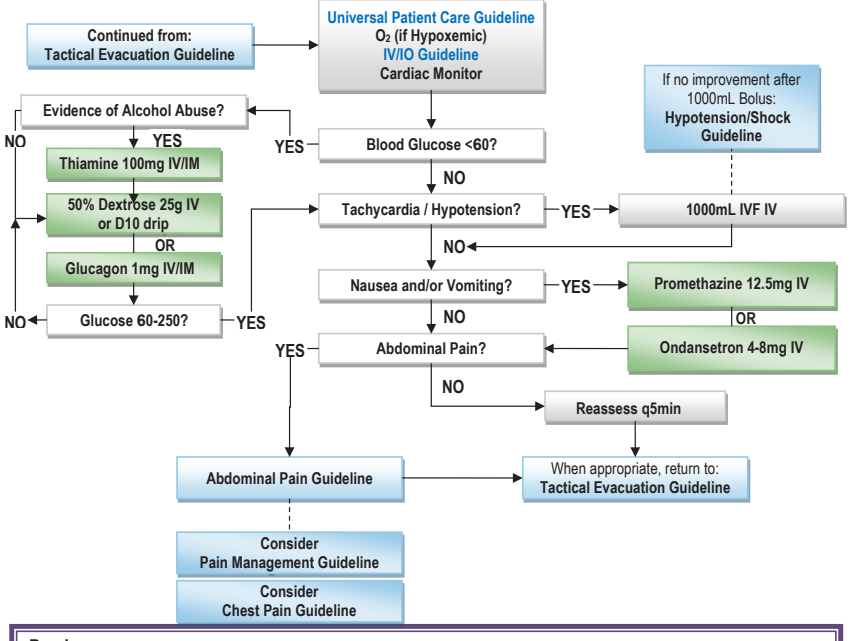
- Pain
- Abdominal Distention
- Constipation
- Diarrhea
- Anorexia

Associated Symptoms:

Fever, Headache, Weakness, Malaise, Myalgia, Cough, Dysuria, Mental Status Changes, Rash

Differential Diagnosis:

- CNS Injury/Mass/Infection
- Myocardial Infarction
- Drugs/Toxins
- Bowel Obstruction
- Diabetic Ketoacidosis
- Pregnancy
- Infections
- Gastroenteritis
- Food Borne / Toxic
- Psychologic
- Appendicitis



Pearls:

- Suspicion of other underlying condition should prompt immediate referral to appropriate protocol.
- In pregnant patients with nausea/vomiting – can substitute D5 1/2NS or D5NS in place of NS.
- Fluid of choice for vomiting is NS. Fluid of choice for diarrhea is LR.
- Continually monitor for any decompensation.

Pediatric VOMITING & DIARRHEA

Signs and Symptoms:

- Pain
- Abdominal Distention
- Constipation
- Diarrhea
- Anorexia

Associated Symptoms:

Fever, Headache, Weakness, Malaise, Myalgia, Cough, Dysuria, Mental Status Changes, Rash

Differential Diagnosis:

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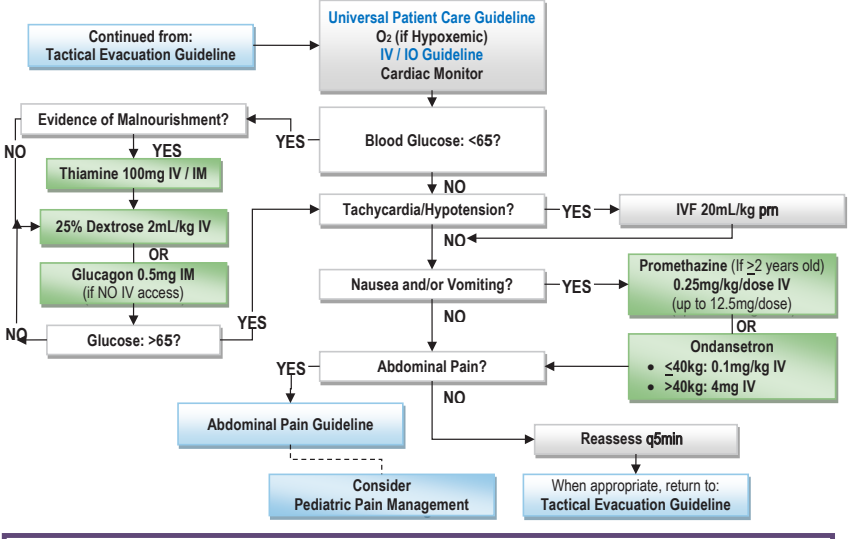
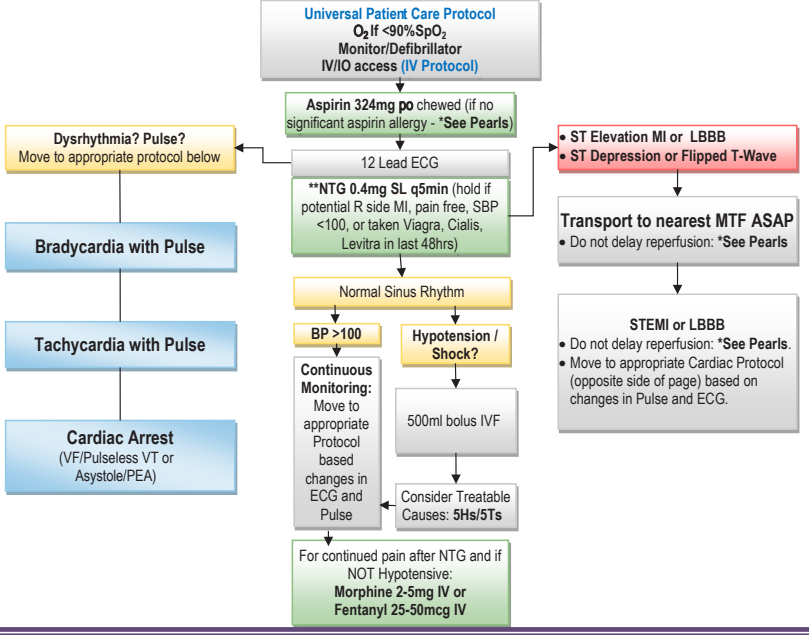


Pearls:

- Suspicion of other underlying condition should prompt immediate referral to appropriate guideline.
- Continually monitor for any decompensation.

CHEST PAIN

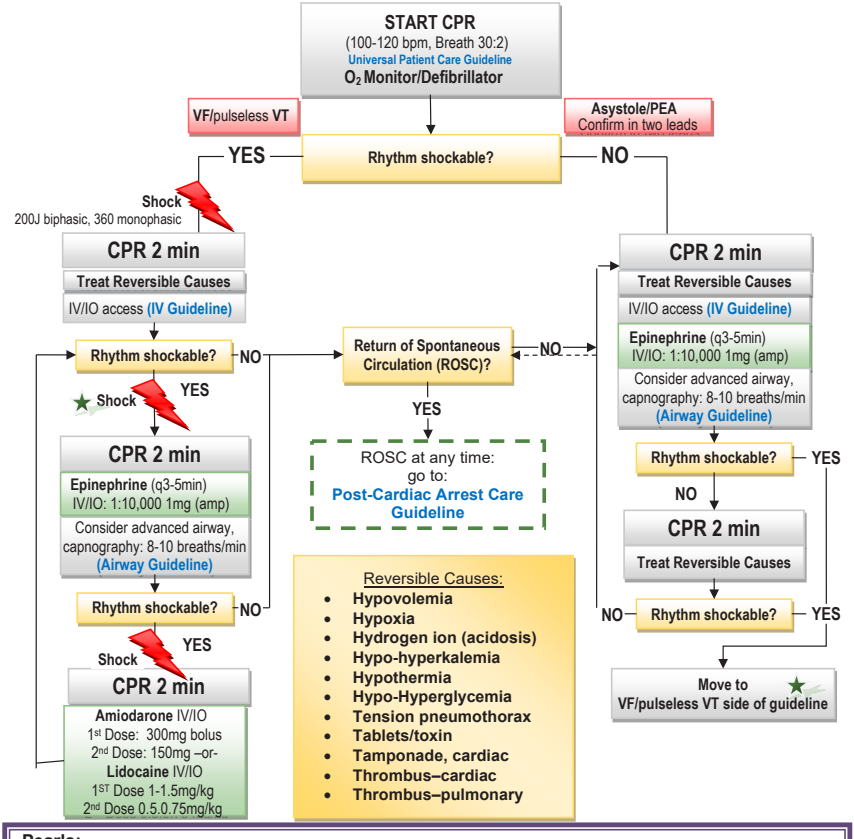
Signs and Symptoms:	Differential Diagnosis:	Differential Diagnosis:
• **Chest Pain**	• **Angina**	• **Aortic Dissection/Aneurysm**
• **Radiation of Pain**	• **Acute MI**	• **GERD**
• **Location of Pain**	• **Pericarditis**	• **Esophageal Spasm**
• **Pale/Diaphoretic/Lightheaded**	• **Pulmonary Embolism**	• **Esophageal perforation**
• **Nausea/Vomiting**	• **Asthma/COPD**	• **Chest Wall Injury/Pain**
• **Shortness of Breath**	• **Pneumothorax**	



Pearls:

- **Aspirin** should be held only for patients with known significant allergy.
- Patients with suspected AMI should be transferred to the nearest MTF for further treatment/thrombolytics.
- **With right sided MI (ST Elevations in leads II, III, AvF), NTG may cause hypotension so use with caution. Add small fluid boluses for low BP.
- Ensure that you have IV access before giving SL NTG.
- **Hold Morphine or Fentanyl for SBP <90**.
- Max dose Morphine 20mg, Fentanyl 200mcg for non-traumatic chest pain (higher doses may be required for trauma, see Pain Control algorithm).

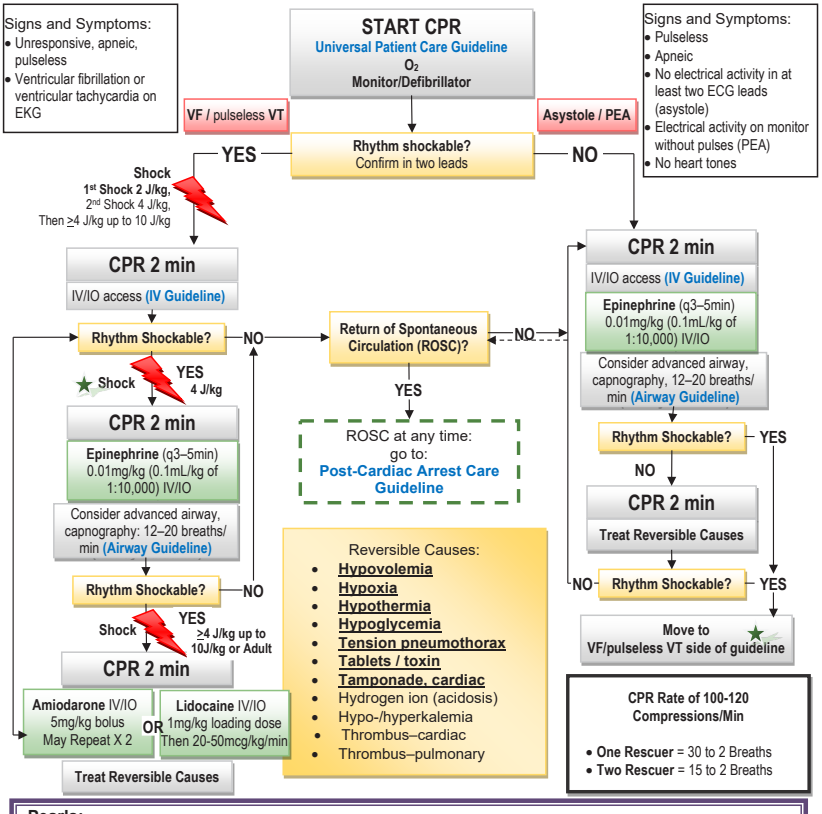
CARDIAC ARREST



Pearls:

- Reversible causes should be addressed as soon as possible.
- Consider discontinuation of efforts if:
  - Asystole following trauma–especially blunt.
  - Prolonged downtimes >15min.
  - Prolonged code with no response >3 rounds of medications, 30min of resuscitation.
  - **All patients should get a glucose check, at least 1L fluid bolus, and ultimately bilateral needle decompression (especially in Trauma) before discontinuation of efforts.**
  - Should take at least 1min to check for pulse in hypothermic patients.

PEDIATRIC CARDIAC ARREST



Pearls:

- **CPR Rate of 100–120/min 2 inches depth for children and 1 1/2 inches depth for infants of chest with complete chest recoil**
- Reversible causes should be addressed as soon as possible.
- Epinephrine Endotracheal Dose: 0.1 mg/kg (0.1mL/kg of 1:1,000 vial)
- Consider discontinuation of efforts if:
  - Asystole following trauma–especially blunt
  - Prolonged downtimes >15min
  - Prolonged code with no response >3 rounds of medications, 30min of resuscitation
  - **All patients should get a glucose check, at least 20ml/kg fluid bolus of NS, and ultimately bilateral needle decompression (Trauma) before discontinuation of efforts**

PEDIATRIC ALS and BLS INDICATORS

Indicators of Potential Need for Cardiopulmonary Support

- **Breathing**
  - Irregular Respirations or >60 breaths/min
  - Labored Breathing (Retractions, Nasal Flaring, Grunting, Pursing of Lips, Tripod Positioning, ↓Ability to Speak)
- **Heart Rate Ranges** (especially if associated with poor perfusion)
  - ≤2 Years Old: <80/min or >180/min
  - >2 Years Old: <60/min or >160/min
- **Poor Perfusion with Weak or Absent Distal Pulses**
  - Cyanosis
  - ↓O_2 Sat
- **Altered Mental Status**
  - GCS <8, Weak Cry, Unusual Irritability, Altered Responsiveness, Lethargy, or Failure to Respond to Painful Stimulus
- **Seizures, Fever with Petechiae, Trauma, and/or Burns >10% Body Surface Area**

IOT Prevent Cardiac Arrest You Must Detect and Treat:
Respiratory Failure / Respiratory Arrest / Shock
Pediatric Cardiac Arrest Results from Deterioration in Respiratory or Cardiac Function!

Heart Rate/Min

Age	Awake Rate	Mean	Sleeping Rate
Newborn to 3mo	85-205	140	80-160
3mo - 2y	100-190	130	75-160
2 - 10y	60-140	80	60-90
>10y	60-100	75	50-90

Blood Pressure	Average	Lower Limit
1-10y	90+(years oldx2)mmHg	70+(years oldx2)mmHg
>10y		90mmHg
MAP	55+(years oldx1.5)mmHg	

Respiratory Rate/Min

Age	Rate
Infant	30-60
Toddler	24-40
Preschool	22-34
School	18-30
Adolescent	12-16

Universal Patient Care
O_2 (100% FiO_2)
Monitor / Defibrillator
IV/IO access (IV Protocol)

Rescue Breathing Ventilation Rate Without Advanced Airway:
- **NEWBORN** = 40–60/min when performed without compressions
- **Infant / Child** = 1 breath/3–5 seconds

CPR Rate of 100 Compressions / Min at:
- **One Rescuer** = 30 Compressions and 2 Breaths
- **Two Rescuer** = 15 Compressions and 2 Breaths

Unresponsive, Not Breathing or ALS Indicators

Check Pulse (up to 10 sec)

DEFINITE Pulse
- GIVE: 1 breath every 3–5 seconds
- Ensure adequate oxygenation & ventilations
- Recheck pulse every 2 minutes
  - Add compressions if pulse <60/min despite O_2 and ventilation
  - Move to appropriate guideline

Rapid Pulse with good perfusion?
→ **PEDs Tachycardia with Pulse & Adequate Perfusion**

Rapid Pulse with poor perfusion despite O_2 and ventilation?
→ **PEDs Tachycardia with Pulse & Poor Perfusion**

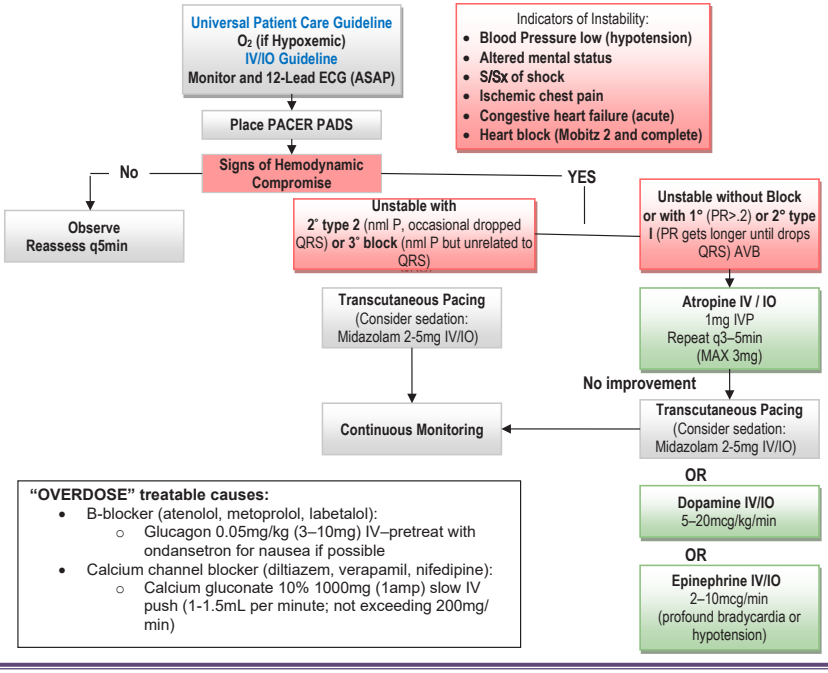
Pulse <60/min with poor perfusion despite O_2 and ventilation?
→ **Begin CPR and move to appropriate protocol**
→ **PEDs Bradycardia with Pulse & Poor Perfusion**

No Pulse?
→ **Begin CPR and move to appropriate protocol**
→ **Pediatric Cardiac Arrest**

BRADYCARDIA with PULSE

Signs and Symptoms:
- HR <50bpm
- Chest Pain
- Respiratory Distress
- Hypotension/Shock
- Altered Mentation
- Syncope

Differential Diagnosis:
- Acute MI
- Hypoxia
- Hypothermia
- Sinus Bradycardia
- Physiologic Bradycardia (Athletes)
- Stroke
- Spinal Cord Lesion
- Toxin/Medications (B-blockers)
- AV Block/Sick Sinus Syndrome



"OVERDOSE" treatable causes:
- B-blocker (atenolol, metoprolol, labetalol):
  - Glucagon 0.05mg/kg (3–10mg) IV–pretreat with ondansetron for nausea if possible
- Calcium channel blocker (diltiazem, verapamil, nifedipine):
  - Calcium gluconate 10% 1000mg (1amp) slow IV push (1-1.5mL per minute; not exceeding 200mg/min)

Pearls:
- Decompensation at any time (e.g., altered MS, hypotension) should prompt treatment as unstable patient.
- All bradycardic patients should have pacer pads in place after initial evaluation.
- Epinephrine infusion for refractory bradycardia: 2–10mcg/min or 0.1–0.5mcg/kg/minute (7–35mcg/min in a 70kg patient)
  - 1mg 1:10,000 in 250mL D5W/NS = 4mcg/mL concentration
- Evaluate for treatable causes of bradycardia (B–blockade, Ca Channel blockade).

PEDIATRIC BRADYCARDIA with Pulse and Poor Perfusion

Typical HR/min

- Newborn 85–205
- 3mo–2y/o 100–190
- 2y/o–10y/o 60–140
- >10 y/o 60–100

Typical Sinus Tachycardia Rates

- **Infants <220/min**
- **Children <180/min**

Indicators of CARDIOPULMONARY COMPROMISE

- **Hypotension**
  - 1-10 y/o lower limit = 70+(years oldx2)mmHg
  - >10 y/o lower limit = 90mmHg
- **Acutely Altered Mental Status**
  - GCS <8, Weak Cry, Unusual Irritability, Altered Responsiveness, Lethargy, or Failure to Respond to Painful Stimulus
- **Signs of Shock**

Identify and Treat Underlying Cause!
Continue:
Universal Patient Care Guideline

- **Maintain Airway/Assisted Breathing**
- **O_2** (Titrate to 94-99% SpO_2)
- **IV/IO access (IV Guideline)**
- **Monitor and 12-Lead ECG (ASAP)**
- **Check Glucose**

Rescue Breathing Ventilation Rate Without Advanced Airway:

- **NEWBORN** = 40-60/min when performed without compressions
- **Infant / Child** = 1 breath/3–5 seconds

CPR Rate of 100 Compressions / Min at:

- **One Rescuer** = 30 Compressions and 2 Breaths
- **Two Rescuer** = 15 Compressions and 2 Breaths

Cardiopulmonary Compromise Continues?

YES → **CPR if HR <60/min** with Poor Perfusion despite O_2 and Ventilation

NO →

- **Support ABCs**
- **Continue O_2**
- **Continuous Monitoring**
- **Consider Consultation**

Bradycardia Persists?

NO → (Support ABCs / Continue O_2 / Continuous Monitoring / Consider Consultation)

YES →

Epinephrine 1:10,000
0.01mg/kg IV/IO q3-5min

Atropine
0.02mg/kg IV/IO
(Increased Vagal Tone or Primary AV Block)
May Repeat Once
(Minimum dose 0.1mg Max Single dose 0.5mg)

Consider:
Transcutaneous Pacing
(Consider sedation: Midazolam 0.05-0.1mg/kg IV/IO)

Treat Underlying Causes

- **Support ABCs**
- **Continue O_2**
- **Continuous Monitoring**
- **Consider Consultation**

Check Pulse every 2 minutes during CPR

If Pulse is lost, GO TO:
PEDIATRIC CARDIAC ARREST

Treatable causes:

- **Check & Treat compromise in ABCs**
- **Hypoglycemia**
  - D25 2mL/kg slow IV (max 25mL)
  - Glucagon 0.025mg/kg IM (max 1mg)
- **Tension Pneumothorax**
  "OVERDOSE (Mothers Milk)**":**
- **B-blocker** (atenolol, metoprolol, labetalol):
  - Glucagon 0.05mg/kg (3–10mg) IV – **pretreat with ondansetron (0.15mg/kg** – max 2mg) for nausea if possible
- **Calcium channel blocker** (dilitiazem, verapamil, nifedipine)
  - Calcium chloride 10% 0.2ml/kg slow IV push
- **Narcotic**
  - Naloxone 0.1mg/kg IV/IM (max 2mg) q2-3min prn

Pearls:

- Decompensation at any time (e.g., altered MS, hypotension) should prompt treatment as unstable patient.
- All bradycardic patients should have pacer pads in place after initial evaluation.
- Evaluate for treatable causes of bradycardia (B-blockade, Ca channel blockade).
- The majority of pediatric cardiac problems are actually airway problems.
- In young, breast fed patients–evaluate for mother's medications as they can cause toxicity in the infant.
- Pediatric pacer pads should be used if available. If only adult pads are obtainable–they should be placed in the anterior-posterior position.

TACHYCARDIA w/PULSE

Signs and Symptoms:
- **Ventricular Tachycardia on EKG (rate typically ≥150/min)**
- **Conscious, Rapid Pulse**
- **Chest Pain/Shortness of Breath**
- **Palpitations**
- **Dizziness**
- **Anxiety**

Differential Diagnosis (*Wide Complex QRS >.12sec*):
- **Artifact/Device Failure**
- **Cardiac**
- **Endocrine/Metabolic**
- **Hyperkalemia**
- **Drugs**
- **Pulmonary**

Differential Diagnosis (*Narrow QRS*):
- **Wolf–Parkinson–White Syndrome**
- **Valvular Heart Disease**
- **Sick Sinus Syndrome**
- **Myocardial Infarction**
- **Electrolyte Imbalance**
- **Sinus Tachycardia/Atrial Flutter**
- **Hypoxia**
- **Drug Overdose/Toxin**
- **Hyperthyroidism**

Universal Patient Care Guideline
O_2 (if Hypoxemic)
IV/IO Guideline
Monitor and 12–lead ECG (ASAP)

METOPROLOL
5mg IV q5min X 3
Hold if SBP <100, P <60

DILTIAZEM
20mg (0.25mg/kg) IV over 2min. If no hypotension, after 15min repeat at 25mg (0.35mg/kg)

ADENOSINE
- 1st Dose: 6mg rapid IV push: followed by NS Flush
- 2nd Dose: 12mg

Chest Pain / SOB / Dizziness?

YES → **Chest Pain Guideline**

NO → **Observe Reassess q5min**

"Sinus Tach"

YES → **STABLE**

NO → **QRS Width?** No unstable signs / symptoms, No "Sinus Tach"

UNSTABLE: Signs / Symptoms of:
- BP Low (hypotension)
- Altered mental status
- Signs/symptoms of shock
- Ischemic chest pain
- Congestive heart failure (acute)

***Synchronized Cardioversion:**
- Narrow Irregular, A-Fib
- Narrow Regular, SVT, Atrial Flutter
- Wide Regular, Stable Monomorphic VT

Consider Sedation: Midazolam 2–5mg IV/IO

QRS Width?

Regular → **Narrow QRS? ≤0.12 Second**

- **Vagal Maneuvers:** Blow through 18ga IV catheter, carotid massage, bear down.
- **ADENOSINE: use for Regular Rhythm ONLY!**
- **DILTIAZEM**
- **METOPROLOL**

Irregular → **Narrow QRS? ≤0.12 Second**
- **DILTIAZEM**
- **METOPROLOL**

***Synchronized Cardioversion:**
- Narrow Irregular, A-Fib
- Narrow Regular, SVT, Atrial Flutter

Consider Sedation: Midazolam 2–5mg IV/IO

Regular → **Wide QRS? >0.12 Second**

Consider:
- **AMIODARONE**

Irregular → **Wide QRS? >0.12 Second**

Consider:
- **Torsades
- A-Fib with/or Wolff-Parkinson-White (look for a delta wave)
- Procainamide 20-50mg/min until arrhythmia suppression, hypotension, QRS widens by >50%, or total dose 17mg/kg reached

If refractory or becomes unstable at any time!

AMIODARONE
Stable Wide-QRS Tachy
- 1st Dose: 150mg IV over 10min
- Repeat prn if VT recurs
- Maintenance infusion: 1mg/min for 1st 6hr

All Pathways End with Continuous Monitoring

***Synchronized Cardioversion**
(Increase Js per manufacture's recommendation)

Narrow Irregular, Atrial Fibrillation:
- 120–200 J biphasic

Narrow Regular, Other SVT, Atrial Flutter:
- 50–100 J, increase in stepwise fashion

Wide Regular, Stable Monomorphic VT:
- 100 J, increase in stepwise fashion

Wide Irregular:
- Defibrillate (NOT Synchronized)
- Go to: **Cardiac Arrest Guideline**

Pearls:
- ****Torsades de Pointes** may benefit from early use of **Magnesium**: 1–2 grams IV over 60 min (mix in 50ml D5W) Start drip of 0.5–1g/hr and titrate to effect.
- If hyperkalemia suspected (end-stage renal disease, dialysis)–administer Ca Chloride through central access or Ca Gluconate through peripheral IV.
- All patients should be warned of discomfort/feeling of heart stopping prior to adenosine administration.

PEDIATRIC TACHYCARDIA with Pulse and Adequate Perfusion

Typical HR/min

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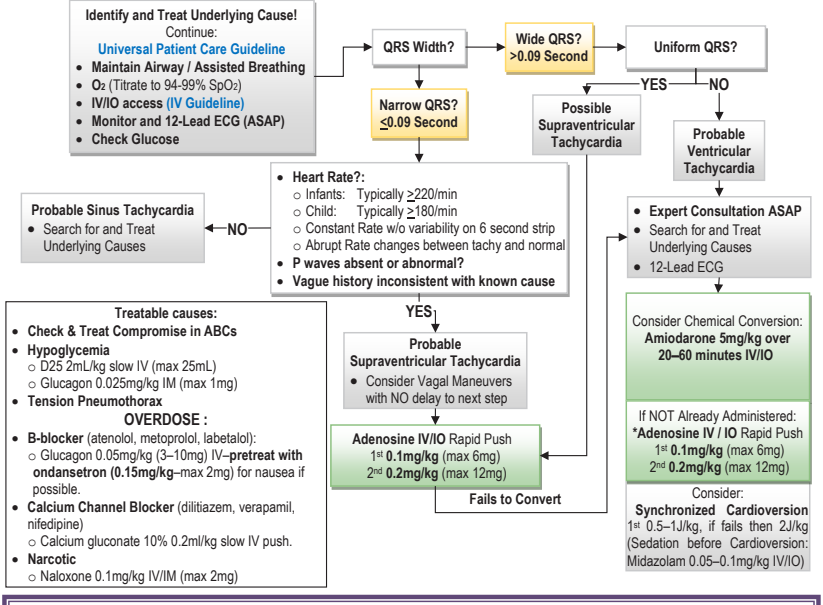


Pearls:

- **Vagal maneuvers:** blow through 18ga IV catheter, ice pack on forehead, carotid massage (unilateral only – listen for bruits prior to performing), or having patient blow against closed glottis ("bear down").
- ***Adenosine should be as central as possible with the "2 syringe technique" – one with adenosine and the other with the saline flush. These should be attached to a 2 port IV adapter and flush should immediately follow drug.**
- ***Adenosine should be utilized in monomorphic and regular R-R interval type presentation.**
- All patients should be warned of discomfort/feeling of heart stopping before adenosine administration.

PEDIATRIC TACHYCARDIA with Pulse and Poor Perfusion

Typical HR/min

- Newborn 85–205
- 3mth–2y/o 100–190
- 2y/o–10y/o 60–140
- >10 y/o 60–100

Typical Sinus Tachycardia Rates

- **Infants <220/min**
- **Children <180/min**

Indicators of CARDIOPULMONARY COMPROMISE

- **Hypotension**
  - 1–10y/o lower limit = 70+(years old X 2)mmHg
  - >10y/o lower limit = 90mmHg
- **Acutely Altered Mental Status**
  - GCS <8, Weak Cry, Unusual Irritability, Altered Responsiveness, Lethargy, or Failure to respond to painful stimulus
- **Signs of Shock**

Identify and Treat Underlying Cause!
Continue:
Universal Patient Care Guideline

- **Maintain Airway / Assisted Breathing**
- **O_2** (Titrate to 94-99% SpO_2)
- **IV / IO access (IV Guideline)**
- **Monitor and 12-Lead ECG (ASAP)**
- **Check Glucose**

QRS Width?

Wide QRS? >0.09 Second → **Possible Ventricular Tachycardia** → **Cardiopulmonary Compromise?**

- **YES** → **Adenosine IV/IO** Rapid Push
  1st **0.1mg/kg** (max 6mg)
  2nd **0.2mg/kg** (max 12mg)
  If no IV/IO access or adenosine fails
  Synchronized Cardioversion
  1st 0.5-1J/kg, if fails then 2J/kg
  (Sedation w/o delay to Cardioversion: Midazolam 0.05-0.1mg/kg IV/IO)
- **NO** → If Regular Rhythm (R-R) and QRS Monomorphic:
  Adenosine IV / IO Rapid Push
  1st **0.1mg/kg** (max 6mg)
  2nd **0.2mg/kg** (max 12mg)
  → **Amiodarone 5mg/kg over 20-60 minutes IV/IO**
  OR
  Procainamide 15mg/kg over 30–60 minutes

Narrow QRS? ≤0.09 Second

- **Heart Rate?:**
  - Infants: Typically ≥220/min
  - Child: Typically ≥180/min
  - Constant Rate w/o variability on 6 second strip
  - Abrupt Rate changes between tachy and normal
- **P waves absent or abnormal?**
- **Vague history inconsistent with known cause**

- **NO** → **Probable Sinus Tachycardia**
  - Search for and Treat Underlying Causes
- **YES** → **Probable Supraventricular Tachycardia**
  - Consider Vagal Maneuvers with NO delay to next step

Treatable causes:

- **Check & Treat compromise in ABCs**
- **Hypoglycemia**
  - D25 2mL/kg slow IV (max 25mL)
  - Glucagon 0.025mg/kg IM (max 1mg)
- **Tension Pneumothorax**

OVERDOSE (Breastfeeding Mother):

- **B-blocker** (atenolol, metoprolol, labetalol):
  - Glucagon 0.05mg/kg (3-10mg) IV – **pretreat with ondansetron (0.15mg/kg** – max 2mg) for nausea if possible
- **Calcium channel blocker** (dilitiazem, verapamil, nifedipine)
  - Calcium chloride 10% 0.2ml/kg slow IV push
- **Narcotic**
  - Naloxone 0.1mg/kg IV/IM (max 2mg)

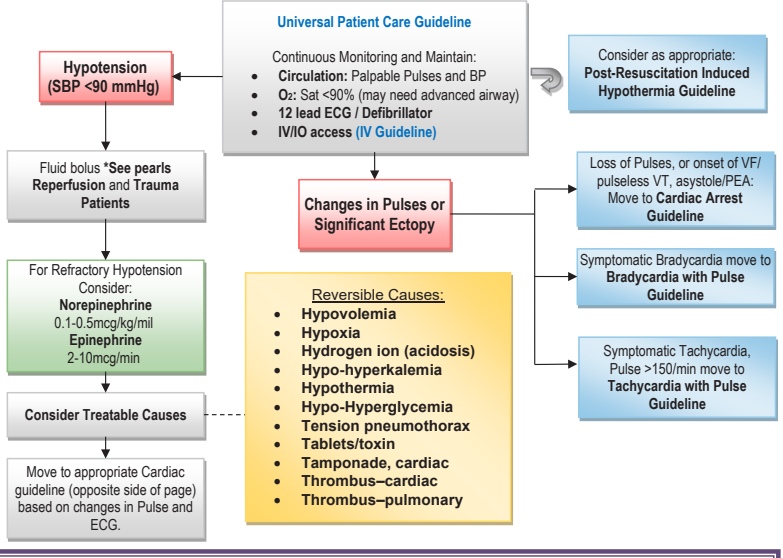
Pearls:

- **Vagal maneuvers:** blow through 18ga IV catheter, ice pack on forehead, carotid massage (unilateral only–listen for bruits prior to performing), or having patient blow against closed glottis ("bear down").
- **Adenosine should be given with the "2 syringe technique" – one with adenosine and the other with the saline flush. These should be attached to a 2 port IV adapter and flush should immediately follow drug.**
- All patients should be warned of discomfort/feeling of heart stopping before adenosine administration.

POST-CARDIAC ARREST CARE

Signs and Symptoms:
- **Return of Spontaneous Circulation**
- **Pulse**
- **Respirations**

Differential Diagnosis:
- **Continually Address Primary Pathology Associated with Arrest**



Pearls:
- Hyperventilation may cause hypotension and/or recurrence of cardiac arrest in the post-resuscitation phase and must be avoided.
- Most patients will require ventilator assistance in the post-resuscitative phase.
- In non-airway controlled patients, it is important to prevent aspiration following resuscitation. For this reason, patients should be rotated onto their side (non-spinal immobilization) or be closely monitored in case vomiting occurs.
- ***Reperfusion:** 1-2L IVF and consider use of a pressor IV/IO **Drip** – **EPINEPHRINE 2–10mcg/min** or **NOREPINEPHRINE 0.1–0.5mcg/kg/min: 70kg adult: 7–35mcg/min**.
  - **Dopamine should be started at a low dose (5mcg/kg/min)** and titrated up to maintain a SBP >90. The same applies norepinephrine.
- ***Trauma patients** post-resuscitation should have fluid resuscitation consistent with hypotensive resuscitation guidelines. Maintain body core temperature 32-36 degrees C for at least 24 hours

HYPERTENSION

Signs and Symptoms of ***Hypertensive Crisis w/ end organ damage.***

One of These:

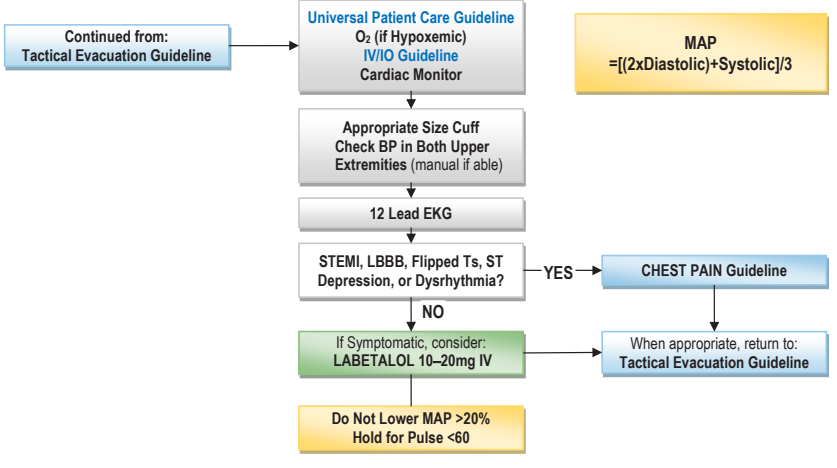
- **Systolic BP 185+**
- **Diastolic BP 110+**

Plus One of These:

- **Altered Mental Status**
- **Blurred Vision**
- **Dizziness/Stroke Symptoms**
- **Chest Pain**

Differential Diagnosis:

- **Primary CNS injury (Cushing's Reflex)**
- **Myocardial Infarction**
- **Aortic Dissection**
- **Pre-Eclampsia/Eclampsia**
- **Toxin/Medication**

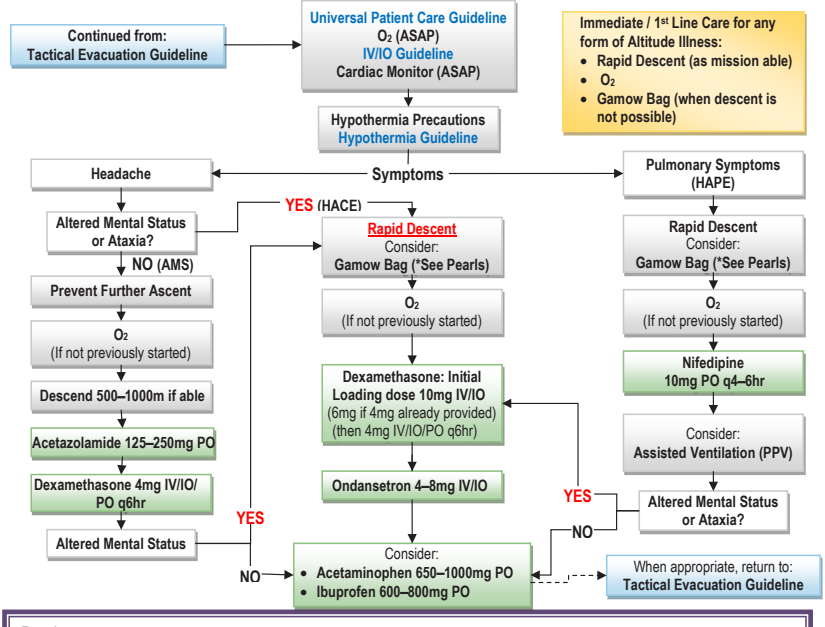


Pearls:

- Do not treat elevated blood pressure based on one set of vital signs.
- Improper cuff size and equipment malfunction are common reasons for abnormally high readings.
- If patient has none of the above symptoms of hypertensive emergencies–they do not require treatment of their blood pressure.
- In setting of stroke–do not treat blood pressure unless SBP >220 and/or DBP >120 or signs of end-organ involvement.
  - Elevated BP is required to maintain perfusion during a stroke.
- Only lower MAP approximately 20% with slow, titrated doses–hypertensive patients often need elevated BP to maintain organ/CNS perfusion. MAP=[(2xDiastolic)+Systolic]/3
- **Labetalol is contraindicated in patients with severe asthma/COPD. In these patients, NTG can be given to lower BP if absolutely necessary. Labetalol doses above are for symptomatic hypertension patients, not hypertension alone.**
- **Metoprolol is contraindicated for CHF, Acute PE, bronchospasms, bradycardia, hypotension, hx of asthma, and thyrotoxicosis.**

ALTITUDE ILLNESS

Differential Diagnosis:	Acute Mountain Sickness (AMS)	High Altitude Cerebral Edema (HACE)	High Altitude Pulmonary Edema (HAPE)
• **Head Trauma** • **Stroke** • **CNS Tumor/Mass/Bleed/Infection** • **Endocrine Disorder** • **Toxic Ingestion** • **Pneumonia/PE** • **Cephalgia**	• Headache • Nausea/Vomiting • Lethargy • Dizziness	• AMS Symptoms • Unstable Gait • Drowsiness • Confusion • Coma	• Cough • Dyspnea • Pink Frothy Sputum • Cyanosis • Hyperthermia



Pearls:

- **The treatment of choice for all altitude–related illnesses is supplemental O_2 and descent**–at least 500–1000m. If unable to descend, a hyperbaric bag (Gamow bag) can be utilized if available.
  - If unable to descend immediately - as soon as HACE or HAPE are suspected, the crew must begin engaging actively with the PIC or other tactical commander to work the issue of descent ASAP.
- **Acetazolamide should not be given to those patients with Sulfa allergies or known Sickle Cell Anemia**.
- **High-Altitude Pulmonary Edema (HAPE)** patients may have crackles/fever/hypoxia.
- **High-Altitude Cerebral Edema (HACE)** patients have AMS and may have tremors, HACE often occurs along with HAPE.
  - ANY altered mental status/confusion/abnormal gait should be presumed to have cerebral edema and descent should be undertaken immediately.
- *Descent should be done with the least amount of patient exertion possible to prevent worsening of the condition.

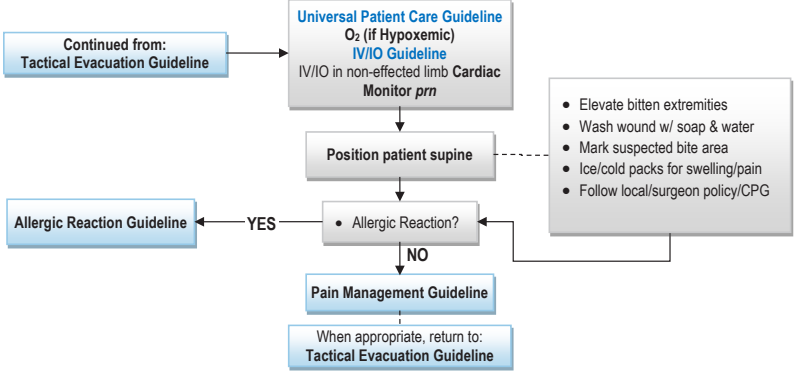
Animal and Insect Bites and Stings

Signs and Symptoms:
- **Rash, Skin Break, Wound, Retained Stinger**
- **Pain, Swelling, Erythema**
- **Bleeding/Discharge**
- **Shortness of Breath/Wheezing/Throat Tightness**
- **Hypotension or Shock**

Differential Diagnosis:
- **Bite/Envenomation**
- **Other Allergic Reaction**
- **Anaphylaxis**
- **Rabies/Tetanus Risk**

For SPIDER/SCORPION see: **SPIDER and SCORPION Envenomation**

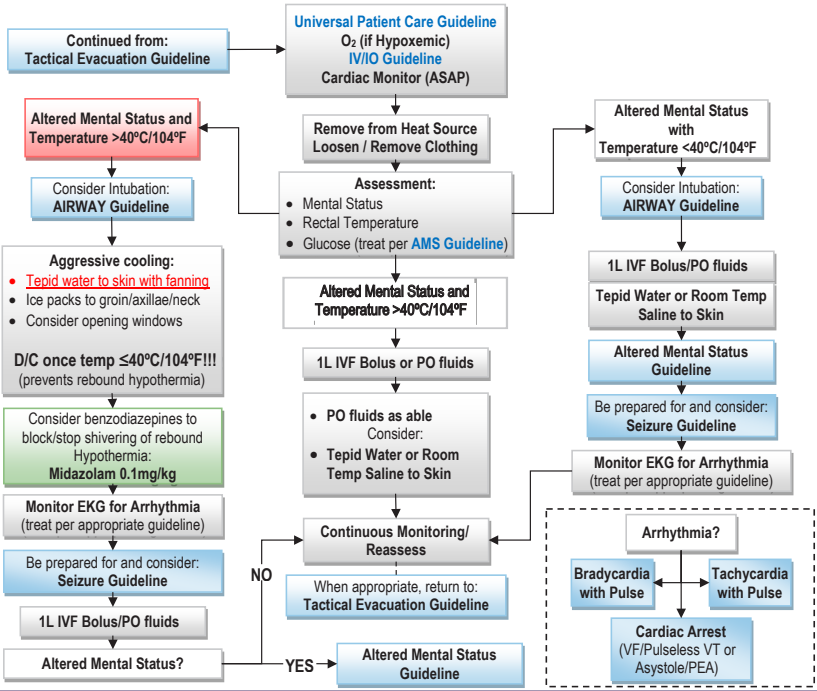
For SNAKEBITE see: **Snakebite Envenomation**



Pearls:
- Never attempt to capture/transport a live animal/insect.
- **Anaphylactic reactions should be treated as soon as recognized.**
- Review country environmental concerns before deployment or visitation.
- All animals should be considered rabid outside the U.S. until proven otherwise. This excludes rodents, which do not carry rabies.
- Consider IV administration of Calcium Gluconate if tetany develops.
- Elevate effected limb to reduce swelling
- ***DO NOT apply constricting bandages or tourniquets*** as these may worsen local tissue injury and increase the risk of permanent disability.
- ***DO NOT*** cut, suck, electrocute, burn, or use chemicals on the envenomation site

HYPERTHERMIA

Signs and Symptoms:	Differential Diagnosis:	
• Altered Mental Status • Loss of Consciousness • Hot/Dry or Sweaty Skin • Hypotension or Shock • Seizure • Nausea/Vomiting	• Infection • Dehydration • Thyroid Storm • Medications/Toxin • Delirium Tremens • Heat Cramps	• Heat Exhaustion • Heat Stroke • CNS Lesions or Tumors



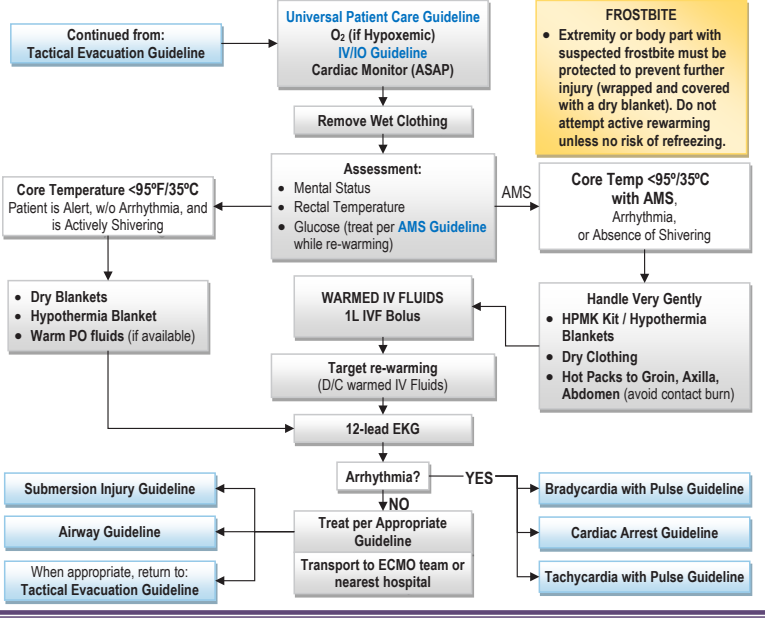
Pearls:

- The single best method to cool patient is sublimation-sprinkling with water and fanning to evaporate off the skin
- Groups at elevated risk for heat emergencies: elderly, very young, highly active.
- Use of alcohol, cyclic antidepressants, phenothiazines, and anticholinergic medications increase risk.
- Cocaine, ecstasy, amphetamines, and aspirin toxicity can all raise body temperature.
- Sweating does not exclude heat stroke/heat illness.
- In conscious patients that can protect their airway, encourage intake of PO fluids and electrolytes.

HYPOTHERMIA

Signs and Symptoms:
- Cold, Clammy
- Shivering/Lack of Shivering
- Mental Status Changes
- Extremity Pain/Numbness
- Bradycardia/Arrhythmia
- Hypotension or Shock

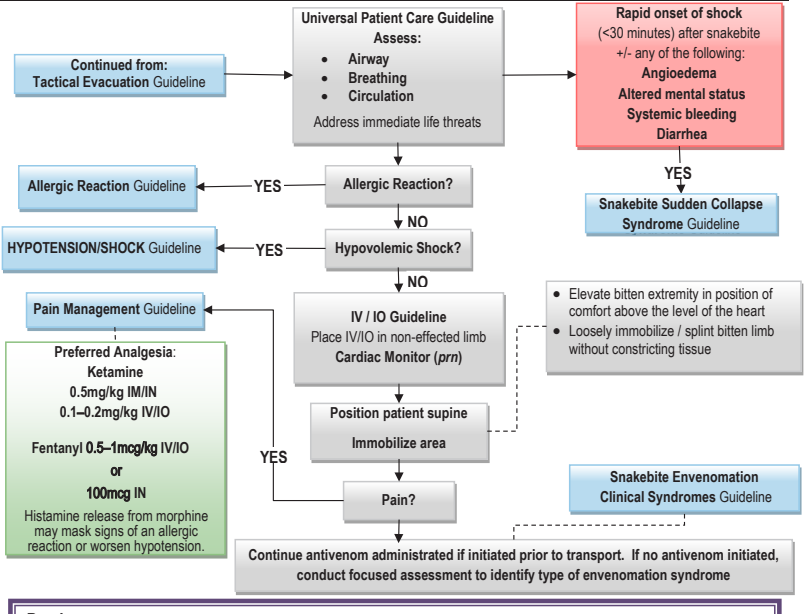
Differential Diagnosis:
- Sepsis
- Environmental Exposure
- Hypoglycemia
- CNS Dysfunction
- Toxic Ingestion



Pearls:
- "No patient is dead until they are warm and dead."
- Hypothermia defined as core temperature <95ºF (35ºC).
- With temperatures <31ºC (88ºF) ventricular fibrillation is common. Cardiac muscle becomes very irritable as temperature drops and rough handling may induce a cardiac dysrhythmia.
- With temperatures below 30ºC (86ºF) shivering ceases – removing an important heat production source.
- The pulse may be very slow in hypothermic patients – should wait at least one minute to feel pulse.
- Arrhythmias at temperature >30ºC (86ºF) treated similar to normo-thermic patients with the addition of active re-warming.
- At temperatures <30ºC (86ºF) one defibrillation can be attempted, but withhold further attempts / meds until temp >30ºC (86ºF).

Snake Envenomation Management: General Principles

If the patient is being medically evacuated from the field or between roles of care, confirm that the receiving facility has an adequate supply of the appropriate regionally specific antivenoms. *Evacuation is not an alternative to antivenom administration. A patient whose snakebite warrants evacuation will require antivenom. The earlier it is given the greater the chance of full recovery without permanent disability.* ***DO NOT*** *delay administration of antivenom in the field if available to a patient with an envenomation.*

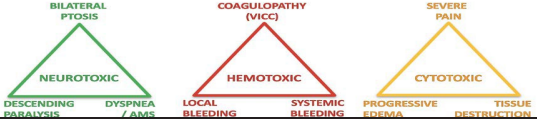


Pearls:

- ***Don't try to ID the snake.*** Snake identification is unreliable and should not be purposely attempted.
- ***DO NOT*** attempt to catch or kill the snake; treatment is clinical and the snake species does not need to be identified. Never attempt to capture or transport a live snake
- Amount of envenomation from snake bites can be variable or dry bites" Snakebite treatment should always be determined by the clinical presentation and evolution of signs and symptoms in the patient
- ***DO NOT*** use ice/tourniquets or constricting bandages as these may worsen local tissue injury and increase the risk of permanent disability.
- If a tourniquet is already in place, ***do not*** remove it until you are ready to treat and resuscitate the patient as a rapid decompensation can occur
- Anaphylactic reactions or hypovolemic shock should be treated as soon as recognized.
- Snakebites are clinically dynamic emergencies and can change dramatically until control has been achieved.

Snakebite Envenomation Clinical Syndromes

There are 3 major clinical syndromes of snakebite envenomation worldwide and 3 major signs and symptoms of each. All dangerous snakes capable of injuring or killing a human will produce at least one sign or symptom from at least one of the 3 major snakebite syndromes. Specific antivenoms required will vary regionally but the major triads are applicable globally.



Continued from:
Snake Envenomation Management: General Principles

Conduct Focused Assessment and Examination to Identify Envenomation Syndrome
With permanent marker:
- Write time of bite on patient
- Circle bite mark on patient

HEMOTOXIC SYNDROME:
- Internal and external active bleeding should cease within 30–60 minutes of antivenom administration once the appropriate dose has been given.
- Packed red blood cell or whole blood transfusion can be considered if the patient is in hemorrhagic shock
- Platelets, fresh frozen plasma, cryoprecipitate, TXA, and ***other agents are not effective in these cases*** due to the mechanism of the venoms.

Conduct rapid examination for signs of:
- **Pain**
- **Swelling (edema)**
- **Tissues destruction (necrosis)**

YES

CYTOTOXIC SYNDROME:
- Mark leading edge of pain with a dash line (- - -) and annotate time
- Mark leading edge of edema with a solid line and annotate time

It is important to keep the limb significantly elevated (>60° is ideal) whenever possible to limit dependent edema and swelling.

NO

Rapid examination for signs of local or systemic bleeding:
- persistent local bleeding >30 mins from the bite wound (if visible) or other lesions
- Inspect the molar gingiva and other mucosa for signs of systemic bleeding

YES

NO

Rapid examination for signs of neuromuscular weakness:
- Evaluate respiratory muscle weakness by single breath count testing
- Dyspnea?.
- Signs and symptoms of descending flaccid paralysis: Ptosis, diplopia, neck flexor muscle weakness, bulbar weakness, etc.
- Signs and symptoms of parasympathetic / cholinergic crisis: SLUDGE mnemonic - Salivation, Lacrimation, Urination, Defecation, GI distress, Emesis
- Altered Mental Status?

YES

NUEROTOXIC SYNDROME:
Anticipate the need for aggressive airway management with intubation and prolonged ventilation in all patients presenting with neurotoxic envenomation.

Cholinergic Crisis?

Consider:
Atropine 0.5mg IV/IO
- Titrated by auscultation to dry up bronchial and oral hypersecretions

Pediatric Dose:
0.01mg/kg up to .25mg

Refer to JOINT TRAUMA SYSTEM CLINICAL PRACTICE GUIDELINE (JTS CPG) Global Snake Envenomation Management (CPG ID: 81) for 1st and 2nd line ANTIVENOM based on Region and Syndrome. Follow JTS CPG for ANTIVENOM administrations.

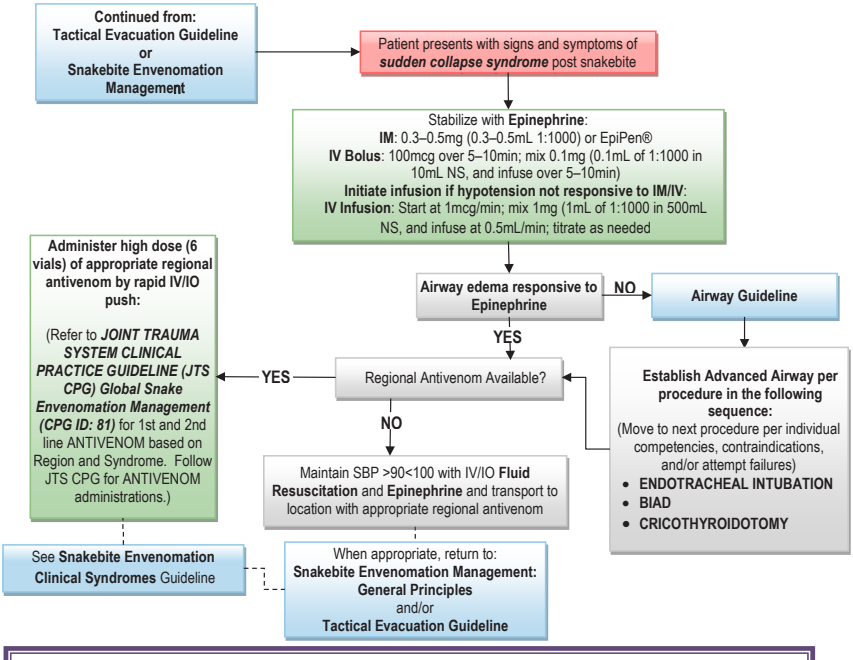
SNAKEBITE SUDDEN COLLAPSE SYNDROME

Signs and Symptoms:

- **Rapid onset of Shock (<30 min) from bite with any of the following:**
  - **Angioedema**
  - **Altered Mental Status**
  - **Systemic Bleeding**
  - **Diarrhea**

Differential Diagnosis:

- **Neurotoxic Syndrome**
- **Allergic reactions**



Pearls:

- Anaphylactic reactions (or hypovolemic shock) should be treated aggressively while simultaneously treating for severe envenomation with appropriate regional antivenom.
- Priority of care for a patient in snakebite sudden collapse syndrome is the consideration of the shorter of two options: ***evacuating the patient to a location with antivenom*** or ***bringing the antivenom to the patient.***
- Most patients presenting with hypotension or angioedema are responsive to epinephrine, but may require IV epinephrine infusions to achieve this effect if they are unresponsive to IM epinephrine

Environmental

Global Spider and Scorpion Envenomation

Background:

Spider and scorpion envenomations can occur in many environments in which the military operates. Many arthropods possess a significant venom but lack a sufficient apparatus (fangs or talon) to inject it into humans. Most bites and stings involve more danger from anaphylaxis, but several species of spiders and scorpions have significant neurotoxic, cytotoxic, or hemotoxic venoms. While most spider and scorpion envenomations result in mild symptoms, severe toxicity and death can occur. Anaphylaxis is the most concerning initial effect. Recognize and treat it immediately using standard acute allergic reaction therapies. Anaphylaxis from an arthropod envenomation is not an indication for antivenom.

SPIDERS:

While many spider species produce venom, the vast majority lack sufficiently large or strong enough fangs to penetrate human skin and cause clinically significant effects. However, spiders venomous to humans can be found throughout much of the world. The chart below provides information regarding clinically significant venomous spider species.

Clinically Significant Venomous Spider Species			
	Widow Spiders *(Latrodectus spp)* *a.k.a* *Black Widow* *Red Widow* *Brown Widow*	**Violin Spiders** (Laxosceles reclusa) a.k.a Brown Recluse Fiddleback Spider	**Funnel Web Spiders** (Atrax) a.k.a Australian Funnel-Web Spider
Africa	X	X	
Asia	X	X	
Australia	X	X	X
Europe	X		
North America	X	X	
South America	X	X	
Picture			
Antivenom Available	Yes	No	Yes

Global Spider and Scorpion Envenomation (Continued)

Scorpions:

Scorpions envenomate humans by stinging them with the telson on their tail. Around 20 species of medically important (meaning potentially lethal to humans) scorpions are known, and all but one of these (Hemiscorpius lepturus) are members of the Buthidae family. Buthidae family contains the large genera Ananteris, Centruroides, Compsobuthus, and Tityus. Centruroides are the only clinically significant venomous scorpion indigenous to the United States (i.e., Bark Scorpions). The majority of medically significant envenomations occur in the Middle East, tropics (e.g., Southwest Asia, India, Central and South America), and North Africa.

Scorpion venoms are complex and can include phospholipase, acetylcholinesterase, hyaluronidase, serotonin, and neurotoxins. Scorpion venom increases neuronal release by blocking inactivation of the sodium channel, resulting in an increase in the amplitude and duration of neuron action potential. The overall result is excess stimulation of the central nervous system, the neuromuscular system, the sympathetic nervous system, and the parasympathetic nervous system.

The components of scorpion venom are species specific and generally fall into the categories of neurotoxic and cardiotoxic; however, this terminology is misleading since the cardiotoxic effects are secondary to an excess release of catecholamines stimulated by the nervous system. The venom of the unique species, Hemicorpius lepturus, found in Iraq and Iran is predominately cytotoxic, similar to the brown recluse spider.

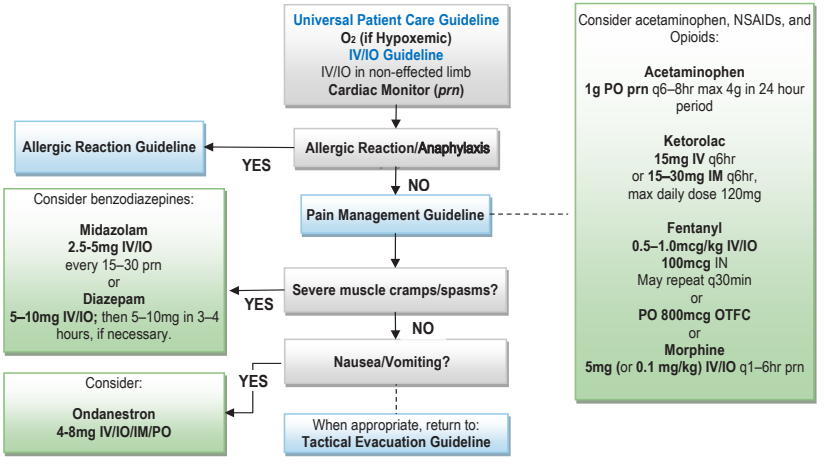
Antivenom is available for some species; data regarding the benefits and risks of many of these antivenoms are significantly limited. In patients with moderate to severe symptoms refractory to analgesics and benzodiazepines, antivenom, if available, may be indicated. Due to the high risk of immediate or delayed allergic reactions to these antivenoms administration should be done at a controlled clinical location and pre-hospital treatment should be focused on supportive care. Intravenous histamine antagonists (i.e. diphenhydramine), steroids, and epinephrine should be immediately available at the patient's bedside prior to antivenom administration. The Joint Trauma System Clinical Practice Guideline: Global Spider and Scorpion Envenomation Management (CPG ID: 84) contains a list of antivenoms available by country. (https://jts.amedd.army.mil/assets/docs/cpgs/Global_Spider_and_Scorpion_Envenomation_Management_09_Feb_2021_ID84.pdf)

Prehospital/En Route Care Treatment Goals for Spider and Scorpion Bites and Stings:

Some moderate to severe cases of envonomations will require medical evacuation to a treatment facility with the capability to administer antivenom. En Route Care consists primarily of supportive care and pain management. En route care providers should be prepared to counter cholernergic, adrenergic, sympathetic and parasympathetic effects. Aggressive use of benzodiazepines as indicated for agitation, neuromuscular stimulation, tachycardia, and hypertension. Secure the airway and initiate mechanical ventilation if indicated. Anaphylaxis is the most concerning initial effect. See specific treatment guidelines for Widow Spiders, Funnel-Web Spiders and Scorpions for additional guidance.

Widow Spider Envenomation

Patients may or may not feel a pinprick upon the initial bite. A pair of small red spots at the envenomation site may be visible; however, the bite site is often not located. Some patients do not develop systemic toxicity. In those patients who do, symptoms typically begin 15 to 60 minutes following the envenomation. The primary symptom is painful muscle cramping, starting at the bite site and progressing towards the center of the body. Patients may develop a painful, rigid abdomen secondary to abdominal muscle spasm which may be mistaken for peritonitis. The pain increases over time and may occur in waves. In some cases, the patient develops a temporary diaphoretic, grimaced, and contorted appearance of the face referred to as "facies latrodectismica." Other symptoms include vomiting, diaphoresis, tachycardia, hypertension (often profound), and restlessness. Symptoms of Latrodectus envenomation last hours to days. Fatalities from Latrodectus envenomation are exceedingly rare and, when they do occur, are secondary to cardiac arrest (presumably from severe hypertension in patients with predisposing medical conditions) and wound infection.

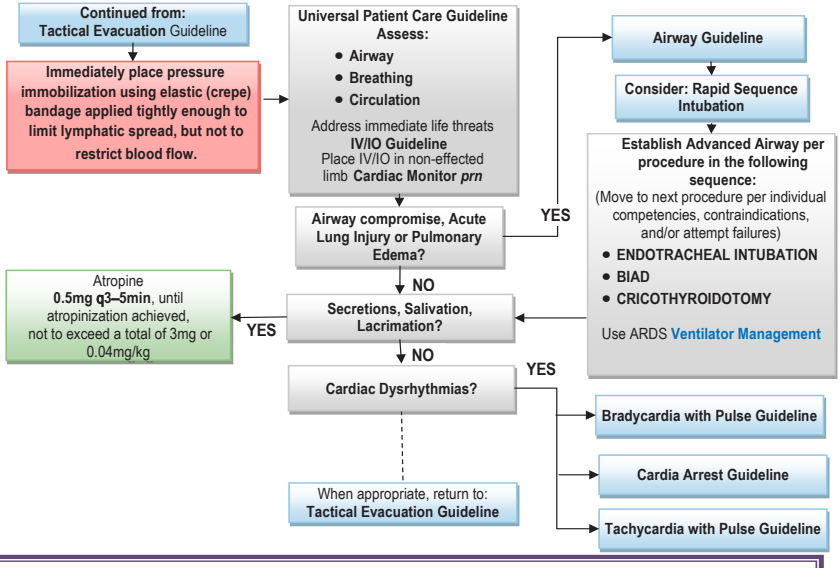


Pearls:

- Review country environmental concerns before deployment or visitation.
- **Anaphylactic reactions should be treated as soon as recognized**.
- Given the low risk of infection, antibiotics are not routinely recommended.
- Depending upon the severity of pain, acetaminophen, nonsteroidal anti-inflammatory agents, and opioids can be used for pain control.
- **Ketamine is not recommended** as patients may develop tachycardia and have profound hypertension due to widow spider toxin.
- Benzodiazepines may improve muscle spasms.
- Pain control and benzodiazepines are often sufficient to manage tachycardia and hypertension.
- Patients with severe pain refractory to pain medications, antivenom (if available) may be indicated, evacuate to MTF where antivenom is available if able.
- Elevate effected limb to reduce swelling.
- ***DO NOT apply constricting bandages or tourniquets*** as these may worsen local tissue injury and increase the risk of permanent disability.
- ***DO NOT*** cut, suck, electrocute, burn, or use chemicals on the envenomation site.

Funnel Web Spider Envenomation

The lethal component of funnel web spider venom is robustotoxin. It induces an autonomic storm by causing excessive release of acetylcholine, norepinephrine, and epinephrine. Funnel web spider envenomation causes a biphasic envenomation syndrome. The first phase includes pain at the bite site, perioral tingling, piloerection, and regional fasciculations which may progress to muscle spasm. This muscle spasm may involve the face, tongue, and larynx leading to airway compromise. The increased stimulation of cholinergic and adrenergic systems causes nausea, vomiting, lacrimation, salivation, tachycardia, hypertension, cardiac dysrhythmias, and acute lung injury. Acute lung injury is the predominate cause of death during the first phase. In the second phase the symptoms of the first phase resolve and lead to the gradual onset of refractory hypotension, apnea, and cardiac arrest.



Pearls:

- Immediately transport to an MTF with antivenom. Effective funnel web spider antivenom is available in Australia.
- **Anaphylactic reactions should be treated as soon as recognized.**
- Local tissue enzymes may inactivate the venom, therefore the use of pressure immobilization bandage may be helpful in delaying the onset of symptoms, but also may allow for a degree of inactivation of the venom.
- **Ketamine is not recommended** as patients may develop tachycardia and have profound hypertension.
- Benzodiazepines may improve muscle spasms.
- Elevate effected limb to reduce swelling.
- ***DO NOT*** cut, suck, electrocute, burn, or use chemicals on the envenomation site.

Scorpion Envenomation

Pearls:

- **Anaphylactic reactions should be treated as soon as recognized.**
- For clinically significant envenomation, management is supportive and focused on the patient's symptoms and graded 1-4.
- Patients graded 3&4 will require antivenom, evacuate to a MTF able to administer antivenom.
- Administer Benzodiazepines aggressively to ensure symptom control.
- For significant neuromuscular spasm, oral secretions, sedation, or other threats to the patent airway, perform endotracheal intubation to prevent aspiration and ensure adequate ventilation.
- Pulmonary edema should be managed with noninvasive or invasive ventilation in combination with optimization of cardiac output
- Direct acting vasopressors(epinephrine and norepinephrine) are recommended to treat bradycardia and hypotension
- Elevate effected limb to reduce swelling.
- ***DO NOT apply constricting bandages or tourniquets*** as these may worsen local tissue injury and increase the risk of permanent disability.
- ***DO NOT*** cut, suck, electrocute, burn, or use chemicals on the envenomation site.

Clinical Grade and Treatment of Scorpion Stings

Grade	Effects	Treatment
1	Local Effects Only	Analgesia
2	Mild/Moderate autonomic excitation (i.e. tachycardia, hypertension)	Benzodiazepines
	Agitation and anxiety	Benzodiazepines
	Pain and paresthesias remote from the sting site	Analgesia
3	Pulmonary edema	Antivenom, noninvasive or mechanical ventilation
	Hypotension and cardiogenic shock	Antivenom, vasopressors (i.e., norepinephrine, epinephrine)
	Neuromuscular excitation, somatic neuromuscular dysfunction or cranial nerve dysfunction (associated with Centruroides species)	Antivenom, benzodiazepines
4	Multiorgan failure, coma, seizures, end-organ damage secondary to hypotension, somatic neuromuscular dysfunction and cranial nerve dysfunction (associated with Centruroides species)	Antivenom, vasopressors, sedation (benzodiazepine, propofol, phenobarbital), mechanical ventilation

Allergic Reaction/ Anaphylaxis

Allergic Reaction Guideline

Airway Compromise

Airway Guideline

Rapid Sequence Intubation

Establish Advanced Airway per procedure in the following sequence:
(Move to next procedure per individual competencies, contraindications, and/or attempt failures)

- **ENDOTRACHEAL INTUBATION**
- **BIAD**
- **CRICOTHYROIDOTOMY**

Pulmonary Edema:
Use ARDS for
Ventilator Management

Analgesia
Consider acetaminophen, NSAIDs, and Opioids:

Acetaminophen
1g PO prn q6–8hr max 4g in 24 hour period

Ketorolac
15mg IV q6hr
or **15-30mg IM** q6hr,
max daily dose 120mg

Fentanyl
0.5–1.0mcg/kg IV/IO
100mcg IN
May repeat q30min
or
PO 800mcg OTFC

Increased Secretions / Salivation/ Lacrimation

Atropine
0.5mg q3–5min, until atropinization achieved, not to exceed a total of 3mg or 0.04mg/kg

Benzodiazepines

Midazolam 2.5–5mg IV / IO q15-30min prn
or
Diazepam
5-10mg IV/IO; then 5–10mg in 3-4 hours, if necessary

Hypotension/Cardiogenic Shock: Vasopressors

HYPOTENSION / SHOCK GUIDELINE

Norepinephrine
2–20mcg/min IV/IO, titrate to effect
(See **Norepinephrine Infusion Chart**)
or
Epinephrine 1mg/10ml
5–20mcg IV/IO Push; may repeat ONCE in 2–5 min.
If patient remains hypotensive, proceed to continuous infusion.
2–10mcg/min; titrate to desired effect
(See **Epinephrine 1mg/10ml Infusion Chart**)

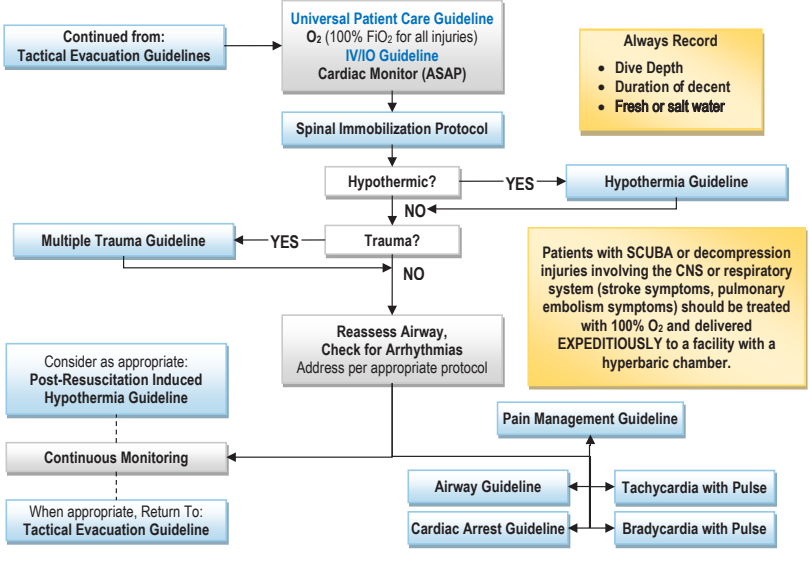
SUBMERSION INJURY

Signs and Symptoms:

- **Unresponsive**
- **Mental Status Changes**
- **Hypoxia**
- **Cyanosis**
- **Hypothermia**
- **Vomiting**
- **Coughing**

Differential Diagnosis:

- **Trauma (esp. C–spine)**
- **Dysbarism**
- **Pressure Injury as in Self–contained under water breathing apparatus (SCUBA)**



Pearls:

- If Decompression Illness or arterial gas embolism is suspected and neurological deficits (including altered mental status) are present, consider high-flow oxygen, lidocaine 1.5mg/kg IV/IO, and aspirin 325mg. While these interventions remain unproven, the risk/benefit ratio makes them acceptable options, particularly if time to hyperbaric chamber is anticipated to be prolonged.
- Rapid hypothermia from cold water immersion in children has resulted in survival despite prolonged downtime–resuscitate per appropriate protocols and rapidly transport. This has not been seen in adults.
- All near-drowning victims should be transported for evaluation due to potential for worsening respiratory status over next several hours.
- Drowning is the leading cause of death among would–be rescuers.
- Head–first diving injuries often associated with unstable Jefferson fracture (burst fracture of C1) due to axial load. Patients found with suspicion of this type of injury should have early and careful C-spine immobilization.
- Altitude should be restricted in patients suffering from decompression illnesses to prevent worsening. Should remain <1000 ft. AGL/ 10,000 ft. MSL whenever possible.
    - Aggressive pre-planning for access to hyperbaric treatment facilities is encouraged if mission requirements warrant it.

CBRN CASUALTY MANAGEMENT

BASIC PRINCIPLES:

Initial care of the CBRN casualty should be approached in the same manner as other casualties. Life threats require prompt recognition and intervention, and non-life-threatening sequelae can be addressed when clinically appropriate. Early recognition and categorization of CBRN-exposed patients is the foundation for further management, and is key not only for initiating patient treatment but also for preventing contamination of medical personnel, equipment, and facilities. Thorough and appropriate decontamination is a core skill that requires planning and practice. Attention to details such as preventing hypothermia in patients undergoing decontamination and clinical reassessment at each stage of the process will reduce unnecessary morbidity. Basic life saving measures such as airway management and resuscitation are fundamental concepts that must be mastered at the appropriate level for each practitioner in the CBRN care chain.

CBRN CRITICAL TASK LIST:

1. Recognize CBRN exposure that requires action to protect self and others.
2. Don personal protective equipment (PPE) to prevent exposure in self and assist others with PPE.
3. Egress from the threat:
    a. Move upwind, uphill, upstream from threat.
    b. Utilize time/distance/shielding for protection.
4. Recognize signs/symptoms of CBRN exposure that prompt immediate self-treatment or treatment of others utilizing CRESS assessment. (RAPID IDENTIFICATION OF CHEMICAL WARFARE AGENTS).
5. Apply TCCC integrated with CBRN response [TCCC + CBRN = (MARCHE)^2]. (MARCHE^2)
6. Apply airway management skills in a CBRN setting (positioning, suction, ventilation to include manual.
7. Perform Rapid Spot Decontamination.
8. Identify and establish Hot/Warm/Cold Zones.
9. Establish a dirty casualty collection point (CCP).
10. Understand decontamination principles and casualty procedures for partial or complete removal of PPE, clothing, and equipment (casualty cut out).
11. Understand cross contamination and take appropriate measures to prevent it.
12. Understand available technology that can aid in agent identification.

CBRN MEDICAL REGULATING CONSIDERATIONS:

1. Military Treatment Facility (MTF).
    a. DECON/Treatment Coordination. Ensure MTF is prepared to receive dirty casualties and determine the most appropriate location for DECON.
    b. Treatment Capabilities (Toxicology, Critical Care, Trauma Surgery). Determine whether the MTF has the services necessary to care for and sustain the CBRN casualty on site and/or establish telemedicine support.
    c. Capacity. The CBRN casualty is far more resource intensive than a typical trauma or critically ill casualty. Assess the MTF's capacity and capability to treat CBRN casualties and identify potential alternate locations.
2. Integrate the medical regulating system into CBRN casualty evacuation.

EVACUATION PLATFORM CONSIDERATIONS:

1. Evacuation of patients must continue even in a contaminated environment.
2. Clean and Dirty. It is necessary to plan for both clean and dirty platforms for evacuation.
    a. Optimize the use of resources, medical or nonmedical, which are already contaminated before employing uncontaminated resources.
    b. Once a vehicle or aircraft has entered a contaminated area, it is highly unlikely that it will be able to be spared long enough to undergo a complete decontamination. Factors include - contaminant, the tempo of the battle, and the resources available.
    c. Contaminated vehicles (air and ground) will have restricted use and are confined to a contaminated environment until decontamination can occur.
3. Refuel.
    a. Consider the time it takes for refueling in a MASCAL situation, as well as the distance from the objective to the DECON site and MTF.
    b. Factor in any platform decontamination that may be necessary prior to arrival at the refueling site.
    c. WARM ZONE Forward Arming and Refuel Points may be necessary.
4. Preparation time (hasty vs. deliberate). Factor the time it takes to prepare the platform for a hasty or deliberate CBRN mission.
5. Radiological Exposure Limitations:
    a. Operational exposure guidance: MEDEVAC operations will establish operational exposure guidelines by the appropriate Surgeon and Command limiting radiation exposure to crews by absorbed dosage.
    b. Radiation exposure records are maintained by the unit CBRN noncommissioned officer and are made available to the commander, staff, and surgeon.
6. Flying Hour Limitations:
    a. Environmental Relative Factors (ERF) under Mission Oriented Protective Posture (MOPP) 3 and 4 limits flying hours to 3 hours day, night or combined modes of flight.
    b. ERF extensions are limited to a case by case basis.

CBRN LANDING ZONES / AMBULANCE (CASUALTY) EXCHANGE POINTS:

1. Route coordination. Consider alternate routes, primary routes may be jammed or unavailable.
2. Consider appropriate distance to accommodate for aircraft rotor wash and direction of landing for Dirty LZs and Clean LZs at the DECON/CCP locations.
3. Environmental Considerations:
    a. Wind
    b. Terrain / Slope
    c. Drainage (for DECON Sites)
    d. Water Sources

CBRN MILITARY WORKING DOG CASUALTY MANAGEMENT

Chemical protective doctrine for animals is incomplete, and there is no chemical protective equipment in the current inventory for MWDs. Equipment and doctrine for animals are under development but pending its availability, any degree of protection of the MWD in a CBRN agent environment will, at best, be extremely difficult. The MWD's Handler should be in possession of additional ATNAA and CANA kits to use on their MWD. Attempt to obtain and use those resources first when treating a MWD.

MILITARY WORKING DOG DECONTAMINATION PROCEDURES

While not generally a MEDEVAC mission, ensuring proper MWD Decon prior to transport is vital to ensuring the platform and crew are not contaminated by the agent involved.

- Rinse the MWD thoroughly with plain water beginning at the head along the back and to the tail; then rinse down the MWD's sides, chest, stomach, legs, and paws.
- Work the soap into the hair starting the head, along the back and to the tip of the tail, then work down the MWD's sides, chest, and abdomen, legs, and paws. Ensure the soap reaches the MWD's skin. If the MWD has erect ears, flush the ears with otic solution or water.

Note. Special attention should be paid to the MWD's stomach, face, ears, eyes, under tail, paws and in between legs to ensure all contamination is removed.

- Flushed the eyes with copious amounts of water, ophthalmic solution, or saline.
- Rinse with plain water using the same pattern as the initial rinse (head to back to tail, then down sides, chest, stomach, legs, and paws).
- Allow the MWD to shake off excess water. A tarp or other impervious materiel may be placed around the MWD while it shakes off excess water to prevent contaminating of other people, MWDs, or equipment.

TREATMENT OF MILITARY WORKING DOG CASUALTIES OF NERVE AGENTS

- For mildly exposed MWDs, administer a total of two ATNAA injections (atropine and 2–PAM Cl in a single autoinjector) (carried by the MWD handler) into the back of the thigh of the dog. The initial dosage of atropine is 4mg and the dosage for 2–PAM Cl is 1200mg

- For severely exposed MWDs, administer three ATNAA and one CANA. This is similar to the buddy aid a Service Member provides another Service Member suffering from severe nerve agent exposure. In general, MWDs should not need additional 2–PAM Cl injections.

- Single atropine injections may be given every 10 to 20 minutes until the nerve agent effects have subsided or signs of atropinization appear. The MWD must be monitored for heat stress. Atropine dries the mucous membranes thus preventing the MWD from expelling body heat.

- The initial dosage of 2–PAM Cl in the dog is 20mg/kilogram. Three ATNAA injectors should provide sufficient amount of 2–PAM Cl. If a MWD is still showing signs of seizure after initial

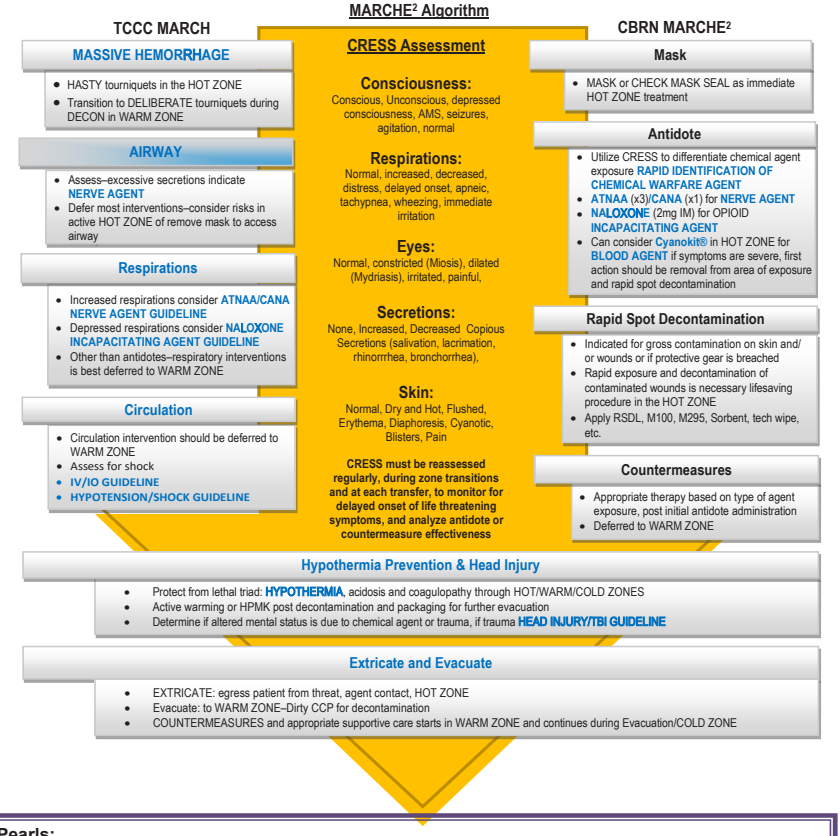
treatment, the handler may give up to 3 additional CANA autoinjections at 5 to 10 minute intervals until the seizures are gone.

- Maintain a clear airway by removing respiratory secretions and saliva obstructing the airway. Loosen or remove the muzzle. In severe nerve agent exposure, the animal's respiration is markedly depressed and extreme muscular weakness or paralysis is present. In such cases, assisted ventilation is required to effectively resuscitate the animal.

Adequate atropine and 2–PAM Cl should bring about an improvement or restoration of spontaneous respiration and also improve blood circulation. However, the effectiveness of 2–PAM Cl is lost after a short period of time. The 2–PAM Cl varies in its effectiveness against nerve agents. It is least effective against GD nerve agent. In some cases, severe nerve agent symptoms may persist or recur and require veterinary personnel to administer additional 2–PAM Cl autoinjectors q8–12hr for up to 3 days.

MARCHE^2

After initial assessment of casualty in CBRN-threat environment for the presence or absence of CBRN symptoms using the CRESS algorithm, the integrated assessment and management of TCCC and CBRN injuries can proceed. MARCHE^2 integrates the TCCC MARCH algorithm with the priorities of CBRN treatment. MARCHE^2 is further broken down into phases similar to TCCC. The "Hot Zone" should be considered as care under fire, addressing only immediate life threats, "Warm Zone" is tactical field care and "Cold Zone" as tactical evacuation care.

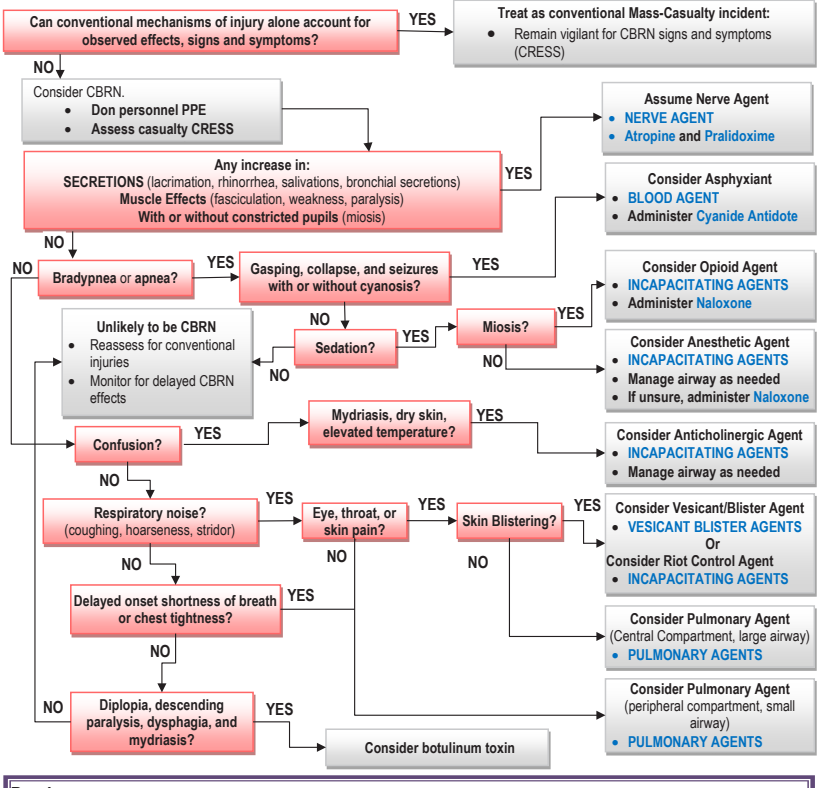


Pearls:

- Treatment goals of CBRN is give antidote, extricate from exposure area, conduct spot decontamination, provide airway support.

RAPID IDENTIFICATION OF CHEMICAL-WARFARE AGENTS

Assess:	Observations:
C- **Consciousness**	• unconscious, seizures, depressed consciousness, agitation
R- **Respirations**	• present, absent, labored, increased, decreased, normal, abnormal
E- **Eyes**	• constricted, dilated, normal
S- **Secretions**	• dry, normal, increased
S- **Skin**	• diaphoretic, dry, hot, cyanosis



Pearls:

- Treatment goals of CBRN is give anti-dote, provide airway support, conduct spot decontamination.

NERVE AGENT

Nerve Agent
- Liquid or Vapor
- Non-Persistent (GA, GB, GF)
- Persistent (VX)
- Organophosphate Treatment

PPE and Detection
- Mask
- AP–PPE
- JLIST or UIPE

M8 Detection Paper
- G–Yellow
- V–Green

CRESS Symptomatic Presentation
C: altered, unconscious, seizures
R: tachypnea, wheezing, respiratory distress
E: miosis (may or may not be present with organophosphate)
S: copious secretions (salivation, lacrimation bronchorrhea)
S: diaphoresis

HOT ZONE
POI

Immediate Action + M² A² R² E.
- address **MASSIVE HEMORRHAGE / Mask check**
- assess **AIRWAY /** administer **ANTIDOTE**
- asses **RESPIRATIONS /** conduct **RAPID SPOT DECON**
- **Extract** (move upwind, uphill, upstream – away from threat)

NERVE AGENT ANTIDOTE
Antidote Treatment, Nerve Agent, Auto-Injector (ATNAA)
- **ATNAA** contains **2.1mg Atropine** and **600mg Pralidoxime Chloride (2PAM)** in each Auto Injector
- Initial administration is **3x ATNAA** in rapid sequence for sever signs of nerve agent poisoning **(6.3mg Atropine, 1800mg 2PAM)**

Convulsant Antidote Nerve Agent (CANA)
- **CANA** contains **10mg Diazepam**
- Administer **1x CANA** following **3x ATNAA**

WARM ZONE
DIRTY CCP

M² A² R² Reassessment (clear airway, O_2 as needed, filtered air)
- Decontaminate and Cutout

C² H² E
- **CIRCULATION** (asses vitals, resuscitate) administer **COUNTERMEASURES** as necessary if **ATNAA/CANA** administered and symptoms persist
- Prevent **HYPOTHERMIA** / assess mental status (altered due to agent or trauma?) **HEAD INJURY**
- **EVACUATE** to next role of care/zone

NERVE AGENT COUNTERMEASURES
ATROPINE IV/IO
- 20mg in 250mL NS IV/IO, titrate 1mg every 3 mins to dry secretions
- Once clinical improvement achieved, adjust to rate of 2–4mg/hr

PRALIDOXIME IV/IO
- 1–2g in 250mL NS IV/IO over 15-30min

BENZODIAZEPINES IV/IO
- **MIDAZOLAM** (preferred)1–2mg IV/IO, titrate to effect
- **DIAZEPAM** 10–20mg IV/IO, titrate to effect

SCOPOLAMINE IV/IM (adjunct if available)
- 0.8mg IV/IM

COLD ZONE

MARCHE² Reassessment
- Continue to address any immediate life threats
- provide **AIRWAY** and **RESPIRATORY** support as necessary
- continue **CIRCULATION** support / **COUNTERMEASURES** as symptoms dictate
- prevent **HYPOTHERMIA** with HPMK, warm fluids / **HEAD INJURY** treat elevated ICP, conduct neuro exam, MACE

Reassess regularly, follow protocols for respiratory or cardiac compromise.

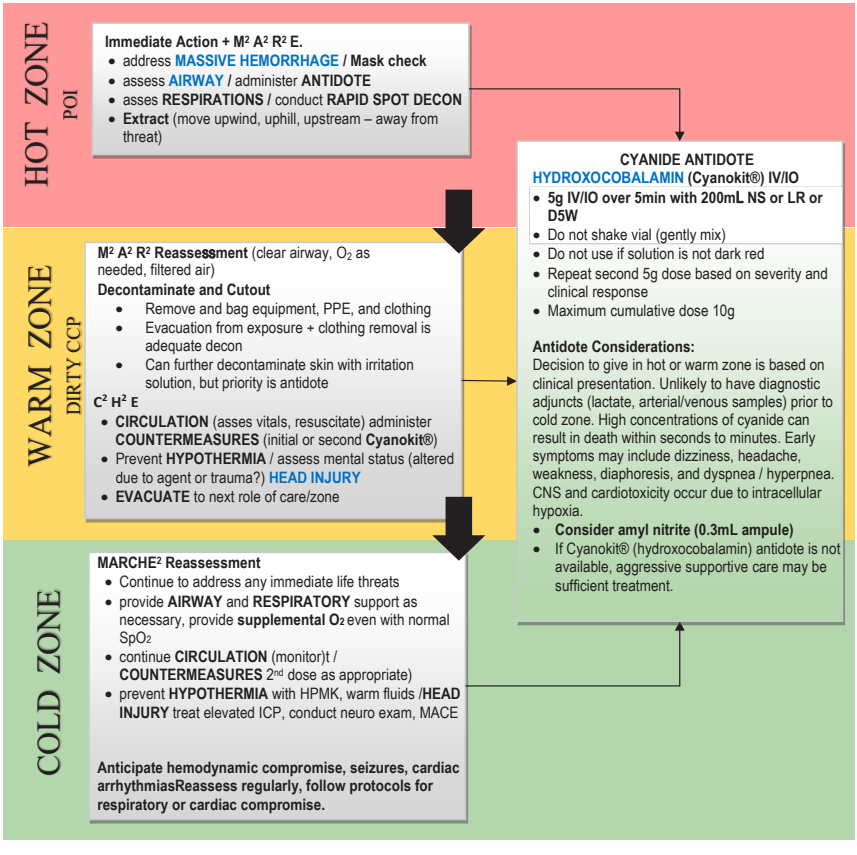
BLOOD AGENT - CYANIDE

Blood Agent–Cyanide
- Hydrogen Cyanide, Cyanogen Chloride
- volatile water-soluble liquid
- vapor
- Odor: Bitter Almonds

PPE and Detection
- Mask
- AP-PPE
- JLIST or UIPE

M8 Detection Paper
- Does not detect

CRESS Symptomatic Presentation
C: altered or unconscious
R: normal to apneic
E: normal unless vapor irritant
S: none
S: may appear flushed (50% occurrence)



PULMONARY AGENTS

Pulmonary Agents: Phosgene, Chlorine
- Phosgene, Chlorine
- Gas ($CoCl_2$) above 47°F/8.3°C
- Gas (Cl) above 29°F/-1.6°C
- Odor Phosgene: freshly mowed hay
- Phosgene toxic below odor threshold

PPE and Detection
- Mask (C2–A1 Filter)
- AP-PPE
- JLIST or UIPE

M8 Detection Paper
- Not effective

CRESS Symptomatic Presentation
C: conscious (unconscious if asphyxia)
R: normal to respiratory distress, delayed onset up to 24 hours (phosgene)
E: irritated, injected (chlorine)
S: Mucous membrane irritation (rhinorrhea, salivation)
S: Chlorine: immediate irritation (tearing and rhinorrhea) Phosgene: delayed fluid buildup

HOT ZONE
POI

Immediate Action + M² A² R² E.
- address **MASSIVE HEMORRHAGE / Mask check**
- assess **AIRWAY /** administer **ANTIDOTE**
- asses **RESPIRATIONS /** conduct **RAPID SPOT DECON**
- **Extract** (move upwind, uphill, upstream – away from threat)

WARM ZONE
DIRTY CCP

M² A² R² Reassessment
- Clear airway (copious secretions)
- Anticipate laryngospasms
- Place advanced airway (largest bore ET as able), be prepare to conduct cricothyroidotomy for failed airway
- Advanced Ventilatory support (SAVe or simple vent may not be sufficient, ARDS technique, need to manipulate peep, volume, FiO_2)
- O_2 as needed, maintain air filter

Decontaminate and Cutout
- Remove and bag equipment, PPE, and clothing
- Soap and water sufficient for skin decon
- Remove and replace contaminated treatments (chest seals, tourniquets, etc.)

C² H² E
- **CIRCULATION** (asses vitals) **COUNTERMEASURES**
- Prevent **HYPOTHERMIA** / assess mental status (altered due to agent or trauma?) **HEAD INJURY**
- **EVACUATE** to next role of care/zone

COLD ZONE

MARCHE² Reassessment
- Continue to address any immediate life threats
- provide **AIRWAY** and **RESPIRATORY** support as necessary, provide **supplemental O_2** even with normal SpO_2
- continue **CIRCULATION** support (monitor vitals), resuscitate as necessary/**COUNTERMEASURES** 2nd dose as appropriate)
- prevent **HYPOTHERMIA** with HPMK, warm fluids/**HEAD INJURY** treat elevated ICP, conduct neuro exam, MACE

There is no antidote for Chlorine or Phosgene exposure. Treatment focus is remove from exposure, aggressive management of airway and respirations, supportive care.

PHOSGENE: Onset of symptoms can be delayed up to 24 hours, generally 2–6 hours after exposure. Exertion is associated with worse outcomes, so keep patients exposed to phosgene at rest. The major effects of phosgene are on peripheral airways, therefore dyspnea, chest tightness or pain, and cough are common symptoms. Development of hypoxia and pulmonary edema. Fluid shifts secondary to pulmonary edema may result in hypovolemia.

Chlorine: Onset of symptoms are immediate. Chlorine causes more immediate symptoms in the moist areas of the eyes, mouth, and upper airways. Eye pain, blepharospasm, and lacrimation are common. Other symptoms may include headache, salivation, dyspnea, cough, hemoptysis, chest burning, and vomiting. Irrigate eyes if irritated or burning.

Laryngospasm may occur with both Phosgene and Chlorine. Anticipate airway edema and manage airway early. If advanced airway required, place largest endotracheal tube possible to facilitate suctioning. Intravenous fluids may be necessary in the setting of volume depletion, but should not be given empirically. Fluid overload can contribute to pulmonary edema and should be avoided.

Consider following for wheezing/ bronchospasms:
- **ALBUTEROL (2.5mg in 3mL NS)**
- **METHYPREDNISOLONE (125mg IV)**
- **See RESPIRATORY DISTRESS**

Mechanical Ventilations
- Use **ARDS VENTILATOR MANAGEMENT** techniques

VESICANT BLISTER AGENTS

Vesicant Agents: Anticholinergics, Opioids, Riot Control
- Lewisite (L), Mustard–Lewisite Mixture (HL)
- Immediate Acting Agent
- Oily liquid
- Persistent, Freezing 0.4°F/-17°C
- Odors: Geraniums

PPE and Detection
- Mask
- AP-PPE
- JLIST or UIPE

M8 Detection Paper
- Red to Pink

LCD Detection
- Red or Orange H

CRESS Symptomatic Presentation
C: Conscious (unconscious due to other effects)
R: Immediate irritation, distress
E: Immediate severe pain, blepharospasm edema
S: Normal to increased
S: Immediate pain, erythema, blisters form hours later
OTHER: Systemic effects–distributive shock

HOT ZONE
POI

Immediate Action + M^2 A^2 R^2 E.
- address **MASSIVE HEMORRHAGE/Mask check**
- assess **AIRWAY**/administer **ANTIDOTE (none in HOT ZONE)**
- asses **RESPIRATIONS**/conduct **RAPID SPOT DECON**
- **Extract** (move upwind, uphill, upstream–away from threat) Extraction to the Dirty CCP [For Small Spills (<2 kg) move away 100m day/300m night] [Large Spills (<25kg) = 500m day/1000m night]

Lewisite binds to tissues and absorbs systemically within two minutes of contact. Symptoms begin to manifest immediately upon exposure and worsen over time. Control of massive hemorrhage and rapid spot decon are top priorities.

Casualties with palm-size exposure without rapid decon, >5% BSA burn, pulmonary edema, or shock symptoms with rapid onset require chelation. Early pain control may be required to ensure casualty cooperation. Administration of BAL within 5 minutes of exposure to skin and eyes can neutralize agent.

WARM ZONE
DIRTY CCP

M^2 A^2 R^2 Reassessment
- Clear airway, O_2 as needed, maintain filtered air
- **ALBUTEROL (2.5mg in 3mL NS)**
- Invasive airway if unresponsive to albuterol

Decontaminate and Cutout
- Remove and bag equipment, PPE, and clothing
- Wipe away gross contamination, RSDL cut line, cut out
- RSDL residual contamination on skin (>2min contact time, then wipe away)
- Remove and replace contaminated treatments (chest seals, tourniquets, etc.)

C^2 H^2 E
- **CIRCULATION** (asses vitals, resuscitate) **COUNTERMEASURES** (rapid decon, irrigate eyes and wounds with water)
- Prevent **HYPOTHERMIA**/assess mental status (altered due to agent or trauma?) **HEAD INJURY**
- **EVACUATE** to next role of care/zone

COUNTERMEASURE/TREATMENT
Dimercaprol (BAL) Administration
- Initial Dose: 3mg/kg deep IM repeat q4hr for two days
- Then: q12hr for 7-10 days
- Severe & Life Threating Exposure: consider 5 mg/kg
- Side Effects: Increased BP, Tachycardia, Nausea/vomiting, Headache, Anxiety, Injection Necrosis
- Contraindications: Nut Allergy.

Supportive Care
- **PAIN MANAGEMENT**
- Expect **SIRS** and **ARDS** in severe cases

Mechanical Ventilations
- Use **ARDS VENTILATOR MANAGEMENT** techniques

Skin
- Burns-apply Silvadene & bandage QID (burn fluid resuscitation not necessary
- Blister fluid may contain Arsenic, unroof >2cm, irrigate, calamine or steroidal cream

Eyes
- Petroleum based ophthalmic ointment,

COLD ZONE

(MARCHE)² Reassessment
M^2: Convert tourniquets & bandage wounds
A^2: In case of severe inhalation symptoms upgrade airway adjunct & RSI
R^2: Vesicant Inhalation Tx SOP, Ventilator, O_2 , PEEP, Suction, Bronchoscopy
C^2: Trend Vitals, TXA, FDP, FWB, Fluid Challenge if Req'd / severe exposures will present with distributive shock requiring chelation therapy with Dimercaprol aka British Anti-Lewisite (BAL) in order to resolve
- **H^2:** Hypothermia (HPMK, fluid warmer)/Head wounds (treat elevated ICP, Neuro exam, MACE) **HEAD INJURY** treat elevated ICP, conduct neuro exam, MACE

INCAPACITATING AGENTS

Incapacitating Agents: Anticholinergics, Opioids, Riot Control
- Variable; aerosol, smoke/gas, or liquid
- Fentanyl derivatives extremely potent lethality

PPE and Detection
- Mask (C2–A1 Filter)
- AP-PPE
- JLIST or UIPE

M8 Detection Paper
- Not effective

CRESS Symptomatic Presentation
C: Varies with agents
R:
E:
S:
S:

HOT ZONE
POI

Immediate Action + M² A² R² E.
- address **MASSIVE HEMORRHAGE / Mask check**
- assess **AIRWAY**/administer **ANTIDOTE**
- asses **RESPIRATIONS**/conduct **RAPID SPOT DECON**
- **Extract** (move upwind, uphill, upstream–away from threat)

OPIOIDS

C – Sedation
R – Decreased respirations
E - miosis
S – normal
S- normal

OPIOID ANTIDOTE:
- **NALOXONE (2–4mg)** additional escalating doses up to10mg prn
- May require **NALOXONE** drip at 2/3 of response dose/hr
- Support respirations as needed see **RESPIRATORY DISTRESS**

WARM ZONE
DIRTY CCP

M² A² R² Reassessment
- Clear airway (copious secretions)
- Anticipate laryngospasms
- Place advanced airway (largest bore ET as able), be prepare to conduct cricothyroidotomy for failed airway
- Advanced Ventilatory support (SAVe or simple vent may not be sufficient, ARDS technique, need to manipulate peep, volume, FiO_2)
- O_2 as needed, maintain air filter

Decontaminate and Cutout
- Remove and bag equipment, PPE, and clothing
- Soap and water sufficient for skin decon
- Remove and replace contaminated treatments (chest seals, tourniquets, etc.)

C² H² E
- **CIRCULATION** (asses vitals) **COUNTERMEASURES**
- Prevent **HYPOTHERMIA**/assess mental status (altered due to agent or trauma?) **HEAD INJURY**
- **EVACUATE** to next role of care/zone

ANTICHOLINERGICS

C – Delirium, agitation
R – normal, tachypnea, tachycardia
E – red
S – mydriasis
S – red, hot dry

ANTICHOLINERGICS ANTIDOTE:
- Titrate **Benzodiazepines (2–4mg IV/IO/IM)** to control severe agitation
- Support respirations as needed see **RESPIRATORY DISTRESS**

Laryngospasm may occur with both Phosgene and Chlorine. Anticipate airway edema and manage airway early. If advanced airway required, place largest endotracheal tube possible to facilitate suctioning. Intravenous fluids may be necessary in the setting of volume depletion, but should not be given empirically. Fluid overload can contribute to pulmonary edema and should be avoided.

Consider following for wheezing /bronchospasms:
- **ALBUTEROL (2.5mg in 3mL NS)**
- **METHYLPREDNISOLONE (125mg IV)**
- **See RESPIRATORY DISTRESS**

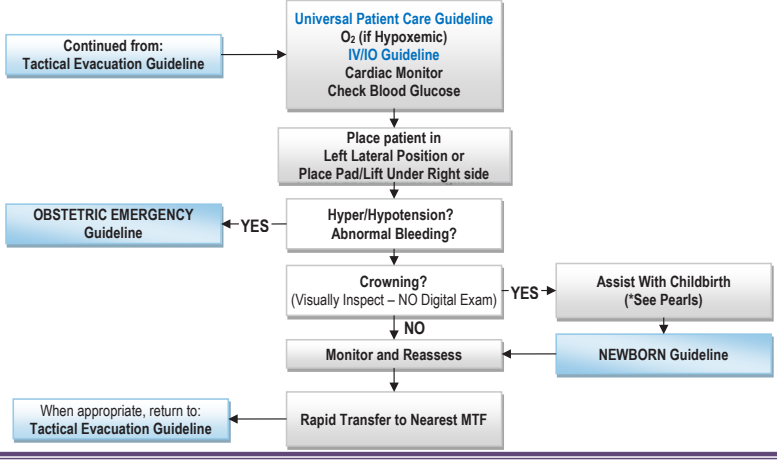
Mechanical Ventilations
- Use **ARDS VENTILATOR MANAGEMENT** techniques

COLD ZONE

MARCHE² Reassessment
- Continue to address any immediate life threats
- provide **AIRWAY** and **RESPIRATORY** support as necessary, provide **supplemental O_2** even with normal SpO_2
- continue **CIRCULATION** support (monitor vitals), resuscitate as necessary / **COUNTERMEASURES** 2nd dose as appropriate)
- prevent **HYPOTHERMIA** with HPMK, warm fluids/**HEAD INJURY** treat elevated ICP, conduct neuro exam, MACE

CHILD BIRTH

Signs and Symptoms:	Possible Complications:
• Spasmodic Pain • Vaginal Fluid/Bleeding • Crowning/Urge to Push • Meconium	• Preterm Labor • Spontaneous Vaginal Delivery • Placenta Previa • Prolapsed Cord • Abnormal Presentation (e.g., breech)



Pearls:

- Document all times–delivery, contraction frequency/length.
- Assist with birth:
  - Position mother as necessary.
  - Prepare 2 sets of hemostats and scissors/scalpel, umbilical cord clamp if available, bulb suction.
  - If umbilical cord palpable around neck–attempt to reduce manually prior to delivery of head (should feel rope–like structure around neck). As last resort, and if unable to keep pressure off of the cord, clamp and cut cord when unable to manually reduce.
  - If umbilical cord seen, elevation of presenting part with vaginal hand and maintain elevation until delivery via C–section AKA "ride the bed" ***Do not place pressure on the cord or monitor pulse via the cord.
  - Suctioning of nose and mouth with bulb aspirate recommended if obvious obstruction from secretions.
  - Use slight downward pressure to deliver superior shoulder, then slight upward pressure to deliver lower shoulder.
  - Clamp cord after 1–3 minutes with 2 hemostats and cut between clamps.
  - Immediately wrap infant and give to mother–assistant to aid in monitoring child.
  - Deliver placenta–should feel lengthening/giving way of cord and gush of blood–keep placenta for pathology evaluation. (This process may take up to 30min. Never pull on the umbilical cord in attempts to speed delivery.)
  - "Externally" massage uterus to encourage contraction and limit bleeding.
  - If neonate appears to be stuck in the birth canal (i.e., turtling of the head), flex the mother's hips (both knees to chest) in order to widen the birth canal.
  - Provide the neonate with safe and adequate hearing protection and hypothermia prevention as possible.

NEWBORN CARE & DISTRESS

Continued from:
- **TACTICAL EVACUATION Guideline,**
- **CHILDBIRTH Guideline, or**
- **Pediatric RESPIRATORY DISTRESS Guideline**

Maintain:
Universal Patient Care Guideline
(Mother and Newborn)

- **Airway Open?** (Breathing or Crying)
- **Good Tone?**
- **Full Term Delivery?**

YES → **Post Resuscitation Care**
- Clear Airway (bulb syringe mouth/nose)
- Dry Infant
- Keep Warm (wrap in blanket)
  - ○ Avoid Hyper/Hypothermia
- Determine APGAR Score
- Treat Hypoglycemia (Glucose <40)
- Continuous Monitoring (with SpO_2)

NO
- Clear Airway (Bulb syringe mouth/nose)
- Dry Infant
- Stimulate (Foot Tap, Back Rub)
- Keep Warm (wrap in dry blanket)
- SpO_2 Monitor (if not already placed)
- Determine APGAR Score

- **HR <100?**
- **Apnea or Gasping?**
- **Labored Breathing?**
- **Persistent Cyanosis?**

NO → **Post Resuscitation Care**

YES
- Clear Airway
- **BVM (PPV): Titrate to 94-99% SpO_2 at 30–60 breaths/min**
- SpO_2 Monitoring

HR <100? NO → **Post Resuscitation Care**

YES → Take Ventilation Corrective Steps **(Intubate if NO Chest Rise)**

HR <60? NO → Take Ventilation Corrective Steps

YES
- **Chest Compressions with PPV** (120 events/min: 90 compressions interspersed with 30 ventilations)
- **Consider Intubation**

HR <60? NO → Chest Compressions with PPV

YES → **Epinephrine 1:10,000 0.01-0.03mg/kg push q3-5min** (0.1-0.3mL of 1:10,000 10cc Cardiac Epi vial)

Consider:
1. **Hypoglycemia** (Treat Glucose <40)
2. **Shock**
3. **Pneumothorax** (Intubate)

1. **D12.5 1.0mL/kg IV** (Dilute D50 to ¼ strength (1mL D50 in 3mL NS)
2. **IVF or Blood 10mL/kg IV**
3. **Intubation**

Meconium Staining of Amniotic Fluid?
- Suction mouth then nose until clear with bulb syringe. Deep suction is no longer advised.

Targeted Preductal SpO_2 After Birth

1 min: 60-65%
2 min: 65-70%
3 min: 70-75%
4 min: 75-80%
5 min: 80-85%
10 min: 85-95%

Do NOT titrate O_2 for SpO_2 >95%

Signs of:
Dehydration
- Tachycardia, ↓BP
- Sunken Fontanelles
- No tears
- Dry mouth, tongue, skin
- ↓UOP

Fluid Overload
- Shortness of Breath
- Ankle/Sacral Edema
- ↑Jugular venous pressure
- Crackles in Lungs

APGAR SCORE
- Determine by end of 1st 60 seconds of care and repeat every 5 min.
- Score of 6 or less? Start Immediate Resuscitation.

(CPR: **90 compressions per 30 ventilations/min** – provide supplemental O_2 to titrate to 94-99% SpO2)

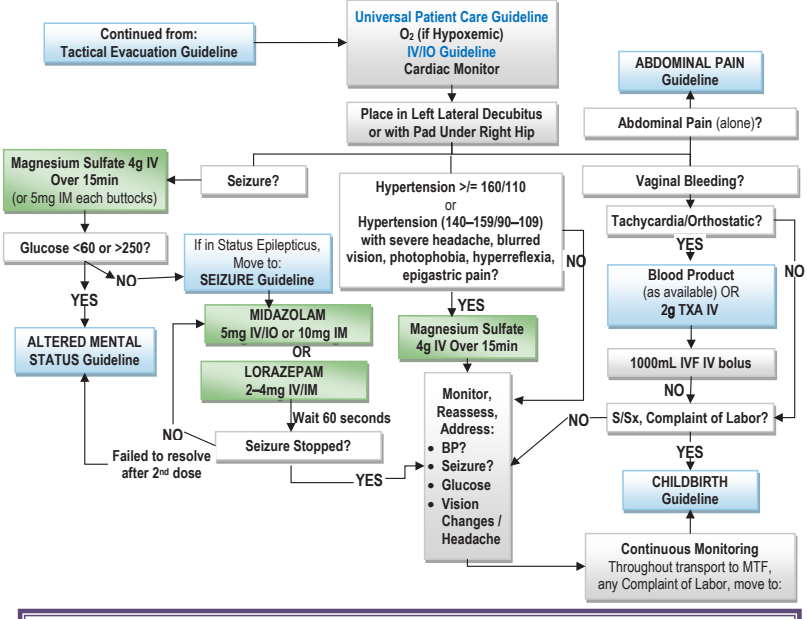
APGAR SCORING	0 POINTS	1 POINT	2 POINTS	SCORE
Activity (Muscle Tone)	Absent	Arms and Legs Flex	Active Movement	
Pulse	Absent	Below 100 bpm	Over 100 bpm	
Grimace (Reflex irritability)	Flaccid	Some Extremity Flexion	Active motion (pull away, cough)	
Appearance (Skin color)	Blue, Pale	Body Pink, Extremities blue	Completely Pink	
Respirations	Absent	Slow, irregular	Vigorous cry	
			TOTAL APGAR:	

Severely Depressed	**0-3**
Moderately Depressed	**4-6**
Excellent Condition	**7-10**

OBSTETRIC EMERGENCY

Signs and Symptoms:
- Vaginal Bleeding
- Abdominal Pain
- Seizure
- Hypertension
- Headache
- Visual Disturbance

Differential Diagnosis:
- Pre-Eclampsia/Eclampsia
- Placenta Previa
- Abruptio Placentae
- Spontaneous Abortion



Pearls:
- Seizure/headache/vision complaints: can give Midazolam 0.1mg/kg IV q15–30min or 1mg IV q2-3min up to 5mg while waiting for magnesium to take effect.
- Seizure activity in an OB patient signifies eclampsia.
- The best life support for the fetus is to resuscitate the mother.
- All pregnant/suspected pregnant patients should be kept in the left lateral decubitus position or have padding placed below the right hip to keep pressure off of the inferior vena cava.
- Use caution when using magnesium–it can lead to cardiorespiratory collapse with hypotension and decreased respiratory drive.
- Treat all hypertensive patients as if they are pre–eclamptic despite any prior history of hypertension.
- The leading cause of Postpartum Hemorrhage is Uterine Atony (lack of contracting), which can be treated with uterine massage

TREATMENT OF MINORS

INDICATIONS:

Responding to treat a minor patient without a parent or legal guardian representative available. For the purpose of these guidelines, all patients under age 18 years will be considered minors. Medical aircrew and medical directors should consult unit rules of engagement and applicable laws and adjust accordingly.

PATIENT MANAGEMENT PROCEDURE:

1. Treatment and transport of any minor requiring immediate care to save a life or prevent severe injury will be performed following the principle of implied consent for emergency care. (Assume any minor who needs treatment to save life, limb, eyesight, or to prevent severe injury has provided consent to treatment.)

2. **ALWAYS** act in the patient's best interest. **ALWAYS** maintain complete and careful documentation.

3. If the parent or guardian is present, follow these guidelines:
    a. Allow one (1) parent to accompany the child during transport after approval of the pilot in command (PC) **and** if it does not interfere with patient care or flight safety.
    b. In event of major trauma and/or cardiac arrest, judgment should be exercised in allowing parents to accompany the child. Recent evidence supports this practice in emergency departments and some EMS settings, but care should be exercised to maintain crew safety and mission accomplishment.
    c. Allow the parent to hold or touch the child, if possible, while assuring optimal transport restraints to assure safety.
    d. Remember to be open and honest to both parent and child about the child's condition and any treatment given. **DO NOT** diagnose, **DO NOT** deceive, and **DO** try to comfort the child and parent.

4. In many jurisdictions, parent or legal guardians **CANNOT** refuse consent for treatment/transport of a minor with a life-threatening condition. Contact your medical director in the event of the parent/guardian refusing treatment/transport of a minor with a life-threatening condition.

SEXUAL ASSAULT

INDICATIONS:

1. Reported and/or suspected assault on any person regardless of age or gender.
2. Trauma and/or bleeding to the vagina, rectum or buttocks that cannot be identified as being the result of any other cause.

REMARKS:

1. Focus shall be placed on the victim and on doing what is necessary and appropriate to support victim recovery and also, if a Service Member, to support that Service Member to be fully mission capable and engaged.
2. Medical personnel should be gender–responsive, culturally competent, and recovery– oriented.
   a. Medical providers giving care to sexual assault victims shall recognize the high prevalence of pre–existing trauma (prior to present sexual assault incident) and the concept of trauma–informed care.
   b. If the attending flight medic is not appropriately trained to utilize a Sexual Assault Forensic Evidence (SAFE) Kit, information will be forwarded to the Medical Treatment Facility in order to make the necessary arrangements to complete the SAFE Kit administration as soon as possible.
3. Flight Paramedics shall abide by the Sexual Assault Prevention and Response (SAPR) Program and coordinate with the Sexual Assault Response Coordinator (SARC) and Sexual Assault Prevention and Response Victim Advocate (SAPR VA). The SARCs shall serve as the single point of contact for coordinating care to ensure that sexual assault victims receive appropriate and responsive care.
4. Sexual assault victims shall be given priority and treated as emergency cases. Emergency care shall consist of emergency medical care and the offer of a SAFE Kit.

PATIENT MANAGEMENT PROCEDURE:

1. In the management of sexual assault patients, the DoD's first priority for victims is to protect, treat with dignity and respect, and to provide the medical treatment, care, and counseling that patients deserve. Under the DoD Confidentiality Policy, sexual assault victims have two reporting options: Restricted and Unrestricted. It is mandatory that all DoD health care providers (including 68Ws) adhere to the parameters of confidentiality and notification pursuant to each form of reporting.

   a. **Restricted Reporting**: Reporting option that allows assault victims to confidentially disclose the assault to specified individuals (e.g., SARC, SAPR VA, healthcare personnel) and receives medical treatment (including emergency care), counseling, and assignment of a SARC and SAPR VA; without triggering an investigation. The victim's report provided to healthcare personnel (including the information acquired from a SAFE Kit), SARCs, or SAPR VAs will NOT be reported to law enforcement or to the command to initiate the official investigative process unless the victim consents or an established EXCEPTION applies. Restricted reporting applies to Service Members and their military dependents 18 years of age and older. Additional persons who may be entitled to Restricted Reporting are NG and Reserve Component members. Only a SARC, SAPR VA, or healthcare personnel may receive a Restricted Report.

   b. **Unrestricted Reporting:** A process that an individual covered by this policy uses to disclose, without requesting confidentiality or Restricted Reporting, that he or she is the victim of a

sexual assault. Under these circumstances, the victim's report provided to healthcare personnel, the SARC, a SAPR VA, command authorities, or other persons is reported to law enforcement and may be used to initiate the official investigative process.

5. Priority treatment as emergency cases includes activities relating to access to healthcare, coding, and medical transfer of evacuation and complete physical assessment, examination, and treatment of injuries including immediate emergency interventions.
6. **DO NOT** attempt to examine the patient without informed consent except to treat immediate life, limb, or eyesight threats. SARC notification must not delay emergency medical care treatment of a victim.
    a. Limit cleaning of wounds to only determine severity.
    b. Check for associated or additional injury and/or other illness. Refer to appropriate medical treatment guidelines as appropriate.
7. In situations where installations do not have SAFE kit capability, the installation commander will require that the eligible victim, who wishes to have a SAFE, be transported to a MTF or local off-base, non-military facility that has a SAFE capability. A local sexual assault nurse examiner or other healthcare providers who are trained and credentialed to perform a SAFE may also be contacted to report to the MTF to conduct the examination.
8. Preserve all evidence:
    a. Bag all personal items (e.g., blood stained items, clothes). Paper bags are recommended if available, in order to prevent excess moisture accumulation and subsequent evidence degradation.
    b. Ensure all items are signed for before handing off.
    c. Ensure all interactions, statements made by the patient, and all treatment given is medically documented in patient care record while maintaining patient confidentiality.

PATIENT REFUSAL

INDICATIONS:

If a patient (or person[s] responsible for a minor) refuses treatment or transport, after pre-hospital providers have arrived on the scene, the following procedures should be carried out:

PATIENT MANAGEMENT PROCEDURE:

1. A Primary Assessment (to include vital signs) should be completed, if possible. Pay particular attention to the patient's mental status.

2. Any injuries or illnesses found to immediately threaten life, limb, or eyesight (or can be assumed will deteriorate en–route) should be addressed and treated immediately while en–route, to the greatest extent possible while assuring safety. With patients that prevent treatment of these injuries, all should be done to encourage the patient seek treatment and any doubt of capacity should prompt treatment/transport under implied consent. Patient with decision-– capacity refusing treatment of life–threatening injury or illness require further clinical judgement and consultation with medical director prior to informed refusal.

3. Injuries or illnesses that do not represent imminent threats to life, limb, or eyesight (or considered unlikely to deteriorate en–route) may be addressed in accordance with the following:

   a. Determine the patient's (or parent's) decision–making capacity to make sound/valid judgments concerning the patient's condition. If there are any doubts from the provider's aspect, consider treating in accordance with the **ALTERED MENTAL STATUS GUIDELINE** or **COMBATIVE PATIENT GUIDELINE.** Decision–making capacity means that:
      - The patient is awake, alert, and oriented to person, place, time and event.

        AND
      - The patient is able to understand his/her medical problem(s), and recite back an understanding of the medical problem(s) and risks of possible resulting problems or worsening of his/her medical condition if patient is not evaluated and treated.
   b. Ensure that you clearly and repeatedly explain to the patient or responsible parties of the concerns and possible risks involved in refusing medical care.
   c. Clearly document all findings during the patient assessment and any discussions with the patient regarding his/her condition as well as all persons involved with the patient. Document all statements made pertaining to the risks associated with refusing treatment and transportation and obtain a signature from a witness (crew member) and the patient or parties responsible for the patient as to refusal of care.
   d. Clearly explain to **Military Personnel** why the treatment is needed**. Notify them that refusal of treatment may bring judicial or administrative adverse action upon them under UCMJ.**

SAMPLE PATIENT REFUSAL

DATE:_____

PATIENT REFUSAL FORM

PATIENT INFORMATION:

_____ _____ _____
LAST NAME FIRST NAME M.I.

_____
ADDRESS

_____ _____ _____
D.O.B / AGE SSN / DOD ID UNIT

_____
GUARDIAN / CARE GIVER

WAIVER OF LIABILITY:
I REFUSE TREATMENT AND/OR TRANSPORTATION BY THE PROVIDING MEDICAL SERVICE. I ASSUME RESPONSIBILITY FOR MY OWN, MY CHILD'S OWN, OR FAMILY MEMBER'S MEDICAL TREATMENT. I RELEASE THIS MEDICAL SERVICE FROM ANY LIABILITY OR MEDICAL CLAIMS RESULTING FROM MY REFUSAL OF EMERGENCY MEDICAL CARE AND/OR TRANSPORTATION.

I HAVE BEEN ADVISED:
☐ TO SEEK MEDICAL CARE OF A PHYSICIAN. (INITIALS_____)
☐ REFUSING MEDICAL CARE AND/OR TRANSPORTATION AGAINST MEDICAL ADVISEMENT CAN LEAD TO WORSENING OF MY CONDITION AND/OR A FATAL OUTCOME. (INITIALS_____)

☐ DIFFERENTIAL DIAGNOSIS:_____
☐ VITALS: BP:_____ HR:_____ RR:_____ SPO2:_____ GCS:_____

☐ I AM MAKING THIS REFUSAL IN GOOD MENTAL CAPACITY AND JUDGEMENT. (INITIALS_____)

_____ _____
PATIENT / GUARDIAN SIGNATURE WITNESS SIGNATURE

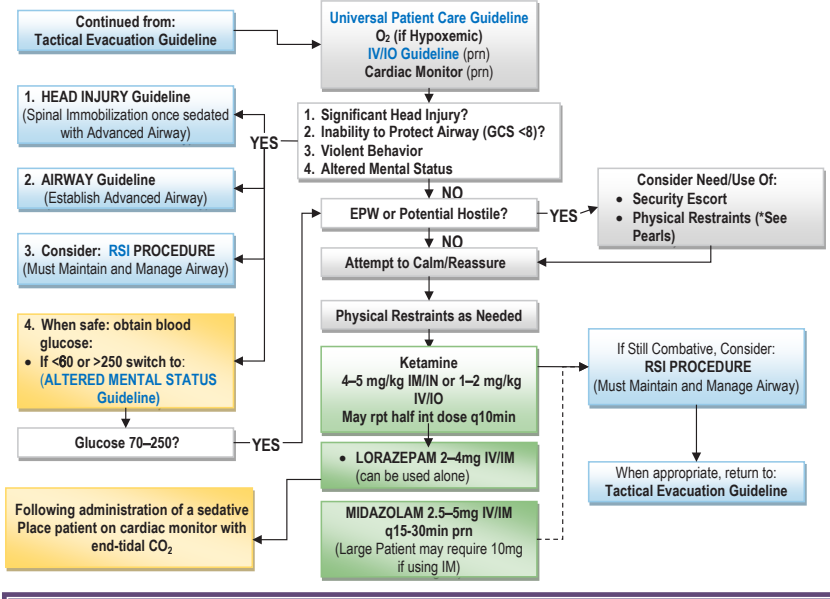
_____ _____
FLIGHT MEDIC SIGNATURE ADDITIONAL WITNESS SIGNATURE

COMBATIVE PATIENT

Signs and Symptoms:
- Bizarre Behavior
- Violent Activities
- Head Injuries/AMS
- Anxiety
- Tachycardia/Elevated BP

Differential Diagnosis:
- Head Trauma/Psychiatric Disorders
- Thyroid Dysfunction
- Hyper/Hypoglycemia
- Diabetic Ketoacidosis/Toxic Ingestion
- Environment (Hyper/Hypothermia)
- Hypoxia

Safety of Helicopter/Crew/other patients is first priority



Pearls:
- ***Physical restraints** such as tying down patient hands to prevent pulling lines, etc., should be limited to the least amount necessary to accomplish treatments/prevent injuries. **(Kerlex gauze can be a useful restraint)**
  - **Do not jeopardize the patient's airway!** Avoid hog tying, lying prone in restraints, sandwiching between spine boards, etc.
  - **Check Vitals, SpO_2, Pulse and Cap Refill q5min.**
- Combative patients present a very real threat to the safety of themselves, the medic, and the aircrew during flight. For this reason, any patient with altered mental status and the potential for combativeness that would threaten aircrew safety or themselves should be prophylactically sedated/paralyzed and intubated for the flight.
- Use of sedative medications adds risk of decreasing respiratory drive and should be used with caution. However, meds should be titrated to adequate dosage to control patient. Be prepared for airway interventions/vomiting if used. Cardiac arrest in patients with excited delirium/extreme agitation following restraint is well documented. Capnography in addition to cardiac monitoring is essential.

MWD Normal Clinical Parameters

for further reference see

Clinical Practice Guidelines for Military Working Dogs, 12 Dec 2018

Vital Signs

- **Temperature (rectal) – 99.5°–103° F**
- **Heart Rate/ Pulse – 60–80 (at rest) bpm**
- **Respiratory Rate – 16–32 bpm**
  (Controlled panting is normal**)**
- **Blood Pressure – Systolic 120mmHg,**
  Diastolic 80mmHg, Mean 90–100mmHg

Clinical Pearls for MWDs-

- Average MWD weighs 30-35kg (German shepherd dogs, Belgian Malinois, Labrador retrievers).
  All drug dosages should be calculated based on measured or estimated body weight.
  DOG HANDLER CARRIES DRUG CARD FOR THE DOG
- IV catheterization access points are:
  - Cephalic vein on the cranial (superior) aspect of the forearm (figures 1&2)
  - Lateral saphenous vein on the lateral aspect of the hind limb at the distal tibial area (figure 3)
  - External jugular vein in the jugular furrow of the neck. Standard human central venous catheter kits can be used; the Seldinger technique is most reliable.
- IO catheterization access points are:
  - Greater trochanter of the humerus (figure 4&5)
  - Medial tibia just distal to tuberosity (figure 6&7)
- Arterial Pulse is palpated at the femoral artery on the medial aspect of the proximal thigh in the inguinal area (figure 8) or at the dorsal metatarsal artery on the dorsal aspect of the proximal hind paw.
- Heart sounds are best auscultated over the lower left lateral thoracic wall between the 4th and 5th intercostal space. (figure 9)
- 3-lead electrocardiograms are sufficient for MWDs. Adhesive electrodes should be taped to the pads of the paws of the left forelimb (**black** lead), right forelimb (white lead), and left hind limb (**red** lead). (figure 10)
- Pulse oximetry probes can be utilized on conscious dogs using the ear pinna, lip fold, or flank skin; while not optimal for oximetry, these alternative sites are generally acceptable. For optimal reliability place probe on tongue (only in unconscious dogs)

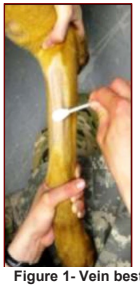


Figure 1- Vein best punctured toward the elbow.

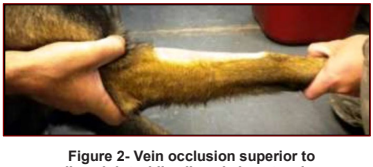


Figure 2- Vein occlusion superior to elbow joint while elbow is in extension.

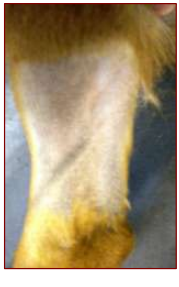


Figure 3–lateral saphenous vein on the hind limb of a MWD

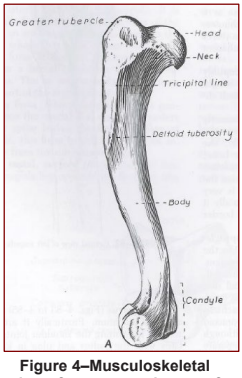


Figure 4–Musculoskeletal view of greater trochanter of the humerus for IO catheter

Figure 5–Shoulder IO catheter location

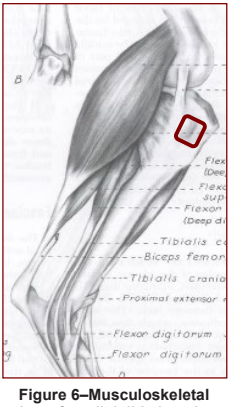


Figure 6–Musculoskeletal view of medial tibia location for IO catheter just distal to tuberosity

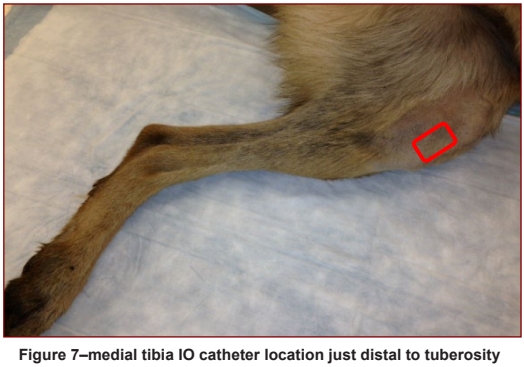


Figure 7–medial tibia IO catheter location just distal to tuberosity

Figure 8–location for palpation of the femoral arterial pulse

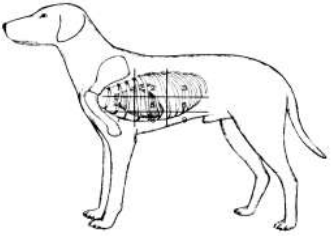


Figure 9–optimal location for auscultation of the heart sounds and palpation of the heart beat

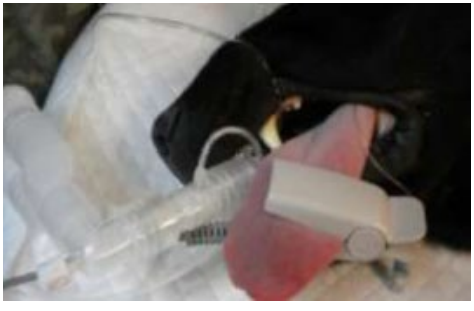
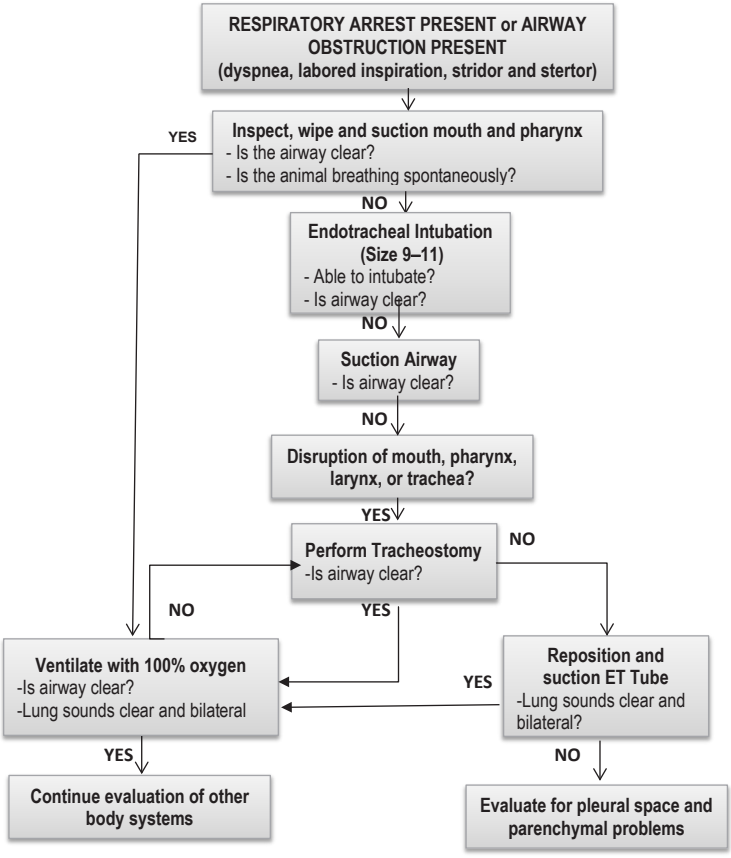


Figure 11–placement of pulse oximetry on tongue

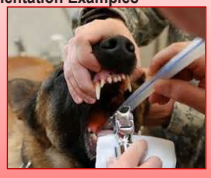
Figure 10–placement of adhesive ECG electrode pads on the footpads

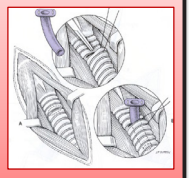
MWD Airway Management



100% Oxygen Supplementation Examples

Conscious or fractious muzzled dogs (10–15L/min)





Orotracheal intubation or Tracheostomy (2L/min)

Clinical Pearls:

- Unconscious MWDs: Use tracheal insufflation, orotracheal intubation, or tracheostomy. If there is an obstruction then bypass the obstruction until the patient is more stable. Do not use tracheal insufflation for >30 min.
- NOTE: intubation of the MWD is most easily performed with the dog in sternal or prone position, head and neck extended, and tongue pulled forward. Verify placement by palpating neck for 1 tube. If 2 tubes are felt, the tube is in the esophagus. Capnometer reading >10mmHg also ensures correct placement.

MWD Heat Injury Treatment

MILD heat injury (heat stress) – excessive thirst, discomfort associated with physical activity, mild dehydration, but with controlled panting (i.e., the patient can control or reduce panting when exposed to a noxious inhalant such as alcohol).

- Remove patient from source of heat, discontinue exercise, cool by fans or air condition, give cold water to drink.

- Monitor patient for
  - Body Temp q15min
  - Mentation/LOC
  - Weakness/collapse
  - Anxiety/restlessness
  - Shock

MODERATE heat injury (heat exhaustion) – heat stress present, as well as weakness, anxiety, and uncontrolled panting (i.e., the patient cannot reduce panting when exposed to a noxious inhalant), but central nervous system (CNS) abnormalities are not present.

- Same as MILD but more aggressive cooling required Remove patient from all heat and stop all activity.

- Cool by fans or air condition.
- Thoroughly soak the hair coat to the skin (room–temp) in order to reduce core body temperature <105F.
-Give IV fluids 3–5mL/kg/hr if not in shock

-Monitor patient for
  - Body Temp q15min
  - Mentation/LOC
  - Petechiae/ecchymoses
  - Weakness/collapse
  - Anxiety/restlessness
  - Shock

SEVERE heat injury (heat stroke) – heat exhaustion are present, coupled with varying degrees of CNS abnormalities (changes in mentation and level of consciousness, seizures, abnormal pupil size, blindness, head tremors, and ataxia.

- Triage
  - Establish airway
  - Provide oxygen
  - Establish IV for shock treatment

- Aggressively cool patient until rectal temp is less than 105°F.
  - Use only room temperature fluids.
  - Give IV fluids (shock protocol)

-Monitor patient for
  - Vitals, Blood Glucose
  - ECG arrhythmias
  - Mentation/LOC
  - Gait abnormalities
  - Vision changes
  - Seizure
  - Rebound hypothermia

Clinical Pearls:

- **PANTING** is the only significant cooling mechanism for dogs.
- **NO** specific body temperature defines heat stroke in MWD's. Normal rectal temperature is 101° to 103° F in the MWD. Temperatures as high as 105.8°F have been associated with pathology. Most commonly, heat stroke is seen in MWDs with rectal temperatures greater than 107°F.
- **DO NOT** use of cold intravenous fluids, ice packs, or ice-water baths for cooling.
- Once the MWD's body temperature is =103°F **CEASE** all cooling efforts and monitor for rebound hypothermia, and prepare for rewarming measures. Actively warm the dog if the temperature <100°F
- Treat seizures with midazolam or diazepam 0.3mg/kg IV/IO or Intranasal prn

MWD CPR Management

Cardiopulmonary Arrest Confirmed

BEGIN BASIC LIFE SUPPORT–SUSTAIN CPR for 2–3 minute cycles

- **Circulation–**Chest compressions, FAST and HARD, 100 compressions per minute
- **Airway–**Clear airway and intubate; perform tracheostomy if obstructed airway
- **Breathing–**Manually ventilate with 100% O_2 at 8–10 breaths per minute

BEGIN ADVANCED LIFE SUPPORT
ECG (determine arrest rhythm)
IV/IO access for drug delivery

VF or VT

- Defibrillate – **2–5J/kg** biphasic
- Resume chest compressions x 1 cycle (2 min)
- Defibrillate twice more, with 1 compression cycle between each counter–shock, if refractory
- Drug therapy if counter-shock no successful:
  - Epinephrine **0.01mg/kg** IV/IO
    or
    Vasopressin **0.8U/kg** IV/IO **once** and
  - Lidocaine **2mg/kg** IV/IO
    or
  - Amiodarone **5–10mg/kg** IV/IO
- Repeat counter–shock (50% INCREASED initial energy) if refractory

ASYSTOLE/BRADYCARDIA/PEA

- Drug therapy:
  - Atropine **0.04mg/kg** IV/IO *only if bradycardia preceded arrest*
  - Epinephrine **0.01mg/kg** IV/IO
    and
    Vasopressin **0.8U/kg IV/IO once**

CPR Emergency Drugs and Doses

		Weight (kg)	2.5	5	10	15	20	25	30	35	40	45	50
		Weight (lb)	5	10	20	30	40	50	60	70	80	90	100
	DRUG	DOSE	ml	ml	ml	ml	ml	ml	ml	ml	ml	ml	ml
Arrest	Epi Low (1:1000)	0.01 mg/kg	0.03	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5
Arrest	Epi High (1:1000)	0.1 mg/kg	0.25	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
Arrest	Vasopressin (20 U/ml)	0.8 U/kg	0.1	0.2	0.4	0.6	0.8	1	1.2	1.4	1.6	1.8	2
Arrest	Atropine (0.54 mg/ml)	0.05 mg/kg	0.25	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
Anti-Arrhyth	Amiodarone (50 mg/ml)	5 mg/kg	0.25	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
Anti-Arrhyth	Lidocaine (20 mg/ml)	2-8 mg/kg	0.25	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
Reversal	Naloxone (0.4 mg/ml)	0.04 mg/kg	0.25	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
Reversal	Flumazenil (0.1 mg/ml)	0.01 mg/kg	0.25	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
Reversal	Atipamezole (5 mg/ml)	50 µg/kg	0.03	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5
Defib Monophasic	External Defib (J)	2-10 J/kg	20	30	50	100	200	200	200	300	300	300	360
Defib Monophasic	Internal Defib (J)	0.2-1 J/kg	2	3	5	10	20	20	20	30	30	30	50
Defib Biphasic	External Defib (J)	2-4 J/kg	6	15	30	50	75	75	100	150	150	150	150
Defib Biphasic	Internal Defib (J)	0.2-0.4 J/kg	1	2	3	5	6	8	9	10	15	15	15

Reprinted with permission from the Veterinary Emergency & Critical Care Society (veccs.org) RECOVER Initiative CPR Emergency Drugs and Doses chart.

Clinical Pearls:

- 70% of MWDs that arrest will have PEA, asystole, or sinus bradycardia as the initial arrest rhythm. Epinephrine or vasopressin are best choices for these rhythms or for empiric use if ECG capability is not available

- Avoid interrupting chest compressions! The key to successful resuscitation is to SUSTAIN chest compressions aggressively for 2-3 minutes before stopping to check status.

- Most people apply too little force when performing chest compressions! Do not be concerned with breaking ribs or injuring the heart or chest with BLS. In contrast to CPR in people, the thorax of MWDs is more compliant and fractures are rare

MWD Analgesia and Sedation

Sedation Protocols in the Military Working Dog

MWDs may become fractious during flight and chemical restraint by intramuscular injection will likely be required to facilitate IV catheter placement and treatment of a conscious MWD

MILD SEDATION

- **INDICATION:** Relax MWD for examination, handling, reducing anxiety
- **PROTOCOL:** Midazolam 0.3mg/kg IM AND Hydromorphone 0.2mg/kg IM
  - **Hydromorphone 0.2mg/kg IM may be substituted for morphine**
- **EXPECTATION:** MWD will be calm, but reactive and noise sensitive

DEEP SEDATION

- **INDICATION**: First line protocol for fractious MWD
- **PROTOCOL:** Midazolam 0.3mg/kg AND Ketamine 5mg/kg AND Hydromorphone 0.1mg/kg IM
  - **Hydromorphone 0.1mg/kg may be substituted for morphine IM**
- **EXPECTATION:** The MWD will not be able to walk but cannot be intubated. MWD may be aroused with significant stimulation and maintains laryngeal and palpebral reflexes

If MWD is suspected of having PAIN or PAIN is anticipated, please provide analgesia

Intermittent IV or IM supplementation

Or

Hydromorphone 0.1–0.2mg/kg q2–4hr	**Morphine Sulfate** 0.2–0.5mg/kg q4–6 hr

- IV catheter (discretional)
- Give Midazolam 0.3mg/kg IM & Hydromorphone 0.2mg/kg IM q2-4hr

Continuous Infusion

Or Or

Fentanyl 2–10mcg/kg/hr	**Morphine** 0.1–0.25mg/kg/hr	**Hydromorphone** 0.02–0.05mg/kg/hr

- Place IV catheter once the MWD is controlled
- Give Midazolam 0.3mg/kg IM & Ketamine 2mg/kg IM & Hydromorphone 0.1mg/kg IM
- Can also use Propofol in 1mg/kg boluses IV as needed to allow catheterization or intubation

Clinical Pearls:

- Dosages for analgesics in dogs are significantly higher than for people.
- Assessment of pain in dogs is difficult. Health Care Providers should err on side of providing analgesia. Properly performed, it is safe and effective, and analgesia is critically important for safe handling and alleviation of pain.
- Note that all protocols have analgesia incorporated into them. Additional analgesia can be provided by the IV/IM or PO route, as necessary.
- Opioids cause emesis, usually within 5 minutes of administration. Be prepared to remove the muzzle to minimize aspiration risk. Hydromorphone causes excessive panting; use caution with head injuries, GDV, and respiratory disease.
    - **CAUTION: Do NOT use acetaminophen or ibuprofen in MWDs, as these drugs can cause liver toxicity. AVOID use of NSAIDs such as naproxen and aspirin in emergently ill or injured MWDs.**
    - **OPIOID REVERSAL:** At appropriate doses, dogs appear less susceptible to opioid-induced respiratory depression and excessive sedation. However, opioid side effects can be reversed in the dog using NALOXONE 0.01-0.02mg/kg slow IV to effect if needed. **Note that this will reverse analgesia as well as sedation!**

MWD Gastric Dilation-Volvulus

GDV is a **rapidly life-threatening** condition common in MWDs. In GDV, the stomach rapidly dilates (gastric dilation) with fluid, food, and air, and then rotates along the long axis (volvulus) and causes shock by interfering with venous return from the abdomen and pelvic limbs.

Clinical Signs:
- varying degree of abdominal distention/tympany, non-productive retching, attempted vomiting without result; signs of pain (grunting when palpating stomach); signs of anxiety; inability to lay comfortably; and signs of compensatory shock (tachycardia, tachypnea)

Initiate Monitoring:
ECG, NIBP, SpO_2, $EtCO_2$, Evaluate for dysrhythmias, hypotension, hypoxemia, hypo- or hypercapnia

Treat Shock
- Give supplemental O_2
- Place at least 2 IV/IO catheters in the forelimbs (preferably one central)
- Give IV or IO crystalloid therapy utilizing the **10-20-10-10** fluid guideline
- Give **hydroxyethyl starch** (**HES**) boluses (10-20mL/kg) IV or IO as needed to maintain normal blood pressure. Repeat this bolus if no response to therapy.
- Give **hypertonic saline (HTS)** IV bolus of 4mL/kg over 5 minutes (if 7-7.5% HTS is available) for MWDs that fail to respond to two or three quarter-shock boluses of crystalloids and/or one or two boluses of HES.

Decompress the Tympanic Stomach
- Position self on left side, or lay dog on left side
- Locate Insertion point: Palpate last rib, move hand two inches caudal to the last rib, midway between the spine and the ventral border of the abdomen on the right side, auscultate the lateral abdominal wall at most distended area while percussing the wall with a finger. Loudest "ping" is the site of insertion.
- Clip hair over a 6-inch area over the area.
- Prepare area with a surgical scrub.
- Forcefully insert 14-18 gauge IV over-the-needle catheter through the skin, abdominal wall, and stomach wall.
- Note gas or air escaping through the needle from the stomach to signify a successful attempt. .

(**DO NOT ATTEMPT SECOND INSERTION** if first is unsuccessful)
- Apply gentle external pressure to abdominal wall to assist exiting air.
- Remove catheter once air is evacuated.

Provide analgesia utilizing analgesia guideline

Clinical Pearls:

Goal is to treat for shock, decompress stomach, and transport for surgical intervention.

Monitor for ventricular arrhythmias, persistent shock and recurrent dilation

Surgery is REQUIRED for definitive treatment to derotate the stomach.

MWD Shock Fluid Therapy

The "10-20-10-20 Rule"

Shock Fluid Therapy Protocol of MWDs

- Place multiple large-bore intravenous catheters, perform venous cut-down, and/or place intra-osseous (IO) catheters. Provide flow-by supplemental oxygen therapy.

- Give IV/IO crystalloid therapy utilizing the 10-20-10-10 fluid guideline:

1. Calculate total fluid "shock" volume (**90mL/kg**) that might be required.
2. Collect baseline physiologic and clinical data (mentation, NIBP, HCT, TP, HR, pulse quality, CRT, mucous membrane color).
3. Give one quarter of the calculated "shock" volume over the first **10** minutes.
4. Reassess the patient's pulse quality, CRT, mucous membrane color, heart rate, NIBP, etc.
5. Give another one quarter of the calculated "shock" volume over the next **10**-**20** minutes, if necessary.
6. Reassess baseline data.
7. If HCT >20% and TP not below 50% of starting value, and further fluid therapy is required, then give another one quarter of the calculated "shock" volume over **10** minutes.
8. Reassess baseline data.
9. If fluid therapy is still required, give the final one quarter of the calculated "shock" volume over **10**-**20** minutes.

- Give a hydroxyethyl starch (HES) IV or IO bolus of 10-20mL/kg over 5-10 minutes if clinical signs of shock do not abate after the first 30 minutes (first 2 quarter-shock IV challenges) of crystalloid fluids, or response to crystalloid challenges is not sustained. Repeat this bolus if no response to therapy.

- Give a hypertonic saline (HTS) IV bolus of 4mL/kg over 5 minutes (if 7-7.5% HTS is available) for MWDs that fail to respond to two or three quarter-shock boluses of crystalloids and/or one or two boluses of HES.

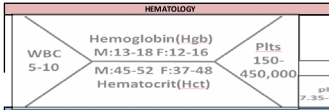
Clinical Pearls:

- Quick calculation for shock dose: Add a zero to the dog's weight in POUNDS for the quarter shock volume in mLs.
- **CAUTION: Human blood products and albumin, or other animal blood products, must never be given to dogs, given the high risk of anaphylactic reactions.**
- Blood product transfusions for MWDs are **ONLY** available from Veterinary Service Support units and their administration is only authorized under the direct supervision of a veterinarian.
- Clinical target for resuscitation end point is a mean arterial pressure (MAP) of >65mmHg or a systolic of >90mmHg. Neonatal or pediatric blood pressure cuffs must be used.
- Consider TXA 10mg/kg in 100mL NS or LRS, IV over 15 min but NOT LATER THAN 3 HOURS post injury

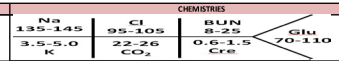
DRUG	STANDARD DOSING	SMALL ADULT (6kg) 132lbs	ADULT (80kg) 176lbs	LARGE ADULT (100kg) 220lbs	INDICATIONS	RESTRICTIONS/ WARNINGS	DURATION	REPEATABILITY/ MAX DOSE
ANTI-FIBRINOLYTIC								
Tranexamic Acid (TXA)	2000mg IV/IO	**2g in 100cc NS over 10min or slow IVP**			Int/Ext Hemorrhage	Give <3 hrs from injury/surgery	UNK	NO REPEAT
ANALGESIA								
Ketamine ** LOW-DOSE	0.1-0.2mg/kg IV/IO >1 min	**6-12mg**	**8-16mg**	**10-20mg**	Analgesia	HTN, Emergence	10-20min	q10-20min prn for pain
Fentanyl (Sublimaze) **	0.5-1mcg/kg IV/IO >3-5 min	**30-60mcg**	**40-80mcg**	**50-100mcg**	Analgesia, Sedation, AMI	Resp depression	20-30min	q20-30min prn MAX 4mcg/kg
Ketorolac (Toradol)	15mg IV or 15-30mg IM	**15mg IV or 15-30mg IM**			Musculoskeletal Pain	Not for Battlefield Trauma	4-6hrs	15mg q6hr; MAX 120mg/day
Morphine **	2-5mg IV/IO or 0.1mg/kg IV	**6mg**	**8mg**	**10mg**	Pain, Anxiolytic, AMI	Resp/BP drop; Head Tx	Variable	prn for sedation if BP/Resp stable
SEDATION ** = Controlled Substance								
Ketamine ** HIGH DOSE	1-2mg/kg IV/IO >2 min	**60-120mg**	**80-160mg**	**100-200mg**	Dissociative Sedation/ RSI	HTN, emergence, avoid sub-dissociative dose	10-20min	1/2 to full dose q10-20min prn for sedation or 1-3 mg/kg/hr infusion
Propofol (Bolus)	1-2.5mg/kg bolus IV/IO, q5-10min prn	**30-90mg**	**40-120mg**	**50-150mg**	RSI/General Anesthesia (Non-analgesic)	Hypotension (up to 30% of MAP)	3-10min	Titrate to effect
Propofol (Constant Infusion)	10-75mcg/kg/min IV/IO	**600-4500mcg/min**	**800-6000 mcg/min**	**1000-7500mcg/min**	General Anesthesia Maint. (Non-analgesic)	Hypotension (up to 30% of MAP)	Infusion	Titrate to effect
Etomidate	0.3mg/kg IV/IO push	**18mg**	**24mg**	**30mg**	Sedation, RSI (Non-analgesic)	Repeat doses can cause adrenal suppression	5-10min	NO REPEAT
Midazolam (Versed) **	0.05-0.1mg/kg IV/IO >1 min	**3-6mg**	**4-8mg**	**5-10mg**	Sedation, Seizures	BP/Resp drop	10-30min	prn q15-30min if BP/Resp stable
PARALYTICS								
Rocuronium (Zemuron)	0.6-1.2mg/kg IV/IO push	**60mg**	**80mg**	**100mg**	RSI/ Maint of paralysis	Must maintain PT airway	30-60min	prn q30-45min for paralysis
Succinylcholine	1-1.5mg/kg IV/IO push	**75mg**	**100mg**	**125mg**	RSI	RSI Only	5-9min	NO REPEAT
Vecuronium	0.1mg/kg IV/IO push Reconstitute w/10mL NS	**6mg**	**8mg**	**10mg**	Maint of paralysis	Must maintain PT airway	40-90min	prn q40-90min for paralysis
PRESSERS								
Epinephrine 1mg/10mL	1mg/500ml NS= 2mcg/mL	**2-20mcg IVP q2-5min or 2-20mcg/min IV/IO infusion**			Hypotension	Must be diluted/ max resuscitation w/blood 1st	Infusion	Start low; Titrate to desired response
Norepinephrine (Levophed)	4mg/500 ml= 8mcg/mL	**Start 2-20mcg/min infusion initially. (adjust for BP) Once BP is appropriate, 2-4mcg/min**			Hypotension	Max resus w/ blood 1st	Consistent Infusion	Start at lowest dose. Titrate up by 0.5mcg/min to MAP >60
Phenylephrine(NEO)	10mg/100ml NS= 100mcg/mL or 10mg/250ml NS= 40mcg/mL	**50-200mcg (1-5mL) q5-10min IVP/IO**			Hypotension	Must be diluted/ Max resus w/ blood 1st	5-10min	prn to maintain SYS BP; start w/low doses and titrate prn
OD/Tox Ingestions (See also Sodium Bicarbonate, Calcium Chloride)								
Glucagon Kit	3-10mg IV/IO/IM	**3-10mg bolus; follow w/3-5mg/hr infusion**			Beta/Ca-ch blocker OD	Dosage is higher than kits	UNK	Titrate infusion for hemodynamics
Naloxone (Narcan)	0.4-2mg IV/IO/IM	**0.4-2mg titrated to appropriate ventilation**			Opioid OD	No minimum needed	20-60min	q2-3min prn (max 10mg)
ANTI-EMETICS								
Zofran (Ondansetron)	4-8mg IV/IO/IM/PO	**4-8mg >30 sec**			Antiemetic	Can cause QT prolongation	4-6hr	Max 8mg q6hr
Promethazine (Phenergan)	12.5-25mg IV/IO/IM	**12.5-25mg**			Antiemetic/Sedation	Altered LOC/ Vesicant	4-6hr	Max 25mg q4hr
ANAPHYLAXIS								
Epinephrine 1mg/1mL	0.3-0.5mg IM; 0.1mg IV/IO	**1 Auto-Injector or 0.3mg IM; 0.1mg IV/IO**			Anaphylaxis	Hold for 10 sec	5-15min	Add doses q5-15min until improve
Diphenhydramine (Benadryl)	25-50mg	**25-50mg PO; 50mg IV/IO**			Antihistamine	Minor sedation	4-8hr	Max 50mg
Methylprednisolone/Solu-Medrol	125mg IV/IO	**125mg**			Anaphylaxis/Asthma	Do not use for head Tx	4hr	NO REPEAT
RESPIRATORY (See also: Methylprednisolone)								
Albuterol(Nebulizer)	2.5-5mg	**2.5-5mg q20min prn (mixed in 3mL NS)**			Bronchodilator	Cardiac arrhythmia	1-4hr	Max 3 initial doses; q1-4hr prn
Albuterol(MDI)	4-8 Puffs	**4-8 Puffs q1-4hr**			Bronchodilator	Cardiac arrhythmia	1-4hr	prn q1-4hr
Epinephrine 1mg/1mL	0.3-0.5mg SQ/IM **or** 0.5mL Neb	**0.3-0.5mg SQ/IM q20min prn or 0.5ml w/3mL NS**			Bronchodilator	No IV use	5-15min	Neb over 15min/Max 3x for SQ/IM
HYPOGLYCEMIA								
D50	10-25g IV/IO	**20-50mL>5min**			Hypoglycemia	Intracranial hemorrhage	UNK	Titrate; avoid over-correction
Glucagon Kit	1mg	**1 Kit (1mg) IV/IM**			Hypoglycemia	Only if D50 not available	UNK	REPEAT q20min
CARDIAC (See also Morphine or Fentanyl for AMI pain)								
Aspirin, Chewable, 81mg	324mg PO	**4 X 81mg Tablets (Chewed)**			Angina/AMI	Must be chewed	4-6hr	NO REPEAT
Nitroglycerin Tablet/Spray	0.4mg SL	**1 Tab/Spray SL q3-5min---MAX 3**			Angina/AMI	Maintain SYS BP>90	20-30min	May repeat up to max of 3 Doses
Epinephrine 1mg/10mL	1mg	**1mg (1 amp) IV/IO q3-5min for Arrest**			Pulseless Arrest	Profusing Tachycardia's	3-5min	Repeat q3-5min w/CPR-No Max
Amiodarone (Cardiac Arrest)	300mg 1st Dose/ 150mg 2nd Dose (Follow w/20ml NS flush)	**300mg IV/IO bolus. If no change in 3-5min give 150mg IV/IO**			Refractory Pulseless V-Fib/V-Tach	Sinus Bradycardia, 2nd/3rd Deg Block	3-5min	Max 2 doses
Amiodarone (Infusion)	150mg over 10-15min, followed by 1mg/min q6hrs	**150mg infusion over 10-15min; followed by 360mg (1mg/min) infusion over 6hr**			Hemodynamically unstable V-Tach/SVT	Sinus Bradycardia, 2nd/3rd Deg Block	Maintain drip	May repeat 150mg infusion q10min prn Do not exceed 15mg/min
Adenosine	6mg/12mg IV/IO Rapid Push	**6mg 1st dose/12mg 2nd dose----Fast push w/rapid, large (>20cc) flush**			Stable, narrow complex tach/PSVT	May cause transient Asystole following push	1-2min	Give 2nd dose if no rhythm change in 1-2min
Atropine	1mg IV/IO	**1mg q3-5min**			Symptomatic Bradycardia	Glaucoma	5-15min	MAX 3mg (3 doses)
Epinephrine 1mg/10mL	0.05-0.5mcg/kg/min	**2-10mcg/minute infusion titrated to desired effect**			Symptomatic Bradycardia	Use if refractive to Atropine/Pacing	5-15min	MAX 3mg (6 doses)
Magnesium Sulfate	1-2g IV/IO	**1-2g diluted in 50ml D5W over 15 min(Torsades w/pulse/VF/V-Tach)**			Torsades De Pointes (with or without pulse)	AV Blocks	30min	Infusion of 1-2g/hr needed following loading dose

DRUG	STANDARD DOSING	SMALL ADULT (60kg) 132LBS	ADULT (80kg) 176LBS	LARGE ADULT (100kg) 220LBS	INDICATIONS	RESTRICTIONS/ WARNINGS	DURATION	MAX DOSE/ REPEATABILITY
CARDIAC-continued								
Sodium Bicarbonate	1mEq/kg IV/IO	**60mEq**	**80mEq**	**100mEq**	TCA OD; Prolonged Cardiac Arrest	Do not mix with other meds/ Flush line after	1-2hr	Maint Infusion of 100-150mEq in 1L D5W @ 100-200mL/hr for TCA OD
Labetalol	10-20mg IV/IO over 1-2min	**10-20mg IV/IO over 1-2 min**			HTN Urgency/ Emergency	Lower MAP by <20%	15-60min	Repeat one time
Calcium Chloride (100mg/mL)	Ca Gluconate can alternatively be used @ 3x doses listed here (except for Beta Blocker OD)	**500-1000mg over 2-5 min for Hyper K issues; 20mg/kg >5-10min for Beta Blocker OD; 1g >5min for Ca Ch Blocker OD; 1g>5min after Blood**			Hyperkalemia/ Beta&Calcium Channel Blocker OD	Central Line use preferred	30min-4hr	20mcg/kg/hr infusion for Beta OD; 1000mg q10-20 x 3 doses prn for Ca Chan Blocker OD
CBRNE								
Atropine	0.05-0.1mg/kg IV/IO q5-10min prn	**3mg**	**4mg**	**5mg**	Organophosphate/ Nerve Agent	Requires large amounts of Atropine (5-20 boxes)	5-15min	Double dose if previous dose does not relieve secretions (atropinization)
Pralidoxime Chloride (2-Pam) (DuoDote ATNAA)	1-3 Auto-Injectors (600mg ea)	**Inject 1-3 injectors (based on severity of symptoms) IM. DuoDote/ATNAA Injector contains both Atropine (2.1mg) and 2-Pam (600mg)**			Organophosphate/ Nerve Agent	Use Atropine 1st if only using single dose 2-Pam (Mark 1/NAAK Kit)	15min	If symptoms remain after 15min, re-inject subsequent doses (Max 1800mg 2PAM)
Multi-Use/ Seizures/ Other								
Diazepam	Anxiety: 2-10mg IV/IM q6hrs///Seizures: 5-10mg q3-4hr///Seizures following Nerve agent Exposure: 10mg IM for seizures or if 3x Mark 1 Kits used				Anxiety/ Seizures/ Nerve Agent Seizures	Respiratory Depression	20-30min	Max dose 30mg for seizures
Lorazepam	1-2mg IV/IO	**Seizures = 1-2mg q10-15min prn; Agitated/Combative Patient = 1-2mg q30-60min**			Seizures/ Agitated or Combative Patient	Respiratory Depression	30-120min	Max 8mg in 12hrs for seizures
Magnesium Sulfate	1-2g IV/IO	**Seizures = 1-2g over 30 min; Wheezing/ Respiratory Distress (3rd line) = 2g over 20 min; (Pre)Eclampsia = 4-6g over 15-20min**			Seizures/ Wheezing in Resp Distress/ (Pre)Eclampsia	Dilute into 50-100mL NS or D5W	30min	2g/hr infusion needed following loading dose for Eclampsia
Mannitol (20%)	1g/kg IV over <20 min	**60g**	**80g**	**100g**	Mod to severe head Tx	Avoid in HoTN Pt's	3-8hr	Follow with 0.25g/kg IVP q4hr
FLUIDS								
Resuscitation (Crystaloid)	≤20mL/kg	**250-500ml Bolus to achieve systolic BP >90**			Hypo-tension/volemia	Blood is 1st fluid choice	prn	Titrate to maintain SBP >90
Maintenance	1-2mL/kg	**75mL/hr(TKO)**	**105mL/hr(TKO)**	**150mL/hr(TKO)**	IV access/Homeostasis	Do not over hydrate	prn	Titrate to effect
Burns >20% TBSA	LR 10ml * %TBSA (Based on 40-80kg adult)	**10mL * % BSA Per Hour**	**10mL * % BSA Per Hour**	**10mL * % BSA+200mL Per Hour**	>20% TBSA partial or full-thickness burns	Track start time and amount infused	N/A	Add 100mL/hr for each 10kg over 80kg
Hypertonic Saline (3%)	0.1-1mL/kg/hr	**250mL bolus followed by 50-100mL/hr**			ICP Reduction	Use only in Head Injuries	N/A	MAX 250mL
HetaStarch/Hextend (HTS)	250-500mL	**250-500mL to achieve sys BP >90**			Int/Ext Hemorrhage	Equates to 1.5 L NS	2+ weeks	prn up to 1500mL/day
Blood Products and Management	**(See also Epinephrine and Benadryl for Hemolytic Reactions)**							
PRBC (1u=250mL)	10ml/kg	**1-2 units prn to achieve Sys BP ~ 90 (Shelf Life =42 days)**			Int/Ext Hemorrhage/ O- Neg Uni Donor	Monitor for Anaphylaxis/ Hyperthermia/ HyperK	prn	Repeat prn to maintain SYS BP >90/MAP >60/hemostasis
FFP (1u=200-250mL)	10ml/kg	**1-2 units prn to achieve 1:1 ratio w/ PRBC's (Shelf Life(thawed) =5 days)**			Int/Ext Hemorrhage/ AB+ Uni Donor	Monitor for Anaphylaxis/ Hyperthermia	prn	Ideal ratio of FFP: PRBC: Platelets is 1:1:1
Acetaminophen	500mg PO or 1g IV	**500mg PO or 1g IV infusion**			Febrile Reaction	Infuse slowly	6hr	Use only for Non-Hemolytic react

HEMATOLOGY



CHEMISTRIES



BLOOD GAS

VENTILATOR MANAGEMENT

Initial Vent Settings	
MODE	AC/ASV (Hamilton T1 only)
RATE	14 BPM
FiO_2	1.0 (100%)
I:E	1:02
TIDAL VOLUME	6mL/kg (Ideal body weight)
PEEP	5cm/H_2O

Ideal Body Weight Calculation	
Men (kg)	50.0 + 2.3 x (Ht - 60 in)
Women (kg)	45.5 + 2.3 x (Ht - 60 in)

Troubleshooting

D.O.P.E.-- **D**isplacement; **O**bstructions; **P**neumothorax; **E**quipment Failure

MILITARY WORKING DOG

VITALS	Normal	Excited
Temperature	101-103 ºF	103 ºF
Respirations	16-30/Min	Panting
Blood Pressure	120/80mmHg (avg); MAP 90-100	
Heart Rate	60-80	
$EtCO_2$	35-45mmHg	

FLUID MANAGEMENT

Shock: Calculate 90mL/kg for total fluid to be infused: Give 25% > 10 min; reassess; give 25% >20 min (prn) reassess; give 25% > 10 min prn; last 25% >10 min prn

Intubate w/ 10.0 ET tube

Defib 2-5 Joules/kg

INDICATION	K9 MEDICATIONS
Analgesia--Intermittent IV/IO/IM	**HYDROMORPHONE** 0.1-0.2mg/kg q2-4hr **OR MORPHINE** 0.2-0.5 mg/kg q4-6hr
Analgesia-- Continuous IV/IO Infusion	**FENTANYL** 2-10 mcg/kg/hr **OR MORPHINE** 0.1-0.25 mg/kg/hr **OR HYDROMORPHONE** 0.02-0.05 mg/kg/hr
Mild Sedation--IM	**MIDAZOLAM** 0.3mg/kg IM **AND HYDROMORPHONE** 0.2mg/kg IM q2-4hr
Agitated K9 Sedation--IM 1st/IV prn	**MIDAZOLAM** 0.3mg/kg **AND KETAMINE** 2mg/kg **AND HYDROMORPHONE** 0.2mg/kg
Alternate K9 Sedation--IV/IO	**PROPOFOL** 1 mg/kg boluses prn to allow catheterization or intubation
Cardiopulmonary Arrest BLS	Compressions @ 100/min; establish airway; Respirations @ 8-10/min for 2-3 minutes before ALS
V-FIB/V-TACH	**Defib 2-5J/kg---2min CPR---Defib---EPI 0.01mg/kg AND Amiodarone 5-10mg/kg---2min CPR---Defib---2min CPR---Defib---EPI 0.01mg/kg AND Amiodarone 5-10mg/kg---2min CPR**
ASYSTOLE/PEA/BRADYCARDIA	**ATROPINE** 0.04mg/kg IV/IO **AND EPINEPHRINE** 0.01mg/kg

NOTES

ANTIBIOTIC THERAPY CHART

**Post-injury antimicrobial agents are recommended to prevent early post-traumatic infectious complications, including sepsis, secondary to common bacterial flora. Selection is based on narrowest spectrum and duration required to prevent early infections prior to adequate surgical wound management. This narrow spectrum is selected to avoid selection of resistant bacteria. The antimicrobials listed are not intended for use in established infections, where multidrug-resistant (MDR) or other nosocomial pathogens may be causing infection.*

Injury	Preferred Agent	Frequency	Duration
Extremity Wounds (Includes Skin, Soft Tissue, and Bone)			
Skin, soft tissue, **without** open fractures	Cefazolin 1-2g Or Ertapenem 1g	q6-8hr x 1 dose	24 hours
Skin, soft tissue, **with** open fractures, exposed bone, or open joints	Cefazolin 1-2g Or Ertapenem 1g	q6-8hr x 1 dose	24 hours, then with each subsequent I&D until soft tissue coverage
Thoracic Wounds			
Penetrating chest injury	Cefazolin 1-2g Or Ertapenem 1g	q6-8hr x 1 dose	24 hours
Penetrating chest injury **with** esophageal disruption	Cefazolin 1- 2g PLUS metronidazole 500mg IV Or Ertapenem 1g	q6-8hr q8-12hr x 1 dose	Stop 24 hours after definitive closure
Abdominal Wounds			
Penetrating abdominal injury **with suspected/known** hollow viscus injury and soilage; may apply to rectal/perineal injuries as well	Cefazolin, 1-2g IV PLUS metronidazole 500mg IV Or Ertapenem 1g	q6-8hr q8-12hr x 1 dose	Stop 24 hours after control of contamination
Maxillofacial And Neck Wound			
Open maxillofacial fractures, maxillofacial fractures **with** foreign body or fixation device	Cefazolin 1-2g Or Ertapenem 1g	q6-8hr x 1 dose	24 hours
Central Nervous System Wounds			
Penetrating brain injury	Cefazolin 1-2g IV Or Ertapenem 1g	q6-8hr x 1 dose	5 days or until CSF leak is closed, whichever is longer
Penetrating brain injury **with** gross contamination with organic debris	Cefazolin 1-2g IV; *Consider* metronidazole 500mg IV Or Ertapenem 1g	q6-8hr q8-12hr x 1 dose	5 days or until CSF leak is closed, whichever is longer
Penetrating spinal cord injury	Cefazolin 1-2g IV Or Ertapenem 1g	q6-8hr x 1 dose	5 days or until CSF leak is closed, whichever is longer
Penetrating spinal cord injury **with** abdominal cavity is involvement	Cefazolin, 1-2g IV PLUS metronidazole 500mg IV Or Ertapenem 1g	q6-8hr q8-12hr x 1 dose	5 days or until CSF leak is closed, whichever is longer
Eye Wounds			
Eye injury, burn or abrasion	Erythromycin ophthalmic ointment Or Bacitracin ophthalmic ointment	q6hr or prn for symptomatic relief	Until epithelium healed. No systemic treatment required
Eye injury, penetrating	Levofloxacin 750mg IV/PO PLUS vancomycin 15-20mg/kg IV or Moxifloxacin 400mg IV/PO once daily	q24 hr q8-12hr q24hr	7 days or until evaluated by an ophthalmologist. No topical agents.
Burns			
Superficial burns	Topical antimicrobials (mafenide acetate or silver sulfadiazine) OR silver impregnated dressing, PLUS excision and grafting	q24hr q3-5d	Until healed
Deep partial thickness burns	Topical antimicrobials (mafenide acetate or silver sulfadiazine) OR silver impregnated dressing, PLUS excision and grafting	q24hr q3-5d	Until healed or grafted
Full thickness burns	Topical antimicrobials PLUS excision and grafting	q24hr	Until healed or grafted
Delayed Evacuation to Surgical Care			
PO tolerable Not PO tolerable	Moxifloxacin 400 mg PO x1 dose. Or Ertapenem 1g IV/IM	X 1 dose X 1 dose	Single dose therapy

MEDICATIONS

mcg/ml
mg/ml

Fluid volume for Dilution

DRUG DOSE	5cc	10cc	20cc	50cc	100cc	250cc	500cc	1000cc
1mcg	0.20mcg/ml	0.1mcg/ml	0.05mcg/ml	0.02mcg/ml	0.01mcg/ml	0.004mcg/ml	0.002mcg/ml	0.001mcg/ml
5mcg	1mcg/ml	0.5mcg/ml	0.25mcg/ml	0.1mcg/ml	0.05mcg/ml	0.02mcg/ml	0.01mcg/ml	0.005mcg/ml
10mcg	2mcg/ml	1mcg/ml	0.5mcg/ml	0.2mcg/ml	0.1mcg/ml	0.04mcg/ml	0.02mcg/ml	0.01mcg/ml
25mcg	5mcg/ml	2.5mcg/ml	1.25mcg/ml	0.5mcg/ml	0.25mcg/ml	0.1mcg/ml	0.05mcg/ml	0.025mcg/ml
50mcg	10mcg/ml	5mcg/ml	2.5mcg/ml	1mcg/ml	0.5mcg/ml	0.2mcg/ml	0.1mcg/ml	0.05mcg/ml
100mcg	20mcg/ml	10mcg/ml	5mcg/ml	2mcg/ml	1mcg/ml	0.4mcg/ml	0.2mcg/ml	0.1mcg/ml
250mcg	50mcg/ml	25mcg/ml	12.5mcg/ml	5mcg/ml	2.5mcg/ml	1mcg/ml	0.5mcg/ml	0.25mcg/ml
500mcg	0.1mg/ml	50mcg/ml	25mcg/ml	10mcg/ml	5mcg/ml	2mcg/min	1mcg/ml	0.5mcg/ml
1mg	0.2mg/ml	0.1mg/ml	50mcg/ml	20mcg/ml	10mcg/ml	4mcg/ml	2mcg/ml	1mcg/ml
2mg	0.4mg/ml	0.2mg/ml	0.1mg/ml	40mcg/ml	20mcg/ml	8mcg/ml	4mcg/ml	2mcg/ml
3mg	0.6mg/ml	0.3mg/ml	0.15mg/ml	60mcg/ml	30mcg/ml	12mcg/ml	6mcg/ml	3mcg/ml
4mg	0.8mg/ml	0.4mg/ml	0.2mg/ml	80mcg/ml	40mcg/ml	16mcg/ml	8mcg/ml	4mcg/ml
5mg	1mg/ml	0.5mg/ml	0.25mg/ml	0.1mg/ml	50mcg/ml	20mcg/ml	10mcg/ml	5mcg/ml
6mg	1.2mg/ml	0.6mg/ml	0.3mg/ml	0.12mg/ml	60mcg/ml	24mcg/ml	12mcg/ml	6mcg/ml
7mg	1.4mg/ml	0.7mg/ml	0.35mg/ml	0.14mg/ml	70mcg/ml	28mcg/ml	14mcg/ml	7mcg/ml
8mg	1.6mg/ml	0.8mg/ml	0.4mg/ml	0.16mg/ml	80mcg/ml	32mcg/ml	16mcg/ml	8mcg/ml
9mg	1.8mg/ml	0.9mg/ml	0.45mg/ml	0.18mg/ml	90mcg/ml	36mcg/ml	18mcg/ml	9mcg/ml
10mg	2mg/ml	1mg/ml	0.5mg/ml	0.2mg/ml	0.1mg/ml	40mcg/ml	20mcg/ml	10mcg/ml
15mg	3mg/ml	1.5mg/ml	0.75mg/ml	0.3mg/ml	0.15mg/ml	60mcg/ml	30mcg/ml	15mcg/ml
25mg	5mg/ml	2.5mg/ml	1.25mg/ml	0.5mg/ml	0.25mg/ml	0.1mg/ml	50mcg/ml	25mcg/ml
50mg	10mg/ml	5mg/ml	2.5mg/ml	1mg/ml	0.5mg/ml	0.2mg/ml	0.1mg/ml	50mcg/ml
75mg	15mg/ml	7.5mg/ml	3.75mg/ml	1.5mg/ml	0.75mg/ml	0.3mg/ml	0.15mg/ml	75mcg/ml
100mg	20mg/ml	10mg/ml	5mg/ml	2mg/ml	1mg/ml	0.4mg/ml	0.2mg/ml	0.1mg/ml
250mg	50mg/ml	25mg/ml	12.5mg/ml	5mg/ml	2.5mg/ml	1mg/ml	0.5mg/ml	0.25mg/ml
500mg	100mg/ml	50mg/ml	25mg/ml	10mg/ml	5mg/ml	2mg/ml	1mg/ml	0.5mg/ml
750mg	150mg/ml	75mg/ml	37.5mg/ml	15mg/ml	7.5mg/ml	3mg/ml	1.5mg/ml	0.75mg/ml
1Gram	200mg/ml	100mg/ml	50mg/ml	20mg/ml	10mg/ml	4mg/ml	2mg/ml	1mg/ml

Value equals amount of fluid in each ml of dilution

Each ml of medication diluted into your chosen fluid still counts towards total solution volume (i.e. 1ml of drug + 4ml fluid = 5ml solution; 1ml drug + 9ml fluid = 10ml solution). Small volume medications (1-2ml) are inconsequential above dilutions >50ml

1mg=1000mcg	0.1mg=100mcg	0.01mg=10mcg

	Amiodarone	Epinephrine	Etomidate	Fentanyl	Hydromorphone	Ketamine	Lorazepam	Midazolam	Morphine	Norepinephrine	Phenylephrine	Propofol	Rocuronium	Sodium bicarb	Succinylcholine	Vecuronium
Amiodarone		C		C	C	C	C	C	C		C			I	C	C
Epinephrine	C			C	C	C	C	C	C	C	C		C	I	C	C
Etomidate				C			C	C	C	C	C	C	C		C	I
Fentanyl		C	C		C	C	C	C	C	C	C	C	C	C	C	C
Hydromorphone	C	C		C		C	C	C	C	C	C	C	C	I	C	C
Ketamine	C	C		C	C		C	C	C	C	C	C	C	I	C	C
Lorazepam	C	C	C	C	C			C	C	C	C	C	I	C	C	C
Midazolam	C	C	C	C	C	C	C		C	C	C	C-syringe	C	I	C	C
Morphine	C	C	C	C	C		C	C		C	C		C	C-Y; I-admixture	C	C
Norepinephrine		C		C	C		C	C	C		C	C		I	C	C
Phenylephrine	C	C	C	C	C		C	C	C	C			C	C	C	C
Propofol				C	C	C	C		C	C			C	C		C-admixture
Rocuronium	C			C	C	I	C	C	C	I	C	C		C	I	C
Sodium bicarb	I	I		C	I	I	C	I	C	I	C	C	C		I	C
Succinylcholine	C	C	C	C	C		C	C	C	C	C			I		C
Vecuronium	C	C	I	C	C		C	C	C	C	C			C	C	
D5W																
Hetastarch	C-Y	C-Y		C-Y	C-Y		C-Y	C-Y	C-Y	C-Y	C-Y		C-Y	I-Y	C-Y	C-Y
LR		C-Y; solutn		C-Y	C-solutn			C-Y	C-Y, solutn	C-Y, solutn	C-Y, solutn	C-solutn	C-solutn	C-Y	C-Y, solutn	C-solutn
NS		C-solutn		C-solutn	C-solutn	C-solutn		C-solutn		C-solutn	C-solutn		C-solutn	C-solutn	C-solutn	C-solutn
NaCl 3%																
D5W	C-solutn	C-solutn		C-solutn	C-solutn	C-solutn		C-solutn	C-solutn	C-solutn	C-solutn		C-solutn	C-solutn	C-solutn	C-solutn
C=compatible																
I=incompatible																
Y=Y-site																

Y-Site Capatability Chart

Vasopressor Priority Chart

	HYPOVOLEMIC SHOCK	SEPTIC SHOCK	CARDIOGENIC $SHOCK_1$	NEUROGENIC $SHOCK_{2,3}$	BURN $SHOCK_4$
1°	**Vasopressors are not recommended in the initial stabilization of hypovolemic shock.**	Norepinephrine	Norepinephrine	Norepinephrine	Vasopressin
2°		Vasopressin	Dobutamine	Epinephrine	Norepinephrine
3°	Norepinephrine	Epinephrine	Epinephrine	Vasopressin	Epinephrine

- **Vasopressors should only be initiated with/after adequate resuscitation is provided with crystalloids, colloids, and/or blood products.**
- **Maintain mean arterial pressure (MAP) 65 mmHg or as needed to achieve adequate end-organ perfusion (e.g. cerebral perfusion pressure, abdominal perfusion pressure, urinary output).**

1. In low output Cardiogenic Shock, dobutamine may be initiated in combination with norepinephrine.
2. Due to the physiologic nature of Neurogenic Shock, vasopressors may be initiated earlier to avoid volume overload.
3. Phenylephrine should be avoided in most Neurogenic Shock patients due to unopposed alpha activity that can result in reflex bradycardia; further worsening spinal cord injury (SCI) associated bradycardia.
4. In Burn Shock casualties at risk of burn fluid over-resuscitation (e.g. 250mL/Kg in the 1st 24 hours), a continuous, non-titratable infusion of Vasopressin at 0.04 Units/minute (2.4 Units/hour) may be initiated to avoid volume overload.

MEDICATION, DRUG CARDS

a. General Use
    i. Use as clinically indicated per guideline.
b. Medications, all:
    ii. If carried, these medications are available for use, within the limitations of these guidelines, drug cards, and supervising medical director/physician. These medications may be used during transfer of critical care patients or during point of injury. These medications are available for use on any patient, within the limitations of these guidelines, as clinically indicated, to address acute life-threatening emergencies not accounted for on the transferring physician's written orders. Some medications utilized during critical care transfer requires written orders and guidance from transferring physician or as directed by unit medical director/supervising physician.

Oxygen

Class: Atmospheric gas.
Mechanism of Action: The essential substrate for cellular respiration.
Duration of action: Onset: immediate. Peak effect: not applicable. Duration: less than 2 minutes.
Indications: All causes of decreased tissue oxygenation and/or decreased level of consciousness. (Confirmed or expected hypoxemia, ischemic chest pain, respiratory, insufficiency, prophylactically during air transport, confirmed or suspected carbon monoxide poisoning). Also provides mechanical work for gas-powered ventilators, if supply and flow rate is sufficient (OBOGS will not work).
Contraindications: Coincidental paraquat inhalation (rare); COPD patients may become hypopneic with high O_2 flow rates due to "oxygen baroreceptor respiratory drive (relative contraindication).
Adverse Reactions: Retinopathy of prematurity (prolonged use); potential oxygen toxicity in hyperbaric environments; cerebral vasoconstriction.
Drug Interactions: None
How Supplied: Medical grade Oxygen is 93% O_2 (+/- 3%) under United States Pharmacopeia (USP) Standards. USP Standard O_2 is supplied through compressed gas cylinders (D cylinder) or continuous flow oxygen generator or concentrator systems.
Dosage and Administration:
• Assure adequate ventilation (spontaneous or supported) coincidental to supplemental oxygen therapy, ideally by end-tidal CO_2 measurement (Goal $EtCO_2$ 35-45).
• All critically ill and injured transport patients will receive supplemental oxygen to maintain SpO_2 of > 93%.
• Administer oxygen 2-6 LPM via nasal cannula.
    ○ If O_2 Saturation remains < 95%, apply non-rebreather face mask with oxygen at 15 LPM.
    ○ If O_2 Saturation remains < 90%, refer to **Airway guideline**.
• Patient on Ventilator:
    ○ Adjust ventilator settings based on ventilatory goals for patient: $EtCO_2$, peak pressures, SpO_2, and patient clinical condition.
    ○ Adjust FiO_2 to maintain pulse oxygen saturations > 93%/tissue oxygen saturation (StO_2) > 70%, if applicable.
• When planning for available O_2 during non-pressurized, aeromedical transfer, ensure adequate resources to provide 1.5 to 2 times the ground transport volume of O_2 to compensate for increased consumption associated with altitude related physiological impact.

0.9% Sodium Chloride (Normal Saline)

Class: Isotonic crystalloid solution.
Mechanism of Action: Replaces water and electrolytes.
Indications: Hypovolemia, Shock, Heat-related injuries, diabetic ketoacidosis, TKO IV, a diluent of choice for blood product transfusion.
Contraindications: Avoid for intravascular volume replacement for hemorrhagic shock due to hemodilution and hyperchloremic metabolic acidosis. Use with caution in patients with known congestive heart failure.
Adverse Reactions: Rare
Drug Interactions: Few in the pre-hospital emergency setting.
How Supplied: 250mL, 500mL, and 1,000mL bags.
Dosage and Administration: The specific situation being treated will dictate the rate in which normal saline will be administered. Hypovolemic shock requires rapid bolus (see relevant guidelines). In other cases, it is advisable to administer the fluid at a moderate rate (for example, 100 mL/h).

Hypertonic Saline 3% Sodium Chloride

Class: Hypertonic crystalloid solution.
Mechanism of Action: Replaces water and electrolytes, increases intravascular sodium concentration, may induce diuresis
Indications: Refractory elevated intracranial pressure (ICP) due to various etiologies (eg, subarachnoid hemorrhage, neoplasm); traumatic brain injury with elevated ICP: (Can be used in place of mannitol).
Contraindications: Do not use in the same line as Blood Products – cause crenation and lysis of RBC. Caution or avoid use in patients with known congestive heart failure and kidney disease.
Adverse Reactions: Rare
Drug Interactions: Few in the pre-hospital emergency setting.
How Supplied: 250mL, 500mL, bags.
Dosage and Administration:

- Dosing (Adult):
    - **Bolus**: 250mL IV Bolus over 15 min
    - **Infusion**: 50-100cc/hr
- Dosing (Pediatrics):
    - **Bolus**: 5cc/kg IV Bolus over 15 min
    - **Infusion**: 0.5cc/kg/hr

Ringer's, Lactate (Lactated Ringers/Hartman's Solution)

Class: Isotonic crystalloid solution.
Mechanism of Action: Replaces water and electrolytes.
Indications: Hypovolemic shock; keep open IV.
Contraindications: Should not be used in the same line with blood components. Use with caution for intravascular volume replacement for hemorrhagic shock due to hemodilution and exacerbation of coagulopathy. Use with caution in patients with known congestive heart failure and kidney disease. Can cause lactic acidosis.
Adverse Reactions: Rare
Drug Interactions: Few in the pre-hospital emergency setting.
How Supplied: 250mL, 500mL, and 1,000mL bags. IV infusion.
Dosage and Administration: Hypovolemic shock; titrate according to the patient's physiologic response. (See appropriate Guidelines)

Dextrose 5% in Water (D5W)

Class: Hypotonic dextrose-containing solution.
Mechanism of Action: D5W provides nutrients in the form of dextrose as well as free water.
Indications: IV diluent for certain emergency drugs; for dilution of concentrated drugs for intravenous infusion.
Contraindications: Not for use as fluid replacement for hypovolemic states.
Adverse Reactions: Rare
Drug Interactions: Phenytoin (Dilantin)
How Supplied: Supplied in 50mL, 100mL, 150mL, 250mL, 500mL, and 1,000mL bags.
Dosage and Administration: Normally administered through a mini-drip (60gtt/mL) set at a rate of "to keep open" (TKO).

PlasmaLyte A

Class: Isotonic crystalloid solution.
Mechanism of Action: Replaces water and electrolytes.
Indications: Hypovolemic shock; compatible with blood or blood components. It may be administered before or following the infusion of blood through the same administration set (i.e., as a priming solution), added to or infused concurrently with blood components, or used as a diluent in the transfusion of packed erythrocytes. PLASMALYTE A and 0.9% Sodium Chloride Injection are equally compatible with blood or blood components.
Contraindications: Use with caution for intravascular volume replacement for hemorrhagic shock due to hemodilution and exacerbation of coagulopathy. Use with caution in patients with known congestive heart failure and kidney disease. Excess administration may result in metabolic alkalosis.
Adverse Reactions: Rare
Drug Interactions: Few in the pre-hospital emergency setting.
How Supplied: 500mL, and 1,000mL bags IV infusion.
Dosage and Administration: Hypovolemic shock; titrate according to the patient's physiologic response. (See appropriate Guidelines)

ACETAMINOPHEN	♀C, **Lactation Yes** (Caution)	Trade Name: **Tylenol**

Class / Mechanism of Action

Analgesic
Blocks cyclooxygenase (COX 1 and 2) enzymes, resulting in reduced formation of prostaglandin precursors. Blocks formation of prostaglandin derivative, thromboxane A2, resulting in inhibited platelet aggregation. Has antipyretic, analgesic, and anti-inflammatory properties.

Indications

Labeled Indications: Treatment of mild to moderate pain and fever, Treatment of moderate to severe pain when provided via IV with opioid analgesia

Contraindications

- Hypersensitivity to acetaminophen or any component of the formulation
- Hepatic impairment or liver disease

Adverse Reactions / Precautions

- Use IV form cautiously in volume depleted patients
- Avoid use in patient suffering alcohol toxicity, known alcohol abuse, or renal impairment
- IV form can cause nausea and vomiting (especially in adults), headache

Dose and Administration:	**ADULT**	**PEDIATRIC** Always Reference BROSELOW Tape

Pain or fever: (Limit total daily dose to <4g/day

PO:

- Regular release: **325-650mg** q4-6hr or **1000mg** 3-4 times daily (maximum: 4g daily)

RECTAL:

- **325-650mg** q4-6hr or **1000mg** 3-4 times daily (max: 4g daily)

IV:

- <50kg**: 15mg/kg** q6hr
  - Max single dose: 15mg/kg/dose (750mg/dose)
  - Max daily dose: 75mg/kg/day (≤3.75g daily)
- ≥50kg**: 1000**mg q6hr
  - Max single dose: 1000mg/dose

Pain or fever: Children ≥12 years & Adolescents: Refer to adult dosing

PO:

- Infants and Children <12 years**: 10-15mg/kg/dose** q4-6hr as needed; do not exceed 5 doses (2.6g) in 24 hours

RECTAL:

- Infants and Children <12 years**: 10-20mg/kg/dose** q4-6hr as needed; do not exceed 5 doses (2.6g) in 24 hours.

IV:

- Children 2-12 years: **15mg/kg** q6hrs or **12.5mg/kg** q4hr
  - Max single dose: 15mg/kg/dose (≤750mg/dose)
  - Max daily dose: 75mg/kg/day (≤3.75g daily)

ACETAZOLAMIDE

♀C, **Lactation Yes**(Caution) Trade Name: **Diamox**

Class / Mechanism of Action

Diuretic, Carbonic Anhydrase Inhibitor; Anticonvulsant
Inhibits carbonic anhydrase causing a decrease in hydrogen ion renal secretion with increased renal secretion of sodium, potassium, bicarbonate, and water. Onset of action PO: 2 hours, IV 5-10 minutes

Indications

Labeled Indications:

- Prevention or treatment of symptoms of acute mountain sickness
- Edema due to congestive heart failure

Contraindications

- Hypersensitivity to acetazolamide, sulfonamides, or any component of the formulation
- Confirmed low sodium/potassium levels otherwise none in emergency setting

Adverse Reactions / Precautions

- May worsen respiratory acidosis
- Drowsiness, deceased alertness, impairment of coordination, nausea, headache
- Flushing of skin, allergic skin reaction, skin photosensitivity

Dose and Administration:

ADULT

Altitude illness (Acute Mountain Sickness):
PO:

- **125-250mg** twice daily.

Note: For high altitude cerebral edema (HACE), dexamethasone is the primary treatment; however, acetazolamide can be used (together with dexamethasone) at the AMS dose.

Edema (Only with referring doctor or medical director instruction):
PO, IV:

- **250-375mg** once daily

PEDIATRIC Always Reference LB tape

Altitude illness (Acute Mountain Sickness):
PO: (IM not recommended due to alkaline pH)

- **2.5mg/kg/dose** q8-12hr
  - MAX dose 250mg/dose.

Note: For high altitude cerebral edema (HACE), dexamethasone is the primary treatment; however, acetazolamide can be used (together with dexamethasone) at the AMS dose.

ACETYLSALICYLIC ACID

♀C, **Lactation Yes** (Short Term or Low Dose OK)

Trade Name: **Aspirin**

Class / Mechanism of Action

Nonsteroidal Anti-inflammatory Drug (NSAID)

Blocks cyclooxygenase (COX 1 and 2) enzymes, resulting in reduced formation of prostaglandin precursors. Blocks formation of prostaglandin derivative, thromboxane A2, resulting in inhibited platelet aggregation. Has antipyretic, analgesic, and anti-inflammatory properties.

Indications

Labeled Indications: Treatment of acute coronary syndromes (ST-elevation MI, non-ST-elevation MI, unstable angina), acute ischemic stroke, and transient ischemic episodes.

Contraindications

- Hypersensitivity to salicylates, other NSAIDs, or any component of the formulation
- Asthma, Rhinitis
- Inherited or acquired bleeding disorders (including factor VII and factor IX deficiency)
- Do not use in children less than 16 years old (Reye's syndrome)

Adverse Reactions / Precautions

- Not for use on trauma patients in the combat environment.
- Risk of bleeding: Avoid use in patients with known or suspected: Bleeding disorders, GI Bleed, GI Ulcers, patients taking Coumadin, or within 24hr of taking Alteplase (tPA) for suspected stroke

Dose and Administration:

ADULT	PEDIATRIC Always Reference BROSELOW Tape
Acute coronary syndrome (ST-segment elevation myocardial infarction [STEMI], unstable angina (UA)/non-ST-segment elevation myocardial infarction [NSTEMI]): (Not for use in trauma patients): PO: • **324mg** (chew nonenteric-coated aspirin as a single 325mg tablet or 4 X 81mg tablets)	**N/A:** **Contraindicated in children under 16 yrs (Reye's Syndrome)**

ACTIVATED CHARCOAL ♀Safe, Lactation Safe

Trade Name: **Actidose**

Class / Mechanism of Action

Antidote

Non-absorbable agent that absorbs toxins within the GI tract inhibiting GI absorption.

Indications

Labeled Indications: Management of suspected or known poisonings when gastrointestinal decontamination is an option.

- Decontamination within 1 hour of ingestion of toxic substance

Contraindications

- Presence of intestinal obstruction or GI tract not anatomically intact
- Patients at risk of GI hemorrhage or perforation
- Patients with an unprotected airway (eg, CNS depression without intubation) or if use would increase the risk and severity of aspiration

Adverse Reactions / Precautions

- If patient unconscious, must establish airway control and must utilized NG/OG tube.
- Be prepared for possible emesis. Consider use of antiemetic.
- Avoid use in patients at risk of GI hemorrhage or perforation

Dose and Administration: **ADULT**

Acute Poisoning:

PO,NG/OG:

- Single dose: **50g**
- Multidose: After initial **50g** dose, follow with **25g** q2hr

Note: Activated Charcoal has limited efficacy if not utilized within 1 hour of toxin ingestion. Risk-benefit of charcoal must seriously be considered because it does not work for all poisons, it must be given early when the poison is still in the stomach, it does not fully bind all poisons, and serious complications can occur with aspiration. Aspiration can occur if deteriorating mental status and/or vomiting.

Note: Some products may contain sorbitol. Co-administration of a cathartic, including sorbitol, is no longer recommended.

Note: Multidose charcoal is indicated if patient ingested a life-threatening amount of drug (carbamazepine, dapsone, phenobarbital, guanine, or theophylline)

PEDIATRIC Always Reference BROSELOW Tape

Acute Poisoning: Children >12 years: Refer to adult dosing.

PO,NG/OG:

- Single dose: **1g/kg**
- Multidose: Initial dose: **1g/kg** initially, followed by multiple doses of **0.5g/kg** q2hr

Note: Some products may contain sorbitol. Co-administration of a cathartic, including sorbitol, is no longer recommended.

Note: Activated Charcoal has limited efficacy if not utilized within 1 hour of toxin ingestion.

ADENOSINE

♀C, Lactation Yes (Caution) — Trade Name: **Adenocard®**

Class / Mechanism of Action

Antiarrhythmic Agent

Slows conduction time through the AV node, inhibits re-entry pathways through the AV node, restoring normal sinus rhythm. The half-life of under 10 seconds allows for rapid repeat dosing.

Indications

Labeled Indications: Paroxysmal supraventricular tachycardia (PSVT) when clinically advisable, vagal maneuvers should be attempted first; not effective for conversion of atrial fibrillation, atrial flutter, or ventricular tachycardia.

Unlabeled: ALS/PALS Guidelines (2020): Stable, narrow-complex regular tachycardias; unstable narrow-complex regular tachycardias while preparations are made for synchronized direct-current cardioversion; stable regular monomorphic, wide-complex tachycardia as a therapeutic (if SVT) and diagnostic maneuver.

Contraindications

- Hypersensitivity to adenosine or any component of the formulation
- Second- or third-degree AV block, sick sinus syndrome, or symptomatic bradycardia (except in patients with a functioning artificial pacemaker)
- Use in patients with atrial fibrillation/flutter with underlying Wolff-Parkinson-White (WPW) syndrome (Fuster, 2006); asthma (ALS, 2020)
- Known or suspected bronchoconstrictive (Asthma) or bronchospastic lung disease.

Adverse Reactions / Precautions

- May cause transient asystole and new arrhythmia after cardioversion (PACs, AF, PVCs) chest discomfort
- Headache, Dizziness, Flushing, GI upset
- Dyspnea, Bronchospasm in asthmatics

Dose and Administration:

ADULT	PEDIATRIC Always Reference BROSELOW Tape
Paroxysmal supraventricular tachycardia: I.V. (rapid push, over 1-2 seconds, via proximal peripheral line (forearm or above, large bore). • Initial:**6mg;** if not effective within 1-2min, **12mg** may be given if needed (maximum single dose: 12mg). **Notes**): Follow each dose with **20mL** normal saline flush. **Note:** Initial dose of adenosine should be reduced to 3mg if patient is currently receiving carbamazepine or dipyridamole, has a transplanted heart or if adenosine is administered via central line (ALS, 2020). **Note:** Adenosine effects are antagonized by caffeine and theophylline, and patients may require higher doses.	**Paroxysmal supraventricular tachycardia:** IV/IO as close to core as possible (rapid push, over 1-2sec, see **Note**): Follow each dose with 10-20mL normal saline flush.. • Initial: **0.1mg/kg** (maximum initial dose: 6mg); if not effective within 1-2min, administer **0.2mg/kg** (maximum single dose: 12mg). Follow each dose with 5-10mL normal saline flush.

ALBUTEROL ♀C, Lactation Yes Trade Name: **Proventil / Ventolin**

Class / Mechanism of Action

Beta$_2$ Agonist (Bronchodilator)
Synthetic sympathomimetic that relaxes bronchial smooth muscle, causing bronchodilation, with little cardiac impact. Onset of action is 2-15min.

Indications

Labeled Indications: Treatment or prevention of bronchospasm in patients with reversible obstructive airway disease; prevention of exercise-induced bronchospasm

- Asthma
- Reactive Airway / Bronchospasm
- COPD
- May also be used in Crush Syndrome (Hyperkalemia)

Contraindications

- Hypersensitivity to albuterol or any component of the formulation
- Symptomatic tachycardia

Adverse Reactions / Precautions

- Risk of abortion during 1st or 2nd trimester
- Headache, Dizziness, Flushing, Diaphoresis, Tremor, Weakness
- Angina, A-Fib, Arrhythmia, Chest Pain, Palpitations
- Dyspnea, Bronchospasm in asthmatics

Dose and Administration: ADULT	**PEDIATRIC** Always Reference BROSELOW Tape
Bronchospasm: *Metered-dose inhaler (90mcg/puff):* • **2 puffs** q4-6hr prn *Solution for nebulization:* • **2.5mg** 3-4 times daily prn **Exacerbation of asthma (acute, severe):** *Metered-dose inhaler:* • **4-8 puffs** q20min for up to 4 hours, then q1-4hr prn *Solution for nebulization:* • **2.5-5mg** q20min for 3 doses, then **2.5-10mg** q1-4hr prn	**Bronchospasm:** *Metered-dose inhaler* (90mcg/puff): • **4-8 puffs** q4-6hr prn *Solution for nebulization:* • Children ≤4 years: **2.5mg** q4-6hr prn • Children ≥5 years: **2.5-5mg** q4-8hr prn • Children ≥12 years: Refer to adult dosing. **Exacerbation of asthma (acute, severe):** *Metered-dose inhaler* (90mcg/puff): • Children <12 years: **4-8 puffs** q20min for 3 doses, then q1-4hr prn • Children ≥12 years: Refer to adult dosing. *Solution for nebulization*: • Children <12 years: **0.15mg/kg** (minimum: 2.5mg) q20min for 3 doses, then **0.15-0.3mg/kg** (maximum: 10mg) q1-4hr prn • Children ≥12 years: Refer to adult dosing.

AMIODARONE ♀D, Lactation: Yes, Not Recommended

Class / Mechanism of Action

Antiarrhythmic Agent, Class III
Inhibits adrenergic stimulation (alpha and beta blocking), prolongs action potential and refractory period (prolongs PR and QT intervals); decreases AV conduction and sinus node function (decreases sinus rate)

Indications

Labeled Indications: Management of life-threatening recurrent ventricular fibrillation (VF) or hemodynamically unstable ventricular tachycardia (VT) refractory to other antiarrhythmic agents
Unlabeled:

- Recurrent, hemodynamically unstable VT. (after other drugs have failed)
- Ventricular tachyarrhythmias (ACLS/PALS 2015): VF/VT Cardiac arrest unresponsive to CPR, Shock, and Vasopressor.

Contraindications

- Hypersensitivity to amiodarone, iodine, or any component of the formulation
- Severe sinus-node dysfunction
- 2nd and 3rd degree heart block (except in patients with a functioning artificial pacemaker)
- Bradycardia causing syncope (except in patients with a functioning artificial pacemaker)
- Cardiogenic shock

Adverse Reactions / Precautions

- **Complex drug with multiple complex drug reactions! (Do not administer with procainamide)**
- Hypotension
- Dizziness, fatigue, Headache, Poor coordination, Neuropathy
- Nausea, Vomiting
- Dysrhythmias, Asystole, AF, Bradycardia, AV block, Conduction abnormalities, SA node dysfunction

Dose and Administration:

ADULT

Pulseless VT or VF (ACLS, 2015):
IV/IO push

- **300mg** rapid bolus; should be diluted in 30mL of NS, Plasmalyte, or D5W; if pulseless VT or VF continues after subsequent defibrillation attempt or recurs, administer **supplemental dose of 150mg.**

Recurrent, Hemodynamically unstable VT (ACLS, 2015):
Initial Dose:
IV/IO slow push

- **150mg IV** over 1st 10 minutes (15mg per min) dilute in 100ml of NS, PlasmaLyte, or D5W (concentration 1.5mg/ml).
- May repeat **150mg** q10min prn if VT recurs

Maintenance Infusion following initial dosing:

- **360mg** over 6 hours (1mg/min) dilute in 500ml of NS, PlasmaLyte, or D5W (concentration 0.72mg/ml).

PEDIATRIC Always Reference BROSELOW Tape

Pulseless VT or VF (PALS, 2015):
IV/IO push

- **5mg/kg** IV bolus during cardiac arrest, May repeat twice for refractory VF/pulseless VT.
- Max single dose: 300mg

Tachycardia with Pulse and poor perfusion, or symptomatic with adequate perfusion (PALS, 2015):
IV/IO push

- Loading dose: **5mg/kg** over 20–60min (Fast push or bolus can precipitate cardiac failure!)
- Can repeat two times (max dose: 15mg/kg in 24hr)
- Max single dose: 300mg

MEDICATIONS

AMIODARONE					
Initial Dose: 15mg/min over 10min (150mg over 10min)					
MIX 150mg/100mL CONCENTRATION 1.5mg/mL					
Dose	Rate	Micro	Macro		
		(60gtt/mL)	20gtt/mL	15gtt/mL	10gtt/mL
mg/min	mL/min	gtt/min	gtt/min	gtt/min	gtt/min
15	10	600	200	150	100
Macro-Drip (10gtt/ml) is set of choice for this infusion					
Set rate provides complete initial infusion of 150mg over 10 minutes. May repeat q10min prn if VT recurs					

Maint Dose: 1mg/min over 6hr (360mg over 360min)					
MIX 360mg/500mL CONCENTRATION 0.72mg/mL					
Dose	Rate	Micro	Macro		
		(60gtt/mL)	20gtt/mL	15gtt/mL	10gtt/mL
mg/min	mL/min	gtt/min	gtt/min	gtt/min	gtt/min
1	1.4	84	28	21	14
Macro-Drip (20gtt/ml) is set of choice for this infusion					
Set rate provides maintenance infusion of 360mg over 6hr.					

ATROPINE Sulfate ♀C, Lactation: Yes, Use Caution Trade Name: **AtroPen**

Class / Mechanism of Action

Anticholinergic, Antidysrhythmic, Antidote for Carbamate Anticholinesterase poisoning

Blocks acetylcholine at parasympathetic sites in smooth muscle, secretory glands, and the CNS; increases cardiac output, and dries secretions. Atropine reverses the muscarinic effects of cholinergic poisoning. Reverses bronchorrhea and bronchoconstriction, but does not affect the nicotinic receptors responsible for muscle weakness, fasciculations, and paralysis.

Indications

Labeled Indications: Treatment of

- Symptomatic Sinus Bradycardia, AV block (nodal level)
- Antidote for anticholinesterase poisoning (carbamate insecticides, nerve agents, organophosphate insecticides)

Contraindications

- Hypersensitivity to atropine or any component of the formulation
- Narrow-angle glaucoma; adhesions between the iris and lens (ophthalmic product)
- Pyloric stenosis
- Prostatic hypertrophy
- **Note:** NO contraindications should prevent use of atropine in setting of life threatening organophosphate, carbamate, or nerve agent poisoning

Adverse Reactions / Precautions

- Tachycardia and arrhythmia (VTach, VFib), Hypotension, Palpitations
- Dilated Pupils, Angle-closure glaucoma
- Headache, Dry Mouth, constipation, urinary retention, flushing
- **Paradoxical Bradycardia noted with doses less than 0.1mg**

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

Symptomatic Bradycardia

IV/IO

- **1mg** q3-5min, not to exceed a total of 3mg or 0.04mg/kg (ARC, 2020)

Organophosphate or carbamate insecticide or nerve agent poisoning:

IV/IM: (Used with 2-Pam Chloride auto injector)

- *Initial:* 1-6mg; repeat q3-5minprn, doubling the dose if previous dose did not induce atropinization. Maintain with repeat doses as needed for ≥2-12 hours based on recurrence of symptoms.

IM (***AtroPen®***)*:* anterolateral aspect of thigh and hold in place for 10 seconds. Follow with 2-Pam Chloride auto injector.

- Mild symptoms (≥2 mild symptoms): **2 mg** once an exposure is known or strongly suspected.
- Severe symptoms (≥1 severe symptom): **Three** 2mg doses in rapid succession.

Mild and Severe Symptoms are noted on product labeling and **Pralidoxime Chloride** drug card.

Symptomatic Bradycardia

IV/IO

- **0.02mg/kg** (Minimum dose is 0.1mg. Maximum single dose of 0.5mg. May repeat once in 3-5 minutes. Maximum total dose is 1mg (PALS, 2020)

Organophosphate or carbamate insecticide:

- IV/IO: Initial: **0.05-0.1mg/kg**; repeat q5-10min as needed, double dose if previous dose does not induce atropinization. Maintain with repeat doses as needed for ≥2-12 hours based on recurrence of symptoms.

Severe Nerve Agent Poisoning:

- IV/IO 1mg every 3 min. Monitor Patient for signs and symptoms of atropinization, (drying up of secretions). Once clinical improvement is achieved restric to 10-20% of original dose (approximately 2-4mg/hr

CALCIUM Chloride 10% ♀Safe, Lactation Safe

Class / Mechanism of Action

Calcium Salt, Electrolyte Supplement
Moderates nerve and muscle contractility via action potential excitation threshold regulation

Indications

Labeled Indications: Treatment of hypocalcemia and conditions secondary to hypocalcemia (eg, tetany, seizures, arrhythmias); emergent treatment of severe hypermagnesemia; massive transfusion prophylaxis
Unlabeled: Calcium channel blocker overdose; beta-blocker overdose (refractory to glucagon and high-dose vasopressors); severe hyperkalemia (K+ >6.5mEq/L with toxic ECG changes) [ALS guidelines]; malignant arrhythmias (including cardiac arrest) associated with hypermagnesemia [ALS guidelines]

Contraindications

- Known or suspected digoxin toxicity
- Not recommended as routine treatment in cardiac arrest (includes asystole, ventricular fibrillation, pulseless ventricular tachycardia, or pulseless electrical activity)
- Hypercalcemia

Adverse Reactions / Precautions

- Hypokalemia: Use with caution in patients with severe hypokalemia. Acute rises in calcium can cause life-threatening arrhythmias
- Rapid push can cause: Arrhythmia, bradycardia, cardiac arrest, hypotension, syncope, vasodilation
- **Use small IV / Large Vein, flush prior and after, AVOID Extravasation** (will cause tissue necrosis)
  - In general, IV Calcium Gluconate is preferred over IV Calcium Chloride in nonemergency settings due to the potential for extravasation with calcium chloride
- **Do not infuse calcium chloride in the same I.V. line as phosphate-containing solutions.**
- Precipitates with $NaHCO_3$ in IV Bag/Tubing

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

ADULT

Cardiac arrest or cardiotoxicity in the presence of hyperkalemia, hypocalcemia, or hypermagnesemia: IV/IO, **SLOW**

- **500-1000 mg** over 2-5 minutes

Beta-blocker overdose, refractory to glucagon and high-dose vasopressors (unlabeled use): IV/IO

- **20mg/kg** over 5-10 minutes followed by an infusion of 20mg/kg/hour titrated to adequate hemodynamic response

Calcium channel blocker overdose (unlabeled use) (CaCl preferred over Calcium Gluconate for this use**):** IV/IO

- Initial: **1000mg** over 5 minutes; may repeat q10-20min with 3-4 additional doses; or a continuous infusion of 2-6grams/hour may be initiated

Hypocalcemia prophylaxis from massive transfusion

- **10ml (10cc) 10% solution** over 5 minutes

Damage Control Resuscitation: IV/IO, **SLOW**
1000mg after 1st blood unit and after every 4th unit

PEDIATRIC

Cardiac arrest or cardiotoxicity in the presence of hyperkalemia, hypocalcemia, or hypermagnesemia:
IV/IO, **SLOW**

- **20mg/kg** (maximum: 2000mg/dose); may repeat as necessary

Calcium channel blocker overdose (unlabeled use):
IV/IO

- Initial: **20mg/kg** (0.2ml/kg) (maximum:1000 mg/dose) over 10-15 minutes; may repeat q10-15 min

Note: Adult and Pediatric dosages are expressed in terms of the calcium chloride salt based on a solution concentration of 100mg/mL (10%) containing 1.4mEq (27mg/mL) elemental calcium. (1gram = 10cc of a 10% solution)

Note: Calcium Chloride is 3X more potent than Calcium Gluconate and therefore lower doses of Calcium Chloride must be used to reach similar therapeutic doses

CALCIUM Gluconate ♀Safe, Lactation Safe

Class / Mechanism of Action

Calcium Salt, Electrolyte Supplement
Moderates nerve and muscle contractility via regulation of action potential excitation threshold.

Indications

Labeled Indications: Treatment of hypocalcemia and conditions secondary to hypocalcemia (e.g, tetany, seizures, arrhythmias); cardiac disturbances secondary to hyperkalemia; magnesium sulfate overdose; massive transfusion prophylaxis
Unlabeled: Calcium channel blocker overdose; treatment of hydrofluoric acid exposure

Contraindications

- Ventricular fibrillation
- Hypercalcemia
- Concomitant use of IV calcium gluconate and ceftriaxone in neonates (risk of precipitation of calcium-ceftriaxone)

Adverse Reactions / Precautions

- Hypokalemia: Use with caution in patients with severe hypokalemia. Acute rises in calcium can cause life-threatening arrhythmias
- Rapid push can cause: Arrhythmia, bradycardia, cardiac arrest, hypotension, syncope, vasodilation
  - Do not exceed 200mg/min except in emergency situations
- Caution in patients receiving digoxin therapy, may cause arrhythmias
- **Use small IV/Large Vein, flush prior and after, AVOID extravasation** (will cause tissue necrosis)
  - In general, IV Calcium Gluconate is preferred over IV calcium chloride in nonemergency settings due to the potential for extravasation with calcium chloride
- **Do not infuse calcium chloride in the same I.V. line as phosphate-containing solutions.**
- Precipitates with $NaHCO_3$ in IV Bag/Tubing

Dose and Administration: **ADULT**

Cardiac arrest or cardiotoxicity in the presence of hyperkalemia, hypocalcemia, or hypermagnesemia:
IV/IO, **SLOW**
- **1500-3000mg** over 2-5 minutes

Calcium channel blocker overdose (off-label use):
Hypotension/conduction disturbances:
IV/IO
- **3g** (3000mg) over 5 minutes; may repeat q10-20min with 3-4 additional doses.

Hypocalcemia prophylaxis from massive transfusion
- **30mL of 10% solution** over 5 minutes
  Note: Calcium Chloride is 3X more potent than Calcium Gluconate and therefore higher doses of Calcium Gluconate must be used to reach similar therapeutic doses.

Hydrofluoric Acid Exposure – (off-label, see Burn SMOG)
- Topical therapy: After **thorough irrigation**, a CaGlu gel (75mL KY Jelly + 25mL 10% CaGlu) can be made and applied to the affected area, left on for 30 minutes, cleaned off, and q4hr. Assess for pain relief and monitor EKG (NO Calcium Chloride!)

PEDIATRIC Always Reference BROSELOW Tape

Cardiac arrest or cardiotoxicity in the presence of hyperkalemia, hypocalcemia, or hypermagnesemia:
IV/IO, **SLOW**
- **60-100mg/kg/dose** (maximum: 3000mg/dose)

Calcium channel blocker overdose (unlabeled use): *Hypotension/conduction disturbances:*
IV/IO
- **45mg/kg** (maximum 3000mg/dose) over 10-15min; may repeat q10-15min

Hypocalcemia prophylaxis from massive transfusion
- **60mg/kg (maximum 30ml of 10% solution) over 5 minutes**

Note: Calcium chloride may provide a more rapid increase of ionized calcium in critically ill children.

CEFAZOLIN

♀C, Lactation Yes

Trade Name: **Ancef**

Class / Mechanism of Action

Antibiotic (Cephalosporin 1st Gen)
Bactericidal - Inhibits bacterial cell wall synthesis by binding to one or more of penicillin-binding proteins which inhibits cell wall biosynthesis, causing bacteria to eventually lyse.

Indications

Labeled Indications: Used for infection control prophylaxis for traumatic open injuries and surgical prophylaxis.

Contraindications

- Hypersensitivity to cefazolin, other cephalosporin antibiotics, other beta-lactams, or any component of the formulation
- Some cross reactions occur in those with penicillin allergies. Use with caution.

Adverse Reactions / Precautions

- Superinfection – prolonged use may result in fungal or bacterial superinfection (including C.Difficile)
- Increased INR (bleeding risk) – especially in nutritionally-deficient, hepatic/renal disease, prolonged treatment

Dose and Administration:

ADULT

Infection Control:

Routine dosing may be based on body mass:

1g if weight <80kg

2g if weight 81-160kg (177-352lbs),

3g if weight > 160kg (>352lbs)

Max dose is 12g per day

War wounds (dirty wounds), 2g in 250 mL NS IV over 5 min q8hr for 24 hours is adequate for most dirty wounds of the head and nek, torso, and extremities

IV:

Adults:

- 1-2g every 6-8hr
  - Max daily dose: 12g/day

PEDIATRIC

Infection Control:

IV:

Pediatrics:

- 20-30mg/kg IV q6-8hr (maximum, 100mg/kg/day)
  - Max daily dose: 100mg/kg/day

DEXAMETHASONE ♀C, Lactation ?(Not Recommended) Trade Name: **Decadron**

Class / Mechanism of Action

Systemic Corticosteroid
Anti-inflammatory, Immunosuppressant Onset of action, IV: Prompt; Duration IV: 72 hours

Indications

Labeled Indications:
- Anti-inflammatory or immunosuppressant in treatment of a variety of diseases: allergic, dermatologic, endocrine, hematologic, inflammatory, neoplastic, renal, respiratory, rheumatic, and autoimmune
- Management if cerebral edema

Unlabeled:
- Treatment of acute mountain sickness (AMS) and high altitude cerebral edema.

Contraindications

- Hypersensitivity to dexamethasone or any component of the formulation
- Systemic fungal infection, cerebral malaria

Adverse Reactions / Precautions

- Not for use in treatment of head injury; increased mortality has occurred in head injury patients treated with high dose IV methylprednisolone. Corticosteroids should not be used in head injuries.

Dose and Administration: ADULT	PEDIATRIC Always Reference BROSELOW Tape
Acute mountain sickness (AMS)/high altitude cerebral edema (HACE) (unlabeled use): PO, IM, IV: • AMS: **4mg** q6hr • HACE: **8mg** as a single dose; followed with: 4mg q6hr until symptoms resolve	**Acute mountain sickness (AMS)/high altitude cerebral edema (HACE)** (unlabeled use): PO, IM, IV: • **0.15mg/kg/dose** q6hr ○ consider use in high altitude pulmonary edema because of associated HACE with pulmonary edema

DEXTROSE 50% ♀C, Lactation? Trade Name: **Glutose / B-D Glucose**

Class / Mechanism of Action

Antidote, Hypoglycemia

Basic source of calories (fuel) for the body and brain, regulated by insulin. Rapidly increases blood glucose, decreases protein and nitrogen loss, preventing ketosis, and promotes glycogen deposition in liver.

Onset of action: Treatment of hypoglycemia Oral dose: 10minutes

Maximum effect: Treatment of Hyperkalemia IV: 30minutes

Indications

Labeled Indications: Treatment of:

- Hypoglycemia: Doses may be repeated in severe cases
- Hyperkalemia: (Must be used in combination WITH Insulin)

Contraindications

- Known Hyperglycemia, otherwise None in the Pre-hospital setting

Adverse Reactions / Precautions

Most adverse effects associated with excessive dose or infusion rate

- If evidence of malnutrition or alcohol abuse, thiamine should be given 1st
- **Tissue Necrosis if Extravasation occurs**; immediately D/C and change IV site
- Hyperglycemia
- Hypokalemia
- Hyponatremia

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

Hypoglycemia:

Oral:

- **4-20g** as a single dose; may repeat if necessary

IV:

- **10-25g** (40-100mL of 25% solution or 20-50mL of 50% solution)

Note: Society of Critical Care Medicine recommends: Treat blood glucose <70mg/dL (<100mg/dL in patients with neurologic injury) immediately by stopping insulin therapy (if receiving) and administering 10-20g (20-40mL of 50% solution) IV; repeat blood glucose measurement in 15 minutes with repeat dextrose as needed; **avoiding overcorrection**.

Hypoglycemia:

Oral:

- **4-20g** as a single dose; may repeat if necessary

IV:

- Newborns: **5ml/kg D10** (Max 25g/dose)
- Infants and Children: **2ml/kg D25** (Max 25g/dose)
- Adolescents: Refer to adult dosing

Note:

- **D25**=25ml NS + 25ml D50 (12.5g in 50ml's solution)
- **D10**=100ml NS + 25ml D50 (12.5g in 125ml's solution)
  or
  40ml NS + 10ml D50 (5g in 50ml's solution)

DIAZEPAM

♀D, **Lactation Yes** (Unsafe) — Trade Name: **Valium**

Class / Mechanism of Action

Benzodiazepine;
Acts as an Anxiolytic/Hypnotic, anticonvulsant and sedative – Long Half Life (25-100hr)
Onset of action: IV, Almost Immediate
Duration: IV, 20-30min

Indications

Labeled Indications:

- Anxiety Disorders
- Convulsive Disorders and Alcohol Withdrawal Symptoms
- Skeletal Muscle Relaxant
- Induce Sedation and Amnesia (Midazolam is primary medication)

Contraindications

- Hypersensitivity to diazepam or any component of the formulation or other benzodiazepines
- Acute narrow angle glaucoma , Acute Alcohol Intoxication
- Respiratory Insufficiency/Depression **(Overdose Reversal: FLUMAZENIL can be used, however it carries elevated risk. Respiratory support until the medication is metabolized is traditionally the best care in Benzodiazepine overdose)**
- Neurologic Depression (Head Trauma)

Adverse Reactions / Precautions

- **No Analgesic properties** (Narcotic pain control is needed for RSI'd/Intubated trauma patients)
- May Cause Respiratory depression: Do not give without stable IV line and BVM (airway control) ready
- Hypotension, vasodilation
- Amnesia, confusion, drowsiness, slurred speech (Paradoxical Reactions possible: aggressiveness, agitation, anxiety, inappropriate behavior)

Dose and Administration: ADULT

Anxiety:
Oral, IV, IM: (Oral and IV doses more reliable)

- **2-10mg** bid/qid prn

Status Epilepticus:
IV: (SLOW)

- **5-10mg** q5-10min given over 3 minutes (maximum dose: 30mg)

Sedation in ICU patient:
IV:

- Loading dose: **5-10mg;** Maintenance dose: **0.03-0.1mg/kg** q30min to 6hr

Muscle Spasm:
IV:

- Initial: **5-10mg**; then 5-10mg in 3-4hr, if necessary. Larger doses may be required if associated with tetanus.

Nerve Agent Exposure (CBRNE)
IM:

- **10mg** for seizures associated with Nerve Agent exposure; or if 3 MARK 1 kits were used on a casualty

PEDIATRIC Always Reference BROSELOW Tape

Sedation / Muscle relaxation / Anxiety :
IV, IM (IV doses more reliable)

- Children: **0.04-0.3mg/kg/dose** q2-4hr to a maximum of 0.6mg/kg within an 8-hour period if needed

Status Epilepticus:
IV:

- Infants >30 days and Children <5 years: **0.2-0.5mg** given slowly q2-5min (maximum total dose: 5mg); repeat in 2-4hr if needed
- Children ≥5 years: **1mg** given slowly q2-5min (maximum total dose: 10mg); repeat in 2-4hr if needed

Muscle spasm associated with tetanus:
IV, IM

- Infants >30 days and Children <5 years: **1-2mg/dose** q3-4hr prn
- Children ≥5 years: **5-10mg/dose** q3-4hr prn

DILTIAZEM

♀C, **Lactation?**(Not Recommended) Trade Name: **Cardizem**

Class / Mechanism of Action

Calcium Channel Blocker; Antiarrhythmic Agent, Class IV
Inhibits calcium ion from entering the "slow channels" or select voltage-sensitive areas of vascular smooth muscle and myocardium during depolarization; produces relaxation of coronary vascular smooth muscle and coronary vasodilation; increases myocardial oxygen delivery in patients with vasospastic angina. Onset of action: IV: 3 minutes, Duration 1-3 hours

Indications

Labeled Indications: Atrial fibrillation or atrial flutter for acute ventricular rate control, conversion of supraventricular tachycardia, hypertension, chronic stable angina, vasospastic angina.
Unlabeled: Hypertrophic cardiomyopathy; Idiopathic ventricular tachycardia; Nonsustained ventricular tachycardia or ventricular premature beats, symptomatic; Pulmonary arterial hypertension (group 1).

Contraindications

- Sick sinus syndrome (except in patients with a functioning artificial pacemaker); Second- or third-degree AV block
- Atrial fibrillation or flutter associated with accessory bypass tract (WPW, short PR syndrome)
- Severe hypotension; Cardiogenic shock; Hypersensitivity to diltiazem or any formulation component
- Ventricular tachycardia (with wide-complex tachycardia [QRS ≥0.12 seconds], must determine whether origin is supraventricular or ventricular)

Adverse Reactions / Precautions

- Cardiovascular: Edema, atrioventricular block, bradycardia, hypotension, dyspnea
- Central nervous system: Headache, dizziness, pain, nervousness, vomiting, weakness, myalgia

Dose and Administration: ADULT

Atrial fibrillation or atrial flutter, rate control:
Note: For rate control in hemodynamically stable patients. Do **not** use in patients with preexcitation associated with an accessory pathway, as this can lead to ventricular arrhythmias.
IV:

- Bolus dose: 0.25mg/kg (actual body weight) over 2 minutes (average dose: 20mg); if rate control is insufficient after 15 minutes, a repeat bolus dose of 0.35mg/kg over 2 minutes may be given (average dose: 25mg). Patients who respond after 1 or 2 bolus doses can be started on a continuous infusion.
- Continuous infusion following bolus(es): Initial: 5-10mg/hour; infusion rate may be increased in 5mg/hour increments according to ventricular response, up to a maximum of 15mg/hour.

Supraventricular tachycardia (alternative agent):
Note: For hemodynamically stable patients if vagal maneuvers and/or adenosine are unsuccessful.

- Bolus dose: 0.25mg/kg (actual body weight) over 2 minutes (average dose: 20mg); if rate control is insufficient after 15 minutes, a repeat bolus dose of 0.35mg/kg over 2 minutes may be given (average dose: 25mg). If bolus(es) do not terminate the arrhythmia, consider alternative therapy.

PEDIATRIC Always Reference BROSELOW Tape

Atrial tachyarrhythmias, rate control:
Very limited data available: Infants, Children, and Adolescents
IV:

- Initial bolus: 0.25mg/kg over 5 minutes (maximum dose: 20mg/dose [average adult dose]) followed by a continuous IV infusion. Dose should be individualized based on patient response.
- Continuous infusion (titrated to effect): 0.05-0.15mg/kg/hour (Rate control achieved ≈10min)

DIPHENHYDRAMINE ♀B, Lactation Yes (Unsafe) Trade Name: **Benadryl**

Class / Mechanism of Action

Histamine H_1 Antagonist;
Competes with histamine for H1-receptor sites within the gastrointestinal tract, blood vessels, and respiratory tract; Also produces anticholinergic and sedative effects

Indications

Labeled Indications:
- Anaphylaxis and allergy disorders
- Motion Sickness
- Antitussive

Contraindications

- Hypersensitivity to diphenhydramine or any component of the formulation
- Acute Asthma
- Use on Neonates, premature infants, Nursing mothers

Adverse Reactions / Precautions

- Normally causes sedation, but may cause paradoxical excitation in children
- May have increased sedative effects when used with other sedatives or alcohol
- May cause hypotension (use with caution in patient with cardiovascular disease)
- Dry mouth

Dose and Administration: ADULT	**PEDIATRIC** Always Reference BROSELOW Tape
Anaphylaxis/Allergic Reactions and Motion Sickness: Oral: • **25-50mg** q6-8hr IV Push: • **50mg** once, prepare to administer epinephrine **Acute Hemolytic reaction** (rapid onset of itching, chills, flushing, nausea/vomiting, coughing, wheezing, laryngeal edema, dyspnea, hypotension hemoglobinuria, rise in venous pressure, distended neck veins, crackles in lung bases): IV: • **50mg** once, after administration of epinephrine 0.5mL in lateral thigh	**Anaphylaxis/Allergic Reactions and Motion Sickness:** Oral, IM, IV: • **1mg/kg** q6hr **Max Doses**: 2 to <6 years: • **6.25mg** every 4-6hr; max of 37.5mg/day 6 to <12 years: • **12.5-25mg** every 4-6hr; max of 150mg/day ≥12 years: • See Adult dosing

DOBUTAMINE

♀B, **Lactation?** (Caution)

Trade Name: **Dobutrex**

Class / Mechanism of Action

Adrenergic Agonist

Positive Inotropic agent. Stimulates beta1 adrenergic receptors: Increases HR and contraction force while sparing beta2 and alpha receptors. Onset IV: 1-2min

Indications

Labeled Indications: Short term management of cardiac decompensation.

Contraindications

- Hypersensitivity to dobutamine or sulfites (some contain sodium metabisulfate), or any component of the formulation
- Idiopathic hypertrophic subaortic stenosis (IHSS)

Adverse Reactions / Precautions

- **Always attempt to correct Hypovolemia 1st when using vasopressors and/or inotropes**
  - **May be combined with Dopamine or Norepinephrine for hypotension not responding to fluid administration**
  - **No applicable use in hemorrhagic shock until fluid replacement therapy maximized!**
- Increase in BP is common, but does have a rare incidence of causing hypotension
- Increases HR
- May exaggerate ventricular ectopy

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

Cardiac Decompensation:

IV:

Dobutamine may be combined with dopamine or norepinephrine for hypotension not responsive to fluid therapy.

- **2-20mcg/kg/min**, start low and titrate to targeted MAP >60mmHg
- **Preparation:** Mix 250mg Dobutamine in 250mL D5W or NS for a concentration of 1000mcg/mL

Infusion Rates for Dobutamine at 1000mcg/mL

Desired Delivery Rate (mcg/kg/min)	Infusion Rate (mL/kg/hr)
2.5	0.15
5	0.3
7.5	0.45
10	0.6
12.5	0.75
15	0.9
20	1.2

Cardiac Decompensation:

IV

- Refer to adult dose

DOPAMINE

♀C, **Lactation?** (Use Caution)

Trade Name: **Intropin**

Class / Mechanism of Action

Adrenergic Agonist; Vasopressor

Stimulates adrenergic and dopaminergic receptors. High doses stimulate dopaminergic and beta1 adrenergic receptors, producing cardiac stimulation and renal vasodilation. Very large doses stimulate alpha adrenergic receptors.

Indications

Labeled Indications:

Treatment of non-hemorrhagic shock (e.g. neurogenic, renal failure, cardiac decompensation) persisting after adequate fluid volume replacement

Unlabeled: Symptomatic bradycardia or heart block unresponsive to atropine or pacing

Contraindications

- Hypersensitivity to sulfites
- Ventricular Fibrillation

Adverse Reactions / Precautions

- **No applicable use in hemorrhagic shock unless fluid replacement therapy maximized! Maximize use of Blood products / Crystalloids before considering use in hemorrhagic shock.**
- Tachycardia and/or Arrhythmias: May increase HR and worsen arrhythmias
- Vesicant: Avoid extravasation, will cause tissue damage/necrosis
- Assure adequate circulatory volume to minimize need for vasoconstrictors. Monitor BP closely, avoid hypertension and adjust infusion rate as needed.

Dose and Administration:

ADULT

Hemodynamic Support:

IV(Use microdrip chamber only):

- **5-20mcg/kg/min**; titrate to desired response. Infusion may be increased by 1-4mcg/kg/min at 10 to 30 minute intervals until optimal response is obtained

Dopamine Dosage Efficacy:

- 1-5mcg/kg/min=Dopaminergic effects: increased urine output, increased renal blood flow
- 5-10mcg/kg/min=Beta1 effects: Increased CO, HR, and contractility
- >10mcg/kg/min=Alpha1 effects: Increased BP, vasoconstriction

Note: Doses >20mcg/kg/minute likely do not have a beneficial effect on blood pressure and may increase risk of tachyarrhythmias
Add additional vasopressor if Dopamine doses of 20mcg/kg/min are inadequate. (**phenylephrine**, **norepinephrine**, **epinephrine**.

PEDIATRIC Always Reference BROSELOW Tape

Hemodynamic Support:

IV:

- "Use adult dosing"

Note: Dopamine is a second line medication for hemodynamic support in Pediatric patients behind Epinephrine and Norepinephrine

Dopamine						
Dosing Range: 5-20mcg/kg/min (300-1200mcg/kg/hr)						
MIX 800 mg/500mL CONCENTRATION 1600mcg/mL						
Pt. Weight	Dose	Rate	Micro	Macro		
			(60gtt/mL)	20gtt/mL	15gtt/mL	10gtt/mL
kg	mcg/kg/min	mL/hr	gtt/min	gtt/min	gtt/min	gtt/min
50	5	9	9	3	2	2
	10	19	19	6	5	3
	15	28	28	9	7	5
	20	38	38	13	10	6
55	5	10	10	3	3	2
	10	21	21	7	5	4
	15	31	31	10	8	5
	20	41	41	14	10	7
60	5	11	11	4	3	2
	10	23	23	8	6	4
	15	34	34	11	9	6
	20	45	45	15	11	8
65	5	12	12	4	3	2
	10	24	24	8	6	4
	15	37	37	12	9	6
	20	49	49	16	12	8
70	5	13	13	4	3	2
	10	26	26	9	7	4
	15	39	39	13	10	7
	20	53	53	18	13	9
75	5	14	14	5	4	2
	10	28	28	9	7	5
	15	42	42	14	11	7
	20	56	56	19	14	9
Micro-Drip is set of choice for this infusion						
Titrate to minimum effective dose. Allow 3-5 minutes between dosing changes to assess hemodynamic effects.						

Dopamine						
Dosing Range: 5-20mcg/kg/min (300-1200mcg/kg/hr)						
MIX 800mg/500 mL CONCENTRATION 1600mcg/mL						
Pt. Weight	Dose	Rate	Micro	Macro		
			(60gtt/mL)	20gtt/mL	15gtt/mL	10gtt/mL
kg	mcg/kg/min	mL/hr	gtt/min	gtt/min	gtt/min	gtt/min
80	5	15	15	5	4	3
	10	30	30	10	8	5
	15	45	45	15	11	8
	20	60	60	20	15	10
85	5	16	16	5	4	3
	10	32	32	11	8	5
	15	48	48	16	12	8
	20	64	64	21	16	11
90	5	17	17	6	4	3
	10	34	34	11	9	6
	15	51	51	17	13	9
	20	68	68	23	17	11
95	5	18	18	6	5	3
	10	36	36	12	9	6
	15	53	53	18	13	9
	20	71	71	24	18	12
100	5	19	19	6	5	3
	10	38	38	13	10	6
	15	56	56	19	14	9
	20	75	75	25	19	13
105	5	20	20	7	5	3
	10	39	39	13	10	7
	15	59	59	20	15	10
	20	79	79	26	20	13
Micro-Drip is set of choice for this infusion						
Titrate to minimum effective dose. Allow 3-5 minutes between dosing changes to assess hemodynamic effects.						

EPINEPHRINE 1mg/mL (formerly 1:1000)

♀C, **Lactation?** (Caution)

Trade Name: **EpiPen / EpiPen Jr**

Class / Mechanism of Action

Alpha & Beta Agonist

Sympathomimetic, stimulates both alpha and beta adrenergic receptors, causing relaxation of the bronchial tree, cardiac stimulation (increasing myocardial oxygen consumption), and dilation of skeletal muscle blood vessels

Indications

- Allergic Reactions, Anaphylaxis
- Asthma (Bronchoconstriction)

Contraindications

- Not for IV use, must first dilute into 10mL NS syringe for Cardiac/IV use

Adverse Reactions / Precautions

- **No applicable use in hemorrhagic shock unless fluid replacement therapy maximized! Maximize use of Blood products/Crystalloids before considering use in hemorrhagic shock.**
- Chest Pain, Tachycardia, Arrhythmias, Palpitations, Sudden death
- Anxiety, Cerebral Hemorrhage, Headache
- Vesicant: Avoid extravasation, will cause tissue damage/necrosis
- Use with caution in patients taking tricyclic antidepressants; effects of epinephrine may be increased

Dose and Administration:

ADULT

Bronchodilator:

SubQ, IM: **1mg/mL**

- **0.3-0.5mg** q20min for 3 doses

Nebulization:

- Add **0.5mL** to nebulizer and dilute with 3mL of NS; administer over 15 minutes

Anaphylaxis / Hypersensitivity reaction (ALS,2020):

IM: **1mg/mL**

- **0.3-0.5mg** 5-15min until clinical improvement

IV Infusion:

- Initiate with an infusion at **5-15mcg/minute** (with crystalloid) (See infusion chart next page)

Acute Hemolytic reaction

IM: **1mg/mL**

- **0.5mg** IM in lateral thigh
  - Repeat q5-15min for moderate bronchospasm or facial/laryngeal edema.
- Follow with Diphenhydramine 50mg IV Push

PEDIATRIC Always Reference BROSELOW Tape

Bronchodilator:

SubQ: Infants and Children **1mg/mL**

- **0.01mg/kg** (0.01mL/kg) (maximum single dose: 0.5mg) q20min for 3 doses

Nebulization:

- Children <4 years: Croup: **0.05mL/kg** (maximum dose: 0.5mL); dilute in 3mL of NS. Administer over 15 minutes; do not administer more frequently than q2hr
- Children ≥4 years: Adult dosing

Anaphylaxis / Hypersensitivity reaction (PALS,2020): Infants and Children

IM:

- **0.01mg/kg** (0.01mL/kg of **1mg/mL** solution) (maximum single dose: 0.3mg) q5-15min

EpiPen Jr, Children <15kg:

- **0.15mg**; if anaphylactic symptoms persist, dose may be repeated in 5-15 minutes using an additional EpiPen Jr

EpiPen, Children ≥15 kg:

- **0.3mg**; if anaphylactic symptoms persist, dose may be repeated in 5-15 minutes using an additional EpiPen

MEDICATIONS

Epinephrine 1mg/1mL (1:1,000)					
Anaphylaxis					
Dosing Range: 5-15mcg/min (150-450mcg/hr)					
MIX 1mg/500mL CONCENTRATION 2mcg/mL					
Dose	Rate	Micro (60gtt/mL)	Macro		
			20gtt/mL	15gtt/mL	10gtt/mL
mcg/min	mL/hr	gtt/min	gtt/min	gtt/min	gtt/min
5	150	150	50	38	25
6	180	180	60	45	30
7	210	210	70	53	35
8	240	240	80	60	40
9	270	270	90	68	45
10	300	300	100	75	50
11	330	330	110	83	55
12	360	360	120	90	60
13	390	390	130	98	65
14	420	420	140	105	70
15	450	450	150	113	75
Macro-Drip (10gtt/mL) is set of choice for this infusion					
Start at lowest dose and titrate to desired effect					

EPINEPHRINE

♀C, **Lactation?** (Caution)

Trade Name: **Adrenalin**

1mg/10mL (formerly 1:10,000)

Class / Mechanism of Action

Alpha & Beta Agonist

Sympathomimetic, stimulates both alpha and beta adrenergic receptors, causing relaxation of the bronchial tree, cardiac stimulation, and dilation of skeletal muscle blood vessels

Indications

- Cardiac Arrest (VF, pulseless VT, asystole, PEA)
- Drip-Dose: Bradycardia (Symptomatic), Fluid Resistant Shock
- Push-Dose: Bradycardia, Hypotension, Refractory Anaphylaxis

Contraindications

- Uncontrolled hypertension is a relative contraindication, otherwise none

Adverse Reactions / Precautions

- **No applicable use in hemorrhagic shock unless fluid replacement therapy maximized! Maximize use of Blood products/Crystalloids before considering use in hemorrhagic shock.**
- Chest Pain, Tachycardia, Arrhythmias, Palpitations, Sudden death
- Anxiety, Cerebral Hemorrhage, Headache
- Vesicant: Avoid extravasation, will cause tissue damage/necrosis
- Use with caution in patients taking tricyclic antidepressants; effects of epinephrine may be increased

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

Asystole/pulseless arrest, pulseless VT/VF:

IV: **1mg/10mL** (0.1mg/mL) Pre-filled 10cc Syringe

- **1 mg** (10cc of 0.1mg/mL) every 3-5 minutes to ROSC, Follow each with 20mL flush

Drip-Dose: Bradycardia (Symptomatic), Fluid Resistant Shock:

IV Continuous Infusion:

- **2-20 mcg/minute** titrate to desired effect (HR >60, MAP >65)

Push-Dose: Bradycardia, Hypotension, Refractory Anaphylaxis:

IV/IO: Mix 100mcg (1mL of 1mg/10mL) Epinephrine in 10cc NS for concentration of 10mcg/mL

- **5-20mcg IV/IO push q2-5min, titrate to desired response**

Asystole, PEA, pulseless VT/VF, Unresponsive and Symptomatic Bradycardia in Infants

IV: **1mg/10mL –** 0.1mg/mL Pre-filled 10cc Syringe

- **0.01mg/kg** (0.1 mL/kg of **1mg/10mL** [0.1mg/mL]) (maximum single dose: 1mg) q3-5min as needed or until ROSC

Severe Hypotension/shock and fluid resistant (unlabeled use):

IV: Continuous Infusion

- **0.1-1mcg/kg/minute** titrated to desired effect

MEDICATIONS

Epinephrine 1mg/10mL (1:10,000)					
Pressor for Hypotension					
Dosing Range: 2-20mcg/min (120-600mcg/hr)					
MIX 1 mg/500mL CONCENTRATION 2mcg/mL					
Dose	Rate	Micro (60gtt/mL)	Macro		
			20gtt/mL	15gtt/mL	10gtt/mL
mcg/min	mL/hr	gtt/min	gtt/min	gtt/min	gtt/min
2	60	60	20	15	10
3	90	90	30	22.5	15
4	120	120	40	30	20
5	150	150	50	37.5	25
6	180	180	60	45	30
7	210	210	70	52.5	35
8	240	240	80	60	40
9	270	270	90	67.5	45
10	300	300	100	75	50
11	330	330	110	82.5	55
12	360	360	120	90	60
13	390	390	130	97.5	65
14	420	420	140	105	70
15	450	450	150	112.5	75
16	480	480	160	120	80
17	510	510	170	127.5	85
18	540	540	180	135	90
19	570	570	190	142.5	95
20	600	600	200	150	100
Macro-Drip (10gtt/mL) is set of choice for this infusion					
Start at lowest dose and titrate to desired effect					

Ertapenem	**♀C, Lactation Yes**	Trade Name: **Invanz**
Class / Mechanism of Action		
Antibiotic (Carbapenem), Biacteriocidal – broad spectrum, Inhibits bacterial cell wall synthesis by binding to one or more of penicillin-binding proteins which inhibits cell wall biosynthesis, causing bacteria to eventually lyse.		
Labeled Indications: Used for infection control prophylaxis for traumatic open injuries and surgical prophylaxis.		
Contraindications		
• Hypersensitivity to cefazolin, other cephalosporin antibiotics, other beta-lactams, or any component of the formulation		
Adverse Reactions / Precautions		
• Superinfection – prolonged use may result in fungal or bacterial superinfection (including C.Difficile)		
Dose and Administration:	**ADULT**	**PEDIATRIC**

Infection Control:
Give 1g in 250mL NS IV over 5min, provides 24 hours of coverage.
 	
IV:
Adults:
• 1g IV q24hr
  ○ Max daily dose: 12g/day
		Infection Control: Children <12 years & ≥12 years
		
		IV:
		Pediatrics:
		• <12years old: 15mg/kg IV q12hr
		  ○ Max daily dose: 100mg/kg/day
		
		• ≥12 years old: 20mg/kg IV or IM once daily
		  ○ Max daily dose: 1g/day

ETOMIDATE

♀C, **Lactation?** (Caution)

Trade Name: **Amidate**

Class / Mechanism of Action

General Anesthetic

Very short acting non-barbiturate sedative/hypnotic used for induction of anesthesia with little cardiovascular effects. Onset of action: 30-60 seconds, Duration 5-10 minutes

Indications

Labeled Indications:

- Rapid Sequence Induction

Contraindications

- Hypersensitivity to etomidate or any component of the formulation

Adverse Reactions / Precautions

- **NO Analgesic properties!**
- Safety in children less than 10 years has not been established
- Inhibits adrenal steroid production; may increase mortality if repeat dosing is required

Dose and Administration:	**ADULT**	**PEDIATRIC** Always Reference BROSELOW Tape
	RSI: IV: • **0.3mg/kg** over 30-60 seconds for induction of anesthesia; **Note:** Limit to single dose for anesthesia/induction. Repeat dosing and continuous infusion (maintenance dosing) may increase patient mortality due to adrenal suppression and inability to respond to stress.	**RSI:** IV: Children <10 • Despite dosing on Broselow tape, not the preferred induction agent for this group due to limited safety information Children >10: • **0.3mg/kg** over 30-60 seconds will produce rapid sedation lasting 10-15 minutes. ○ Max dose: 20mg **Note:** Limit to single dose for anesthesia/induction. Repeat dosing and continuous infusion (maintenance dosing) may increase patient mortality due to adrenal suppression and inability to respond to stress.

FENTANYL

♀C, **Lactation Yes** (Not recommended) Trade Name: **Sublimaze**

Class / Mechanism of Action

Opioid Analgesic; General Anesthetic
Binds to opioid receptors within the CNS increasing pain threshold and altering pain reception; inhibits ascending pain pathways (blocking painful stimulus); produces CNS depression
Onset: IV almost immediate, Duration: IV 0.5-1 hour

Indications

Labeled Indications:

- Pain relief
- Adjunct to general or regional anesthesia

Contraindications

- Hypersensitivity to fentanyl or any component of the formulation

Adverse Reactions / Precautions

- When using only as pain med and not adjunct to general anesthesia, ensure Slow IV Push (3-5 min). Rapid infusion may result in chest wall rigidity, impaired ventilation, or respiratory distress/arrest Always be prepared for use of paralytic and intubation (positive control of airway).
- **Head trauma: Use with extreme caution in head injury, or suspected increased ICP; exaggerated increase in ICP may occur if patient management is inadequate.**
- May worsen Bradycardia
- May cause life-threatening hypoventilation and Reparatory depression
- CNS depression: Impairs physical and mental abilities

Dose and Administration: ADULT	PEDIATRIC Always Reference BROSELOW Tape
Pain Management: IV: Slow (Unlabeled) • **0.5-1mcg/kg** prn for breakout pain q30-60min IN: • **100mcg** **Note:** Patients with prior opioid exposure may have increased tolerance and require higher dosing **Sedation during mechanical ventilation**: IV: • Initial Bolus: **1-2mcg/kg** Continued Sedation: • **0.5-1mcg/kg/hr** infusion (See Infusion chart next page) (Combine with 0.05-0.1mg/kg Midazolam for best effect) • **0.5-2mcg/kg** IVP q30-60min **Pretreatment for RSI:** 3-5 min prior to RSI in pt's with Head injuries, Increased ICP, Cardiac Ischemia or Aortic Dissection (if situation allows): • **3mcg/kg** slow IV push **Non-Traumatic Chest Pain (Cardiac)** • **25-50mcg** IV	**Pain Management:** IV: Slow (Unlabeled) • **0.5-1mcg/kg** prn for breakout pain q30-60min **Sedation during mechanical ventilation**: IV: • Initial Bolus: **1-2mcg/kg** • Continued Sedation: **0.5-2mcg/kg** q30-60min or **0.5-2mcg/kg/hr** infusion (Combine with 0.05-0.1mg/kg Midazolam for best effect) **Note:** Titrate doses and intervals to pain relief/prevention. Monitor vital signs. • Single IV doses last 0.5-1 hour

FENTANYL (SUBLIMASE)					
Dosing Range: 0.5-1mcg/kg/hr					
MIX 1mg/100mL CONCENTRATION 10mcg/mL					
Dose	Rate	Micro	Macro		
		(60gtt/mL)	20gtt/mL	15gtt/mL	10gtt/mL
mcg/hr	mL/hr	gtt/min	gtt/min	gtt/min	gtt/min
25	3	3	1	1	0
30	3	3	1	1	1
35	4	4	1	1	1
40	4	4	1	1	1
45	5	5	2	1	1
50	5	5	2	1	1
55	6	6	2	1	1
60	6	6	2	2	1
65	7	7	2	2	1
70	7	7	2	2	1
75	8	8	3	2	1
80	8	8	3	2	1
85	9	9	3	2	1
90	9	9	3	2	2
95	10	10	3	2	2
100	10	10	3	3	2
105	11	11	4	3	2
110	11	11	4	3	2
115	12	12	4	3	2
120	12	12	4	3	2
125	13	13	4	3	2
130	13	13	4	3	2
135	14	14	5	3	2
140	14	14	5	4	2
145	15	15	5	4	2
150	15	15	5	4	3
155	16	16	5	4	3
160	16	16	5	4	3
165	17	17	6	4	3
170	17	17	6	4	3
175	18	18	6	4	3
180	18	18	6	5	3
185	19	19	6	5	3
190	19	19	6	5	3
195	20	20	7	5	3
200	20	20	7	5	3
Micro-Drip is set of choice for this infusion					
Sample patient: 80kg pt at 0.5-1mcg/kg/hr = 40mcg/hr-80mcg/hr dosing range					

FUROSEMIDE

♀C, **Lactation Yes** (Caution) Trade Name: **Lasix**

Class / Mechanism of Action

Antihypertensive; Loop Diuretic

Inhibits reabsorption of sodium and chloride in the kidney, causing increased loss of water, sodium, chloride, magnesium, and calcium within urine. When given IV it also causes rapid venous dilation. Symptomatic improvement of acute pulmonary edema approximately 15-20 minutes

Indications

Labeled Indications: Management of edema associated with heart failure and hepatic or renal disease;

- Management of edema associated with heart failure and hepatic or renal disease; acute pulmonary edema
- Hypertension (alone or in combination with other antihypertensives)

Contraindications

- Hypersensitivity to furosemide or any component of the formulation
- Anuria **(No pre-hospital utility in hypovolemic shock)**

Adverse Reactions / Precautions

- Can cause profound diuresis with resulting shock and electrolyte depletion. Monitor closely
  - May cause: Hypovolemia, Hypotension, hyponatremia, hypokalemia
- May potentiate effect of additional antihypertensives

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

Acute pulmonary edema:

IV

- **40mg** over 1-2min. If response not adequate within 1hr, may increase dose to 80mg

Edema, heart failure:

IV, IM:

- Initial: **20-40mg/dose**; if response is not adequate, may repeat the same dose or increase dose in increments of 20mg/dose and administer 1-2 hours after previous dose (maximum dose: 200mg/dose).

Continuous IV Infusion:

- Initial: IV bolus dose **20-40mg** over 1-2 minutes, followed by continuous IV infusion doses of **10-40mg/hr**. If urine output is <1 mL/kg/hr, double as necessary to a maximum of 80-160mg/hr.

Edema, heart failure: Infants and Children

IV, IM:

- Initial: **1mg/kg/dose**; if response not adequate, may increase dose in increments of 1mg/kg/dose and administer not sooner than 2 hours after previous dose, until a satisfactory response is achieved; may administer maintenance dose at intervals of q6-12hr; maximum dose: 6mg/kg/dose.

GLUCAGON ♀B, Lactation? (Caution)

Class / Mechanism of Action

Antidote, Hypoglycemia Antidote, Diagnostic agent
Raises blood glucose levels by stimulating increased production of cyclic AMP, promoting hepatic glycogenolysis and gluconeogenesis

Indications

Labeled Indications: Management of hypoglycemia (Glucose <70 in adults or <60 in children)
Unlabeled:

- Beta-blocker or calcium channel blocker induced myocardial depression (with or without hypotension) unresponsive to standard measures
- Hypoglycemia secondary to insulin or sulfonylurea overdose (as adjunct to dextrose)

Contraindications

- Hypersensitivity to glucagon or any component of the formulation
- Insulinoma / Pheochromocytoma

Adverse Reactions / Precautions

- Should NOT be used as 1st line medication for hypoglycemia or Altered mental status
  - **Hypoglycemia patients should receive dextrose**. If IV access cannot be established or if dextrose is not available, glucagon may be used as alternate until dextrose can be given.
- Thiamine should precede use in patient with suspected alcoholism or malnutrition

Dose and Administration:	**ADULT**	**PEDIATRIC** Always Reference BROSELOW Tape
	Hypoglycemia: IV, IM, SubQ: • **1mg**; may repeat in 20 minutes prn **Beta-blocker / Calcium channel blocker overdose (myocardial depression)** unresponsive to standard measures (unlabeled use): IV: **(ACLS, 2015)** • **3-10mg** (or 0.05-0.15mg/kg) bolus followed by an infusion of 3-5mg/hour (or 0.05-0.1mg/kg/hr); titrate infusion rate to achieve adequate hemodynamic response	***Hypoglycemia:** IV, IM, SubQ: • **Children <20kg: 0.5mg** or 20-30mcg/kg/dose; repeated in 20 prn. • Children ≥20 kg: Adult dosing. **Note:** IV dextrose should be given ASAP; if patient fails to respond to glucagon, IV dextrose must be given ***Only use if hyperinsulinemia thought to be cause of hypoglycemia (rare in kids). If hypoglycemic without glycogen stores, Glucagon will be ineffective.** **Beta-blocker / Calcium channel blocker overdose (myocardial depression)** unresponsive to standard measures (unlabeled use): IV: • **30-150mcg/kg** bolus. Can be repeated if no response in 15 min. Follow with an infusion of 20-70mcg/kg/hr; titrate infusion rate to achieve adequate hemodynamic response

HEPARIN	♀C, **Lactation No**	Trade Name:

Class / Mechanism of Action

Anticoagulant
Inactivates thrombin and activated coagulation factors (IX, X, XI, XII, and plasmin) and prevents conversion of fibrinogen to fibrin.

Indications

Labeled Indications: Treatment of thromboembolic disorders
Unlabeled: ST elevation MI (STEMI) as an adjunct to thrombolysis; unstable angina/non-STEMI

Contraindications

- Hypersensitivity to heparin or any component of the formulation
- Active Bleeding (Trauma Patient)

Adverse Reactions / Precautions

- Continuously monitor for bleeding: Stop immediately if any bleeding occurs
- Urticarial reactions and anaphylaxis can occur

Dose and Administration: **ADULT**	**PEDIATRIC** Always Reference BROSELOW Tape
Acute coronary syndromes: STEMI/Unstable Angina as an adjunct to fibrinolysis (full-dose alteplase: IV: • Initial bolus of **60units/kg** (MAX: 4000units) ○ Maintenance: 12units/kg/hr (MAX: 1000units/hr) as continuous infusion. **Treatment of venous thromboembolism:** IV: (unlabeled dosing) • DVT/PE: **80units/kg** (or alternatively 5000 units) IV push followed by continuous infusion of 18units/kg/hr **Note:** Heparin is ONLY for use only under written direction of referring provider or direct consultation with medical director.	**Treatment of venous thromboembolism:** IV: (unlabeled dosing) >1 year • DVT/PE: **75units/kg** IV push followed by continuous infusion of 20units/kg/hr

HETASTARCH

♀C, **Lactation Yes** (Caution)

Trade Name: **Hextend**

Class / Mechanism of Action

Plasma Volume Expander, Colloid

Colloidal starch producing plasma volume expansion. Onset of Action: approximately 30 minutes

Indications

Labeled Indications: Volume expander used in treatment of hypovolemic / hemorrhagic shock

Contraindications

- Hypersensitivity to hydroxyethyl starch or any component of the formulation
- Renal failure with oliguria and anuria (not related to Hypovolemia)
- Fluid overload conditions, (pulmonary edema, congestive heart failure
- Pre-existing bleeding or coagulation disorders (eg, von Willebrand's disease): Use caution in bleeding disorders; may increase risk of more bleeding

Adverse Reactions / Precautions

- Anaphylactoid reactions (allergies to corn)

Dose and Administration: **ADULT** | **PEDIATRIC** Always Reference BROSELOW Tape

Plasma volume expansion:

IV

- **250-500mL** Bolus. May repeat prn (up to 1500 mL/day). Titrate to individual hemodynamic needs (Sys BP >90).

Notes:

- May be administered via infusion pump or pressure infusion.
- Do not administer with blood through the same line/tubing
- Change tubing or flush extensively with NS before administering blood through the same line.

HYDROMORPHONE ♀C, Lactation Yes(Not Recommended) Trade Name: **Dilaudid**

Class / Mechanism of Action

Opioid Analgesic
Binds to opioid receptors within the CNS increasing pain threshold and altering pain reception; inhibits ascending pain pathways (blocking painful stimulus); produces CNS depression
Onset: IV 10-20 minutes. Duration 2-4 hours

Indications

Labeled Indications: Moderate to severe pain.

Contraindications

- Hypersensitivity to hydromorphone or any component of the formulation
- Severe respiratory depression (in absence of resuscitative equipment or ventilator support)
- Acute or severe asthma
- Paralytic ileus

Adverse Reactions / Precautions

- Always be prepared for use of paralytic and intubation (maintain positive control of airway).
- **Head trauma: Use with extreme caution in head injury, or suspected increased ICP; exaggerated increase in ICP may occur.**
- May cause Hypotension, Use with caution in hypovolemic patients.
- May cause life-threatening Reparatory depression
- CNS depression: Impairs physical and mental abilities

Dose and Administration:	**ADULT**	**PEDIATRIC** Always Reference BROSELOW Tape
	Acute pain (moderate-to-severe): IV: (Slow) • **0.5mg (range 0.25-2mg) IV/IO q1-6hr prn** • **Critically ill require lower dose, opioid tolerant may require higher dose** • Continuous infusion: Usual dosage range: **0.5-3mg/hr (See infusion chart next page)**	**Acute pain (moderate-to-severe):** IV: (Slow) • Children: **0.015mg/kg** IV q4-6hr prn • Adolescents >50kg: Refer to adult dosing

HYDROMORPHONE (DILAUDID)					
Dosing Range: 0.5-3mg/hr (8.3-50mcg/min)					
MIX 2mg/100mL CONCENTRATION 20mcg/mL					
Dose	Rate	Micro (60gtt/mL)	Macro		
			20gtt/mL	15gtt/mL	10gtt/mL
mg/hr	mL/hr	gtt/min	gtt/min	gtt/min	gtt/min
0.5	25	25	8	6	4
1	50	50	17	13	8
1.5	75	75	25	19	13
2	100	100	33	25	17
2.5	125	125	42	31	21
3	150	150	50	38	25
Macro-Drip (20gtt/mL) or Micro-Drip is set of choice for this infusion					
Start at lowest dose and increase rate by 0.5mg/hr prn for appropriate pain management					

HYDROXOCOBALAMIN ♀C, Lactation? (Caution) Trade Name: **Cyanokit®**

Class / Mechanism of Action

Antidote; Vitamin

Precursor to Vitamin B_{12} (cyanocobalamin). Binds cyanide ion to form cyanocobalamin which is excreted within urine

Indications

Labeled Indications:

- IM: Treatment of pernicious anemia and B_{12} deficiencies
- IV: (Cyanokit®) Treatment of known or suspected cyanide poisoning

Contraindications

- No contraindications when treating for suspected or known cyanide poisoning

Adverse Reactions / Precautions

- May cause transient hypertension (≥180mmHG systolic, ≥110mmHG diastolic)
- Will cause red colored urine and skin

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

Cyanide Poisonings:

IV (**Note:** If cyanide poisoning is suspected, antidotal therapy must be given immediately)

- Initial: **5g** as single infusion given over 15min
  - Repeat a second 5g dose based on severity and clinical response.
  - Maximum cumulative dose: 10g

Smoke Inhalation / Fire victims: (Closed space exposure with evidence of airway injury: soot in mouth / nose / sputum)

- May present with both cyanide and carbon monoxide poisoning. Hydroxocobalamin is the agent of choice for treating cyanide toxicity in this setting.

Preparation:

Cyanokit®: Reconstitute each vial with 200mL of NS (LR and D5W also OK).

- Do not shake vial (gently mix)
- Do not use if solution is not dark red

Cyanide Poisonings:

IV: (Unlabeled Use)

- Initial: **70mg/kg (max 5g)** as single infusion given over 15 min
  - Repeat a second dose of 35mg/kg based on severity and clinical response.

Smoke Inhalation / Fire victims: (Closed space exposure with evidence of airway injury: soot in mouth / nose / sputum)

- May present with both cyanide and carbon monoxide poisoning. Hydroxocobalamin is the agent of choice for treating cyanide toxicity in this setting.

KETAMINE

♀C, Lactation Yes (Risk not ruled out) Trade Name: **Ketalar**

Class / Mechanism of Action

General Anesthetic

Dissociative anesthetic; produces a cataleptic like state acting directly on the cortex and limbic system. Onset of action IV: 30-60 seconds; Duration is dose dependent averaging 10-20 minutes

Indications

Labeled Indications: Induction and maintenance of general anesthesia
Unlabeled: Analgesia and sedation

Contraindications

- Hypersensitivity to ketamine or any component of the formulation
- Conditions that cannot tolerate increases in blood pressure
  - E.g. spontaneous cerebral hemorrhage or acute coronary syndrome hypertension
- Children <3 mo age

Adverse Reactions / Precautions

- Rapid IV administration may cause hypotension, apnea, or laryngospasm. Large doses may cause hypotension and respiratory depression
- Use with caution in patients with cardiovascular disease. Continuously monitor cardiac function.
- **Preferred general anesthetic/sedative for hypo/normotensive head injury patient.**
- **Dosing between 0.5-0.9mg/kg IV (and equivalent IM dose) can give patients the feeling of unreality leading to agitation and should be avoided.**

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

LOW DOSE:

Analgesia:

IV/IO Push (over 1 min)
- **0.1-0.2mg/kg,** repeat q10-30min prn

IM/IN
- **0.5 mg/kg,** repeat q10-30min prn

HIGH DOSE:

RSI / Induction of anesthesia; Combative Patients:

IV Push
- **1-2mg/kg**

IM
- **4-5mg/kg**

Maintenance of anesthesia:

IV :
- **0.5-2mg/kg** dose q10-20min

IV Continuous Infusion
- **0.5-2mg/kg bolus then 0.5-1mg/kg/hr**. Titrate levels by 0.25mg/kg/hr prn to achieve appropriate sedation. **(See infusion chart next page)**

Analgesia:

IM:
- **0.5mg/kg,** q10-30min prn

IV:
- **0.1–0.2mg/kg,** q10-30min prn

Induction of anesthesia (unlabeled dosing):

IV:
- **1-2mg/kg (3-5mg/kg for procedural sedation)**

Maintenance of anesthesia:

IV :
- **½ to Full induction dose** every 20-30 minutes

IV Continuous Infusion:
- **0.5-1mg/kg/hr**. Titrate levels by 0.25mg/kg/hr prn to achieve appropriate sedation.

NOTE Avoid sub-dissociative doses to prevent emergence phenomenon.

NOTE: *If patient experiences Ketamine Induced Agitation (Emergence Phenomena) give Midazolam 2-5mg IV x1 for adults and 0.05 mg/kg for children not hypotensive or in danger of being* hypotensive.

KETAMINE (KETALAR)

Dosing Range: 1-3mg/kg/hr (17-50mcg/kg/min)

MIX 500mg/500 mL
CONCENTRATION 1mg/mL

Pt. Weight	Dose	Rate	Micro	Macro		
			(60 gtt/mL)	20 gtt/mL	15 gtt/mL	10 gtt/mL
kg	mcg/kg/min	mL/hr	gtt/min	gtt/min	gtt/min	gtt/min
50	15	45	45	15	11	8
	20	60	60	20	15	10
	25	75	75	25	19	13
	30	90	90	30	23	15
	35	105	105	35	26	18
	40	120	120	40	30	20
	45	135	135	45	34	23
	50	150	150	50	38	25
	55	165	165	55	41	28
	60	180	180	60	45	30
55	15	50	50	17	13	8
	20	66	66	22	17	11
	25	83	83	28	21	14
	30	99	99	33	25	17
	35	116	116	39	29	19
	40	132	132	44	33	22
	45	149	149	50	37	25
	50	165	165	55	41	28
	55	182	182	61	46	30
	60	198	198	66	50	33
60	15	54	54	18	14	9
	20	72	72	24	18	12
	25	90	90	30	23	15
	30	108	108	36	27	18
	35	126	126	42	32	21
	40	140	140	47	35	23
	45	162	162	54	41	27
	50	180	180	60	45	30
	55	198	198	66	50	33
	60	216	216	72	54	36
65	15	60	60	20	15	10
	20	78	78	26	20	13
	25	98	98	33	25	16
	30	117	117	39	29	20
	35	137	137	46	34	23
	40	156	156	52	39	26
	45	176	176	59	44	29
	50	195	195	65	49	33
	55	215	215	72	54	36
	60	234	234	78	59	39
70	15	63	63	21	16	11
	20	84	84	28	21	14
	25	105	105	35	26	18
	30	126	126	42	32	21
	35	147	147	49	37	25
	40	168	168	56	42	28
	45	189	189	63	47	32
	50	210	210	70	53	35
	55	231	231	77	58	39
	60	252	252	84	63	42
75	15	68	68	23	17	11
	20	90	90	30	23	15
	25	113	113	38	28	19
	30	135	135	45	34	23
	35	158	158	53	40	26
	40	180	180	60	45	30
	45	203	203	68	51	34
	50	225	225	75	56	38
	55	248	248	83	62	41
	60	270	270	90	68	45

Macro-Drip is set of choice for this infusion

Sample patient: 80kg pt at 1-3mg/kg/hr = 81-240mg/hr (81-240mL/hr)

KETAMINE (KETALAR)

Dosing Range: 1-3mg/kg/hr (17-50mcg/kg/min)

MIX 500mg/500 mL
CONCENTRATION 1mg/mL

Pt. Weight	Dose	Rate	Micro	Macro		
			(60 gtt/mL)	20 gtt/mL	15 gtt/mL	10 gtt/mL
kg	mcg/kg/min	mL/hr	gtt/min	gtt/min	gtt/min	gtt/min
80	15	72	72	24	18	12
	20	96	96	32	24	16
	25	120	120	40	30	20
	30	144	144	48	36	24
	35	168	168	56	42	28
	40	192	192	64	48	32
	45	216	216	72	54	36
	50	240	240	80	60	40
	55	264	264	88	66	44
	60	288	288	96	72	48
85	15	77	77	26	19	13
	20	102	102	34	26	17
	25	128	128	43	32	21
	30	153	153	51	38	26
	35	179	179	60	45	30
	40	204	204	68	51	34
	45	230	230	77	58	38
	50	255	255	85	64	43
	55	281	281	94	70	47
	60	306	306	102	77	51
90	15	81	81	27	20	14
	20	108	108	36	27	18
	25	135	135	45	34	23
	30	162	162	54	41	27
	35	189	189	63	47	32
	40	216	216	72	54	36
	45	243	243	81	61	41
	50	270	270	90	68	45
	55	297	297	99	74	50
	60	324	324	108	81	54
95	15	90	90	30	23	15
	20	114	114	38	29	19
	25	143	143	48	36	24
	30	171	171	57	43	29
	35	200	200	67	50	33
	40	228	228	76	57	38
	45	257	257	86	64	43
	50	285	285	95	71	48
	55	314	314	105	79	52
	60	342	342	114	86	57
100	15	90	90	30	23	15
	20	120	120	40	30	20
	25	150	150	50	38	25
	30	180	180	60	45	30
	35	210	210	70	53	35
	40	240	240	80	60	40
	45	270	270	90	68	45
	50	300	300	100	75	50
	55	330	330	110	83	55
	60	360	360	120	90	60
105	15	95	95	32	24	16
	20	126	126	42	32	21
	25	158	158	53	40	26
	30	189	189	63	47	32
	35	221	221	74	55	37
	40	252	252	84	63	42
	45	284	284	95	71	47
	50	315	315	105	79	53
	55	347	347	116	87	58
	60	378	378	126	95	63

Macro-Drip is set of choice for this infusion

Sample patient: 80kg pt at 1-3mg/kg/hr = 81-240mg/hr (81-240mL/hr)

KETOROLAC

♀C, **Lactation Yes**(Caution) Trade Name: **Toradol**

Class / Mechanism of Action

Nonsteroidal Anti-inflammatory Drug (NSAID)

Inhibits cyclooxygenase (COX 1 & 2) enzymes, which decreases production of prostaglandin precursors. Provides antipyretic, analgesic, and anti-inflammatory action.

Indications

Labeled Indications: Short term management of moderate to severe acute pain as an opioid alternative.

Contraindications

- Hypersensitivity to ketorolac, aspirin, other NSAIDs, or any component of the formulation.
- High risk of bleeding, recent history of GI bleeding or perforation, known history of peptic ulcer disease.
  - **Not for use as pain management for battlefield trauma patient!**
- Suspected cerebrovascular bleeding Dizziness, Flushing, Diaphoresis, Tremor, Weakness
- Risk of renal failure secondary to volume depletion
- Concurrent use with other NSAIDs

Adverse Reactions / Precautions

- Inhibits platelet function
- Associated with an increased risk of adverse cardiovascular thrombotic events, including MI and stroke
- May increase risk of GI irritation, inflammation, ulceration, bleeding, and perforation.
- May cause severe bronchospasm in patients with asthma
- May cause new onset hypertension or worsening of existing hypertension.

Dose and Administration:	**ADULT**	**PEDIATRIC** Always Reference BROSELOW Tape
	Pain management (acute; moderately severe): ***Patients ≥50 kg*** IM: • **15-30mg** q6hr (maximum daily dose: 120mg) IV: • **15mg** q6hr (maximum daily dose: 120mg) ***Adults ≥65 years and/or adults ≤50 kg*** IM: • **15-30mg** q6hr (maximum daily dose: 60mg) IV: • **15mg** q6hr (maximum daily dose: 60mg)	**Pain management (acute; moderately severe):** ***Adolescents >17 years only:*** • Refer to adult dose

LABETALOL

♀C, **Lactation Yes** (Caution)

Trade Name: **Trandate**

Class / Mechanism of Action

Beta Blocker with alpha blocking activity

Blocks alpha and beta-1/beta-2 adrenergic receptor sites. Onset IV: 2-5

Indications

Labeled Indications: Treatment of hypertension.

- IV: Treatment of severe hypertension and hypertensive emergencies

Unlabeled:

- Pre-eclampsia and severe hypertension in pregnancy, hypertension during acute ischemic stroke, and Pediatric hypertension

Contraindications

- Hypersensitivity to labetalol or any component of the formulation
- **Bradycardia <60bpm, heart block >1st degree**
- Uncompensated heart failure, Cardiogenic shock
- Asthma

Adverse Reactions / Precautions

- Symptomatic hypotension with or without syncope, Monitor EKG closely
- Use with extreme caution in patients with compensated heart failure and Bradycardia
- Patient with bronchospastic diseases (reactive airway) should not use Beta blockers

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

Acute Hypertension (hypertensive emergency/urgency:

Hypertensive Crisis
(Sys: >185/Dia: >110)

- **10-20mg** IV over 1-2 minutes. May repeat one time

Continuous Infusion:

If continued medication required, **2-8mg/min**

Note: Goal to lower MAP by no more than 25% within minutes to one hour.

***Hypertension emergencies:**

IV Continuous Infusion

- 0.4-1mg/kg/hr with a maximum of 3mg/kg/hr have been used; administration requires the use of an infusion pump.
- Intermittent bolus doses of 0.3-1mg/kg/dose have been reported

*Not 1st Line medication for children

Pearls:

For inter-facility transports with confirmed Ischemic CVA, Intraparenchymal Hemorrhagic CVA, or Spontaneous Non-traumatic SAH manage Hypertension according to diagnosis or guidance from sending facility

- Ischemic CVA Lytic ineligible: SBP <220 and DBP <120
- Ischemic CVA Lytic eligible: SBP <185 and DBP <110
- Intraparenchymal Hemorrhagic CVA: SBP <180
- Non-traumatic SAH: SBP <160

LEVETIRACETAM ♀C, Lactation Yes (Caution) Trade Name: **KEPPRA**

Class / Mechanism of Action

Anticonvulsant

Causes modulation of synaptic neurotransmitter release through binding to the synaptic vesicle protein SV2A in the brain.

Indications

Labeled Indications

- Treatment of focal (partial) onset seizures

Unlabeled:

- Traumatic brain injury, severe acute (short-term seizure prophylaxis); Status epilepticus; Craniotomy, seizure prophylaxis; Subarachnoid hemorrhage (short-term seizure prophylaxis)

Contraindications

- Hypersensitivity to any component of the formulation

Adverse Reactions / Precautions

- May cause CNS depression
- Dermatologic reactions, possibly severe (TEN, SJS, etc)
- Hypertension has been reported in children <4 years
- Hematologic effects: Decreases in red blood cell counts, hemoglobin, hematocrit, white blood cell counts, and neutrophils and increases in eosinophils have been observed

Dose and Administration: **ADULT**	**PEDIATRIC** Always Reference BROSELOW Tape
Traumatic brain injury (severe acute) (short-term seizure prophylaxis): • Loading dose: 20mg/kg (rounded to the nearest 250mg) over 60 minutes • Maintenance dose: 1,000mg over 15 minutes q12hr for 7 days **Status epilepticus**: • IV: 1,000-3,000mg administered at a rate of 2-5mg/kg/min **or** 40-60mg/kg as a single dose infused over 15 minutes in combination with a parenteral benzodiazepine. Maximum dose: 4,500mg.	**Status epilepticus, refractory:** (Limited data available) Infants, Children, and Adolescents: • IV: 20-60mg/kg over 15 minutes as a single dose

LIDOCAINE

♀B, **Lactation Yes** (Caution) Trade Name: **Xylocaine (Cardiac)**

Class / Mechanism of Action

Antiarrhythmic
Suppresses automaticity of cardiac conduction tissue.

Indications

Labeled Indications: Acute treatment of ventricular arrhythmias from myocardial infarction (alternate to amiodarone when amiodarone not available)
Unlabeled: (ACLS, 2015)

- Hemodynamically stable monomorphic VT and polymorphic VT
- Pulseless VT/VF (unresponsive to defibrillation, CPR, and vasopressor administration)
- Monomorphic VT secondary to drug, when amiodarone is not available

Contraindications

- Hypersensitivity to lidocaine or any component of the formulation
- Prophylactic use in AMI
- Bradycardia, severe degrees of SA, AV, or intraventricular heart block
- Wolff-Parkinson-White syndrome, Adam-Stokes syndrome

Adverse Reactions / Precautions

- Continuous EKG monitoring is necessary
- Increased ventricular rate may be seen when given to a patient in AFib
- At high doses, monitor closely for CNS toxicity, seizure, depression, and respiratory depression.
  - D/C immediately if toxicity develops
- The elderly may have increased chance of CNS and cardiovascular side effects.

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

Cardiac Arrest from VF/VT, (if Amiodarone is not available): (ACLS, 2015):
IV, IO:

- Initial dose: **1-1.5mg/kg**
- For refractory VF may give additional **0.5-0.75mg/kg** IV push, repeat in 5 to 10 minutes

Perfusing Arrhythmia (if amiodarone is not available): Stable VT, wide complex tachycardia, significant ectopy:
IV, IO

- Doses ranging from **0.5-0.75mg/kg and up to 1-1.5mg/kg.** Repeat 0.5-0.75mg/kg q5-10min.
  - Maximum cumulative dose 3mg/kg

Flush after initiation of IO:

- May add 2-3mL Lidocaine 2% (without epinephrine) to 5mL NS flush

Local Anesthesia during Tube/Finger Thoracostomy

- Draw 10mL 2% Lidocaine and locally anesthetize incision area.

Decompression Illness/ Arterial Gas Embolism:

- **1.5mg/kg** IV/IO

VF/Pulseless VT, Wide Complex Tachycardia (with pulses): (PALS, 2015)
IV, IO:

- Initial dose**: 1mg/kg**

2015 AHA ACLS guidelines state:
"There is inadequate evidence to support the routine use of lidocaine after cardiac arrest. However, the initiation or continuation of lidocaine may be considered immediately after ROSC from cardiac arrest due to VF/pVT"

Maintenance Infusion (Adults and Peds):
IV, IO: Continuous Infusion

- **1-3mg/hr** (or 20-50mcg/kg/min).

LORAZEPAM ♀D, Lactation Yes (not recommended) Trade Name: **Ativan**

Class / Mechanism of Action

Benzodiazepine
Acts as an Anxiolytic/Hypnotic, anticonvulsant and sedative.
Onset of action: IV Sedation 2-3 minutes; IM hypnotic, 15-30 minutes. Duration: IV, 8-12 hours.

Indications

Labeled Indications: Anesthesia premedication, Status epilepticus
Unlabeled:
- Rapid tranquilization of the combative / agitated patient
- Alcohol withdrawal delirium / syndrome
- Seizures
- Induce Sedation and Amnesia (Midazolam is primary medication)

Contraindications

- Hypersensitivity to Lorazepam or any component of the formulation or other benzodiazepines
- Acute narrow angle glaucoma, Acute Alcohol Intoxication, Sleep apnea
- Respiratory Insufficiency/Depression (except during mechanical ventilation)
  - Overdose Reversal: FLUMAZENIL **can be used, however it carries elevated risk. Respiratory support until the medication is metabolized is traditionally the best care in Benzodiazepine overdose**
- Neurologic Depression (Head Trauma) (unless having active seizure)

Adverse Reactions / Precautions

- **No Analgesic properties** (Narcotic pain control is needed for RSI'd / Intubated trauma patients)
- May Cause Respiratory depression: Do not give without stable IV line and BVM (airway control) ready
- Hypotension, vasodilation
- Amnesia, confusion, drowsiness, slurred speech (Paradoxical Reactions possible: aggressiveness, agitation, anxiety, inappropriate behavior)

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

Acute Seizures:
IV:
- **2-4mg** slow IV push, may repeat x2 q3-5min prn.

Note: Not recommended IM for seizure due to erratic absorption.

Anxiety:
IV:
- 0.5-2mg slow IV push

Rapid tranquilization of agitated / combative patient (Off-label use):
IV, IM:
- **2-4mg** q30-60min**;** may be used alone or administered with an antipsychotic (i.e. haloperidol)

Acute Seizures / Status epilepticus (unlabeled use):
IV:
- **0.05-0.1mg/kg;** repeat doses q5min (max x2) for clinical effect. Max 4mg

Agitation:
- **0.05mg/kg/dose** q20-30min prn

MAGNESIUM SULFATE ♀D, Lactation Yes(Caution)

Class / Mechanism of Action

Anticonvulsant, Electrolyte Supplement

IV magnesium decreases acetylcholine in motor nerve terminals and slows rate of SA node impulse formation and prolongs conduction time. Magnesium functions to facilitate the movement of calcium, sodium, and potassium in and out of cells.

Indications

Labeled Indications:

- Prevention and treatment of seizures in pregnancies with severe pre-eclampsia or eclampsia
- Torsades de Pointes: Cardiac arrhythmias (VT/VF) cause by low serum magnesium

Contraindications

- Hypersensitivity any component of the formulation
- Myocardial damage and heart blocks
- Use for pre-eclampsia/eclampsia during 2 hour period before delivery

Adverse Reactions / Precautions

- Possible cardiovascular arrest, respiratory depression, and hypotension in large doses
- Hypomagnesaemia is often joined by hypokalemia and requires correction in order to normalize potassium.

Dose and Administration: ADULT	PEDIATRIC Always Reference BROSELOW Tape
Torsades de pointes or VF/pulseless VT associated with torsades de pointes (unlabeled use): IV/IO: • **1-2g** over 15 minutes **Wheezing in Respiratory Distress** (3rd line drug): IV: • **2g** over 20min **Seizure (Refractory to Benzodiazepines):** IV: • **1-2g** over 30 min **Eclampsia/pre-eclampsia, severe** (unlabeled): IV: • **4-6g** over 15-20 minutes followed by 2g/hr continuous infusion	**Torsades de pointes:** IV/IO: • **25-50mg/kg/dose** over several minutes ○ maximum single dose: 2000 mg **Respiratory Distress**: IV: • **25-75mg/kg** over 30min (max 2g) **Magnesium Sulfate should be diluted into 50-100mL NS or D5W for all Adult and Pediatric infusions**

MANNITOL 20% ♀C, Lactation? (Caution)

Class / Mechanism of Action

Osmotic Diuretic

Increases osmotic pressure of glomerular filtrate. This reduces kidney reabsorption of water and electrolytes and increases urinary output. Decreases cerebral blood volume and intracranial pressure (ICP) while increasing cerebral blood flow and O_2 transport. Onset of action is 15-30 minutes

Indications

Labeled Indications:

- Reduction of increased ICP secondary to cerebral edema
- Reduction of elevated intraocular pressure
- Urinary excretion of toxic substances

Contraindications

- Hypersensitivity to mannitol or any component of the formulation
- Active intracranial bleeding
- Pulmonary congestion and edema
- Severe renal disease, or renal dysfunction after mannitol use
- Severe dehydration: (Do NOT use in **under-resuscitated or hypotensive casualties**)

Adverse Reactions / Precautions

- Chest pain, CHF, tachycardia, circulatory overload (with rapid administration), peripheral edema
- Headache, seizure
- Fluid and electrolyte imbalance, dehydration and hypovolemia
- Keep in a temperature controlled climate. Will crystalize at low temperatures.

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

Moderate to severe head injury, *Patient continuing to deteriorate or showing signs of herniation despite adjustment to ventilation and starting hypertonic saline.*

IV

- **1g/kg** IV bolus over <20 minutes.
- Follow with **0.25g/kg** IVP q4hr

Vital Functions Goal in Head Injury (Prevention of secondary brain injury)**:**

- Keep SBP >90mmHg, MAP >60mmHg, and SaO_2 >93%. [(CPP=MAP–ICP) Minimal goal CPP >60mmHg]

Note: Always have urinary catheter in place and monitor output.

Increased intracranial pressure (unlabeled dosing):

IV:

- **0.25-1g/kg/dose**
- Maintenance dose of **0.25-0.5g/kg** IV q4-6hr prn to maintain serum osmolality <300-320 mOsm/kg

METHYLPREDNISOLONE ♀C, Lactation Yes(Caution) Trade Name: **SoluMedrol**

Class / Mechanism of Action

Systemic Corticosteroid
Anti-inflammatory, Immunosuppressant, shock

Indications

Labeled Indications: Treatment of a variety of diseases: allergic, inflammatory, hematologic, neoplastic, and autoimmune;
Unlabeled:
None identified unless added by medical direction.

Contraindications

- Hypersensitivity to methylprednisolone or any component of the formulation
- No other in emergency setting

Adverse Reactions / Precautions

- Not for use in treatment of head injury; increased mortality has occurred in head injury patients treated with high dose IV methylprednisolone.
- No immediate effect will be observed while treating in the pre-hospital environment. Onset of action may take several hours

Dose and Administration: ADULT	**PEDIATRIC** Always Reference BROSELOW Tape
Asthma exacerbations, including status asthmaticus IV: • **125mg** x 1 dose **Allergic Reaction:** IV: • **125mg** x 1 dose **Note:** Only methylprednisolone sodium succinate can be used for IV doses.	**Asthma exacerbations, including status asthmaticus** IV: • Children <12 years: **1-2mg/kg** initial dose**;** followed by **0.5-1mg/kg** q6hr (maximum: 60mg/day) **Allergic Reaction** IV • **2mg/kg** x 1 dose **Note:** Only methylprednisolone sodium succinate can be used for IV doses.

METOCLOPRAMIDE ♀B Trade Name: Reglan

Class / Mechanism of Action

Prokinetic Agent: Antiemetic, Upper GI Stimulant
Potent dopamine-receptor antagonist. At higher doses blocks serotonin receptor in chemoreceptor trigger zones of CNS. Increases GI tract motility and gastric emptying. Onset of action 1-5 minutes via IV with a duration of 1-2 hours.

Indications

Labeled Indications: Prevention of postoperative nausea and vomiting; Acid Reflux/Heartburn/GERD; Migraine Headache

Contraindications

- Hypersensitivity to glucagon or any component of the formulation
- Insulinoma / Pheochromocytoma

Adverse Reactions / Precautions

- Hypersensitivity, History of tardive dyskinesia or dystonic reaction to Metoclopramide in the past, GI Obstruction or Hemorrhage, and seizure disorder (epilepsy).

Dose and Administration: ADULT	PEDIATRIC Always Reference BROSELOW Tape
5-10mg IV/IO slow push; repeat dose q20-30min prn for a max of 20mg. *Rapid IV push may cause intense feelings of anxiety and restlessness* Ideal administration to Prevent Agitation/Adverse Effects: Dilute in a 50 or 100mL NS bag and infuse over 10-15 minutes.	**Not recommended or approved for routine pediatric use**

METOPROLOL ♀C, Lactation?(Not Recommended) Trade Name: **Lopressor**

Class / Mechanism of Action

Beta-1 Selective Beta-Blocker; Antihypertensive; Antianginal Agent
Selective inhibitor of beta-1 adrenergic receptors; competitively blocks $beta_1$-receptors, with little or no effect on beta-2 receptors at oral doses <100 mg (in adults); does not exhibit any membrane stabilizing or intrinsic sympathomimetic activity.
Onset of action: IV: 5 minutes, Duration 3-5 hours

Indications

Labeled Indications: Angina, Hypertension, Myocardial infarction
Unlabeled: Atrial fibrillation/flutter; Hypertrophic cardiomyopathy; Marfan syndrome with aortic aneurysm; Migraine prophylaxis; Supraventricular tachycardia (AVNRT, AVRT, focal atrial tachycardia); Thyrotoxicosis; Ventricular arrhythmias

Contraindications

- Hypersensitivity to metoprolol, any component of the formulation, or other beta-blockers; second- or third-degree heart block
- Severe sinus bradycardia (heart rate <45 beats/minute); significant first-degree heart block (P-R interval ≥0.24 seconds); systolic blood pressure <100mmHg; moderate to severe cardiac failure

Adverse Reactions / Precautions

- Cardiovascular: Hypotension, bradycardia, first degree atrioventricular block, arterial insufficiency, cardiac failure, CVA, cold extremities, palpitations, peripheral edema, claudication
- Central nervous system: Dizziness, fatigue, depression, vertigo, confusion, disturbed sleep, hallucination, headache, insomnia, nightmares, temporary amnesia, tinnitus

Dose and Administration: ADULT	PEDIATRIC Always Reference BROSELOW Tape
Atrial fibrillation or atrial flutter (off-label use): **Acute ventricular rate control:** IV: • 2.5-5mg over 2-5 minutes; q5min prn; maximum total dose: 15mg. **Supraventricular tachycardia/Ventricular arrhythmias (off-label use):** **Note:** For hemodynamically stable patients if vagal maneuvers and/or adenosine are unsuccessful. IV: • 2.5-5mg over 2-5 minutes; q5min prn to achieve a ventricular rate of 90–100; maximum total dose: 15mg. **Note:** For sustained ventricular tachycardia, beta-blockers are generally administered in addition to an antiarrhythmic drug (eg, Amiodarone) for these indications. A beta-blocker is also used to reduce shocks in patients who receive an implantable cardioverter defibrillator for these indications; propranolol may be the preferred beta-blocker in these situations	**Note: Guidelines do not recommend beta-blockers as initial therapy in pediatric patients; beta-blockers should be reserved for use in patients who have contraindications to preferred agents or after ≥2 preferred agents have failed in patients with hypertension and chronic kidney disease, proteinuria, or diabetes mellitus.**

MIDAZOLAM ♀D, Lactation Yes(Caution) Trade Name: **Versed**

Class / Mechanism of Action

Benzodiazepine
Acts as an Anxiolytic/Hypnotic, anticonvulsant and sedative.
Onset of action: Sedation; IV: 1-5min, IM: 15min, Intranasal: 4-8min Duration: IV, less than 2 hours. (20-30min per ECCN Nurse Protocols, May 2012)

Indications

Labeled Indications: Preoperative sedation, induction and maintenance of general anesthesia
Unlabeled: Anxiety / agitation, status epilepticus, conscious sedation (intranasal)

Contraindications

- Hypersensitivity to midazolam or any component of the formulation or other benzodiazepines
- Acute narrow angle glaucoma, Acute Alcohol Intoxication
- Respiratory Insufficiency/Depression (except during mechanical ventilation)
- (Overdose Reversal: **FLUMAZENIL** **can be used, however it carries elevated risk. Respiratory support until the medication is metabolized is traditionally the best care in Benzodiazepine overdose)**
- Should not be used in shock
- Neurologic Depression (Head Trauma) (unless having active seizure)

Adverse Reactions / Precautions

- **No Analgesic properties** (Narcotic pain control is needed for RSI'd/Intubated trauma patients)
- May Cause Respiratory depression: Do not give without stable IV line and BVM (airway control) ready
- Hypotension, vasodilation
- Amnesia, confusion, drowsiness, slurred speech (Paradoxical Reactions possible: aggressiveness, agitation, anxiety, inappropriate behavior)

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

Induction for RSI; Continued sedation; Hyperthermia:
IV:
- **Induction 0.1mg/kg** IV/IO
- **Continued Sedation .05mg** IV/IO
- **Infusion sedation** 0.05mg/kg bolus IV, then titrate 0.05-0.1mg/kg/hr IV gtt

Transcutaneous Pacing / Cardioversion, Anxiety, Agitation,:
IV
- **2.5-5mg** q15-30min prn

Seizure Dosage:
- If no IV/IO access, **5mg IN** (repeat in 10 minutes in opposite nostril if still seizing (preferred) or **10mg IM** (alternate)
- **5mg IV/IO**, may repeat

After 3 doses should consider addition of another agent.

Procedural sedation; Transcutaneous Pacing; Cardioversion:
IV:
- **0.05-0.1mg/kg** q15-30min prn

Intranasal (unlabeled route):
- **0.2-0.5mg/kg** (maximum total dose: 10mg or 5mg per nare

Induction/RSI (Not preferred drug)
IV:
- **0.1-0.3mg/kg**

Seizure
IV, IM:
- **0.2mg/kg q15-30min prn**

Status epilepticus, prehospital treatment (unlabeled use):
IV:
- Infants: **1-2mg**
- 13-40 kg**: 4mg once**
- >40 kg: Refer to adult dosing

MORPHINE	♀C, **Lactation Yes**(Caution)	Trade Name:

Class / Mechanism of Action

Opioid Analgesic
Binds to opioid receptors within the CNS increasing pain threshold and altering pain reception; inhibits ascending pain pathways (blocking painful stimulus); produces CNS depression
Onset: IV variable but rapid, Duration variable, patient dependent.

Indications

Labeled Indications: Moderate to severe acute and chronic pain; pain of myocardial infarction; preanesthetic medication

Contraindications

- Hypersensitivity to morphine sulphate or any component of the formulation
- Severe respiratory depression
- Acute or severe asthma (in an unmonitored setting or without resuscitative equipment)
- Paralytic ileus

Adverse Reactions / Precautions

- Always be prepared for use of paralytic and intubation (maintain positive control of airway).
- **Head trauma: Use with extreme caution in head injury, or suspected increased ICP; exaggerated increase in ICP may occur. Some formulations are specifically contraindicated.**
- May cause Hypotension, Use with caution in hypovolemic patients.
- May worsen Bradycardia
- May cause life-threatening hypoventilation and Reparatory depression
- CNS depression: Impairs physical and mental abilities

Dose and Administration:

ADULT

Chest Pain/AMI:
IV/IO:

- **2-5mg** q5-15min prn

Acute pain (moderate-to-severe):

IM, SubQ: The use of IM/SubQ injections is no longer recommended especially for repeated administration due to painful administration, variable absorption and lag time to peak effect.

IV/IO: (Slow)

- **5mg (0.1mg/kg, range 2.5–10mg)** q1-6hr prn

PEDIATRIC Always Reference BROSELOW Tape

Acute pain (moderate-to-severe):

IM, SubQ: The use of IM/ SubQ injections is no longer recommended especially for repeated administration due to painful administration, variable absorption and lag time to peak effect.

IV: (Slow)

- **0.1-0.2 mg/kg** q2-4hr prn not to exceed 10mg per dose

Continuous infusion:

- **10-30mcg/kg/hour**; titrate prn for pain

MOXIFLOXACIN	**♀C, Lactation Yes**	Trade Name Avelox

Class / Mechanism of Action

Antibiotic (Fluoroquinolone)
Bactericidal - DNA gyrase inhibitor and topoisomerase IV inhibitor–which is an essential enzyme that maintains the superhelical structure, replication, transcription, and repair of bacterial DNA.

Indications

Labeled Indications: Used for infection control prophylaxis for traumatic open injuries and surgical prophylaxis.

Contraindications

- Hypersensitivity to cefazolin, other cephalosporin antibiotics, other beta-lactams, or any component of the formulation
- May cause QT prolongation.
- Avoid use in known aortic aneurysm or dissection

Adverse Reactions / Precautions

- Superinfection – prolonged use may result in fungal or bacterial superinfection (including C.Difficile)

Dose and Administration:	**ADULT**	**PEDIATRIC**

Infection Control:

For PO tolerable patients

PO:

Adults:

- 400mg once daily
  - Max daily dose: 400mg/day

Infection Control:

PO:
Pediatrics:

<15yrs old:

10mg/kg/day PO
- Max daily dose: 400mg/day

15yrs old:

- 400 mg once daily
  - Max daily dose: 400mg/day

NALOXONE

♀C, **Lactation ?**(Caution) Trade Name: **Narcan**

Class / Mechanism of Action

Antidote, Opioid Antagonist

Competes and displaces opioids at opioid receptor sites, reversing narcotic effects.

Indications

Labeled Indications: Reversal of opioid drug effects, including respiratory depression

Contraindications

- Hypersensitivity to naloxone or any component of the formulation

Adverse Reactions / Precautions

- When correcting for respiratory depression in a postoperative (intubated patient), carefully titrate the dose to reverse hypoventilation; do not fully awaken patient or reverse analgesic effect.
- Recurrence of respiratory depression is possible continue to watch for respiratory depression until patient hand-off.
- May cause narcotic withdrawal effects

Dose and Administration:

ADULT

Opioid overdose (with standard ACS protocols):

IV, IM, SubQ:

- **0.4-2mg**; may dose q2-3min prn
    - If no response after 10mg total, look for other cause of respiratory depression.
    - Following reversal, may need to readminister after 20-60min.

Reversal of respiratory depression with therapeutic opioid doses:

IV, IM, SubQ:

- **0.1-0.4mg** titrated to adequate respiratory rate. If not improved after 0.8mg total, look for other cause of respiratory depression.

PEDIATRIC Always Reference BROSELOW Tape

Opioid overdose (with standard PALS protocols):

IV, IM, SubQ:

- <5 years or ≤20kg (unlabeled dose): **0.1mg/kg/dose** (maximum dose: 2mg); repeat q2-3min prn
- ≥5years or >20kg: Adult Dosing

Reversal of respiratory depression with therapeutic opioid doses:

IV, IM, SubQ:

- **0.001-0.015mg/kg/dose** prn

NIFEDIPINE

♀C, **Lactation Yes**(Not Recommended) Trade Name: **Procardia**

Class / Mechanism of Action

Antianginal Agent, Calcium Channel Blocker

Inhibits movement of calcium ion across cell membranes of smooth muscle and myocardium resulting in relaxation of coronary vascular smooth muscle and vasodilation as well as reduced peripheral vascular resistance (reducing blood pressure).

Indications

Labeled Indications: Chronic stable or vasospastic angina

Unlabeled: Prevention and treatment of high altitude pulmonary edema

Contraindications

- Hypersensitivity to nifedipine or any component of the formulation
- Cardiogenic Shock
- Acute MI

Adverse Reactions / Precautions

- Symptomatic hypotension:
- Bradycardia, nausea

Dose and Administration:	**ADULT**	**PEDIATRIC** Always Reference BROSELOW Tape
	High altitude pulmonary edema (unlabeled use): PO: • **10mg** q4-6hr **Pulmonary hypertension** (unlabeled use) PO: • **30mg** (Extended Release) twice daily; may increase cautiously to 120-240mg/day **Note:** Do not use for acute anginal episodes; may precipitate myocardial infarction	**High altitude pulmonary edema** (Not FDA approved for use in children) (unlabeled use): PO: • Immediate release: **0.5mg/kg/dose** (maximum: 20mg/dose) q8hr **Note:** Treatment is needed only necessary if response to oxygen and/or descent is poor.

NITROGLYCERIN

♀C, **Lactation ?**(Caution) Trade Name: **NitroMist/Nitrostat**

Class / Mechanism of Action

Antianginal agent, Vasodilator

Induces smooth muscle relaxation and vasodilation of peripheral veins and arteries and coronary arteries thus improving collateral blood flow to ischemic regions of the myocardium. Reduces cardiac oxygen demand by decreasing preload. Onset of action: Sublingual tablet and spray, 1-3 minutes. Duration: 25 minutes

Indications

Labeled Indications: Treatment or prevention of angina pectoris

Contraindications

- Hypersensitivity to nitrates or any component of the formulation
- Use with phosphodiesterase-5 inhibitors (Sildenafil, Levitra, Cialis) in previous 48 hours
- Increased intracranial pressure
- Hypotension (SBP <90mmHg or >30mmHg below baseline), Bradycardia <50bpm, Tachycardia without heart failure (>100bpm), and Right ventricular infarction.

Adverse Reactions / Precautions

- **IV/IO access should be placed and SBP should be >110.**
  - **Use cautiously in cases of chest pain unless inferior wall / right-ventricular MI can be ruled-out by ECG prior to administration**
- Can cause severe hypotension with associated paradoxical bradycardia and increased angina
- Use with caution in volume depleted patients
- Do not use for inferior wall MI and suspected right ventricular involvement

Dose and Administration:

ADULT

Angina/coronary artery disease:

PO:

- Sublingual: **0.4mg** q5min max 3 doses in 15 min
- Translingual: **1 spray** (0.4mg per spray) onto or under tongue q3-5min max 3 doses in 15 min

CHF related Respiratory Distress:

PO:

- Sublingual: **0.4mg** q5min max 3 doses in 15 min as long as SBP>90

IV Drip: (Only used at written direction of referring provider or consultation with medical director)

- Start at **10 mcg/min**, titrate up or down to:
  - 10% reduction in MAP if normotensive
  - 30% reduction in MAP if hypertensive.
  - Max dose: 400mcg/minute)

PEDIATRIC Always Reference BROSELOW Tape

Not indicated in most children, even with heart failure, as their heart failure is not usually due to coronary artery disease. Could cause significant problems in those with depressed myocardial function. Consult Medical Direction (if able) before use in Pediatrics.

CHF related Respiratory Distress:

PO:

- **0.4mg** q5min if SBP>70+2xAge

CHF or Cardiogenic Shock:

IV Drip:

- Children: **0.25 - 0.5mcg/kg/min**; titrate by 1 mcg/kg/min q15-20min as tolerated (Typical dose=1-5mcg/kg/min)(Max 10mcg/kg/min)
- Adolescents: **5-10mcg/min** (not per kg) (max 200mcg/min)

NOREPINEPHRINE ♀C, Lactation? (Caution) Trade Name: **Levophed**

Class / Mechanism of Action

Alpha and Beta Agonist
Stimulates beta-1 and alpha adrenergic receptors: increases contractility, heart rate, and vasoconstriction. Increases systemic blood pressure and coronary blood flow. Effects on vasoconstriction (alpha receptors) are greater than inotropic (beta receptors). Onset of action: IV very rapid. Duration: 1-2min

Indications

Labeled Indications: Treatment of shock persisting after adequate fluid volume replacement; severe hypotension.
ALS 2020: Severe cardiogenic shock and hemodynamically significant hypotension (SBP <70mmHg) with low total peripheral resistance. Agent of last resort for management of ischemic heart disease and shock.

Contraindications

- Hypersensitivity to norepinephrine, bisulfites or any component of the formulation
- Hypotension from hypovolemia except as an emergency measure to maintain coronary and cerebral perfusion until volume can be replaced

Adverse Reactions / Precautions

- **No applicable use in hemorrhagic shock unless fluid replacement therapy maximized! Maximize use of Blood products/Crystalloids before considering use in hemorrhagic shock.**
- Strong Vesicant; ensure proper catheter placement and avoid extravasation, use a large vein (preferably a central line) and avoid leg veins.
- Assure adequate circulatory volume to minimize need for vasoconstrictors. Monitor BP closely, avoid hypertension and adjust infusion rate as needed.

Dose and Administration: ADULT	PEDIATRIC

Hypotension/shock:
IV: Administer as continuous infusion with infusion pump. Do not use in same line as sodium bicarbonate. It will inactivate norepinephrine.
• Initial: **2-20mcg/min**; titrate to SBP goal.
  ○ Maintenance: **2-4mcg/min**
 	
Post ROSC Hypotension:
• Initial: **0.1-0.5mcg/kg/min** titrate to effect.
 	
If unable to maintain MAP >60mmHg, add **Epinephrine** infusion.
 	
Use in Burn Patient:
For Burn patients, norepinephrine is only used when target MAP (≥55) and UOP (≥30mL/hr) fail to be reached with fluid resuscitation alone. Its sequence of use follows administration of **Vasopressin.**
 	
(See infusion chart next page for mix and dosage information)
	Hypotension/shock:
	IV: Continuous infusion
	• Initial: **0.05-0.1mcg/kg/min**; titrate to effect
	  ○ Max dose: 2 mcg/kg/min

NOREPINEPHRINE (LEVOPHED)					
Dosing Range: 2-20mcg/min (120-1200mcg/hr)					
MIX 4mg/500mL CONCENTRATION 8mcg/mL					
Dose	Rate	Micro (60gtt/mL)	Macro		
			20gtt/mL	15gtt/mL	10gtt/mL
mcg/min	mL/hr	gtt/min	gtt/min	gtt/min	gtt/min
2	15	15	5	4	3
3	23	23	8	6	4
4	30	30	10	8	5
5	38	38	13	10	6
6	45	45	15	11	8
7	53	53	18	13	9
8	60	60	20	15	10
9	68	68	23	17	11
10	75	75	25	19	13
11	83	83	28	21	14
12	90	90	30	23	15
13	98	98	33	25	16
14	105	105	35	26	18
15	113	113	38	28	19
16	120	120	40	30	20
17	128	128	43	32	21
18	135	135	45	34	23
19	143	143	48	36	24
20	150	150	50	38	25
Macro-Drip (20gtt/mL) or Micro-Drip is set of choice for this infusion					
Start at lowest dose and increase rate by 0.5mcg/min q2min prn to target MAP >60mmHg					

ONDANSETRON

♀B, **Lactation?**(Caution) Trade Name: **Zofran**

Class / Mechanism of Action

Antiemetic
Blocks serotonin, peripherally on vagus nerve terminals and centrally. Onset of action is 5-30min dependent on route.

Indications

Labeled Indications: Prevention of postoperative nausea and vomiting
Unlabeled: Hyperemesis gravidarum (severe or refractory)

Contraindications

- Hypersensitivity to ondansetron or any component of the formulation

Adverse Reactions / Precautions

- Dose dependent QT interval prolongation occurs and IV doses >16mg are not recommended.
  - In most patients, QT changes are not clinically relevant; however, if used with other medications that prolong QT intervals (antiarrhythmics) or in those at risk for QT prolongation, arrhythmia can occur. Torsades de points has been reported.

Dose and Administration:

ADULT

Nausea and Vomiting:
IV/IO/IM/PO

- **4-8mg**

Treatment of severe or refractory hyperemesis gravidum (unlabeled use):
IV:

- **8mg** administered over 15min q12hr

PEDIATRIC Always Reference BROSELOW Tape

Nausea and Vomiting (Children 1 month to 12 years)**:**
IV:

- ≤40 kg**: 0.1mg/kg** as a single dose over 2-5min
- >40 kg**: 4mg** as a single dose over 2-5min

PHENYLEPHRINE ♀C, Lactation?(Caution) Trade Name: **Neosynephrine**

Class / Mechanism of Action

Alpha Adrenergic Agonist

Potent, direct acting alpha adrenergic agonist with virtually no beta adrenergic activity; causes systemic arterial vasoconstriction.

Onset of action IV: Immediate, Duration: approximately 15-20min.

Indications

Labeled Indications: Treatment of hypotension, vascular failure in shock

Contraindications

- Hypersensitivity to phenylephrine or any component of the formulation
- Ventricular Tachycardia and Hypertension
- Bradycardia

Adverse Reactions / Precautions

- **No applicable use in hemorrhagic shock unless fluid replacement therapy maximized! Maximize use of Blood products / Crystalloids before considering use in hemorrhagic shock.**
- Not recommended for routine use in the treatment of septic shock
- Reflexive Bradycardia. Assure adequate circulatory volume to minimize need for vasoconstrictors. Monitor BP closely, avoid hypertension and adjust infusion rate as needed.
- Vesicant: Avoid extravasation, will cause tissue damage/necrosis, ensure proper needle placement

Dose and Administration:	**ADULT**	**PEDIATRIC** Always Reference BROSELOW Tape

	Hypotension / Shock:
	IV Push:
	• **50-200mcg/dose** q5-10min
	  ○ Max 1000mcg
	  ○ Titrate to blood pressure, use as temporary support or bridge to Vasopressor drip
	  ○ Mix 10mg phenylephrine in 100mL NS for a concentration of 100mcg/mL
	
	IV Infusion:
	• **40-200mcg/min;** titrate to MAP>60mmHg.
	  ○ To titrate, increase rate by 10mcg/min q2min.
	  ○ Maximum dose is 200mcg/min.
	  ○ Mix 10mg phenylephrine in 250mL D5W/NS for a concentration for 40mcg/mL
	
	If unable to maintain MAP >60mmHg, add Epinephrine infusion.
		Hypotension / Shock:
		IV Push:
		• **5-20mcg/kg/dose** q10-15min prn
		
		IV Infusion:
		• **0.1-0.5mcg/kg/min**
		
		Note: Almost never used in pediatric shock. Isolated increased afterload usually causes significant problems in this population. Use with caution and contact Medical Direction if able.

PRALIDOXIME CHLORIDE ♀C, Lactation?(Caution) Trade: **2-Pam Chloride**

Class / Mechanism of Action

Antidote for organophosphate anticholinesterase poisoning
Peak plasma concentration following IM dose is reached in approximately 30min

Indications

Labeled Indications:

- Organophosphate Pesticide Poisoning: Used with Atropine to reverse muscle paralysis
- Chemical Warfare Agent Poisoning: Used with Atropine for treatment of nerve agent (e.g., sarin, soman, tabun, VX [methylphosphonothioic acid])

Contraindications

- None in emergency setting

Adverse Reactions / Precautions

- Not effective in exposure to phosphorus, inorganic phosphates, or organophosphates that do not possess anticholinesterase activity.
- Consider cautions and adverse reactions of Atropine when using together
- Monitor BP and cardiac rhythm

Dose and Administration:

Pesticide Poisoning:

Mild symptoms: Miosis or blurred vision, tearing, runny nose, hypersalivation or drooling, wheezing, muscle fasciculations, nausea/vomiting.
Severe symptoms: behavioral changes, severe breathing difficulty, severe respiratory secretions, severe muscle twitching, involuntary defecation or urination, seizures, unconsciousness.

Chemical Warfare Agent Poisoning:

Mild to moderate symptoms: localized sweating, muscle fasciculations, nausea, vomiting, weakness, and/or dyspnea.
Severe symptoms: apnea, flaccid paralysis, seizures, and/or unconsciousness.

DOSING:

Auto-injector: IM into anterolateral aspect of thigh and hold in place for 10 seconds.

- Pralidoxime chloride auto-injector single dose 600mg: (administer after **Atropine**). Repeat injections if symptoms remain after 15min. Repeat again if not resolved after 2nd 15min.
- DuoDote®, ATNAA: For ≥2 mild symptoms, inject single dose. If severe symptoms develop, inject 2 additional doses in rapid succession.
- DuoDote®, ATNAA: For severe symptoms, utilize 3 auto-injectors (total dose: atropine 6.3mg and pralidoxime chloride 1800mg) in rapid succession.

Note: DuoDote® and ATNAA auto-syringe provides a sequential single IM dose of atropine (2.1mg) and pralidoxime chloride (600mg) through one needle.

Chemical Warfare Agent Poisoning:

Pralidoxime (2-PAM) Drip Protocol 8-10mg/kg/hr
*given after 1800mg IM Injection (3 ATNAAs) if symptoms persist.

1. Reconstitute 1g 2-PAM with 20mL of sterile water
2. Add 10mL 2Pam (500mg) to 100mL Bag of NS and infuse over 5min
3. Prepare continuous infusion by mixing 1g (20mL reconstituted) in 100mL bag of NS which will provide a 10mg/mL solution. Can also prepare 10g in 1L NS for a 10mg/mL solution.
4. Begin continuous infusion at 10mg/kg/hr.

Chemical Warfare Agent Poisoning:

Organophosphate Anticholinesterase Nerve Agents:

IM:

- Children 0–10 years of age and adolescents >10 years of age who present with mild/moderate symptoms: 15mg/kg.
- Children 0–10 years of age and adolescents >10 years of age who present with severe symptoms: 25mg/kg.
- Children and Adolescents ≥40kg dose as adult

PROCAINAMIDE ♀C, Lactation?(Not Recommended) Trade Name: **Procanbid**

Class / Mechanism of Action

Antiarrhythmic Agent, Class Ia
Decreases myocardial excitability & conduction velocity, may depress myocardial contractility by increasing the electrical stimulation threshold of ventricle, His-Purkinje system and through direct cardiac effects
Onset of action: IV: 5min, IM: (**Not for emergent situations)** 10-30min, Duration 4-6hr

Indications

Labeled Indications: Treatment of supraventricular arrhythmias, life-threatening ventricular arrhythmias.
Unlabeled: Atrial fibrillation (preexcited); Junctional tachycardia; Stable monomorphic ventricular tachycardia.

Contraindications

- Hypersensitivity to procainamide, procaine, other ester-type local anesthetics
- complete heart block; second-degree AV block or various types of hemiblock
- SLE (Systemic lupus erythematosus)
- Torsade de pointes

Adverse Reactions / Precautions

- Lupus-like syndrome
- Hypotension
- Skin rash
- Diarrhea, dysgeusia, nausea/vomiting

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

Ventricular arrhythmias/ Atrial fibrillation (preexcited):
Note: Dose must be individualized and titrated to patient response

- IV Loading dose: 10-17mg/kg at a rate of 20-50mg/min **or** 100mg q5min;
- Must dilute prior to IV administration. Dilute loading dose to a maximum concentration of 20mg/mL; administer loading dose at a max rate of 50mg/min until:
  - Arrhythmia suppression
  - Hypotension
  - QRS widens by >50%
  - total dose 17mg/kg reached
- Maintenance infusion: 2-6mg/min

Ventricular arrhythmias:
Infants, Children, and Adolescents IV:

- Loading dose: 10-15mg/kg over 30-60min
  - Neonates: Administer over 60min
  - Infants and Children: Administer over 30-60min
  - Adolescents: Administer at usual infusion rate: 20-50mg/min not to exceed 50mg/min
- Maintenance infusion: 20-80**mcg**/kg/min; maximum daily dose: 2000mg/24hr

Note: Infusion rate should be decreased if QT interval becomes prolonged or patient develops heart block; discontinue the infusion if patient develops hypotension or QRS interval widens to >50% of baseline; severe hypotension can occur with rapid IV administration

PROMETHAZINE ♀C, Lactation?(Not Recommended) Trade Name: **Phenergan**

Class / Mechanism of Action

Phenothiazine derivative Antiemetic, Histamine H_1 Antagonist, Sedative
Blocks postsynaptic dopaminergic receptors in the brain; strong alpha adrenergic blocking effect and depresses release of hypothalamic and hypophyseal hormones; reduces stimuli to the reticular system
Onset of action IV: 5 minutes, Duration 4-6 hours

Indications

Labeled Indications: Symptomatic treatment for allergic conditions; antiemetic; motion sickness; sedative; adjunct to postoperative analgesia and anesthesia
Unlabeled: Treatment of nausea and vomiting of pregnancy

Contraindications

- Hypersensitivity to promethazine, phenothiazine allergy, or any component of the formulation
- Coma
- Children <2 years old
- Intra-arterial and SubQ administration

Adverse Reactions / Precautions

- May cause Bradycardia, hyper-/hypotension, nonspecific QT changes, orthostatic hypotension, tachycardia: Life threatening arrhythmias have occurred with normal dosage
- May cause extrapyramidal symptoms (pseudoparkinsonism, acute dystonic reactions, akathisia, etc.)
- Avoid use in severe respiratory disease (asthma, COPD), and in patients using other sedatives or depressants: may lead to respiratory depression
- **Vesicant**: can cause severe tissue injury regardless of route of delivery
  - Deep IM injection; or IV in line. Slow IVP over 1 minute
  - For IV, ensure proper needle/catheter venous placement; avoid extravasation

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

Antiemetic:
IV push over >1 minute

- **12.5mg, not to exceed 25mg**
  - May repeat 12.5mg once after 10min if first dose ineffective
  - Subsequent dose of 25mg may be given q4hr
  - Can dilute with 10-20mL of NS

Sedation, analgesia/hypnotic adjunct:
IM, IV:

- **25-50mg** in combination with analgesic or hypnotic (at reduced dosage)

Allergic conditions (including allergic reactions to blood or plasma):
IM, IV:

- **25mg**, may repeat q2hr prn

Antiemetic:
IM, IV:

- Children ≥2 years: **0.25mg/kg** 4-6 times/day prn (max: 12.5mg/dose)

Preoperative analgesia/hypnotic adjunct:
IM, IV:

- Children ≥2 years: **1.1mg/kg** in combination with an analgesic or hypnotic (at reduced dosage) and with an atropine like agent (at appropriate dosage).

Note: Promethazine dosage should not exceed half of suggested adult dosage.

PROPOFOL

♀B, **Lactation Yes**(Not Recommended) Trade Name: **Diprivan**

Class / Mechanism of Action

General Anesthetic
Lipophilic intravenous general anesthetic.
Onset of action IV bolus: 9-51 seconds (average 30 seconds), Duration is dose and rate dependent: 3-10 minutes, prolonged with continued doses

Indications

Labeled Indications: Induction of anesthesia in patients ≥3 years of age; maintenance of anesthesia in patients >2 months of age; sedation in intubated, mechanically-ventilated ICU patients

Contraindications

- Hypersensitivity to propofol or any component of the formulation
- Allergy to eggs, egg products, soybeans, soy products, and peanuts.

Adverse Reactions / Precautions

- May cause Hypotension especially in hypovolemic patients or if bolus dosing is used.
  - Hypotension may result in reduction of MAP exceeding 30%
    - Head Injury patients or those with suspected / known increased intracranial pressure are at increased risk of decreased cerebral perfusion pressure.
- Do not use in pre-hospital trauma environment or in transfer patients unless directed by medical director or provided written orders by referring provider.
- No Analgesic properties. Must supplement with analgesic agents.

Dose and Administration:	**ADULT**	**PEDIATRIC** Always Reference BROSELOW Tape
	Sedation/ RSI: IV Push: • **1-2.5mg/kg** q5-10min prn **Maintenance of general anesthesia:** IV Infusion: • **10-75mcg/kg/min** via infusion pump or Dial-a-Drip. Titrate to minimum effective dose. **(See infusion chart next page)** o MAX DOSE: 100mcg/kg/min. • Use of Dial-a-Drip tubing in the absence of an infusion pump will increase accuracy of infusion dosage. Note: Wait 3-5 minutes between dosage changes to clinically assess drug effects. Smaller doses are required when used with opioids.	**Sedation/ RSI:** IV Push: • **1-2.5mg/kg** q5-10min prn **Maintenance of general anesthesia,** IV Infusion: Healthy children 2 months to 16 years: • **125-300mcg/kg/min** (or 7.5-18mg/kg/hr)

MEDICATIONS

PROPOFOL (DIPRIVAN)

Dosing Range: 10-75mcg/kg/min (600-3000mcg/kg/hr)

MIX 500mg/50mL
CONCENTRATION 10mg/mL

Pt. Weight	Dose	Rate	Micro (60gtt/mL)	Macro		
				20gtt/mL	15gtt/mL	10gtt/mL
kg	mcg/kg/min	mL/hr	gtt/min	gtt/min	gtt/min	gtt/min
50	10	3	3	1	1	1
	15	5	5	2	1	1
	20	6	6	2	2	1
	25	8	8	3	2	1
	30	9	9	3	2	2
	35	11	11	4	3	2
	40	12	12	4	3	2
	45	14	14	5	3	2
	50	15	15	5	4	3
	55	17	17	6	4	3
	60	18	18	6	5	3
	65	20	20	7	5	3
	70	21	21	7	5	4
	75	23	23	8	6	4
55	10	3	3	1	1	1
	15	5	5	2	1	1
	20	7	7	2	2	1
	25	8	8	3	2	1
	30	10	10	3	2	2
	35	12	12	4	3	2
	40	13	13	4	3	2
	45	15	15	5	4	2
	50	17	17	6	4	3
	55	18	18	6	5	3
	60	20	20	7	5	3
	65	21	21	7	5	4
	70	23	23	8	6	4
	75	25	25	8	6	4
60	10	4	4	1	1	1
	15	5	5	2	1	1
	20	7	7	2	2	1
	25	9	9	3	2	2
	30	11	11	4	3	2
	35	13	13	4	3	2
	40	14	14	5	4	2
	45	16	16	5	4	3
	50	18	18	6	5	3
	55	20	20	7	5	3
	60	22	22	7	5	4
	65	23	23	8	6	4
	70	25	25	8	6	4
	75	27	27	9	7	5
65	10	4	4	1	1	1
	15	6	6	2	1	1
	20	8	8	3	2	1
	25	10	10	3	2	2
	30	12	12	4	3	2
	35	14	14	5	3	2
	40	16	16	5	4	3
	45	18	18	6	4	3
	50	20	20	7	5	3
	55	21	21	7	5	4
	60	23	23	8	6	4
	65	25	25	8	6	4
	70	27	27	9	7	5
	75	29	29	10	7	5
70	10	4	4	1	1	1
	15	6	6	2	2	1
	20	8	8	3	2	1
	25	11	11	4	3	2
	30	13	13	4	3	2
	35	15	15	5	4	2
	40	17	17	6	4	3
	45	19	19	6	5	3
	50	21	21	7	5	4
	55	23	23	8	6	4
	60	25	25	8	6	4
	65	27	27	9	7	5
	70	29	29	10	7	5
	75	32	32	11	8	5
75	10	5	5	2	1	1
	15	7	7	2	2	1
	20	9	9	3	2	2
	25	11	11	4	3	2
	30	14	14	5	3	2
	35	16	16	5	4	3
	40	18	18	6	5	3
	45	20	20	7	5	3
	50	23	23	8	6	4
	55	25	25	8	6	4
	60	27	27	9	7	5
	65	29	29	10	7	5
	70	32	32	11	8	5
	75	34	34	11	8	6

Macro-Drip (20gtt/mL) or Micro-Drip is set of choice for this infusion

Titrate to minimum effective dose. Allow 3-5 minutes between dosing changes to sedative and hemodynamic effects.

PROPOFOL (DIPRIVAN)

Dosing Range: 10-75mcg/kg/min (600-3000mcg/kg/hr)

MIX 500mg/50mL
CONCENTRATION 10mg/mL

Pt. Weight	Dose	Rate	Micro (60gtt/mL)	Macro		
				20gtt/mL	15gtt/mL	10gtt/mL
kg	mcg/kg/min	mL/hr	gtt/min	gtt/min	gtt/min	gtt/min
80	10	5	5	2	1	1
	15	7	7	2	2	1
	20	10	10	3	2	2
	25	12	12	4	3	2
	30	14	14	5	4	2
	35	17	17	6	4	3
	40	19	19	6	5	3
	45	22	22	7	5	4
	50	24	24	8	6	4
	55	26	26	9	7	4
	60	29	29	10	7	5
	65	31	31	10	8	5
	70	34	34	11	8	6
	75	36	36	12	9	6
85	10	5	5	2	1	1
	15	8	8	3	2	1
	20	10	10	3	3	2
	25	13	13	4	3	2
	30	15	15	5	4	3
	35	18	18	6	4	3
	40	20	20	7	5	3
	45	23	23	8	6	4
	50	26	26	9	6	4
	55	28	28	9	7	5
	60	31	31	10	8	5
	65	33	33	11	8	6
	70	36	36	12	9	6
	75	38	38	13	10	6
90	10	5	5	2	1	1
	15	8	8	3	2	1
	20	11	11	4	3	2
	25	14	14	5	3	2
	30	16	16	5	4	3
	35	19	19	6	5	3
	40	22	22	7	5	4
	45	24	24	8	6	4
	50	27	27	9	7	5
	55	30	30	10	7	5
	60	32	32	11	8	5
	65	35	35	12	9	6
	70	38	38	13	9	6
	75	41	41	14	10	7
95	10	6	6	2	1	1
	15	9	9	3	2	1
	20	11	11	4	3	2
	25	14	14	5	4	2
	30	17	17	6	4	3
	35	20	20	7	5	3
	40	23	23	8	6	4
	45	26	26	9	6	4
	50	29	29	10	7	5
	55	31	31	10	8	5
	60	34	34	11	9	6
	65	37	37	12	9	6
	70	40	40	13	10	7
	75	43	43	14	11	7
100	10	6	6	2	2	1
	15	9	9	3	2	2
	20	12	12	4	3	2
	25	15	15	5	4	3
	30	18	18	6	5	3
	35	21	21	7	5	4
	40	24	24	8	6	4
	45	27	27	9	7	5
	50	30	30	10	8	5
	55	33	33	11	8	6
	60	36	36	12	9	6
	65	39	39	13	10	7
	70	42	42	14	11	7
	75	45	45	15	11	8
105	10	6	6	2	2	1
	15	9	9	3	2	2
	20	13	13	4	3	2
	25	16	16	5	4	3
	30	19	19	6	5	3
	35	22	22	7	6	4
	40	25	25	8	6	4
	45	28	28	9	7	5
	50	32	32	11	8	5
	55	35	35	12	9	6
	60	38	38	13	9	6
	65	41	41	14	10	7
	70	44	44	15	11	7
	75	47	47	16	12	8

Macro-Drip (20gtt/mL) or Micro-Drip is set of choice for this infusion

Titrate to minimum effective dose. Allow 3-5 minutes between dosing changes to sedative and hemodynamic effects.

ROCURONIUM ♀C, Lactation?(Caution) Trade Name: **Zemuron**

Class / Mechanism of Action

Nondepolarizing Neuromuscular Blocking Agent (Paralytic)
Blocks acetylcholine from binding to motor neuron receptors inhibiting depolarization.
Onset of action IV: 1-2min, Duration: approximately 25-40min (increases with higher doses)

Indications

Labeled Indications: Rapid Sequence Intubation/Paralysis and routine endotracheal intubation, facilitates mechanical ventilation in ICU patients

Contraindications

- Hypersensitivity (eg, anaphylaxis) to rocuronium, other neuromuscular-blocking agents, or any component of the formulation

Adverse Reactions / Precautions

- Resistance may occur in burn patients (>30% of body) for period of 5-70 days after injury
- High potential for interactions: Numerous drugs either antagonize (eg, acetylcholinesterase inhibitors) or potentiate (eg, calcium channel blockers, certain antimicrobials, inhalation anesthetics, lithium, magnesium salts, procainamide, and quinidine) the effects of neuromuscular blockade; use with caution in patients receiving these agents.
- **Provides NO analgesia or sedation!**
  - **Must provide appropriate sedation and analgesia prior to paralytic use and throughout maintenance.**

Dose and Administration:	**ADULT**	**PEDIATRIC** Always Reference BROSELOW Tape
	RSI: IV Push: • **1mg/kg** (Dosing ranges from **0.6-1.2mg/kg**) **Note:** In adult patients with morbid obesity (BMI >40kg/m^2), use dose of 1.2mg/kg using ideal body weight (IBW) **Maintenance dosing:** (unlabeled and unreferenced dose) IV Push: • **1mg/kg IV/IO q30-45min** prn or 8-12mcg/kg/min IV/IO (Dosing ranges from **0.6-1.2mg/kg**)	**RSI:** IV: • **1mg/kg** (Dosing ranges from **0.6-1.2mg/kg**.) **Maintenance bolus dosing:** (unlabeled and unreferenced dose) IV Push: • **1mg/kg every 30-45min** (Dosing ranges from **0.6-1.2mg/kg**.)

SODIUM BICARBONATE ♀C, Lactation Yes

Class / Mechanism of Action

Alkalinizing Agent; Antacid
Provides bicarbonate ion to neutralize hydrogen ion concentration and raise blood and urinary pH
Onset of action IV: 15 minutes, Duration 1-2 hours

Indications

Labeled Indications: Management of metabolic acidosis, hyperkalemia, overdose of certain drugs (including tricyclic antidepressants and aspirin), and gastric hyperacidity.

Contraindications

- Alkalosis, hypernatremia, hypocalcemia
- severe pulmonary edema
- Unknown abdominal pain

Adverse Reactions / Precautions

- Use should be reserved for documented metabolic acidosis and for hyperkalemia induced cardiac arrest. Routine use in cardiac arrest is not recommended.
- Avoid extravasation, tissue necrosis can occur.
- Can cause Hypernatremia, hypocalcemia, hypokalemia, intracranial acidosis, metabolic alkalosis

Dose and Administration:

ADULT

TriCyclic Antidepressant OD
IV:

- **1mEq/kg**; May repeat to maintain QRS <100
- Start Maintenance Infusion: **100-150mEq** (2-3 amps) in 1 L D5 / NS @ 100-200mL/hr IV

Cardiac arrest (ACLS Guidelines, 2015):
IV:

- **1mEq/kg/dose**; repeat doses should be guided by arterial blood gases

Note: Routine use in cardiac arrest is not recommended. Use may be considered in cases of prolonged cardiac arrest once adequate alveolar ventilation and effective cardiac compressions have been established. In some cardiac arrest situations (eg, metabolic acidosis, hyperkalemia, or tricyclic antidepressant overdose), sodium bicarbonate may be beneficial.

Hyperkalemia (ACLS Guidelines, 2015)
IV:

- **50mEq** over 5 minutes

Metabolic acidosis:
If acid-base status is not available: **2-5mEq/kg** infusion over 4-8 hours

PEDIATRIC Always Reference BROSELOW Tape

- **Follow Adult Dosing**

SUCCINYLCHOLINE

♀C, **Lactation?**(Caution) Trade Name: **Anectine**

Class / Mechanism of Action

Depolarizing Neuromuscular Blocking Agent (Paralytic)
Acts like acetylcholine, produces myoneural depolarization causing sustained flaccid skeletal muscle paralysis. Onset of action IV: 30-60 seconds, Duration 5-9 minutes with single dose

Indications

Labeled Indications: Rapid Sequence Intubation and routine endotracheal intubation

Contraindications

- Hypersensitivity to succinylcholine or any component of the formulation
- Acute phase of injury following major burns, multiple trauma (greater than 5 days after injury)
- Myopathies associated with elevated serum creatine phosphokinase and myasthenia gravis
- **DO NOT USE IN PATIENTS WITH BURNS, CRUSH INJURIES, OR HYPERKALEMIA**
- Re-Dosing is not advised due to increased risk of Hyperkalemia
- Neuromuscular disease (Muscular dystrophy, Spinal Muscular Atrophy, etc.)

Adverse Reactions / Precautions

- May cause Bradycardia, Malignant hyperthermia, and increased intraocular pressure
- Severe hyperkalemia can develop in cases of chronic abdominal infection, burn injury, children with skeletal muscle myopathy, subarachnoid hemorrhage, or conditions which cause degeneration of the nervous system commonly greater than 5 days old. Potassium increase of 0.5mEq/L is expected with use.
- **Provides NO analgesia or sedation!**
  - **Must provide appropriate sedation and analgesia prior to paralytic use and throughout maintenance.**

Dose and Administration:	**ADULT**	**PEDIATRIC** Always Reference BROSELOW Tape

	RSI/ Neuromuscular blockade:
	IV:
	• **1-1.5mg/kg**
	
	Note: Pretreatment with 10% dosage of non-depolarizing agents prior to neuromuscular-blockade with Succinylcholine is **NO LONGER ADVISED**
		RSII / Neuromuscular blockade:
		IV:
		• <10kg:
		  ○ Initial: **1.5-2mg/kg/dose**
		• >10kg:
		  ○ Initial: **1-1.5mg/kg/dose**
		
		Note: Pretreatment with 10% dosage of non-depolarizing agents prior to neuromuscular-blockade with Succinylcholine is **NO LONGER ADVISED**

THIAMINE	♀A, **LactationYes**(Caution)	Trade Name: **Vitamin B1**

Class / Mechanism of Action

Vitamin, water soluble
Essential coenzyme in carbohydrate metabolism. Onset of action IV/IM: Rapid

Indications

Labeled Indications: Treatment of thiamine deficiency including beriberi, Wernicke's encephalopathy, Korsakoff's syndrome, neuritis associated with pregnancy, or in alcoholic patients

Contraindications

- Hypersensitivity to thiamine or any component of the formulation

Adverse Reactions / Precautions

- Administration of dextrose may worsen acute symptoms of thiamine deficiency; use caution when low thiamine is suspect

Dose and Administration:	**ADULT**	**PEDIATRIC** Always Reference BROSELOW Tape
	AMS; Seizure; Syncope; Malnutrition; Vomiting and Diarrhea; w/ Hx of ETOH abuse: IM/IV: • **100mg/day**	**AMS or Seizure w/ signs of Malnutrition:** IM/IV: • **25mg/day**

TRANEXAMIC ACID

♀B, **Lactation: Yes**(Caution) Trade Name: **Cyklokapron/Lysteda**

Class / Mechanism of Action

Antifibrinolytic Agent, Hemostatic Agent

Displaces plasminogen from fibrin resulting in inhibition of fibrinolysis and inhibits the proteolytic activity of plasmin

Indications:

- Trauma-associated hemorrhage: Casualty likely needing blood transfusion (hemorrhagic shock, elevated lactate, one or more major amputations, penetrating torso trauma, or evidence of severe bleeding)
- Post-Operative Hemorrhage by dissection, enteric staples or suspected internal bleeding
- Signs or symptoms of significant TBI or altered mental status associated with blast or blunt trauma
- Postpartum Hemorrhage (continued bleeding despite Oxytocin and fundal massage)

Contraindications

- **TXA is contraindicated in trauma if dose is not given within first 3 hours following Traumatic event (Ideal dosing time-frame is within 1 hour of trauma)**
- Hypersensitivity to tranexamic
- Subarachnoid hemorrhage
- Thromboembolic disease (Cerebral Thrombosis, DVT, PE)

Adverse Reactions / Precautions

- Disseminated intravascular coagulation (DIC): Use with extreme caution in patients with DIC requiring antifibrinolytic therapy; patients should be under strict supervision of a physician experienced in treating this disorder. TXA should be used in Pt.'s with trauma related DIC however.
- Thrombosis (especially when given after 3hr from injury)
- Seizure

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

Trauma-associated hemorrhage (unlabeled use):

IV:

- Initial Dose: **2g TXA** in 100cc NS or LR ASAP via IV/IO Bolus, or 2g IV/IO push (1g over 1min per push) but **NOT** later than 3 hours after injury.
- If patient received **1g of TXA** prior and <3hr from time of injury: **1g TXA** IV/IO push over 1 minute or mixed in 100cc NS or LR Bolus. If >3hr from time of injury: ***DO NOT*** administer TXA.

Suspected Post-Operative Hemorrhage by dissection, enteric staples or suspected internal bleeding:

- Initial Dose: **2g of TXA** in 100cc NS or LR ASAP via IV/IO Bolus or 2g IV/IO push (1g over 1 minute push) but **NOT** later than 3 hours after start of suspected hemorrhage.

Trauma-associated hemorrhage (unlabeled use):

IV:

- Initial Dose: **15mg/kg** via IV/IO Bolus (goal within 1 minute),

VASOPRESSIN

♀C, **Lactation?**(Caution) Trade Name: **Vasostrict**

Class / Mechanism of Action

Antidiuretic Hormone Analog-Vasopressor

Vasopressin, at therapeutic doses used for vasodilatory shock, stimulates the AVPR1a (or V1) receptor and increases systemic vascular resistance and mean arterial blood pressure; in response to these effects, a decrease in heart rate and cardiac output may be seen.

Onset of action IV: Rapid with peak effect occurring within 15 minutes of initiation of continuous IV infusion. Duration: Within 20 minutes after IV infusion terminated.

Indications

Labeled Indications: Treatment of hypotension, vascular failure in shock

Contraindications

- Hypersensitivity to Vasopressin or any component of the formulation
- Use with caution in patients with asthma, cardiovascular disease, renal disease, or a history of seizure disorder

Adverse Reactions / Precautions

- **No applicable use in hemorrhagic shock unless fluid replacement therapy maximized! Maximize use of Blood products / Crystalloids before considering use in hemorrhagic shock.**
- Assure adequate circulatory volume to minimize need for vasoconstrictors. Monitor BP closely, avoid hypertension and adjust infusion rate as needed.
- Vesicant: Avoid extravasation, will cause tissue damage/necrosis, ensure proper needle placement
- Cardiac arrhythmias are possible, monitor with 12 lead EKG

Dose and Administration: **ADULT** **PEDIATRIC** Always Reference BROSELOW Tape

Hypotension / Shock:

Vasopressors should be used if patient is hypotensive after fluid resuscitation to maintain mean arterial pressure (MAP) ≥65mmHg.

Use in addition to norepinephrine for raising MAP to target or to decrease norepinephrine dosage.

Titrate to lowest effective dose.

IV Infusion:
4 Unit bolus IV/IO followed by **0.04 U/min** infusion to maintain MAP>65mmHg

Hypotension / Shock:

Limited data available; efficacy results have varied.

IV Infusion:

- **0.17-8 miliunits/kg/min (0.01-0.48units/kg/hr)**

VECURONIUM	♀C, **Lactation?**(Caution)	Trade Name: **Norcuron**

Class / Mechanism of Action

Nondepolarizing Neuromuscular Blocking Agent (Paralytic)
Blocks acetylcholine from binding to motor neuron receptors inhibiting depolarization.
Onset of action IV: 1.5-3 minutes, Duration: approximately 30-60 minutes

Indications

Labeled Indications: Endotracheal intubation, facilitates mechanical ventilation in ICU patients

Contraindications

- Hypersensitivity to vecuronium or any component of the formulation

Adverse Reactions / Precautions

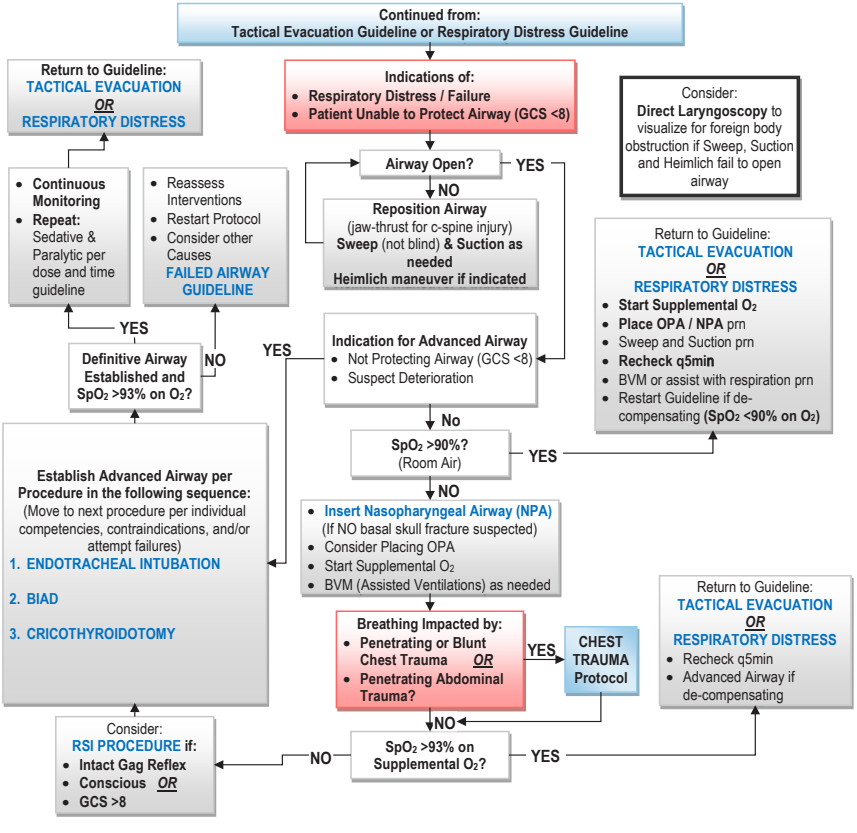
- Resistance may occur in burn patients (>30% of body) for period of 5-70 days after injury
- High potential for interactions: Numerous drugs either antagonize (eg, acetylcholinesterase inhibitors) or potentiate (eg, calcium channel blockers, certain antimicrobials, inhalation anesthetics, lithium, magnesium salts, procainamide, and quinidine) the effects of neuromuscular blockade; use with caution in patients receiving these agents.
- **Provides NO analgesia or sedation!**
  - **Must provide appropriate sedation and analgesia prior to paralytic use and throughout maintenance.**

Dose and Administration:	**ADULT**	**PEDIATRIC** Always Reference BROSELOW Tape
	RSI) and maintenance of paralysis: IV Push: • Induction: **0.1mg/kg** **Dose range (0.8-0.15mg/kg)** • Maintenance: **0.1mg/kg** q30-60min prn **Dose range (0.8-0.15mg/kg)** IV Continuous infusion: • **1 mcg/kg/min** and titrate to 2:4 train of four (TOF) if stimulation devise is available. **Note:** Paralytic use and management: If available, utilize the train of four stimulation device with either the temple or radial/ulnar nerve placement. Maintain paralysis at a level of 2/4 twitches with TOF stimulation. **Note:** Vecuronium is only recommended for use in RSI in the absence of available Succinylcholine or Rocuronium, as they are the preferred induction agents.	**RSI and maintenance of paralysis::** IV Push: • Induction: **0.1-0.15mg/kg** • Intermittent bolus dosing: **0.1mg/kg** q30-60min prn IV Continuous infusion: • **1-2.5mcg/kg/min**

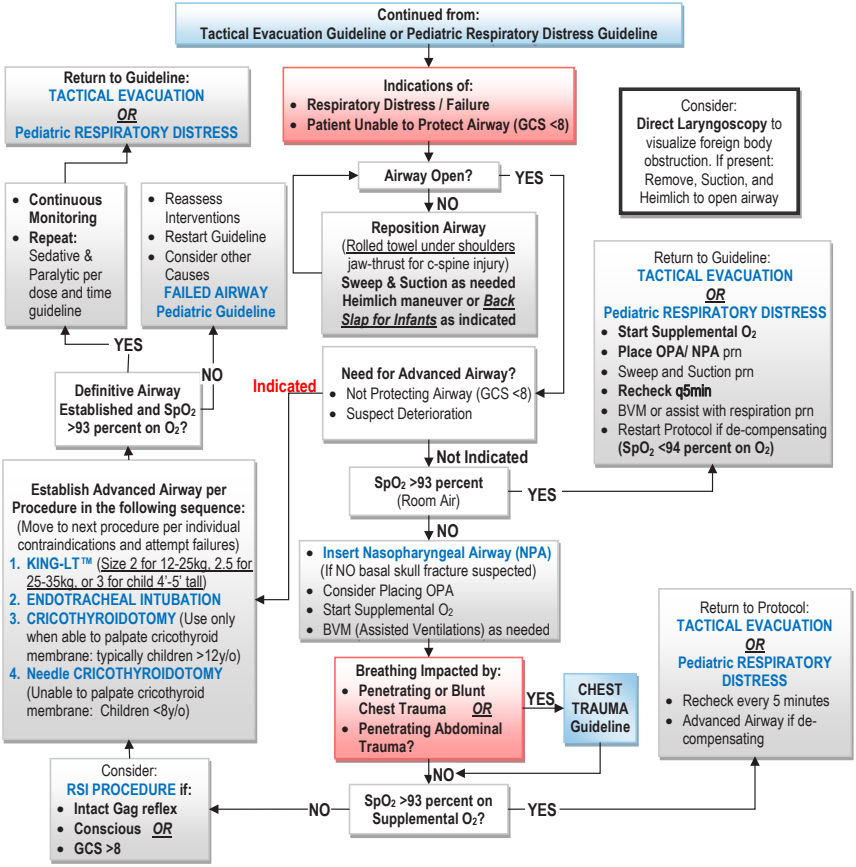
AIRWAY

Signs and Symptoms of Distress and/or Failure:

- **SpO_2 Decreasing or <90%** (Room Air) with / without supporting Signs / Symptoms of:
  - Tachypnea, Tachycardia, Fever, Cough, Wheezing, Rhonchi, Rales, Shock
- **Difficulty Breathing or Excess Work** as demonstrated by:
  - Pursing of Lips, Accessory Muscle Involvement, Cyanosis, Decreased Ability to Speak, Diaphoresis
- **Airway Obstruction** due to Trauma, Edema, Excess Secretions, Foreign Body, or Tongue
- **Apnea**
- **Decreased LOC** (GCS <8)



PEDIATRIC AIRWAY



AIRWAY Pearls

Signs and Symptoms of Respiratory Distress and/or Failure

- **SpO_2 decreasing <90%** (Room Air) with / without supporting S/Sx of:
  - Tachypnea, Tachycardia, Fever, Cough, Wheezing, Rhonchi, Rales, Shock
- **Difficulty Breathing or Excess Work** as demonstrated by:
  - Purpling of Lips, Accessory Muscle Involvement, Cyanosis, Decreased Ability to Speak, Diaphoresis, Tripod Breathing
- **Airway Obstruction** Due to Trauma, Edema, Excess Secretions, Foreign Body, or Tongue
- **Apnea**
- **Cyanosis,** Central and/or Peripheral: Blue/Pale Tinting and Mottling of Skin
- **Decreased LOC** (GCS <8), **Altered Responsiveness, Weak Cry**

Pearls:

- **PCO_2 is affected by respiratory rate and tidal volume (ventilation), while PO_2 is affected by PEEP and FiO_2 (oxygenation)**
- Capnography is mandatory for all intubations. Record results. Capnometer (standalone END TIDAL CO_2 detector) is an alternate if monitor capnography not available**. For capnography, normal range is 35-45mmHg;** adjust vent as needed.
- All intubated patients should receive nasogastric / orogastric tube (time permitting) and continuous pulse oximetry.
- **Maternal Medication:** Adverse effects can include respiratory insult to newborn.
- Pediatric is defined as anyone <12yo.
- **If RSI is impractical or provider is not credentialed to perform**, but patient requires an advanced airway with / without ventilatory support, consider:
  1. Pharmacologically-Assisted Sedation using KETAMINE followed by supraglottic airway device placement (do not attempt BIAD placement without sedation in semi-conscious patients)
  2. Surgical cricothyroidotomy using approved device. (modified 6.0 ET not ideal)
  3. Medical personnel should not actively seek to determine if gag reflex is present by touching the palate, posterior lounge, or posterior pharynx.

RSI MEDICATIONS: IV/IO Doses

Pretreatment:
Fentanyl 3mcg/kg IV
Atropine 0.02mg/kg IV Min: 0.1mg (**Infants <1yo)**

Induction Agents:	**80kg adult dose:**
Etomidate 0.3mg/kg	24mg
*Ketamine 1-2mg/kg	80-160mg
Midazolam 0.1mg/kg	8mg
Propofol 1-2.5mg/kg	80-200mg

Paralytics:
Vecuronium 0.08-0.15mg/kg
*Rocuronium 0.6-1.2mg/kg, q25-40min
Succinylcholine 1.0-1.5mg/kg

Continued Sedation:
Fentanyl 0.5-2mcg/kg, q20-60min
Ketamine 0.5-2mg/kg, q10-20min
Ketamine 0.5-2mg/kg bolus then 0.5-1mg/kg/hr
Midazolam 0.05mg/kg-NO Painl, q15-30m
Midazolam 0.05mg/kg bolus IV x1 prn, then titrate 0.05-0.1mg/kg/hr IV gtt
Propofol 10-75 mcg/kg/min IV

VOCAL CORD VISUALIZATION MANEUVERS:

- **Ensure correct alignment-** External auditory meatus is aligned with sternal notch and head is in neutral to sniffing position.
- **BURP** = **B**ackward; **U**pward; **R**ightward; **P**ressure on thyroid cartilage.

RSI (Abbreviated: see RSI PROCEDURE as needed)

1. **Preoxygenate** (100% FiO_2 via mask or PPV as needed)
2. **Pretreat** (Premedicate) as able or mission allows (Atropine blocks reflex bradycardia in pediatric (<2y/o only) population)
3. **Induce** (Primary Sedation / Anesthesia)
4. **Paralyze** (Neuromuscular blocking agent)
5. **Wait for Fasciculation, Jaw Relaxation, Absence of Movement**
6. **Pass ET Tube or insert BIAD** (throughout attempt, ensure good O_2 saturation. If below 94% stop and provide PPV)
7. **Confirm Placement and Secure Tube**
8. **Continue Sedation and Paralytic** as needed per dosing time.

Note: Midazolam and Propofol should only be used for continued sedation when pain management is NOT a concern (i.e., Non Trauma Patient or Patient is already on adequate narcotic pain control).

Rescue Breathing Ventilation Rate Without Advanced Airway:

- **NEWBORN** = 40-60/min when performed without compressions
- **Infant / Child** = 1 breath/3-5 seconds
- **Adult** = 1 breath/5-6 seconds

VENTILATOR SETTINGS:

- Mode: AC, SIMV, or ASV
- Rate: 14 initially, then adjust PRN
- Tidal Volume: 6mL/kg initially, then adjust 4-8mL/kg
- I:E = 1:2
- PEEP: 5
- FiO_2: 100% initially. Try to decrease FiO_2 as much as possible while keeping O_2 saturation >93%.
- **Goal FiO_2 = 50-60% to conserve battery life and O_2, while maintaining patient SpO_2 >93%.**

AIRWAY CONFIRMATION

CLINICAL INDICATIONS:

- Post endotracheal intubation to confirm proper placement of endotracheal tube (ETT)

CONTRAINDICATIONS:

- None

PROCEDURE:

- Primary / First confirmation of proper placement is always good visualization of tube passing through cords.
- Provider or second individual should listen for bilateral breath sounds and absence of gastric sounds. Also evaluate for equal chest rise. Look for ETT fogging.
- Ensure ETT is at appropriate depth and good pilot cuff tension is present.
- **WAVEFORM CAPNOGRAPHY** is gold standard for patient airway monitoring.
- Capnometer: Place onto ETT and bag patient 2-3 breaths. Proper placement will result in color change to Gold/Yellow. Esophageal placement will result in a purple color. (**Gold=good**, **Barney=bad**) Change will only occur with perfusion (e.g. High quality CPR required.)
- Esophageal detection device: Squeeze bulb expressing all air out of the EDD. Place this onto end of ETT. Rapid refilling suggests proper placement (the rigid trachea does not collapse and therefore there is no obstruction to air return). Poor filling or no filling suggests improper placement (the flaccid esophagus will collapse around ETT preventing refilling).
- Pulse oxygenation: After a short delay (30-60 seconds in young children, particularly those with poor perfusion), the pulse oxygenation should increase to normal range (this is not reliable in excessively cold patients, methemoglobinemia, or CO poisoning). Do not extubate if other confirmation measures say it is in!

Document procedure, results, and vital signs.

At any time, doubt as to correct placement should prompt removal of tube, oxygenate with BVM, and re-attempt with BIAD before rescue airway!

BLIND INSERTION AIRWAY DEVICE (BIAD)

CLINICAL INDICATIONS:

Patient with inadequate respiratory drive or respiratory failure due to any reason (e.g., altered mental status, trauma, infection) other than airway burns, anaphylaxis, or other causes of airway swelling / obstruction.

CONTRAINDICATIONS:

- Massive upper airway trauma distorting anatomy
- Penetrating neck trauma

PROCEDURE:

Consider paralytic/analgesia/sedation medications when placing supraglotic airways devices. In any instance of BIAD placement, caregiver must be prepared for vomiting and aspiration.

- Prepare, position, and pre-oxygenate the patient with 100% O_2. Ensure patient on monitor if possible.
- Select appropriate size BIAD and ensure proper cuff inflation / deflation.
- Lubricate with water-soluble jelly.
- Advance tube towards posterior pharynx until seated in correct position.
- Inflate balloon as per package insert and attempt to ventilate with BVM.
- If good airflow / chest rise / PO_2, secure device in place and ventilate patient with BVM / Vent.
- If unable to ventilate / resistance, leave first BIAD in place, deflate balloon, and pass a second BIAD in the same manner as the first (second should only be able to enter the trachea as the first may have entered into the esophagus approx 5-10%). Once second BAID is in place, remove first and inflate the cuff on the second device. Attempt to bag as above. If successful, ventilate patient.

WARNING: BIADs may not prevent or block aspiration of gastric contents.

Document procedure, results, and vital signs.

FAILED AIRWAY

Criteria:

- **Unable to open airway**
- **Two (2) Failed intubation attempts by the most proficient technician on scene**
  - Assumes at least 1 attempt with Supraglottic Airway (unless contraindicated or appropriate size not available) and 2 attempts with ET Tube

OR

- **Intubation contraindicated due to anatomical abnormalities or major airway trauma**

All Attempts as Appropriate:

- **Reposition Airway (jaw-thrust for c-spine injury)**
- **Sweep & Suction (as needed)**
- **Heimlich Maneuver /Abdominal Thrusts / Back Slaps (as indicated)**

Able to Ventilate with BVM

NO → **(*See Pearls)** Attempt to: Insert Oral Airway *AND/OR* **Nasopharyngeal Airway (NPA)** (if NO basal skull fracture suspected) → **Continue BVM**

YES → **Continue BVM**

If adequate ventilation with BVM, continue BVM. If inadequate, continue with protocol.

CRICOTHYROIDOTOMY open, percutaneous (>10 y/o) or needle

Ventilate Patient (per age respiratory rate)

Respiratory Rate: (breaths/min) without Advance Airway and *NOT* performing BLS.

Infant	30-60
Toddler	24-40
Preschooler	22-34
School Age	18-30
Adolescent	12-18

Pearls:

- Continuous pulse oximetry should be utilized in all patients with an inadequate respiratory function.
- Continuous $EtCO_2$ monitoring should be attached when available to monitor adequacy of ventilation.
- Contraindication for Oropharyngeal Airway (OPA: Intact gag reflex, conscious or semiconscious, severe facial trauma
- Contraindication for Nasopharyngeal Airway (NPA): Known esophageal disease, recent ingestion of caustic substances, severe facial trauma, possible nasal and adjacent (basilar skull) fracture
- **In the setting of significant facial/neck trauma or distortion of anatomy (i.e. angioedema) laryngoscope and intubation may be difficult or impossible. Based on physical examination of the airway, Cricothyroidotomy may be the initial airway of choice. Consider procedural sedation with Ketamine in awake patients.**
- **Cricothyroidotomy can be performed by all medics once approved by medical director. This should be utilized quickly with sever airway trauma or inability to intubate.**
- **Needle Cricothyroidotomy can be performed by all CCFPs once approved by medical director. This should be utilized quickly with severe airway trauma or inability to intubate.**

NASOPHARYNGEAL AIRWAY

CLINICAL INDICATIONS:

- Depressed mental status with need for airway augmentation to ensure patency / access.

RELATIVE CONTRAINDICATIONS:

- Patient at high-risk of aspiration and/or unable to protect airway
- Massive facial trauma, burns, or suspicion of basilar skull fracture (e.g., CSF otorrhea, Battle's sign, raccoon eyes, mechanism).

PROCEDURE:

- Position patient in the sniffing position.
- Select appropriate sized NP tube and lubricate with water-soluble jelly (can measure tube by placing exterior (lipped) end next to nare and tip should reach to angle of mandible).
- Select most patent nare, orient open angle medially, and pass tube in a posterior **– not superior –** direction. If resistance is met, attempt to corkscrew slightly or remove and attempt in other nare. If unsuccessful, try the next smallest sized tube.
- Pass tube until lip of NP tube rests against nare.
- Bag patient with BVM / mask as needed.

Document procedure, results, and vital signs.

Pre-Intubation Checklist

PRE-INTUBATION CHECKLIST

INSTRUCTIONS FOR USE

The Pre-Intubation Checklist serves as a final reference prior to administering a sedative and paralytic during a Rapid Sequence Intubation. Run the checklist to ensure preparation is complete before embarking on induction and paralysis. Refer to **RAPID SEQUENCE INTUBATION** for how to do an RSI.

PLAN

- ☐ **Consider Dangerous Physiology Issue: SBP <100, SpO_2 <94%, Metabolic Acidosis**
  - ➢ Appropriately modify or avoid RSI in unstable patient
  - ➢ **SBP <100** → Consider resuscitation with IVF and vasopressors, Lower the dose of sedative
  - ➢ **Sat <94%** → Consider use of CPAP or BVM with PEEP valve to increase Mean Airway Pressure during Pre-Oxygenation
  - ➢ **Severe Met. Acidosis** →Consider awake intubation or delayed sequence intubation with severe Metabolic Acidosis
- ☐ **Difficult Airway Evaluation** (LEMON, HEAVEN Criteria)
  - ➢ Consider alternate airway, cricothyrotomy, or modify plan
- ☐ **Rapid Sequence Intubation, Delayed Sequence Intubation, Rapid Sequence Airway (SGA), or Cricothyrotomy**
  - ➢ Choose the most appropriate technique for physiology and anatomy
- ☐ **Evaluate Cricothyrotomy Landmarks and Assess Procedural Difficulty**
- ☐ **Induction Agent/Paralytic**
  - ➢ Choose and draw up appropriate Sedative and Paralytic
- ☐ **Push-Dose Pressors**
  - ➢ Consider drawing up or administering Push-dose Epinephrine
- ☐ **Post-tube Sedation / Analgesia**
  - ➢ Prepare Post-intubation Sedation and Analgesia
- ☐ **Consider Pretreatment 3-5 minutes prior**
  - ➢ Fentanyl (TBI, CVA, MI, Ao Dissection); Atropine (Pediatric)
- ☐ **Failed Airway Plan Verbalized to the team**
  - ➢ Discuss management plan for failed intubation

PATIENT PREPARATION

- ☐ **PreOx** ≥ 3 minutes with 15 LPM NRB or BVM + PEEP, and NC 4-6 LPM
- ☐ **Apneic Oxygenation with NC 15 LPM** once Induced/Sedated
- ☐ **Oxygenated ≥ 94%** prior to Induction
  - ➢ Consider using CPAP or BVM + PEEP if unable to reach 94% with NRB
- ☐ **Positioning**: 30° Head-up for Pre-Ox, Ear-to-Sternal Notch for Intubation
  - ➢ If C-Spine Consideration, open front of C-Collar and perform Manual In-line Stabilization
- ☐ **Monitor is Visible** (HR, BP, SpO_2%, RR, $EtCO_2$)
- ☐ **Reliable IV Access Tested**

EQUIPMENT

- ☐ BVM (± PEEP Valve) on Oxygen
- ☐ Waveform Capnography on BVM (minimum Colorimetric)
- ☐ ± Video Laryngoscope powered on
- ☐ ± Back-up Laryngoscope ETT, ETT size down, 2x Stylet, 2x Syringe, Tube Securing
- ☐ Bougie
- ☐ OPA, NPA, SGA (iGel, LMA, King LT)
- ☐ Nasogastric or Orogastric Tube
- ☐ Cricothyrotomy Kit
- ☐ Suction on and accessible

Rapid Sequence Intubation

CLINICAL INDICATIONS:

- Airway Compromise or Inability to Protect Airway
- Respiratory Failure (Hypoxic, Hypercapnic)
- Expected Clinical Deterioration
  - >40% TBSA Burns, Severe Sepsis, TBI with AMS, etc
- Patient or Crew Safety
  - Combative, prolong transfer in critically sick, etc

CONTRAINDICATIONS:

- High likelihood of failure (Distorted Anatomy)
- Penetrating neck trauma

PROCEDURE:

- Make a plan, prepare patient and equipment (See **PRE-INTUBATION CHECKLIST**)

Conduct seven "P" pneumonic **(7Ps):**

PREPARE	☐ **SOAPME:** - Suction: available, check for function - Oxygen: Pre-Oxygenation + Apneic Oxygenation - Airways: ETT, SGA (iGel, King, etc), Cricothyrotomy - Pharmacology: Induction, Paralysis, Post-intubation Sedation - Monitor: BP, HR, RR, SpO_2%, $EtCO_2$ capnography, 4-lead - Equipment: Bougie, Laryngoscope, Video Laryngoscope, Cric Kit ☐ **Difficult Airway Evaluation** (LEMON or HEAVEN Criteria) - Consider alternate airway, cricothyrotomy, or modify plan ☐ **Evaluate Cricothyrotomy Landmarks and Assess Procedural Difficulty**
PRE-OX	**PreOxygenate / Denitrogenate** ≥ 3 minutes or 8 Vital Capacity Breaths with 15 LPM NRB or BVM + PEEP, and NC 4-6 LPM ☐**Oxygenated ≥ 94%** - Patients remaining <94% may require CPAP or BVM + PEEP safe O_2 saturation **Apneic Oxygenation with NC 15 LPM** once Induced/Sedated
POSITIONING	☐ **30° Head-up for Pre-Oxygenation** ☐ **Ear-to-Sternal Notch for Intubation** ☐ **C-Spine Consideration:** Open front of C-Collar; perform Manual In-line Stabilization
PRETREAT	**Resuscitate** with IVF or Blood Products and Push-Dose Pressors to ensure SBP>100mmHg ☐**3-5 Minute prior to Sedative / Paralytic** - **Fentanyl** 3mcg/kg slow IV push to prevent Hypertension in head injury, cardiac ischemia, or aortic dissection - **Atropine** 0.02mg/kg IV to prevent bradycardia in Peds (age <1y)
PARALYZE / SEDATE	**Push** Ketamine or Etomidate; and then Rocuronium or Vecuronium ☐**Apneic Oxygenate:** Turn Nasal Cannula to 15LPM once patient becomes drowsy ☐ **Monitor SpO_2%** and Wait 45-60 second for adequate paralysis
PASS TUBE	☐ **Visualize Cords and Pass Tube**
POST-TUBE MANAGEMENT	☐ **Inflate Bulb and Begin Bagging** ☐ **Verify Tube Place with $EtCO_2$ waveform capnography** - Direct visualization, mist in tube, equal rise and fall, bilateral breath sounds with absent gastric sounds, improving SpO_2%, $EtCO_2$ colorimetric gold color change x6 ☐ **Secure Endotracheal Tube with commercial securing device** ☐ **Place patient on Post-intubation Sedation**

RSI MEDICATIONS

Induction Agents:

Ketamine 1-2mg/kg IV
Etomidate 0.3mg/kg IV
Midazolam 0.1mg/kg IV
Propofol 1-2.5mg/kg IV

Paralytics:

Rocuronium 0.6-1.2mg/kg IV
Vecuronium 0.08-0.15mg/kg IV
Succinylcholine 1.0-1.5mg/kg IV

Maintenance Sedation:
Ketamine 0.5-2mg/kg IVP or 0.5-2mg/kg bolus then 0.5-1mg/kg/hr
Propofol 10-75mcg/kg/min
Midazolam .05mg/kg IVP or .05mg/kg bolus then 0.05-0.1mg/kg/hr

Push Dose Epi:
Epinephrine 5-20mcg IV q2-5min

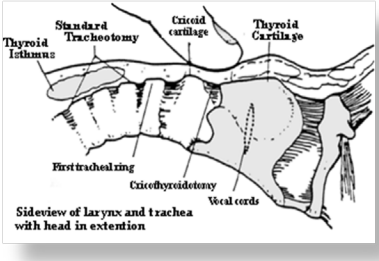
CRICOTHYROIDOTOMY

CLINICAL INDICATIONS:

- DIFFICULT AIRWAY- Airway can receive one (1) RSI attempt before calling it a failed airway. Two exceptions exist:
  - Inability to maintain proper O_2 saturation above 90% or major trauma or obstruction
- NON-DIFFICULT AIRWAY- Airway can receive two (2) attempts so long as O_2 saturation is >90%.
- Inability to place / ventilate with blind insertion airway device (BIAD) or inability to provide ventilation with Bag-Valve mask.
- Massive facial trauma or neck trauma precluding the use of orotracheal intubation/BIAD.

CONTRAINDICATIONS:

- Age <12yo, abnormal anatomy. (See Needle Cricothyroidotomy)



PROCEDURE:

- Maintain patient in sniffing position or place them into sniffing position. Utilize inline stabilization if indicated.
- Oxygenate the patient with 100% O_2. Identify and cleanse the cricoid area with betadine / alcohol while oxygenating if possible.
- Before incising place static non-dominant hand using the middle and thumb to hold either side of the thyroid cartilage with the palm towards the head leaving and area between the fingers inferiorly to make the incision. This hand will not move until bougie is confirmed in the trachea.
- Using a scalpel, make an adequate (2-3cm) vertical incision over the cricothyroid membrane. Then, using hemostats, bluntly dissect until membrane fully visualized.
- Make an adequate horizontal incision through the cricothyroid membrane into the trachea. Spread incision with either hemostats or scalpel handle.
- At this point the index finger of the hand gripping the thyroid cartilage can be placed within the opening and the posterior aspect of the trachea can be palpated. The index finger maintains the tract should the airway be extremely bloody as this procedure is prone to be. The bougie/stylet is then placed along the index finger ensuring tracheal guidance and not subcutaneous plane dissection or posterior tracheal perforation into the esophagus.
- Once the bougie/stylet is inserted, pass a cricothyroid tube or 6-0 ETT into the trachea (if ETT used, only insert until just past the cuff, then inflate the cuff). Secure tube in place and begin to ventilate with BVM / 100% O_2.
- Confirm placement with capnography, capnometer, bilateral chest rise / breath sounds, good PO_2, $EtCO_2$, lack of increasing SQ air (a small amount is normal).
- **Document procedure, results, and vital signs.**

NEEDLE CRICOTHYROIDOTOMY

CLINICAL INDICATIONS:

- Child <10yo in whom open cricothyroidotomy is contraindicated with the following:
    - Failed intubation attempts x 3 by the most experienced provider present with inability to ventilate with BVM/high risk to ventilate with BVM.
    - Inability to place/ventilate with blind insertion airway device (BIAD).
    - Massive facial trauma or neck trauma precluding the use of orotracheal intubation/BIAD.

CONTRAINDICATIONS:

- Ability to ventilate adequately with BVM.
- Prolonged time to definitive care (relative).

NOTE: this technique requires a minimum of 50 psi O_2 or pressurized air flow and a special adapter to connect the line to the catheter hub; do not attempt otherwise.

PROCEDURE:

- Maintain patient in sniffing position or place them into sniffing position. Utilize inline stabilization if indicated.
- Oxygenate the patient with 100% O_2. Identify and cleanse the cricoid area with betadine / alcohol while oxygenating if possible.
- Using a 14g IV attached to a 3mL syringe, puncture the cricothyroid membrane at a 90º angle. **Do not advance needle once air returned.**
- Change angle to 45º and **advance catheter only.** Should advance with no resistance. Remove needle and syringe.
- Secure catheter in place. Remove needle and plunger from syringe and place an adapter from a 7-0ETT on end of syringe in place of plunger. Attach this to the catheter.
- Attach a BVM attached to 100% O_2 to the adapter / syringe and ventilate. A large amount of resistance will be felt due to the small catheter size. Evaluate for chest rise and oxygenation. The provider needs to allow a 1:3 ratio of inhalation/exhalation.

Document procedure, results, and vital signs.

NOTE: Needle Cricothyroidotomy only allows for oxygenation, not ventilation. It is meant as a temporizing measure until definitive care–tracheostomy–can be performed at an MTF.
This airway should be used for only 20-30min maximum if able.

- Start working alternatives immediately after initiation-such as retrograde wire intubation, surgical cric with needle as an anatomical landmark.

SIMPLE (FINGER) and TUBE THORACOSTOMY

CLINICAL INDICATIONS:

- Pneumothorax + positive pressure ventilation or interfering with oxygenation
- Hemothorax + positive pressure ventilation or interfering with oxygenation
- Chest injury with suspected pneumo / hemothorax as above
- Evidence of tension pneumothorax after needle thoracostomy attempts

CONTRAINIDICATIONS:

- Stable patient oxygenating well, no tension PTX
- Blood clotting abnormalities (relative)

PROCEDURE (STERILE):

- Ensure all equipment prepared / available: Scalpel, 4X4 gauze, petroleum gauze, suture material (0-1-0 silk), 28Fr or larger chest tube, Heimlich valve/Water seal, large Kelly clamp x 2, betadine/skin cleanser, 1-2% lidocaine, 10mL syringe with needle for lidocaine, sterile gloves.
- If possible, position patient supine with shoulder flexed up and hand under his/her head.
- Identify and clean area of insertion with skin cleanser. Area of insertion should be over the 4th or 5th rib (3rd or 4th intercostal space) on injured side.
- If possible, with conscious patient, anesthetize the area with lidocaine. Take care to anesthetize the rib by passing needle perpendicular to skin until bone contacted and backing off slightly to inject lidocaine. May also anesthetize the pleura by advancing needle just until air returned and then injecting area while pulling back needle.
- Make incision in skin/SQ tissue overlying 5th rib. Ensure incision large enough for insertion of tube/ finger (approximately 1-2 inch).
- Bluntly dissect tissue going over 5th rib with second clamp until pleura is reached, then puncture the pleura with the clamps. *Prevent overly deep insertion by using non-dominant hand to guide insertion or holding clamps in hand with index finger on shaft of the instrument.*
- Open clamps as wide as possible to enlarge the pleural opening and remove clamps. Blood and/or air may present at this time.
- Place finger into opening and palpate for any adhesions.
    - If Simple Thoracostomy **ONLY**, place vented chest seal over opening and position patient on ipsilateral side (if possible) and monitor for signs of tension pneumothorax.
    - If proceeding to tube placement, continue below ensuring tube is clamped closed on distal end before insertion.
- Advance tube into opening directing the tip of the tube posteriorly and superiorly towards the lung apex along the posterior aspect of the chest wall, ensuring all fenestrations are moved into opening. This method ensures tube will drain both hemo and pneumothoraces.
- Holding tube in place – Pad under tube with Kerlix and place modified chest seal around the tube ensuring seal of the wound and securing tube in place. If possible, stitch or staple tube into place.
- Apply suction to tube / Heimlich valve and remove clamp.

Document procedure, results, and vital signs.

CHEST TUBE TROUBLESHOOTING:

- Ensure tube not clamped / kinked and that suction is working.
- Ensure tube has not become dislodged.
- If evidence of tension PTX–remove attachments from end of chest tube (e.g., suction adapter, Heimlich valves, suction devices) to convert to open PTX. Troubleshoot attachments and re-apply if appropriate.

NEEDLE THORACOSTOMY

CLINICAL INDICATIONS:

Suspect a tension pneumothorax and treat when a casualty has significant torso trauma or primary blast injury and one or more of the following:

- Severe or progressive respiratory distress or tachypnea, absent or markedly decreased breath sounds on one side of the chest, chest pain, distended neck vessels, hemoglobin oxygen saturation <90% on pulse oximetry, shock, traumatic cardiac arrest without obviously fatal wounds

* Note: If not treated promptly, tension pneumothorax may progress from respiratory distress to shock and traumatic cardiac arrest.

CONTRAINDICATIONS:

- None

PROCEDURE: **Note: This intervention is a BRIEF stopgap utilized in order to buy time for a definitive tube thoracostomy. It is not a solution unto itself.**

- Decompress the chest on the side of the injury with a 14-gauge or a 10-gauge, 3.25-inch needle/catheter.
- If a casualty has significant torso trauma or primary blast injury and is in traumatic cardiac arrest: decompress both sides of the chest before discontinuing treatment. Clean area if possible with betadine / alcohol, but do not delay treatment for this step.

Note: Either the 5th intercostal space (ICS) in the anterior axillary line (AAL) or the 2nd ICS in the mid-clavicular line (MCL) may be used for needle decompression (NDC.) If the anterior (MCL) site is used, do not insert the needle medial to the nipple line.

- The needle/catheter unit should be inserted at an angle perpendicular to the chest wall and just over the top of the lower rib at the insertion site. Insert the needle/catheter unit all the way to the hub and hold it in place for 5-10 seconds to allow decompression to occur.
- After the NDC has been performed, remove the needle and leave the catheter in place.
- The NDC should be considered successful if:
    - Respiratory distress improves; there is an obvious hissing sound as air escapes from the chest when NDC is performed (this may be difficult to appreciate in high-noise environments); hemoglobin oxygen saturation increases to 90% or greater (note that this may take several minutes and may not happen at altitude); casualty with no vital signs has return of consciousness and/or radial pulse.
- If the initial NDC was successful, but symptoms later recur:
    - Perform another NDC at the same site that was used previously. Use a new needle/catheter unit for the repeat NDC.
- If the second NDC is also not successful:
    - Fix appropriate circulation issues and consider finger/tube thoracostomy.

Document procedure, results, and vital signs.

VENTILATOR MANAGMENT

CLINICAL INDICATIONS:

- Patient received from transferring facility, intubated, and requires ventilator support.
- Patient requiring intubation in the field and subsequent respiratory support.

CONTRAINDICATIONS:

- Equipment malfunction / failure.

PROCEDURE:

- Turn on ventilator and ensure that machine is functional and battery is charged.
- Attach ventilator tubing and O_2 tubing to machine.
- If patient is a transfer and already on vent, maintain ventilator settings from medical treatment facility.

If patient "newly" on ventilator, initial settings include:

- **Mode:** Assist Control (AC) / CMV+ or ASV (Hamilton T1 only). AC / CMV+ are the preferred modes over ASV.
- **Tidal Volume (Vt):** Initially 6cc/kg, (Ideal Body Weight (IBW) then adjust based on ventilatory needs (4-8cc/kg)
  - IBW calculation for Predicted Body Weight in Kg:
    - Men: [(height in inches – 60) x 2.3] + 50
    - Women: [(height in inches – 60) x 2.3] + 45.5.
  - ***Tidal Volume should not be altered to fix ventilation, adjust rate instead for increased or decreased minute volumes***! Vt only gets changed for lung protection (i.e. to prevent barotrauma/volutrauma)
  - Reduce VT by 1ml/kg at intervals ≤ 2hr until VT = 6cc/kg PBW
  - SEE PBW Tidal Volume Chart Below

PA.10 Simple & Tube Thoracostomy
PA.11 Needle Thoracostomy
PA.12 Ventilator Management
PA.123 754 Preflight and Troubleshooting
PA.14 731 Preflight and Troubleshooting
PA.15 COVID-19 Management
PA.1p Pediatric Airway
PA.2 Airways Pearls
PA.3 Airway Confirmation
PA.4 BIAD
PA.5 Failed Airway
PA.4 Nasopharyngeal Airway
PA.7 Rapid Sequence Intubation
PA.7a Pre-intubation Checklist
PA.8 Cricothyroidotomy
PA.9 Needle Cricothyroidotomy

- **Rate (RR):** Initially 14, adjust based on CO_2 (If CO_2 >45mmHg) and ventilatory needs (10-30)
- **I:E:** 1:2 (Patients with obstructive lung diseases should have increased I:E around 1:4 or 1:5; If rate >20 (most children) will need to titrate iTime down to achieve appropriate I:E ratio)
- **FiO2/PEEP (Should be adjusted in concert per the chart below)**
  - Start at 100% (1.0) FiO_2 and PEEP of 5; PEEP no higher than 16 on Pediatrics w/out expert consult
  - Wait 5 minutes and assess SpO_2

Lower PEEP/higher FiO2

FiO_2	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7
PEEP	5	5	8	8	10	10	10	12

FiO_2	0.7	0.8	0.9	0.9	0.9	1.0
PEEP	14	14	14	16	18	18-24

*** Hypotensive patients (MAP <70 or SBP <90) may respond negatively to increased PEEP causing decreased venous return. Monitor for increased hypotension and tachycardia.**

- **Alternate Higher PEEP settings**

Higher PEEP/lower FiO2

FiO_2	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5
PEEP	5	8	10	12	14	14	16	16

FiO_2	0.5	0.5-0.8	0.8	0.9	1.0	1.0
PEEP	18	20	22	22	22	24

- **Oxygenation Goal:** PaO_2 55-80 mmHg or SpO_2 88-95%
- **Plateau Pressure Goal: ≤30cm H_2O**
  - Check Pplat (0.5 second inspiratory pause), at least q4hr and after each change in PEEP or VT.
  - **If Pplat >30cm H_2O:** decrease VT by 1ml/kg steps (minimum = 4ml/kg).
  - **If Pplat <25cm H_2O and VT<6ml/kg**, increase VT by 1 ml/kg until Pplat >5cm H_2O or VT = 6ml/kg.
  - **If Pplat <30 and breath stacking or dys-synchrony occurs:** may increase VT in 1ml/kg increments to 7 or 8ml/kg if Pplat remains <30cm H_2O.
- **Alarm Settings:**
  - **High Pressure Alarm:** 10cm H_20 above peak airway pressure
  - **Low Pressure Alarm:** 5cm H_2O below peak airway pressure

    or
  - **High Pressure Alarm** 50% above the baseline PIP (1.5 x current PIP)
  - **Low Pressure Alarm** 50% below the baseline PIP (0.5 x current PIP)

    ** *Pressures will be determined by placing patient on vent for ~1-2 minutes and determining intrinsic peak inspiratory pressure. (Labeled as PEAK on 754 Ventilator (top right); Labeled as Ppeak on Hamilton T1 ventilator (top left).*
- Monitor waveform on machine and patient to ensure not "breathe stacking" – if this occurs, a high-pressure alarm may sound. However, if breath stacking suspected even in absence of alarm – disconnect tubing and allow exhalation. Increase I:E.

Predicted Body Weight and Tidal Volume (V_T)

Male PBW and Tidal Volume							
Height		Predicted Body Weight	mL/kg of PBW (total V_T)				
Ft'In"	Inches		4.0 mL	5.0 mL	6.0 mL	7.0 mL	8.0 mL
4'0"	48	22.4	90	112	134	157	179
4'1"	49	24.7	99	124	148	173	198
4'2"	50	27	108	135	162	189	216
4'3"	51	29.3	117	147	176	205	234
4'4"	52	31.6	126	158	190	221	253
4'5"	53	33.9	136	170	203	237	271
4'6"	54	36.2	145	181	217	253	290
4'7"	55	38.5	154	193	231	270	308
4'8"	56	40.8	163	204	245	286	326
4'9"	57	43.1	172	216	259	302	345
4'10"	58	45.4	182	227	272	318	363
4'11"	59	47.7	191	239	286	334	382
5'0"	60	50	200	250	300	350	400
5'1"	61	52.3	209	262	314	366	418
5'2"	62	54.6	218	273	328	382	437
5'3"	63	56.9	228	285	341	398	455
5'4"	64	59.2	237	296	355	414	474
5'5"	65	61.5	246	308	369	431	492
5'6"	66	63.8	255	319	383	447	510
5'7"	67	66.1	264	331	397	463	529
5'8"	68	68.4	274	342	410	479	547
5'9"	69	70.7	283	354	424	495	566
5'10"	70	73	292	365	438	511	584
5'11"	71	75.3	301	377	452	527	602
6'0"	72	77.6	310	388	466	543	621
6'1"	73	79.9	320	400	479	559	639
6'2"	74	82.2	329	411	493	575	658
6'3"	75	84.5	338	423	507	592	676
6'4"	76	86.8	347	434	521	608	694
6'5"	77	89.1	356	446	535	624	713
6'6"	78	91.4	366	457	548	640	731
6'7"	79	93.7	375	469	562	656	750
6'8"	80	96	384	480	576	672	768
6'9"	81	98.3	393	492	590	688	786
6'10"	82	100.6	402	503	604	704	805
6'11"	83	102.9	412	515	617	720	823
7'0"	84	105.2	421	526	631	736	842

PBW Males = 50 + 2.3 [height (inches) - 60]

Female PBW and Tidal Volume							
Height		Predicted Body Weight	mL/kg of PBW (total V_T)				
Ft'In"	Inches		4.0 mL	5.0 mL	6.0 mL	7.0 mL	8.0 mL
4'0"	48	17.9	72	90	107	125	143
4'1"	49	20.2	81	101	121	141	162
4'2"	50	22.5	90	113	135	158	180
4'3"	51	24.8	99	124	149	174	198
4'4"	52	27.1	108	136	163	190	217
4'5"	53	29.4	118	147	176	206	235
4'6"	54	31.7	127	159	190	222	254
4'7"	55	34	136	170	204	238	272
4'8"	56	36.3	145	182	218	254	290
4'9"	57	38.6	154	193	232	270	309
4'10"	58	40.9	164	205	245	286	327
4'11"	59	43.2	173	216	259	302	346
5'0"	60	45.5	182	228	273	319	364
5'1"	61	47.8	191	239	287	335	382
5'2"	62	50.1	200	251	301	351	401
5'3"	63	52.4	210	262	314	367	419
5'4"	64	54.7	219	274	328	383	438
5'5"	65	57	228	285	342	399	456
5'6"	66	59.3	237	297	356	415	474
5'7"	67	61.6	246	308	370	431	493
5'8"	68	63.9	256	320	383	447	511
5'9"	69	66.2	265	331	397	463	530
5'10"	70	68.5	274	343	411	480	548
5'11"	71	70.8	283	354	425	496	566
6'0"	72	73.1	292	366	439	512	585
6'1"	73	75.4	302	377	452	528	603
6'2"	74	77.7	311	389	466	544	622
6'3"	75	80	320	400	480	560	640
6'4"	76	82.3	329	412	494	576	658
6'5"	77	84.6	338	423	508	592	677
6'6"	78	86.9	348	435	521	608	695
6'7"	79	89.2	357	446	535	624	714
6'8"	80	91.5	366	458	549	641	732
6'9"	81	93.8	375	469	563	657	750
6'10"	82	96.1	384	481	577	673	769
6'11"	83	98.4	394	492	590	689	787
7'0"	84	100.7	403	504	604	705	806

PBW Males = 45.5 + 2.3 [height (inches) - 60]

ARDSnet, NIH NHLBI ARDS Clinical Network Mechanical Ventilation V_T card

Troubleshooting: Airway compromise or lost airway in-flight

- If at any time patient begins to desaturate or develop respiratory problems, immediately disconnect ventilator and ventilate patient with BVM (with PEEP valve if available) and 100% O_2 while correcting issues utilizing the **D.O.P.E.** algorithm:
    - **Displacement:** ETT in place, patient not extubated/ tube did not move during transfer. If advanced – pull back to original length and attempt to bag; if tube has pulled farther out of trachea, DO NOT ATTEMPT TO ADVANCE IT without placement of bougie to verify tracheal placement. When advancing bougie, feel for tracheal rings or carina stop. If in doubt, pull tube and attempt BVM. If this fixes problem, continue to bag patient. Upon stabilization, consider alternative advanced airways (extraglotic airway or cric).

      ****If ETT moves freely, access for ETT bulb rupture.**
    - **Obstructions:** Assess for secretions in ETT. Suction if indicated.
    - **Pressure:** Ensure that a tension pneumothorax / hemothorax has not developed (if chest tube in place, ensure it is functioning/ not kinked or clamped). If tension pneumo/hemothorax suspected, perform immediate needle thoracostomy. Assess the need for escarotomy if circumferential burn. Consider additional paralysis and sedation if patient does not tolerate ventilation.
    - **Equipment:** Ensure that vent did not fail; O_2 tank not empty. If ventilator is operational, trace all tubes to the patient connection (airway tube, transducer line, exhalation line) ensuring patency and connections.

- **High pressure alarms / Peak airway pressure alarms** (Peak pressure >35cm H_2O): Correct problems causing increased airway resistance and decreased lung compliance, including pneumothorax or pulmonary edema. Check ventilator to make sure prescribed tidal volume is being delivered. Check for linked/crushed tubing.
- **Air leaks causing low pressure alarms / volume loss**: Assess, correct air leaks in endotracheal tube, tracheostomy cuff, ventilator system; recheck ventilator to make sure prescribed tidal volume is delivered.
- **Ventilator desynchrony**: Agitation and respiratory distress that develop in a patient on a mechanical ventilator who has previously appeared comfortable represents an important clinical circumstance that requires a thorough assessment and an organized approach. The patient should not always be automatically re-sedated but must instead be evaluated for several potentially life-threatening developments that can present in this fashion.
- **Lung hyperinflation (air trapping) and auto-PEEP:** Dynamic hyperinflation is associated with positive end-expiratory alveolar pressure, or auto-PEEP. The physiologic effects include decreased cardiac preload because of diminished venous return into the chest. The reduced cardiac output that results from the reduction in preload can lead to hypotension and, if severe, to Pulseless Electrical Activity and cardiac arrest. Dynamic hyperinflation can also lead to local alveolar over-distention and rupture**.** Prevent, manage lung hyperinflation by decreasing tidal volume, changing inspiratory and expiratory phase parameters, switching to another mode, and correcting physiological abnormalities that increase airway resistance.

- **Document procedure, results, and vital signs.**

Ventilator Transfer Procedure

1. Ensure endotracheal tube is secure, document size and position of ETT at the teeth. Clamp tube immediately before disconnecting patient from vent in order to maintain PEEP and un-clamp only after connected to new vent circuit.

2. Ventilator settings should be coordinated with the transferring physician, anesthesia provider or respiratory therapist. Verify settings, review arterial blood gas (ABG) analysis, and current SpO_2 and $EtCO_2$ readings. Place those setting on transport vent and place patient on transport vent early to verify patient tolerance and compatibility.

3. ABG should be done within 30 minutes of flight. If time allows, patient should be on transport ventilator for at least 15 minutes prior to transport.

4. Ventilator settings for en-route care team should initially be matched to those of the transferring facility. Adjust settings prn in order to maintain appropriate clinical parameters listed on first page of ventilator management protocol or transferring physician orders.

5. Ensure adequate sedation and analgesia medications are on hand.

VENTILATOR Terms

Volume-targeted modes: (Examples**: CMV** Continuous Mandatory Ventilation, **A/C** Assist/Control, **SIMV** Synchronized Intermittent Mechanical Ventilation) - Volume constant, inspiration terminates when preset V_t delivered. Peak airway pressure is variable and increases as needed to deliver prescribed V_t

Pressure-targeted modes: (Examples: **PSV** Pressure Support Ventilation**, PCV** Pressure Controlled ventilation) - Volume variable, terminates when preset pressure reached. Volume is variable. Peak airway pressure is fixed, determined by set pressure level.

Adaptive Support Ventilation (ASV): Only available on the Hamilton T1. ASV provides intelligent ventilation mode that continuously adjusts respiratory rate, tidal volume, and inspiratory time depending on the patient's lung mechanics and effort.

Tidal volume (V_t): The volume of gas, either inhaled or exhaled, during a breath and commonly expressed in milliliters. V_t is generally set between 4-8ml/kg IBW (ideal body weight), to prevent lung over-distension and barotrauma.

Minute Ventilation (V_E): The average volume of gas entering, or leaving, the lungs per minute, commonly expressed in liters per minute. The product of V_t and RR (respiratory rate). Normal V_E is 5–10L/min.

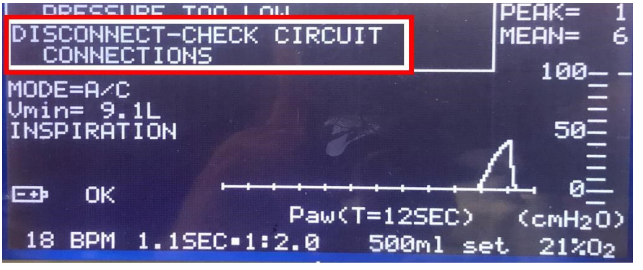
Inspiratory (I) **and Expiratory** (E) **time and I:E ratio**: The speed at which the V_t is delivered. Setting a shorter inspiratory time (I) results in a faster inspiratory flow rate. Average adult I time is 0.7-1 second. I:E ratio is usually 1:2-1:4

Positive end-expiratory pressure (PEEP): The amount of positive pressure that is maintained at end-expiration. It is expressed in centimeters of water. The purpose of PEEP is to increase end-expiratory lung volume and reduce air-space closure at end-expiration. Normal Physiologic PEEP is 5cm/H_2O.

Peak flow rate or peak inspiratory flow: The highest flow, or speed, that is set to deliver the V_t during inspiration, usually measured in liters per minute. When the flow rate is set higher, the speed of gas delivery is faster and inspiratory time is shorter.

Peak Airway Pressure (P_{AW}): Represents the total pressure that is required to deliver the V_t and depends upon various airway resistance, lung compliance, and chest wall factors. It is expressed in centimeters of water (cm H_2O).

Sensitivity or trigger sensitivity: Effort, or negative pressure, required by the patient to trigger a machine breath, commonly set so that minimal effort (-1 to -2 cm H_2O) is required to trigger a breath.



14. Preset ventilator for use per Duty Inspection Power On Checks and turn off.

Provide Continuous Positive Airway Pressure (CPAP/BiPAP)

Contraindications: Suspected Pneumothorax, SBP < 90mmHg, facial trauma, lack of airway protective reflex (unconscious) respiratory or cardiac arrest, vomiting or active upper GI bleed

1. If possible, place patient in seated position and explain the procedure.

2. Perform an initial respiratory assessment and assess vital signs.

3. Use the mask-sizing gauge to measure the patient for the correct mask size and attach the mask to the circuit.

Note: The mask selected should come close to, but not in contact with the nasal bone, external nares, and upper lip.

4. Turn the unit on and operate device according to manufacturer's specifications.

    Initial settings: CPAP 5cm H_2O

    Initial settings: BiPAP 10cm H_2O/ 5cm H_2O

    Adjusted on most ventilators by using PEEP input button

5. Place the head straps on the patient IAW the manufacturer's instructions. Check for leaks and readjust if necessary.

6. Initiate positive airway pressure and adjust the CPAP/BiPAP pressure with the lowest continuous pressure that is effective.

7. Perform a respiratory assessment and titrate treatment to physiological goal.

8. Monitor patient continuously, assess and record vital signs at a minimum of every 5 minutes.

9. Observe for signs of deterioration or failure to respond to CPAP/BiPAP.

10. Consider low-dose benzodiazepine for anxiety and mask tolerance.

IMPACT 754 Ventilator Pre-mission checks and Troubleshooting

Routine Care

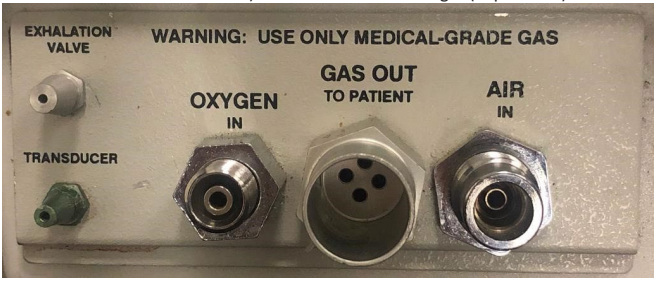
Clean unit and hose attachments with damp soapy cloth and wipe dry. Inlet filter may be removed to check for dirt or debris. Check metal hose couplings for thread wear and debris.

Duty Inspection

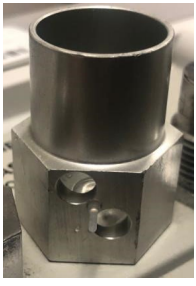
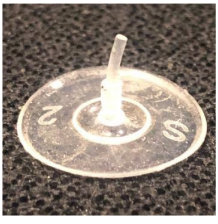
1. Power Off Checks
   a. Within calibration date (6 month maintenance cycle)

   b. Air inlet clear and filter in place (Right side of vent)

   c. Gas (“OXYGEN IN” and “AIR IN”) and Patient (“EXHALATION VALVE” and “TRANSDUCER”) connections clear and tight (Top of vent)



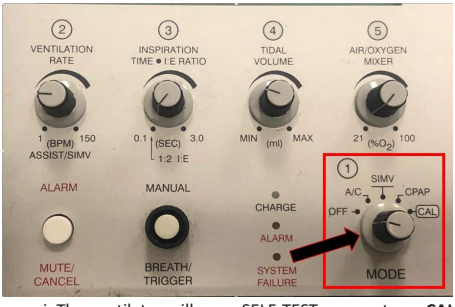
d. GAS OUT clear leaf valve installed and seated (Reseat if loose, Replace if missing) See replacement instructions at the end of this document.

e. Inspect green high pressure oxygen hose for cracks, dry rot, threads, Black O-ring (Replace if damaged).


f. Connect ventilator to high pressure oxygen source, turn on Oxygen tank and ensure no leaks present. Turn off O_2 when complete. (Conduct in environment conducive to hearing leaks)

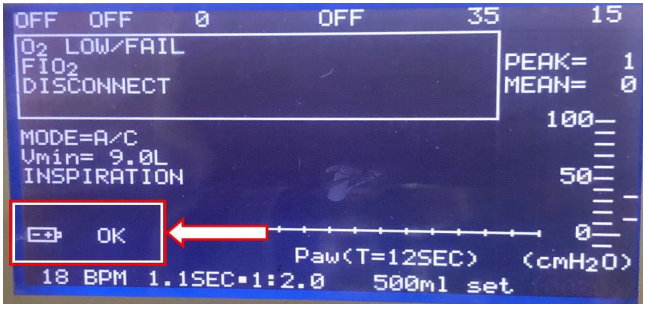
2. Power On Checks
   a. Turn “MODE” knob (1) to desired setting (A/C, SIMV, CPAP)



i. The ventilator will run a SELF-TEST upon set up. **CAUTION:** *SELF-CHECK must be performed with the disposable ventilator circuit disconnected. Ignoring this requirement could cause the SELF-CHECK process to sense a residual airway pressure leading to a SELF-CHECK failure.*

1. At this point, CAL is not required. If SELF-TEST results in a Calibration Failure, place (1) to CAL until CAL OK is displayed. If calibration fails, ventilator is deadlined.

b. Check BATT OK



c. Preset ventilator knobs to:

i. Rate (2) 18
ii. Inspiration Time (3) 1:2
iii. Vt (4) 500
iv. FiO_2 (5) 100%
v. HIGH pressure alarm to 35cmH_2O vi. LOW pressure to 15cmH_2O

d. Turn OFF

e. Store Ventilator with Air Inlet and Gas Out Ports protected and covered.

Ventilator is now pre-set for duty and able to be rapidly employed as needed with minor adjustments to Vt based on patient ideal body weight and turning on O_2 source

Weekly Inspections

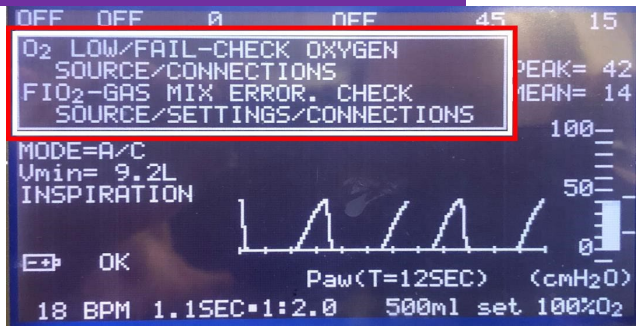
ALL CAUTIONS, WARNINGS, AND NOTIFICATIONS THAT CORRESPOND WITH THE 754 SCREEN WILL BE IN ALL CAPS AND HIGHLIGHTED YELLOW

1. Complete Duty Inspection
2. Set FiO_2 to 21%
3. Attach vent circuit to vent and field expedient training lung:
    a. Slide one large exam glove inside another.
    b. Wrap open end of the gloves around the patient end of the circuit tube.
    c. Secure with rubber band (DD1380) / Cut-off wrist bead of another glove / Penrose drain / Tape

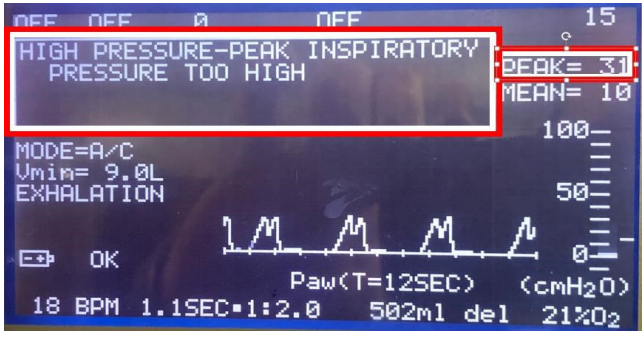
4. Connect high pressure oxygen source and turn on O_2
5. Turn vent on and allow respirations to begin (listen for compressor)
6. Set FiO_2 to 100%
    a. Internal compressor will stop (audible)
7. Turn off oxygen source
    a. Ventilator will alarm and show
    b.

"O_2 LOW/FAIL-CHECK OXYGEN SOURCE/CONNECTIONS"
and
"FiO_2-GAS MIX ERROR. CHECK SOURCE/SETTINGS/CONNECTIONS"

    c. Compressor will turn on (audible)

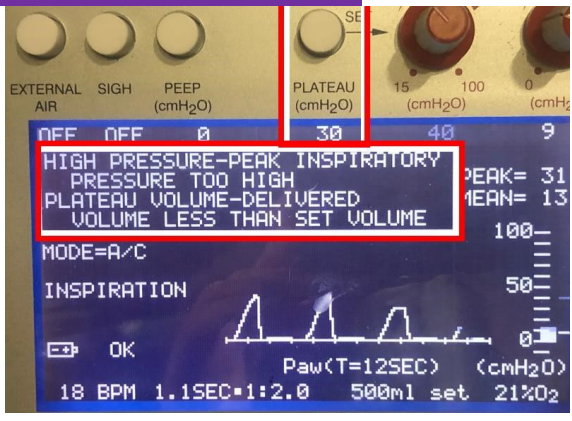


8. Set FiO_2 to 21%.
9. Set HIGH pressure alarm to 5cmH_2O **below** PEAK.
    a. Ventilator will "stutter" and show "HIGH PRESSURE-PEAK INSPIRATORY PRESSURE TOO HIGH" warning and signal an alarm.



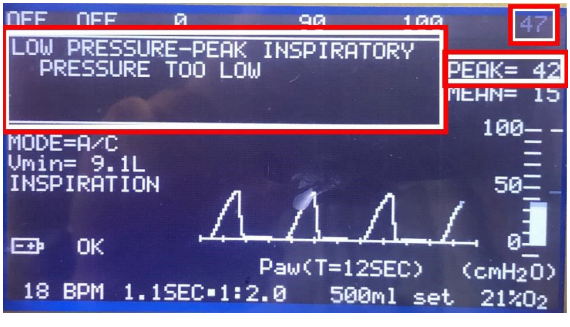
10. Turn PLATEAU pressure ON

    a. Ventilator will display "HIGH PRESSURE-PEAK INSPIRATORY PRESSURE TOO HIGH" and "PLATEAU VOLUME-DELIVERED VOLUME LESS THAN SET VOLUME" and trigger an alarm.



11. Turn HIGH Pressure alarm to 100.

12. Set LOW pressure alarm to 5cmH_2O **above** PEAK
    a. Ventilator will display "LOW PRESSURE-PEAK INSPIRATORY PRESSURE TOO LOW" and trigger an alarm.



13. Remove circuit from ventilator.

    a. Ventilator will display "DISCONNECT-CHECK CIRCUIT CONNECTIONS" and trigger an alarm.

IN-FLIGHT EMERGENCY

*****These procedures should be practiced before performed on live patients*****

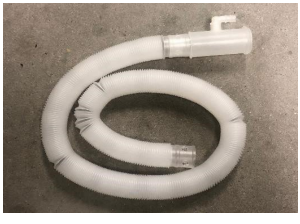
****Any known malfunction of ventilator should be addressed prior to flight. The following are not for routine use but for emergencies when alternate ventilitory measures are not available and long term BVM is not practical****

Loss of high pressure O_2 delivery when needs exceed 21% FiO_2 (i.e. missing/unserviceable green high pressure hose.) will alarm and show "O_2 LOW/FAIL-CHECK OXYGEN SOURSE/CONNECTIONS" on screen

NOTE: First Place Patient on BVM with supplemental O_2. Second, check oxygen tank volume. Third, check the O_2 lines and connections

Alternative methods to increase delivered oxygen content

1. Commercial oxygen reservoir kit for low pressure supply is available (Part # 820-0097-15)



2. Oxygen reservoir fashioned from primary circuit and BVM
   a. Connect short portion of main circuit tube to the BVM and to the airinlet port.
   b. Connect BVM O_2 hose to the BVM and the regulator.
   c. Set regulator to desired setting (~10LPM, but no lower than total minute volume.

3. Oxygen reservoir fashioned from second ventilator patient circuit.
   a. Cut/disconnect exhalation valve off of second ventilator circuit.
   b. Remove transducer fitting from exhalation valve at attach it to the main circuit.

c. Connect the transducer hose to the original transducer fitting and the other end to regulated oxygen source.
d. Connect the transducer fitting (still attached to the circuit) to the air inlet port.
e. Set regulator on O_2 source to 10 LPM to deliver up to 99% FiO_2.

NOTE: Ventilator circuit tubing will provide reservoir for 650-700ml of O_2. Vt of greater than 650-700ml may result in lower FiO_2.

Missing or damaged "GAS OUT" leaf valve

1. Missing "GAS OUT" leaf valve will trigger an alarm, give a "DISCONNECT- CHECK CIRCUIT CONNECTIONS", no "PEAK" value will display, and little to no volume will be delivered to patient.

    a. Place patient on BVM with supplemental O_2
    b. Perform DOPE (Dislodgment, Obstruction, Pneumothorax, and Equipment) assessment.
    c. Check "GAS OUT" leaf valve for installation and proper seating.
        i. If folded, use small object to gently unfold or push valve back into place
        ii. If missing, replace ventilator immediately if able. If unable to replace, cover GAS OUT side ports with occlusive dressing. (Replacing GAS OUT leaf valve is optimal but time consuming.)

***WARNING**: Occluding GAS OUT side ports will enable ventilator to provide full respirations, however, this will eliminate the antiasphyxia function these ports provide (Ventilator failure will result in increased resistance in spontaneous respiration) and strict surveillance must be kept on ventilator to ensure any further failure is caught immediately. Patient must immediately be transitioned to BVM in the event of any failure.*

Compressor failure/alarms (may show CODE 2)

1. Place patient on BVM with supplemental O_2
2. Cycle ventilator to OFF

3. Turn FiO_2 knob (#5) to 100%
4. Cycle back on and to desired settings leaving FiO_2 at 100%
    a. PEEP will have to be reset when vent is cycled on.

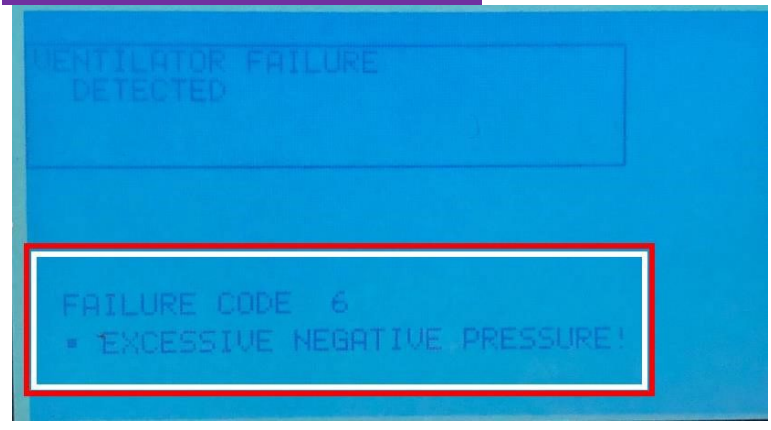
Note: This technique will transition the ventilator to using oxygen pressure instead of the compressor to drive ventilation and may hasten oxygen usage

 Battery Failure

1. Place patient on BVM with supplemental O_2
2. Turn ventilator OFF
3. Replace ventilator battery with battery from 326M suction apparatus. (Per the manufacturer, they are the exact same!)
    a. 326M battery is in the same location as the 754.
4. Resume normal operations
    a. PEEP will have to be reset when vent is cycled on.

Fail Code 6

Suctioning to long with inline suction and/or patient inspiratory effort is significant enough to trigger.

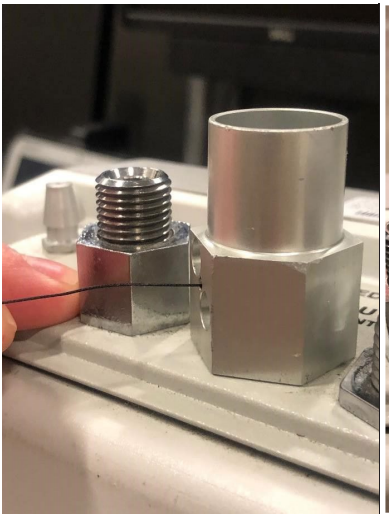


1. Place Patient on BVM with O_2
2. Assess Patient
3. Cycle Vent off and on (will have to reset Peep)
4. Check vent settings
5. Place patient on ventilator

Document all failures of equipment and solutions on DD1380, DA4700, and in Joint Patient Safety Reporting (JPSR) registry https://health.mil/Military-Health-Topics/Access-Cost-Quality-and-Safety/Quality-And-Safety-of-Healthcare/Patient-Safety/Joint-Patient-Safety-Reporting

REPLACING GAS OUT LEAF VALVE

1. Feed suture through small center hole.



2. Tie small square knot over end of tail of leaf valve.

3. Pull gentle tension on suture while guiding the leaf valve into place.

4. Maintain gentle traction against suture while applying pressure against the leaflet valve inside gas port with finger. Remove string once valve is seated. (Use caution to not apply too much tension to suture as leaf valve tail can tear.)

Ventilator inspiratory bacteria filter can be attached to air inlet (Missing air filters allow dust, debris, and/or moisture to be pulled into the ventilator compressor. This results in increased work-load of the ventilator leading to diminished battery life and eventual compressor failure)

Common Replacement Parts

Zoll/ NSN Part Numbers

-Zoll Part #: 820-0097-15 Oxygen reservoir kit for low pressure supply

-MEDSILS: OXYGEN ADAPTER BLEED-IN RESERVOIR FOR VENTILATORS

NSN: 6515-01-518-5060

-Zoll Part #: 704-0754-01 Battery Pack

-MEDSILS: BATTERY POWER SUPPLY USED ON VENTILATOR

NSN: 6130-01-468-8361

-Zoll Part #: 490-0005-00 Valve, Leaf

-MEDSILS: VALVE REGULATING SYSTEM PRESSURE

NSN 6530-01-464-0267

ZOLL 731 Ventilator Pre-mission Checks and Troubleshooting

Routine Care

- Keep the ventilator and its accessories clean at all times.
- Clean the unit's housing and hose connections with a damp, soap cloth
- For general decontamination, apply a 10% bleach solution with a damp cloth.
- After cleaning, thoroughly dry the unit with a lint free cloth. Make sure all exposed surfaces are cleaned and dried.

Duty Inspection

- Ensure the ventilator is clean and free of visible damage
- Inspect all accessories and connectors for signs of damage or excessive wear. Replace worn or defective items.
- Examine high pressure hose for cracking, discoloration, or disfigurement. Examine end connection fittings for damaged threads and sharp edges. Replace worn or defective hoses. *DO NOT attempt to repair hoses
- Examine the ventilator circuit for damage or wear including cracking or discoloration. If there are signs of physical degradation or the unit is indication ventilator circuit problems, replace the circuit
- Examine the filters and replace them if dirty of clogged
- Inspect the external AC/DC adapter, line cords, and DC power cables for wear or damage. Replace if worn or damaged.

*Recommended to use a disposable external filter when operating in areas where fine dust or dirt is airborne due to wind.

* The Zoll Ventilator can operate over the range of -25 to 49 degrees Celsius in emergency situations. When operating at high temperatures, you should remove the unit from its padded case, which allows the unit to pass heat into the surrounding environment.

Operational Test

Before attaching the patient to the ventilator, you must perform an Operational Test to ensure that the breathing circuit is properly attached and that the primary patient safety alarms, such as PATIENT DISCONNECT and AIRWAY PRESSURE HIH, are functioning properly.

1. Press the MANUAL BREATH button; gas should flow out of the patient connection each time the button is pressed.
2. Close the patient port with a gloved hand. During inspiratory phase, the HIGH AIRWAY PRESSURE LIMIT alarm should activate after 2 breaths.

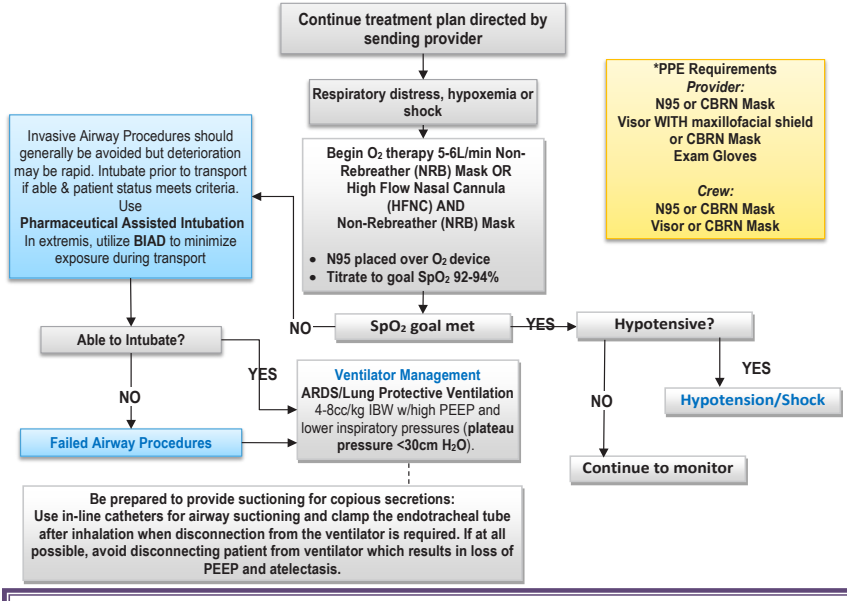
a. If the AIRWAY PRESSURE HIGH alarm fails to activate, ensure all the tubing connections are secure, the exhalation valve is closing during inhalation, and that the High Airway Pressure Limit is set to 35cm H_2O or less.

3. After a breath or two, release the patient port while allowing the ventilator to operate. The PATIENT DISCONNECT alarm should activate.
4. Partially close the patient port to reset the PATIENT DISCONNECT alarm.
5. With no other alarms occurring, remove external power from the ventilator. The EXTERNAL POWER LOW/DISCONNECT alarms should activate. Reconnect external power to reset alarms. **MAY SKIP THIS STEP IF NOT CONNECTED TO EXTERNAL POWER**
6. If operating using internal battery, verify the Battery Icon indicates sufficient available battery capacity remains to support the anticipated duration of operation.

If either the HIGH AIRWAY PRESSURE, PATIENT DISCONNECT, or EXTERNAL POWER LOW/DISCONNECT alarms fail to activate, continue to manually ventilate the patient, replace the ventilator, and send the unit in for service.

COVID-19 Management

Criteria:
Only as last resort if all ground/fixed wing options have been exhausted. MEDEVAC crews WILL follow OTSG guidance for transport of COVID patients, and transport only if required PPE, PM, decon material and appropriate approval authorities are available BEFORE transport



Pearls:

- Recognize severe hypoxemic respiratory failure when a patient with respiratory distress is failing to respond to standard oxygen therapy. Prepare to provide advanced oxygen and ventilatory support. Patients may deteriorate rapidly, continuous monitoring is critical!
- Avoid fluids if not in shock. If required, use balanced crystalloids (LR) instead of unbalanced crystalloids (0.9% NS). If patient remains hypotensive, refer to **Hypotension/Shock**
- Do not prone position patients in flight; rehearse for emergency re-proning in event of accidental lost airway
- Favor HFNC over BiPAP/noninvasive ventilation (NIV) if early intubation and mechanical ventilation is not possible.
- Avoid use of nebulized medications, Bag Valve Mask ventilations (BVM), NIV, and suctioning when possible
- Avoid BiPAP if HFNC is unsuccessful and consider early intubation
- Perform continuous $EtCO_2$ monitoring. Permissive hypercapnia is acceptable.
- If high pressure alarms are presenting, it may be necessary to reduce Vt if SpO_2 and $EtCO_2$ are within normal limits.
- *Post-mission Decon- Crewmembers should remain in full PPE until completion of mission, not just patient drop-off if aircraft is not being deconned at drop-off site

Epidemiologic risk factors	Exposure category	Recommended Monitoring for COVID-19 *(until 14 days after last potential exposure)*	Work Restrictions for Asymptomatic HCP
Prolonged close contact with a COVID-19 patient who was wearing a facemask (i.e., source control)			
HCP PPE: None	Medium	Active	Exclude from work for 14 days after last exposure
HCP PPE: Not wearing a facemask or respirator	Medium	Active	Exclude from work for 14 days after last exposure
HCP PPE: Not wearing eye protection	Low	Self with delegated supervision	None
HCP PPE: Not wearing gown or gloves[a]	Low	Self with delegated supervision	None
HCP PPE: Wearing all recommended PPE (except wearing a facemask instead of a respirator)	Low	Self with delegated supervision	None
Prolonged close contact with a COVID-19 patient who was not wearing a facemask (i.e., no source control)			
HCP PPE: None	High	Active	Exclude from work for 14 days after last exposure
HCP PPE: Not wearing a facemask or respirator	High	Active	Exclude from work for 14 days after last exposure
HCP PPE: Not wearing eye protection[b]	Medium	Active	Exclude from work for 14 days after last exposure
HCP PPE: Not wearing gown or gloves[a,b]	Low	Self with delegated supervision	None
HCP PPE: Wearing all recommended PPE (except wearing a facemask instead of a respirator)[b]	Low	Self with delegated supervision	None

*****Report all potential high and medium exposures to Flight Surgeon as soon as possible*****

Self-Monitoring with delegated supervision in this setting means HCP perform self-monitoring with oversight by their Flight Surgeon or delegate. On days HCP are scheduled to work, healthcare facilities could consider measuring temperature and assessing symptoms prior to starting work.

Ventilator Exchange Checklist

Two person procedure- One for airway, one for ventilator.

- All persons in the room/area in full PPE
- All equipment gathered and field prepped
- Transport ventilator preset / staged in sequence with circuit- $EtCO_2$- *Filter-Inline Suction
- Temporarily hyper-oxygenate with 100% FiO_2 prior to exchange
- Allow patient to inhale
- Clamp tube at end of inhalation (ensure use of smooth clamps or pad ET tube)
- Place primary/in use ventilator in Stand-by (ex. T1) or disconnect inspiratory limb from ventilator side- ensuring to minimize contamination from in-use vent and circuit
- Break the circuit
- Place transport ventilator on patient
- Unclamp ET Tube (ensure tube is open)
- Verify Ventilation

* HME/viral filters should be placed as close to patient as possible and in accordance with manufacturer guidelines

HEMORRHAGE CONTROL PROCEDURES

CLINICAL INDICATIONS:

- Hemorrhage

CONTRAINIDICATIONS:

- None

PROCEDURE:

- Rapid bleeding and/or arterial source recognized (extremities, axial, inguinal) – immediate application of extremity and/or junctional tourniquets, as appropriately needed, to stop bleeding.
- For compressible (external) hemorrhage not amenable to limb tourniquet use Combat Gauze, the CoTCCC hemostatic dressing of choice.
    - Alternative hemostatic adjuncts:
        - Celox Gauze, ChitoGauze, XStat (best for dep, narrow-tract junctional wounds) or iTCLamp (may be used alone or in conjunction with hemostatic dressing or XStat).
    - Hemostatic dressings should be applied with at least 3 minutes of direct pressure (optional for XStat). Must apply adequate force to compress vessels. If size of wound and bleeding are concerning for adequate control, place hemostatic dressing as close to the bleeding vessel as possible followed by 5 min of direct pressure. Each dressing works differently, so if one fails to control bleeding, it may be removed and a fresh dressing of the same type or a different type applied. (Note: XStat is not to be removed in the field, but additional XStat, other hemostatic adjuncts, or trauma dressings may be applied over it.) If bleeding continues, apply a pressure dressing to the wound if applicable.
    - If unable to control bleeding in extremity wounds with above, apply tourniquet. Note: immediate transition to a tourniquet in an extremity wound hemorrhage is preferred.
    - In penetrating injuries to the abdomen, after removing blood, hemostatic dressings should be pushed into the wound and pressure held for five minutes to encourage clotting. Do not remove bandage after placement. Penetrating abdominal/thoracic injuries require a large amount of pressure to compress vessels.

- In pelvic wounds – utilize pelvic binding to limit capacity for hemorrhage (tie pelvis with sheet/commercial binder).
- For external hemorrhage of the head and neck where the wound edges can be easily re-approximated, the iTClamp may be used as a primary option for hemorrhage control. Wounds should be packed with a hemostatic dressing or XStat, if appropriate, prior to iTClamp application. DO NOT APPLY on or near the eye or eyelid (within 1cm of the orbit).
  - The iTClamp does not require additional direct pressure, either when used alone or in combination with other hemostatic adjuncts.
  - If the iTClamp is applied to the neck, perform frequent airway monitoring and evaluate for an expanding hematoma that may compromise the airway. Consider placing a definitive airway if there is evidence of an expanding hematoma.
- Administer IVFs as per guideline – use care with internal bleeding so as not to raise SBP above 80mmHg. MAP should be greater than >60mmHg.
- Consider 2g TXA if significant blood loss.

Document procedure, results, and vital signs.

*****Clear endpoints for fluid resuscitation remain unclear. Resuscitation should be geared towards patient response to therapy. A MAP greater than 60mmHg or a systolic BP between 70-80mmHg is a reasonable goal in trauma patients without a head injury. A MAP between 80-110mmHg or systolic pressure between 110-160mmHg is a recommended goal in patients with a head injury.**

MAP= Mean Arterial Pressure: MAP = [(2 x diastolic BP) + systolic BP] / 3)

Hemorrhage Classification (ATLS)

	Class I	Class II	Class III	Class IV
Estimated Blood Loss (mL)	<750 15%	750-1500 15-30%	1500-2000 30-40%	>2000 >40%
Heart Rate (min)	Normal to slightly elevated	Mild Tachycardia >100-119	Tachycardia 120-140	Tachycardia >140
Respiratory Rate (min)	Normal 12-20	Mild Tachypnea 20-24	Tachypnea 24-40	Tachypnea 24 - >40
Blood Pressure (from baseline)	Normal or slightly elevated	SBP with mild decline	SBP decreased*	SBP decreased (<90mmHg)
Urine Output (mL/hr	Normal > 30	Slight decrease 20-30	Decreased 5-15	Negligible <5
Capillary Refill	1-2 seconds	2 seconds	>2 seconds	> 3 seconds
Mental Status and Skin (color/texture)	Normal or slightly anxious	Mildly anxious, skin may become cool, clammy	Anxious, confused, skin cool, clammy	Confused, lethargic, skin will be cool/cold, pale

TOURNIQUET APPLICATION

CLINICAL INDICATIONS:

- Extremity trauma with continued hemorrhage or amputation.

CONTRAINDICATIONS:

- None

PROCEDURE: All medical personnel should be regularly practiced in deploying and applying all CoTCCC approved tourniquets. Tourniquets should be pre-set and removed from wrapping (ready for immediate use and application).

Initial HASTY placement (over uniform, clearly proximal to bleeding. If site of life-threatening bleeding is not readily apparent, place the tourniquet "high and tight" as proximal as possible on the injured limb.) HASTY tourniquet placement is appropriate for initial treatment of massive hemorrhage or hemorrhage while in care under fire phases. Reassess all HASTY placement tourniquets and asses if hemorrhage is manageable by other methods while in tactical field care or transition to tactical evacuation care. If tourniquet is necessary to manage hemorrhage, replace all HASTY placement tourniquets with DELIBERATE placement tourniquets, preferably prior to patient evacuation, per the following steps:

- Remove clothing as necessary to visualize bleeding area.
- Place tourniquet (commercial or any 2" wide piece of fabric, leather, etc.) directly on skin proximal to wound. Tourniquet should be placed at least 2-3" above bleeding site, proximal or distal to joints, as appropriate.
- Tighten tourniquet by twisting included rod (commercial) or piece of 6" rigid material (e.g., stick) until bleeding stops. If converting from HASTY to DELIBERATE tourniquet placement, loosen HASTY tourniquet. If bleeding is not well controlled with the first tourniquet, apply a second tourniquet side-by-side with the first.
- Secure ends of tension bar to prevent unwinding.
- Document presence of tourniquet and time of placement. ("T" signifies tourniquet). Do not cover tourniquet. Recheck tourniquet intermittently (q15min) and after any movements to ensure no new bleeding/loosening has occurred.
- **TCCC recommendations:**
    - Limb tourniquets … should be converted to hemostatic or pressure dressings as soon as possible if three criteria are met: the casualty is **not in shock**; it is possible to **monitor the wound closely** for bleeding; and the tourniquet is **not being used to control bleeding from an amputated extremity**. Every effort should be made to convert tourniquets in less than 2 hours if bleeding can be controlled with other means.
    - **Convert all necessary HASTY tourniquets to DELIBERATE tourniquets as soon as tactically feasible.**
    - Do not remove a tourniquet that has been in place more than 6 hours unless close monitoring and lab capability is available.

Document procedure, results, and vital signs.

JUNCTIONAL TOURNIQUET APPLICATION

CLINICAL INDICATIONS:

• High level amputation not amendable to a standard tourniquet, non-compressible hemorrhage in a transition zone (inguinal and axilla), and pelvic immobilization.

CONTRAINDICATIONS:

• None

PROCEDURE: All medical personnel should be proficient in deploying and applying all available tourniquets. Junctional tourniquets (JT) should be pre-set and removed from wrapping (ready for immediate use and application). Junctional tourniquets should be applied according to manufacturer's instructions.

• Remove clothing as necessary to visualize area of application if possible. Remove objects from patient's pockets or pelvic area. Slide device into place as necessary to proper position.

• Tighten tourniquet by twisting or pumping up balloon/bladder until bleeding stops. (depends on JT used)

• Secure all straps in order to ensure security of device.

• Document presence of tourniquet and time of placement on patient (forehead). ("T" signifies tourniquet). Do not cover tourniquet.

• Recheck tourniquet intermittently (q15min) and after any movements to ensure no new bleeding/loosening has occurred.

• Junctional tourniquets are recommended to be in place for up to **four** hours.

• ***If using a JT with pump device, additional inflation may be necessary with changes in altitude.

• The uniqueness of junctional tourniquets do not lend themselves to conversion well and should be left to Roles with surgical capability. Use caution if attempting Junctional Tourniquet Conversion. Must have high index of suspicion that injury is compressible and can be managed by other adjuncts.

Document procedure, results, and vital signs.

TOURNIQUET CONVERSION

CLINICAL INDICATIONS:

- Wounds that have high possibility of compressible hemorrhage control with hemostatic or pressure dressings where hemorrhage was originally controlled by a tourniquet

CONTRAINDICATIONS:

- Patient showing signs and symptoms of hypotensive/hemorrhagic shock
- Tourniquets controlling hemorrhage for amputated or partial-amputated extremity.
- Tourniquets that have been in place >6 hours.
- Unable to monitor wound for bleeding post tourniquet conversion due to task saturation, limited visibility or poor positioning.

PROCEDURE: Limb tourniquets and junctional tourniquets should be converted to hemostatic or pressure dressings as soon as possible if no above contraindications are present.

Every effort should be made to convert tourniquets in less than 2 hours if bleeding can be controlled with other means. **Do not remove a tourniquet that has been in place more than 6 hours**.

- Confirm patient is not showing any signs of hypotensive/hemorrhagic shock.
- With Tourniquet in place, attempt to pack wound with hemostatic dressing and apply a pressure dressing.
    - Combat Gauze is the CoTCCC hemostatic dressing of choice
    - Alternate hemostatic adjuncts:
        - Celox Gauze
        - ChitoGauze
        - XStat (best for deep, narrow-tract junctional wounds)
        - iTClamp (may be used alone or in conjunction with hemostatic dressing or XStat)
- Loosen but don't remove the tourniquet by unwinding the windlass until pulses return and closely monitor for return of bleeding for 5 minutes.
- If bleeding returns, retighten tourniquet until loss of distal pulse and document procedure failure.
- If no bleeding returns, loosen tourniquet completely but leave loosely looped around limb and monitor for return for bleeding for 5 minutes.
- If bleeding returns, retighten tourniquet until loss of distal pulse and document procedure failure.
- If no bleeding returns, document procedure success and time. Continue to monitor and assess for bleeding.

Document procedure, results, and vital signs.

VASCULAR ACCESS (INTRAVENOUS)

CLINICAL INDICATIONS:

- Need for intravascular access to provide resuscitative fluids and/or medications.
- Anticipated need for intravenous access in emergency patients.

CONTRAINDICATIONS:

- Injuries proximal to IV site/ipsilateral to IV site (relative).

PROCEDURE:

- Prepare all necessary equipment: PPE, tourniquet, IV catheters, alcohol/betadine wipe, saline lock or IV tubing, IVFs if administering, and tape/securing device.
- Ensure all IV tubing/saline locks flushed prior to attempting IV.
- Place venous tourniquet proximal to anticipated IV puncture site.
- Identify vein to be cannulated and cleanse overlying area with alcohol/betadine.
- While holding traction on skin/vessel, cannulate the vessel (use a shallow angle of attack with the needle). Once flash returned, advance slightly to ensure catheter in vessel, then advance catheter only fully into vessel (should pass without resistance).
- While holding pressure proximally on vein and maintaining catheter position, remove tourniquet and needle. Attach NS flush and flush IV – this fluid should flow easily into the vein – any resistance suggests missed attempt or "blown" vein. (Note: If blood samples being drawn – they should be taken prior to removing tourniquet and always prior to flush (after flushing – may obtain dilute sample which will alter results.)
- Secure catheter using transparent dressing or tape.
- Repeat until 2 IV sites have been established and are functional.

Document procedure, results, and vital signs.

VASCULAR ACCESS (INTRAOSSEOUS)

CLINICAL INDICATIONS:

- Need for intravascular access to provide resuscitative fluids and/or medications with inability to obtain adequate peripheral intravascular access (2 failed attempts or greater than 90sec).
- Anticipated need for intravenous access in emergency patients.

CONTRAINDICATIONS:

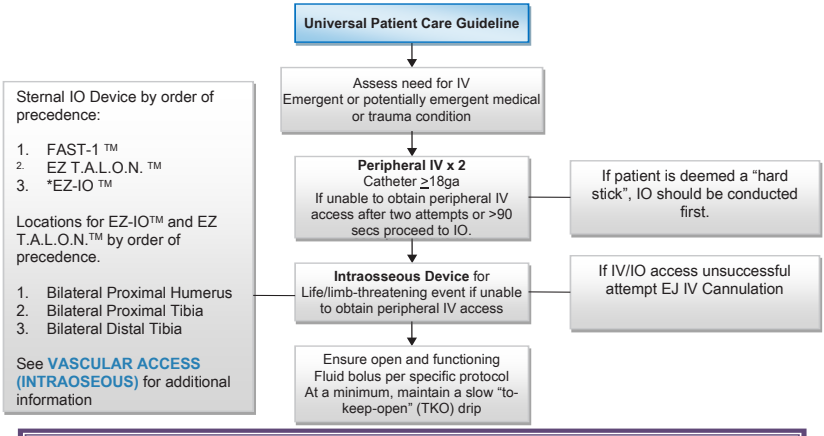
- **Only absolute contraindication is fracture at affected site or prior IO attempt in the same bone.**
- Cellulitis overlying puncture site (relative contraindication).
- Injury (not fracture) proximal to puncture site (relative – site dependent).
- FAST Tactical™ device contraindicated in pediatric patients less than 18 years old.

PROCEDURE:

- Prepare all necessary equipment: PPE, IO device, betadine scrub, and IV tubing.
- Ensure all IV tubing/saline locks flushed prior to attempting IV.
- Identify appropriate puncture area as follows:
  - **FAST Tactical™**
    - **Sternum – follow manufacturer instructions or training guidelines.**
  - **EZ IO™**
    - **Proximal Humerus (YELLOW 45mm) – 1 to 2 cm above the surgical neck into the most prominent aspect of the greater tubercle lateral to intertubercular (bicipital) groove, aiming 45-degrees downward towards contralateral hip.**
    - **Distal Femur (peds, BLUE 25mm) – Proximal to patella (max 1cm) and 1-2cm medial to midline.**
    - **Proximal tibia (BLUE 25mm or PINK 15mm) – 2cm (2 finger widths) distal to tibial tuberosity on medial aspect.**
    - **Distal tibia (BLUE or PINK) – 2cm (2 finger widths) proximal to medial malleolus.**
  - **Manual IO**
    - **Proximal tibia and distal tibia – same as EZ IO™ site.**
- Cleanse site well as failure to appropriately disinfect the area can lead to bone infections.
- Applying firm pressure, puncture skin at 90° angle (45 degree down for Humeral IO), puncture bone (felt as loss of resistance, give or "pop").
- Confirm placement by (1) needle felling firm in bone and (2) aspiration of blood/bone marrow. If unable to aspirate blood, attempt to aspirate after the flush
- Flush IO catheter with normal saline. May add 2% preservative-free Lidocaine without epinephrine to flush to decrease pain (2mL or 40 mg in adults, 0.5mg/kg not to exceed 40mg in pediatric).
- Constantly monitor for increased tension in muscular compartments as misplacement into a compartment with subsequent fluid administration can lead to iatrogenic compartment syndrome.
- With the exception of adult proximal humerus insertions, routinely inserting the needle set to the hub is not recommended technique.

Document procedure, results, and vital signs.

IV / IO PROTOCOL



Pearls:

- **GAIN VASCULAR ACCESS** where available based upon patient
- Any pre-hospital fluids or medications approved for IV use may be given through an intraosseous line – including blood products.
- All trauma patients or potentially ill patients should have **AT LEAST TWO functioning** IV / IO lines whenever possible.
- Upper extremity IV sites are preferable to lower extremity IV sites.
- Following IV attempt failure and IO attempt failure, external jugular lines can be attempted for life-threatening events with no peripheral access.
- Utilize EZ-IO™, FAST-1™, EZ T.A.L.O.N.™ or unit Medical Director approved IO device.
    - Sternal or humeral head sites are preferred over all other sites.
        - (Tibia is preferred for pediatrics).
    - Correct needle size is critical for the EZ-IO; use of universal/adjustable depth needle or:
        - Yellow - 45mm for humerus and *heavy sternal
        - Blue - 25mm for adult *sternum/tib
        - Pink - 15mm for children and *sternal/tib
    - Pressure infusion bag is recommended for IO starting at 300mmHg

*NOTE: Use of EZ-IO in sternal is off label emergency procedure only see VASCULAR ACCESS (INTRAOSEOUS)

VASCULAR ACCESS via CENTRAL CATHETERS

CLINICAL INDICATIONS:

- In the presence of a life threatening condition, with clear indications for immediate use of medication or fluid bolus. (Not for prophylactic IV access.)

CONTRAINDICATIONS:

- Suspected infection at skin site.

PROCEDURE:

- Determine the type of catheter present: PICC, Broviac, Hickman, Groshong Mediport, etc.

Procedure for peripherally inserted Central Catheter (Cook, Neo-PICC, etc.) and Tunneled Catheter (Broviac, Hickman, Groshong, etc.):

- Prepare equipment:
  - 2-3 10mL prefilled syringes of 0.9% NaCl
  - Sterile gloves (if available)
- If more than one lumen is available (PICCs, Hickmans and Broviacs can have one, two, or three lumens), select the largest lumen available.
- Vigorously cleanse the cap of the lumen with chlorhexidine or 70% alcohol prep pad, allow to dry.
- Unclamp the selected catheter lumen and using a prefilled 10ml syringe:
  - Vigorously flush the catheter using a pulsating technique and maintaining pressure at the end of the flush to prevent reflux of fluid or blood
  - If catheter does not flush easily (note that a PICC line will generally flush more slowly and with greater resistance than a typical intravenous catheter), re-clamp the selected lumen and attempt to use another lumen (if present)
  - If unable to flush any of the lumens, the catheter is unable to be used
- Attach primed IV administration set and observe for free flow of IV fluid.
  - Utilizing an IV pump, set the flow rate based on the patient condition and IAW SMOG

Document procedure, results, and vital signs.

Procedure for implanted catheter (Port-a-Cath, P.A.S. port, Medi-port):

- Prepare all necessary equipment:
  - Non-coring, right angle needle specific for implanted vascular access ports
  - 2-3 10mL prefilled syringes of 0.9% NaCl
  - Sterile infusion port cap
  - Sterile gloves (if available)
  - Sterile occlusive dressing large enough to completely cover the insertion site
- Identify the access site; usually located in the chest.
- Vigorously cleanse the cap of the lumen with chlorhexidine or 70% alcohol prep pad, allow to dry.
- Attach the infusion port cap to the end of the non-coring, right angle needle tubing.
- Prime the non-coring needle with attached tubing with saline using one of the prefilled 10ml syringes. Leave the syringe attached to the tubing.
- Palpate the port to determine the size and center of the device.
- Secure the access point port firmly between two fingers and firmly insert the non-coring needle into the port, entering at a direct 90° angle.
- Aspirate 3–5mL of blood with the syringe.
  - If unable to aspirate blood, re-clamp the catheter and do not attempt further use
  - Asking the patient to cough may facilitate access of the port
- Flush the catheter with 3–5mL 0.9% NaCl using a prefilled 10mL syringe.
  - If catheter does not flush easily, do not attempt further use
- Attach IV administration set and observe for free flow of IV fluid.
  - Utilizing an IV pump, set the flow rate based on the patient condition and IAW SMOG
- Cover the needle and insertion site with the sterile occlusive dressing.

Document procedure, results, and vital signs.

CATHETER	SIZE	MAX FLOW RATE
PICC	Less than 2.0 fr	125mL/hr
PICC	Greater than 2.0 fr	250mL/hr
Groshong PICC	3 fr	240mL/hr
Groshong PICC NXT	4 fr	540mL/hr
Groshong PICC NXT	5 fr	200mL/hr
Hickman/Broviac	8–9.5 fr	3000mL/hr

PEARLS:

- Do not exceed recommended flow rates.
- Avoid taking a blood pressure reading in the same arm as the PICC.
- Only non-coring, right angle needles specific for implanted ports are to be used for vascular access devices that are implanted in the patient. These are generally not carried MEDEVAC units but may be provided by the patient.
- Priming the tubing of the non-coring needle **is essential** to prevent air embolism.
- There are many peripherally inserted, tunneled and/or implanted ports options. Providers should do their best to discern what option the patient has. Patient may be carrying a reference/wallet card about their device.
- PICC lines will not tolerate rapid infusions or infusions under pressure.

VASCULAR ACCESS via External Jugular Vein Cannulation

CLINICAL INDICATIONS:

- In the presence of a life threatening condition, with clear indications for immediate use of medication, blood or fluid bolus. It should only be used when a peripheral IV site cannot be established (Not for prophylactic IV access.)

CONTRAINDICATIONS:

- Inability to obtain any other suitable peripheral IV access
- Administer IV fluids or blood
- Administer medications

Equipment:

- IV start kit (alcohol swabs 4 x 4s, tourniquet, tape)
- Large bore IV catheter (14 or 16 gauge)
- IV fluid tubing

PROCEDURE:

- Explain the procedure to the patient
- Select the insertion site
- Find the landmarks midway between the angle of the jaw and the midpoint of the clavicle.
- Turn the patient's head away from the intended site of insertion. Consider placing the patient in the Trendelenburg position or holding the thumb over the vein to facilitate insertion.
- Insert the IV catheter pointing towards the ipsilateral acromioclavicular joint until a flash fills the chamber of the catheter, then advance the catheter over the stylet and remove the stylet.
- Attach the IV fluids to the catheter and infuse to verify the intravenous line is patent and dose not infiltrate.
- Secure the IV catheter using tape and a Tegaderm dressing or a clear occlusive dressing.
- Dispose of sharps in an approved biohazard container.
- **Document procedure, results, and vital signs.**

Complications:

- Infiltration
- Hematoma formation
- Cellulitis/infection
- Thrombosis
- Phlebitis

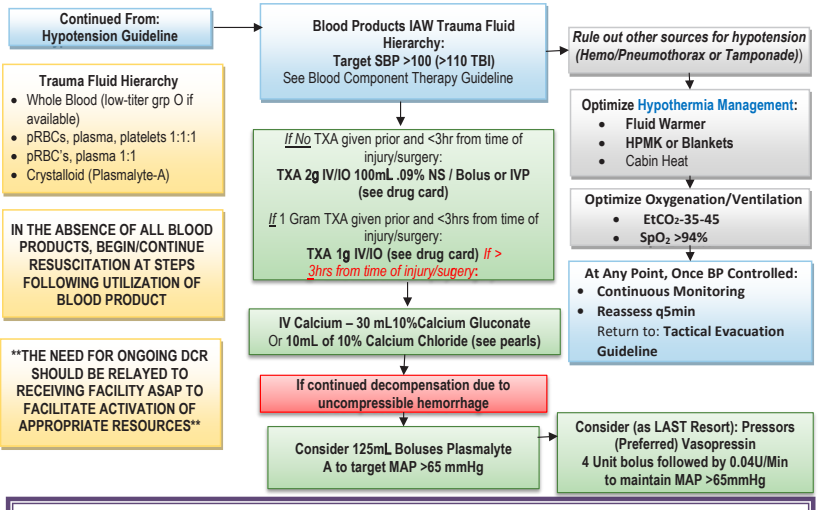
ENROUTE DAMAGE CONTROL RESUSCITATION (DCR)

Indications:

- **Systolic BP <100mmHg**
- **Heart Rate >100 bpm**
- **Hematocrit <32%**
- **pH <7.25**

Injuries associated with need for DCR:

- **Above the knee traumatic amputation (especially if pelvic injury present)**
- **Multi-Amputation**
- **Penetrating injury to chest or abdomen**
- **Intra-abdominal/thoracic hemorrhage**
- **2 regions positive on eFAST scan**
- **Lactate >2.5**



Pearls:

- **All patients requiring DCR should be transferred to the closest facility capable of Damage Control Surgery or REBOA ASAP!!!**
- **Blood Product:** Continue to resuscitate with blood product as available and PRN to achieve/maintain target SBP of >100mmHg (>110mmHg in patients with TBI/Head Injury). If a unit is transfused in a sending hospital the unit must be delivered to the receiving hospital
- **Hypothermia Management:** Blood fluid warmer use and blankets/HPMK/APLS contribute to effective hypothermia management.
- **Calcium**-30mL of 10% Calcium Gluconate or 10ml of 10% Calcium Chloride, given during or after the first unit of blood product and additionally after every 4 units of blood product during continued resuscitation. Calcium Gluconate preferred over Calcium Chloride (if available). Use extreme caution to avoid extravasation.
- **Calcium**-May be given before TXA due to hypocalcemia and blood product use.
- Optimize hemostasis and correct volume loss first!! Avoid the use of pressors or crystalloids unless absolutely necessary to maintain BP in the absence of blood products and ongoing hemorrhage. Hypertonic saline **SHOULD NOT** be used for treatment of hemorrhagic shock.
- **The use of hydroxyethyl starch (Hextend, Hespan) or Factor VII (rhFVIIa) is NO LONGER RECOMMENDED Administering**
- **TXA <3 hours from time of injury includes both point of injury and post-operative**

BLOOD COMPONENT / FRESH WHOLE BLOOD USE

IMMEDIATE CLINICAL INDICATIONS in trauma patients with SERIOUS INJURIES and evidence of hemorrhage / shock:

- Systolic blood pressure less than 100mmHg or absence of radial pulse
- Tachycardia greater than 100 beats per minute (BPM) or higher
- One or more major amputations

CLINICAL INDICATIONS:

- Uncontrolled hemorrhage or evidence of hemorrhagic shock
    - Trauma patients with amputation (complete or partial with distal circulation compromise)
    - Non-compressible penetrating thoracic, abdominal, and transitional zone injuries (axilla, inguinal, neck)
    - Pelvic Fractures in conjunction with traumatic injury (significant mechanism of injury)
    - Clinical signs of coagulopathy
        - Tachycardia, tachypnea, fever, altered mentation, hypoxemia
    - Severe hypothermia associated with blood loss

CONTRAINIDICATIONS:

- None

PRIOR TO BLOOD PRODUCT TRANSFUSION:

- Maximal hemorrhage control
- Treatment of suspected tension pneumothorax
    - Clinical signs may include: hypotension, hypo-perfusion, diminished or absent breath sounds. Late signs include: tracheal deviation and distended neck veins.
- Patent airway or airway control
- IV/IO access
- Hypothermia prevented and/or treated

ORDER OF PRECEDENCE:

- Resuscitate with Whole Blood
- Plasma, RBCs, Platelets in a 1:1:1 Ratio (no particular order)
- Plasma and RBCs in a 1:1 Ratio
- Plasma (thawed, liquid, reconstituted) alone or RBCs alone

PROCEDURE:

- Document all items on the SF 518 (only authorized document for blood products aboard Army Aeromedical Evacuation platforms).
    - Two person verification of patient and blood products given matching SF 518.
- Observe units of blood
    - Look for gas, discoloration, clots, and sediment
    - Safe-T-Vue must remain white on color indicator. Red coloration indicates that temperature has been exceeded and is no longer acceptable for use.
- Initiate large bore IV (18ga minimun, 14ga preferred) or IO access.
    - IO access via sternum or humerus is preferred. Tibia site can be utilized as alternate, but attempt should be made to gain another access point.
    - Lidocaine 2% (2-3mL) flush in IO sites provides analgesia and increases compliance.
- All blood and blood products will be administered through a dedicated line of NS using Y-tubing with filter.
- Transfuse blood through an approved fluid warming device if available.
- Rapid transfusion can be achieved by using an approved pressure infusion device.
    - Inflate pressure bag to at least 300mmHg
    - 60cc syringe or manual pressure can also be utilized in the event a pressure infuser is not available.
- Slow all other concurrent infusions unless they are TXA or RFVIIa.
- Resuscitation Goal:
    - until palpable radial pulse, improved mental status or SBP 100 (SBP >110 w/ head injury) and MAP >60mmHg.
- Addition of Calcium when administering any amount blood will be given. Citrate binding can adversely affect serum Calcium levels. 30mL of 10% calcium gluconate or 10mL of 10% calcium chloride IV/IO should be given to patients in hemorrhagic shock during or immediately after transfusion of the first unit of blood product and with ongoing resuscitation after every 4 units of blood products. Ideally, ionized

calcium should be monitored and calcium should be given for ionized calcium less than 1.2mmol/L.

- Monitor patient every 5 minutes and document any patient signs and symptoms consistent with a transfusion reaction. These include: chills, back/chest pain, rash, fever, hives, and/ or wheezing.

Document procedure, results, and vital signs on the SF 518.

CLINICAL PEARLS AND CONSIDERATIONS:

- Febrile Reaction- Temperature increase (1°C or 2°F) from baseline, chills, flushing, headache and rapid pulse
- Allergic/Anaphylaxis Reaction- itching, chills, flushing, nausea/vomiting, coughing and/or wheezing, or laryngeal edema
  - Treat with Diphenhydramine 50mg IVP or IM. Have Epinephrine standing by.
- Acute Hemolytic Reaction- rapid onset of dyspnea, hypotension, hemoglobinuria, rise in venous pressure, distended neck veins, cough and/or crackles at the bases of the lungs. Treatment is to stop the transfusion, titrate O_2 saturations above 94%, and increase IV fluid hydration to 100-200mL/hr to support a urine output above 100-200mL/hr.
- Circulatory Overload- onset of shortness of breath, tachycardia, hypertension, jugular vein distention, pulmonary rates, and hypoxia. This condition may be difficult to distinguish from a hemolytic reaction.
- If a casualty with an altered mental status due to suspected TBI has a weak or absent peripheral pulse, resuscitate as necessary to restore and maintain a normal radial pulse. If BP monitoring is available, maintain a target systolic BP goal of at least 110mmHg.
- Blood is very viscous, use the largest line available to infuse.

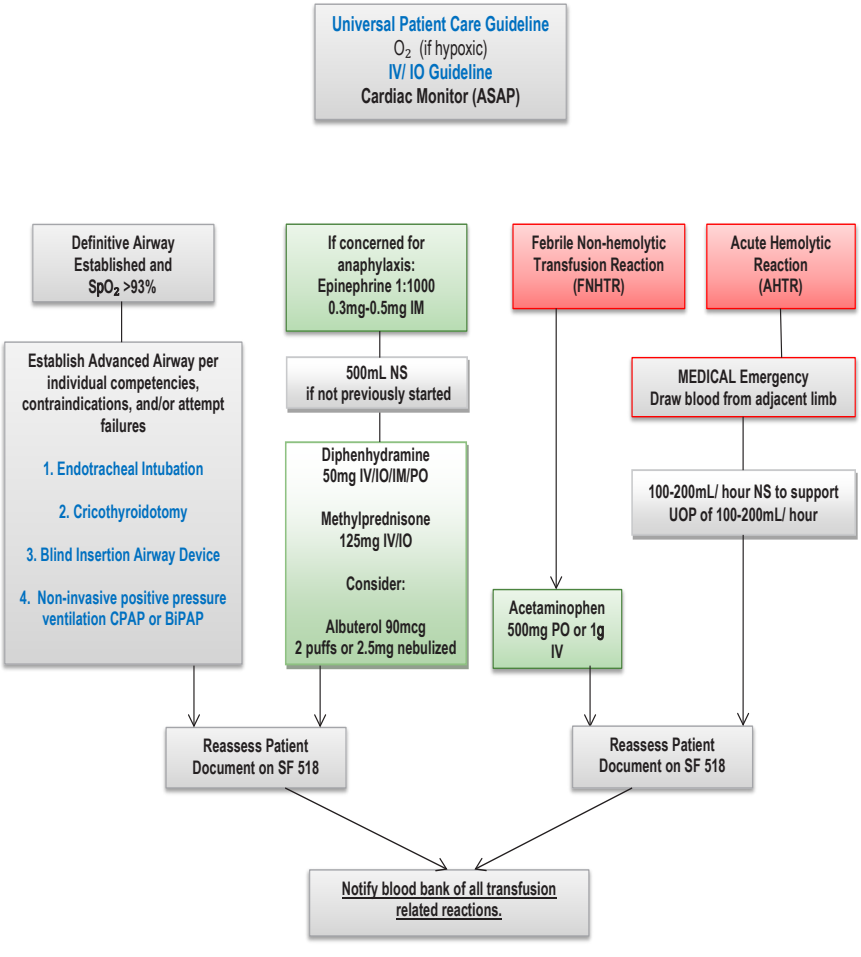
*** Blood component therapy is location specific and is not standard for all missions OCONUS and CONUS.

BLOOD TRANSFUSION RELATED REACTIONS

Differential Diagnosis:	Signs and Symptoms:
Anaphylaxis reaction	Rapid onset of shock, hypotension (<100mmHg systolic), angioedema, and respiratory distress
Acute hemolytic transfusion reaction (AHTR)	Fever (>100.4°F), chills, flank pain, red/brown urine
Febrile non-hemolytic transfusion reaction (FNHTR)	Fever (>100.4°F) or temperature increase of (1°C or 2°F) from baseline, chills, possible dyspnea
Transfusion-related acute lung injury (TRALI)	Hypoxemia (SpO_2 <94%), Fever (>100.4°F), hypotension (<100mmHg systolic), cyanosis, tachypnea (>24 breaths per minute), tachycardia (>100bpm)
Transfusional volume/circulatory overload (TACO)	Dyspnea, orthopnea, tachycardia (>100bpm), wide pulse pressure, hypertension (>140mmHg systolic), hypoxemia (SpO_2 <94%), headache, possible seizure
Mechanical-caused hemolysis	Varies with each device. Fever (>100.4°F), chills, possible dyspnea
Transfusion-transmitted bacterial infection	Fever (>102.2°F or >3.6°F change after transfusion), rigors, tachycardia (>120bpm or >40bpm increase following transfusion), rise or fall of systolic blood pressure (>30mmHg)

Pearls:

- GENERAL RULES:
  - Stop the transfusion
  - Keep the intravenous line open with saline
  - Identify and treat cause of the reaction
  - Re-institute the transfusion only if it is deemed to be clinically essential
- Before initiating IVF bolus, ensure IV tubing is new. DO NOT USE existing Y-tubing from blood administration set.
- The most common transfusion reaction is a febrile, non-hemolytic transfusion reaction. These are mostly benign with no lasting sequelae. Treatment consists of antipyretics. (Acetaminophen 500mg PO q4hr.)
- TRALI is the leading cause of transfusion-related mortality and commonly occurs is patients who have undergone recent surgery, massive blood transfusion, or who have an active infection. Goal of treatment is supportive and aimed at maintaining oxygenation and reducing respiratory distress.
- TACO is essentially pulmonary edema secondary to congestive heart failure usually occurring in elderly, small children and those with compromised cardiac function. Large volumes of fluid given rapidly are a common precursor to this reaction. Goal is aimed at mobilizing fluids (diuretics) and treating underlying condition. Both TACO and TRALI require immediate resuscitation by an advanced level practitioner.
  - A unit of packed cells should be given at a rate of 2.5-3.0mL/kg/hr.
- Mechanical-caused hemolysis is commonly caused by rapid transfusion, poor collection and storage, or heating the blood above 42°C during transfusion.



Pearls:

- Blood transfusions conducted during point of injury for casualties suffering from blood loss/massive hemorrhage may not show any transfusion reaction during the limited transport time.

BLOOD GLUCOSE ANALYSIS

CLINICAL INDICATIONS:

- Suspicion of blood glucose abnormalities – hyperglycemia/hypoglycemia.

CONTRAINDICATIONS:

- None

PROCEDURE:

- Gather and prepare equipment.
- Obtain blood samples for analysis as per manufacturer's recommendations.
- Place blood sample onto reagent strip and place into machine for analysis as per manufacturer recommendations.
- Record result and treat any glucose abnormalities per appropriate guideline.
- Perform quality assurance on glucometers weekly. If any suspicious recordings are noted, follow manufacturer's recommendations

Document procedure, results, and vital signs.

Invasive Pressure Monitoring

Purpose:

MEDEVAC Crews are required to monitor invasive pressure on any patient with central venous or arterial access.

Procedure:

- If the referring facility's transducer unit is not compatible with transport unit's cable, replace with compatible transducer setup using aseptic technique.
- Ensure IV pressure bag is preset and inflated to 300mmHg with stopcock closed
- Place transducer at phlebostatic axis and secure with tape
- Zero the line to obtain a "zeroed" reading on the transport monitor
- Flush the line and perform a square waveform test
  - Evaluate the waveform and numeric values for correlation with recent patient trends

Notes:

- Evaluate the insertion site for bleeding, swelling, hematoma, or dislodgement
- Tightly secure stopcocks and cover openings with non-vented endcaps
- Continue monitoring correlation between NIBP and ABP
- Zero the line after movement of patient, at altitude, and if suspected erroneous reading
  - Adjust/re-calibrate monitor every 1000ft if required based upon monitoring device
- If waveform dampened, check pressure bag inflation and reassess position of leg/wrist
- If invasive line is in the femoral artery, keep patient head <30° and leg straight. Reassess distal pulses with any patient movement
- Flush line and evaluate square waveform test as needed
- If invasive line becomes dislodged, immediately apply direct pressure

REBOA MANAGEMENT

Purpose:

Surgical Team or SOF Medic placement for trauma arrest or non-compressible hemorrhage in the pelvis. Secondary to emergency thoracotomy or external junctional tourniquets.

Procedure:

- Receive report from team that placed device.
  - Who inserted the device?
  - What type of device (ER-REBOA)?
  - Where located (Zone 1 or Zone 3)? How confirmed? (xray, ultrasound)
  - When was the balloon inflated?
  - Why was it placed (Arrest? Peri-arrest? Pelvic bleed?)
  - How is the device secured?

- Confirm vital sign trends with sending team
- Confirm security of REBOA device with sutures, commercial securing device, or tape.
- Record the length measurement at insertion site.
- Confirm balloon pressure.
- Check distal circulation and any external hemorrhage (Doppler)
- Connect Arterial line to hemodynamic monitoring device.
- Verbalize plan to move patient to next level of care. Ensure time of balloon inflation.
- Continue to closely monitor until patient is secured in the next level of care (Hemodynamic monitoring, distal circulation, device security, catheter depth)

CONCERNS:

- Changes in altitude
- Transient drop in blood pressure
- Change in balloon pressure
- Dislodge of device
- Loss of distal circulation
- Distal external hemorrhage

CARDIAC DEFIBRILLATION

CLINICAL INDICATIONS:

- Patient who is in pulseless cardiac arrest with either ventricular fibrillation or ventricular tachycardia seen on monitor.

CONTRAINDICATIONS:

- None

PROCEDURE:

- Ensure patient attached to monitor/defibrillator. If paddles used, ensure that they are several centimeters away from monitor leads to prevent arcing. Use pediatric paddles as indicated – if unavailable and pads used, should place in anterior/posterior position for pediatric patients.
- Set energy level to appropriate level. Start 200J adult (biphasic) or 360J adult (monophasic), or 2J/kg pediatric.
- Press "charge" button 30 seconds prior to end of compressions. This maneuver minimizes time between compressions and defibrillation. Compressions should continue until end of cycle.
- Ensure all personnel clear of patient and pilots aware of cardioversion.
- Press and hold "shock" button until energy delivered.
- If rhythm converts–treat as per post resuscitation protocol.
- Following shock delivery, immediately begin/return to CPR for 2 minutes before checking for pulse.
- If pediatric patient fails to convert–repeat steps 2-7 above using escalating energy levels.
- **Document procedure, results, and vital signs on run sheet following mission.**

AUTOMATED EXTERNAL DEFIBRILLATOR (AED):

- Turn on power to machine and follow prompts to attach pads to patient and machine.
- Ensure no one touching/moving patient and press the "Analyze" or equivalent button. (If not present, the machine will automatically check the rhythm at dedicated time intervals. A vocal warning will tell you when this is occurring).
- If shock advised, press button to deliver shock and return to CPR for 2 minutes.
- After analysis, if subsequent shocks advised, repeat steps 2-3 up to 3 shocks, until further care arrives, or until no further shock advised. **If no shock advised at any time, CHECK PULSE**. Continue CPR if no pulse. If pulse present, place patient in recovery position and transport.

12-LEAD ELECTROCARDIOGRAM

CLINICAL INDICATIONS:

- Suspicion of arrhythmia.
- Chest pain believed to be of cardiac origin.
- Toxic ingestion with cardiac side-effects.

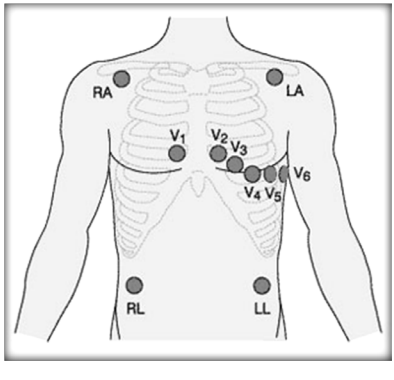
CONTRAINDICATIONS:

- None

PROCEDURE:

- Ensure patient lying flat on bed and place leads as per diagram.
- If patient is unstable, address any emergent issues prior to attempting the 12-lead EKG.
- May have to shave and/or dry patient for pad adhesion.
- Once leads are in place, instruct the patient to remain still and limit any movements around the patient (as possible).
- Press button to obtain 12-lead EKG.
- If questions exist, maintain supportive care and contact medical control if able.

Document procedure, results, and vital signs.



SYNCHRONIZED CARDIOVERSION

CLINICAL INDICATIONS:

- Unstable patient with tachycardia-dysrhythmia noted on monitor/EKG.
- Patient who has failed conservative and/or chemical cardioversion.
- Patient not pulseless.

CONTRAINDICATIONS:

- None

PROCEDURE:

- Ensure patient attached to monitor/defibrillator with synchronized cardioversion capability.
- Time-permitting, ensure adequate IV/IO access present. Ensure that unsynchronized cardioversion/defibrillation capabilities present in case patient degenerates into another dysrhythmia.
- Consider use of sedating medication (e.g., Midazolam 0.1mg/kg (5mg max dose) prior to delivery of shock. **Note: This step is not mandatory and should not delay appropriate management of emergent condition.**
- Set energy level to appropriate level. Usually starting at 50J-100J in adults or 0.5J/kg-1J/kg in children for atrial/ventricular arrhythmias, respectively.
- Select **Synchronized Cardioversion** option. This should result in machine displaying **"SYNC"** as well as tracking electrical activity (arrow or highlighted segment of EKG).
- Ensure all personnel clear of patient and pilots aware of cardioversion.
- Press and hold "Shock" button until energy delivered. (This may take several seconds for machine to synchronize with cardiac cycle. Shock is not immediately delivered as in defibrillation.)
- If rhythm converts – monitor and treat as appropriate.
- If fails to convert – repeat steps 4-7 above using escalating energy levels. If patient degenerates, treat as per appropriate protocol/CPR. **Note: most machines require pushing the "SYNC" after each shock if synchronized cardioversion to be repeated, failure to do so will result in delivery of an unsynchronized shock.**
- **Document procedure, results, and vital signs on run sheet following mission.**

TRANSCUTANEOUS (EXTERNAL) CARDIAC PACING

CLINICAL INDICATIONS:

- Patients with pulse rate <60 (or appropriate for age) and signs of inadequate cerebral or end-organ perfusion.

CONTRAINDICATIONS:

- None

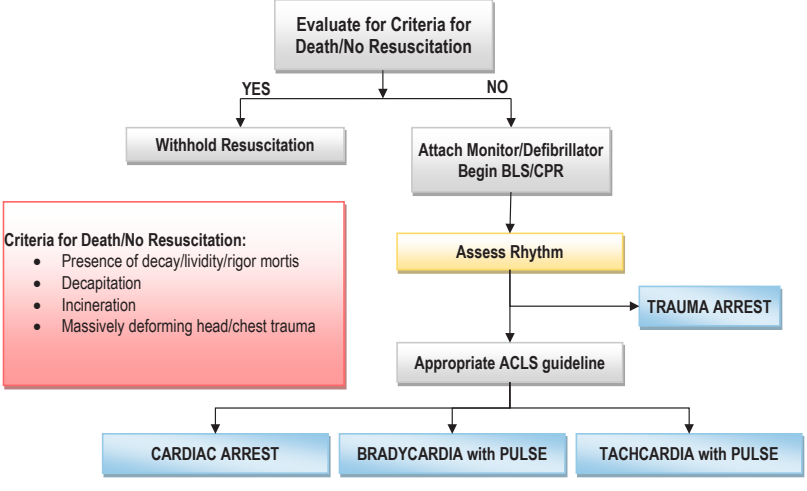
PROCEDURE:

- Ensure patient attached to monitor and defibrillator with external cardiac pacing capabilities.
- Time-permitting, ensure adequate IV/IO access prior to pacing. Also, may administer sedative agent (midazolam) prior to beginning pacing.
- Turn selector switch to "Pace."
- Set rate to twice the patients intrinsic rate (often 70-80 for adult, 100 for pediatric).
- Set energy level to lowest setting and gradually increase until capture is obtained (each pacer spike followed by QRS).
- Once capture obtained, ensure pulse and vital signs correspond with pacing. Evaluate patient for improvement. Monitor and continue sedation as needed.
- If fails to capture at maximal setting, discontinue pacer.
- At any time, if patient degenerates and needs CPR – begin compressions immediately. Pacer pads are insulated and it is okay to perform compressions with pacer running.
- **Document procedure, results, and vital signs on run sheet following mission.**

WITHHOLD RESUSCITATION

Signs and Symptoms:
- **Unresponsive**
- **Apneic**
- **Pulseless**

Differential Diagnosis:
- **Medical vs. Traumatic Arrest**
- **Dysrhythmia**



Pearls:
- As with all ALS protocols – **concentrate on adequate compressions**.
- Minimize interruptions in compressions, including if/when placing advanced airway.
- Early defibrillation associated with greatest success in early cardiac arrest.
- Survival rate for traumatic arrest approaches zero.
- Cardiac arrest in MASCAL situations requires frequent re-triage to apply care where it will be most effective.
- Lack of response alone does not equal death–always check for pulse/cardiac activity.
  - If available, cardiac US can be helpful in determining if continued efforts will be helpful. If there are no signs of cardiac movement on US and there is no other known reversible cause, the likelihood of ROSC and recovery with continued resuscitative efforts in the out-of-hospital setting is incredibly unlikely.

ALTITUDE PHYSIOLOGY AND PATIENT TRANSFER

ALTITUDE CONCERNS FOR AEROMEDICAL TRANSFERS:

- **Gas expansion** occurs as altitude above sea level increases. Gas volume doubles at 18,000ft mean sea level (½ sea level atmospheric pressure) and increases 25% from 5,000ft-10,000ft. This will typically not affect the operational ceiling for the UH-60 Blackhawk during Aeromedical Evacuation operations. Certain conditions and precautions to note:
  - ✓ **Air embolism/Decompression illness**–This is the only absolute contraindication to transport of patients at altitude. These patients should be transferred at sea level or in an A/C capable of cabin pressurization to sea level.
  - ✓ **Pneumothorax**–There is little risk of developing a tension PTX due to gas expansion from altitude during typical aeromedical evacuation flights in rotary-wing A/C. However, altitude should be limited when possible to <5,000ft MSL. If mission requirements mandate higher altitudes, the use of aeromedical evacuation platforms with pressurized cabins should be considered as applicable and tactically capable. Prophylactic chest tubes (for altitude-related concerns) are recommended for any flights above 10,000ft mean sea level.
  - ✓ **Gastric distention**–Gas expansion does increase the risk of vomiting and, therefore, aspiration. Therefore, all patients with decreased LOC should have an NG/OG tube placed prior to transfer.
  - ✓ **Head injury**–As with PTX, there is little concern of altitude related elevation of elevated ICP in head injured patients although penetrating intracranial or maxillofacial injuries may set conditions for an entrapped-gas phenomenon with adverse clinical consequences. Any evidence of elevated ICP should result in treatment per guideline. Altitude restrictions do not differ from those listed for PTX. Constant vigilance should be maintained for evidence of elevation of ICP.
  - ✓ **Eye injury**–Penetrating eye injuries or surgeries may introduce air into the globe. Again, the altitudes obtained for rotary-wing A/C does not pose a risk of elevating the IOP during normal operations.
  - ✓ **Gas filled equipment**–Medical equipment with gas filled bladders also may suffer from interference at high-altitudes. Primarily, endotracheal tube cuffs and pressure bags which should be evaluated at altitude by testing the pressure of the exterior bladder or filled with air. If able, utilize manometer to

verify tube pressure. A cuff pressure between 20-30cm H_2O is recommended to provide adequate seal and reduce the risk of complications or tissue damage. Verify with supervising physician or flight surgeon before filling endotracheal tube with saline. Routine filling of endotracheal tubes with saline is no longer recommended.

- **Flow Rates:** Decreased atmospheric pressure may interfere with IV flow rates and/or pump function. These must be monitored continuously.
- **Invasive Blood Pressure:** Adjust/re-calibrate monitor every 1000ft if required based upon monitoring device.
- **Hypothermia:** As altitude increases, the temperature will drop about 3.5°F/1000ft. This is further complicated in the H-60 due to rotor-wash, forward air speed, normal lapse rate. Therefore, patients must be protected from hypothermia at all times. This includes use of the Hypothermia Prevention and Management Kit (HPMK), blankets, heaters if available, and closing cabin doors/crew windows during transport.
- **Hypoxia:** Patients are at increased risk of hypoxia during transport at altitude. If transfers are taking place in high-altitude locations, pulse oxygenation should be monitored at all times and the medic/provider should maintain a low threshold for the use of supplemental O_2. At no time should the patient's O_2 be allowed to go below 92% (commercial pulse oximeters read up to 3% off, therefore a sat of 91% may be seen in a patient who is really at 88%.). ***Patients who smoke or have underlying cardiopulmonary disease are at increased risk even at low altitudes.***
- **Dysbarism:** Patients may experience discomfort due to gas expansion in air-filled body spaces (e.g., ears, sinuses, teeth) during ascent. Conversely, patients and aircrew may experience "squeeze" resulting from descent from altitude. These are typically mild during RW transport, however, if severe, altitude should be held and attempts made to alleviate pain and/or slow rate of ascent/descent.

Document procedure, results, and vital signs.

POST-OPERATIVE & CC INTERFACILITY TRANSFER

CLINICAL INDICATIONS:

- Patient at outlying MTF requiring transfer to higher role of care for more definitive surgery/treatment

PRE-TRANSFER Patient Status Requirements:

a. JTS CPG–Intra-theater Transfer and Transport–recommends clinical parameters that should be met prior to transfer; if parameters are not met, they should be addressed and en-route mitigation plans formulated BEFORE departure/transfer:
   1) Heart rate 50><120 bpm
   2) SBP >90mmHg, MAP >60mmHg
   3) If elevated ICP or CPP, maintain MAP 80><110mmHg, SBP 110><160mmHg
   4) Hematocrit >24% (or Hgb >8g/dL)
   5) Platelet count >50/mm^3
   6) INR <2.0
   7) pH >7.3
   8) Base deficit <5mEq/L
   9) Temperature >35.5^{0}C or 96^{0}F
   10) $EtCO_2$ 35><45, SpO_2 ≥92%, and/or $PaCO_2$ 35><45mmHg

If these criteria are not met, the transferring physician should continue resuscitation or provide documentation indicating limitations that compel urgent transfer. This can be documented in the comments section of the **Standard Order Set for Critical Care Transfers** document.

b. The four *MINIMUM* requirements which will be met prior to patient transfer are hemorrhage control, adequate shock resuscitation (SBP 90mmHg, MAP >60mmHg, UOP >0.5mL/kg/hr, and/or BD <2, Temp >97^{0}F and <100^{0}F), stabilization of fractures, and initial post-operative recovery.
c. Attempt to keep patient packaging time at <25 minutes; use of warming devices in accordance with the JTS Hypothermia Prevention CPG.
d. Movement of Deceased Patients:
   1) In general, patients who meet clinical criteria for death are not to be transported by MEDEVAC, with the exception of extreme extenuating circumstances, such as emergency exfiltration during CSAR.
   2) If vital signs are absent prior to launch, make all reasonable attempts to resuscitate as clinical and tactical circumstances permit. If unsuccessful, consider basic cardiac ultrasound (as available) to determine whether any signs of cardiac activity are present. If absent, mission abort is warranted.

3) In such circumstances, contact and consultation with medical control or other available physician is suggested, in order to facilitate field determination of death and cessation of resuscitative efforts.

PROCEDURE:

a. **Role 2/3 provider responsibilities:**

It is the **responsibility of the transferring physician to write enroute care orders** appropriate for the transport environment and individualized for each patient in consultation with the Critical Care Flight Paramedic and/or the ECCN (or attending Flight Provider) prior to launch. The Flight Paramedic / Provider should be given a **Standard Order Set for Critical Care Transfers** or similar document with en route care orders signed by the transferring physician.

1) Provide a complete report to Flight Paramedic/Provider.
2) Provide all patient-specific related medical records.
3) Assist Flight Paramedic/Provider with packaging patient for transport as requested.
4) Complete specified areas on the appropriate patient care report
   i. Administrative data
   ii. Most current laboratory data
   iii. Mechanism of Injury (MOI)
   iv. Diagnosis
   v. Procedures
5) Place patient on ventilator at least 30 minutes prior to flight. Obtain pre-flight ABG to ensure patient tolerates ventilator settings.
6) It is strongly suggested that the transferring physician make every possible attempt to contact and discuss the case with the receiving physician or facility representative. Flight Paramedics and ECCNs should confirm or encourage this vital "physician-to-physician hand-off" if practicable.

b. **FLIGHT PARAMEDIC / PROVIDER responsibilities prior to transfer**:

1) Obtain orders for en route care from transferring physician; review orders and discuss potential en route problems with transferring physician, reconcile medications (ensure needed medications, specific to patient's condition, are obtained and prepared), allergies and patient's weight, confirm patient's identification, and secure personal effects.
2) Perform primary & secondary assessment ensuring an understanding of the patient's injuries/illness/procedures performed.
3) Spinal immobilization is indicated during transfer if ordered by transferring physician.
4) Assess placement and secure all tubes, lines, and drains & ensure proper functioning.
5) Ensure endotracheal tube is secure; secure pulse oximeter/$EtCO_2$ monitor.

6) Review ABG – ABG should be done within 30 minutes of flight; patient should be on transport ventilator with vent settings for transport; ABG obtained 15 minutes after being placed on transport ventilator.
7) Ensure vascular access X 2 - peripheral, central or IO and A-line as needed.
8) Check all bandages, splints, dressing, fixation devices and tourniquets for placement and ensure no evidence of ongoing hemorrhage.
9) If indicated, insert OG/NG tube for gastric decompression, especially in intubated patients; cap or place to suction.
10) Empty Foley catheter bag prior to flight; ensure UOP documentation by transferring facility.
11) For an intubated patient, provide adequate analgesia and sedation PRIOR to giving additional paralytic medications. Re-dose medications as needed prior to flight in accordance with transferring physician's orders.
12) Continue administration of blood products if ordered by transferring physician. If anticipated administration of blood products enroute, Flight Paramedic/Provider should request orders for blood products and appropriate blood products from the transferring physician and use FDA approved fluid warming device as appropriate for warming fluids.
13) Collect all patient care documentation for transport with patient, i.e. pre-hospital, transport, labs, x-rays, transferring facility notes, etc.
14) Remove all air from IV fluid bags and place all free flowing bags in pressure bags.
15) Ensure patient is properly packaged in a warming device unless contraindicated prior to transfer. Follow directions specific to each warming device ensuring over heating or thermal burns do not occur. Hypothermia, acidosis and coagulopathy constitute the "triad of death" in trauma patients.
16) Securely affix all equipment, supplies, loose tubing and lines to NATO litter prior to moving the patient to the vehicle or aircraft.
17) Once patient is packaged, ensure all lines are leveled and monitors are zeroed.
18) Provide eye and ear protection to patient.

c. Special considerations:

1) Eye Trauma: Fox shields should be placed for any patient with a suspected or confirmed open globe, possible intraocular foreign body or eye injury. **DO NOT remove impaled or stubborn foreign bodies from the eyes.** (even contact lens**) SHIELD AND SHIP. DO NOT PLACE ANY DRESSINGS UNDER RIGID EYE SHIELD** or manipulate the injured eye. Both the injured and uninjured eye should be covered IOT avoid excessive movement of the injured eye which may result from involuntary convergence. Also want to avoid nausea/vomiting in these patients. Normal Saline may be used to rinse eyes in awake patient with no penetrating injury. (JTTS CPG - Initial Care of Ocular & Adnexal Injuries)
2) Compartment Syndrome: Patients with extremity injuries, abdominal injuries/surgery, burns, coagulopathy and those who have received massive transfusion are at risk for compartment syndrome. Ensure proper assessment prior

to flight. If compartment syndrome is suspected during flight, place extremity at the level of the heart. Pain out of proportion to the injury and paresthesia are symptoms of compartment syndrome, as well as pallor, paralysis, pulselessness, and poikilothermia. Patients who are sedated, paralyzed or have an epidural or block in place are at increased risk and require judicious hands on assessment of at risk abdomen and extremities. (JTTS CPG–Compartment Syndrome and Fasciotomy)

3) Burns: For patients with partial and/or full-thickness burns to >20% TBSA, use of the Burn Patient Admission Orders and **JTTS Burn Resuscitation Flow Sheet** are REQUIRED and should be continued during transfer to another facility. (JTTS CPG – Burn)
4) Advanced pain management modalities: For patients with epidurals, continuous peripheral nerve blocks, PCA infusions, or other pain medicine infusions, a pain note should be completed prior to transport as it is a vital part of provider communication. (JTTS CPG–Management of Pain, Anxiety and Delirium in Injured Warfighters)
5) Sedation and pain management must be maintained at appropriate levels throughout transport. As appropriate and as directed by transferring physician, attempt to maintain sedation target as follows using the Riker Sedation-Agitation Scale (SAS)

Riker Sedation-Agitation Scale (SAS): Used as sedation target goal for Post Surgical/CC

- Non-intubated patients, provide sedation as needed to maintain a goal SAS Score of 3-4.
- Intubated patients, provided sedation as needed to maintain a goal SAS Score of 1-2.

		Definition
7	Dangerous agitation	Pulling at endotracheal tube, trying to remove catheters, climbing over bedrail, striking at staff, thrashing from side-to-side
6	Very agitated	Does not calm despite frequent verbal reminding of limits, requires physical restraints, biting endotracheal tube
5	Agitated	Anxious or physically agitated, attempting to sit up, calms down on verbal instructions
4	Calm, cooperative	Calm, arousals easily, follows commands
3	Sedated	Difficult to arouse, awakens to verbal stimuli or gentle shaking but drifts off again, follows simple commands
2	Very sedated	Arouses to physical stimuli but does not communicate or follow commands, may move spontaneously
1	Unarousable	Minimal or no response to noxious stimuli, does not communicate or follow commands

ECC Nurse Protocols May 2012

d. Patient Care Enroute to the Receiving Hospital

1) Patient vital signs will be monitored continuously enroute and documented at least every 5–15 minutes (q5min if on pressors) per transferring physician's orders.
2) Reassess patient at least q15min and address events as necessary following transferring physician's orders and protocols for the specific illness or injury.

3) Assess pain control, sedation and need for paralysis. Re-dose medications as needed in accordance with transferring physician's orders. Ideally, paralytic medication should not be administered near the end of the flight. Significant, adjunctive analgesia may be required to compensate for initial lift, landing and in flight combat maneuvers, therefore Flight Paramedic/Provider should consider carrying higher volumes of analgesia that would be normally used in ground transport or fixed facilities.
4) All events will be addressed with appropriate interventions according to transferring physician's orders and protocols. All interventions require reassessment for patient response to the intervention.
5) All enroute care, including ventilator changes, medications, events, interventions, and patient's response will be documented on the appropriate patient care documentation.

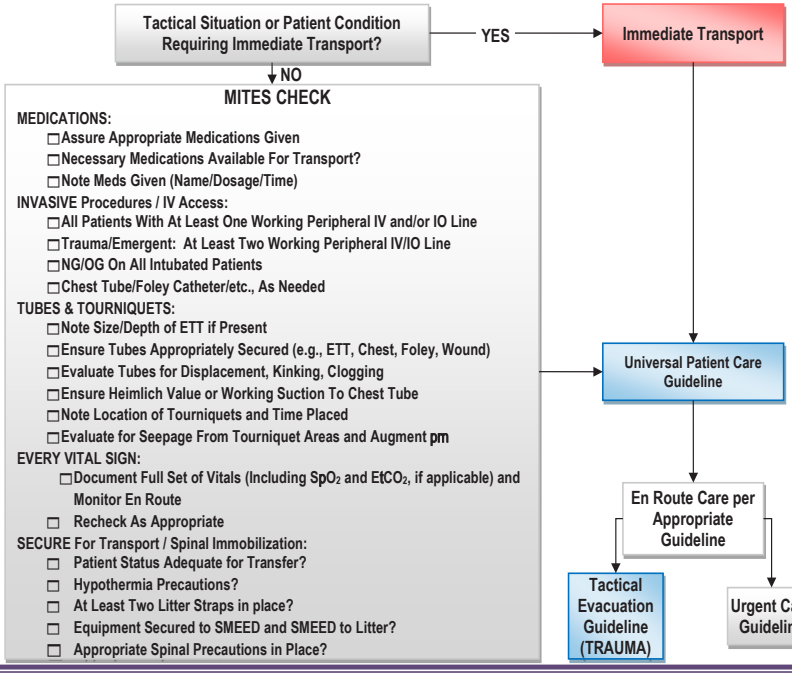
e. Patient Report and Transfer of Care at the Receiving Hospital

1) A verbal and written patient report will be given to the receiving nurse or physician upon delivery of the patient.
2) Routinely, the responsibility of care will be transferred at the receiving ED. On rare occasions (i.e. mass casualty incidents, pending emergency flights, etc.), care may need to be transferred on the helipad rather than at the bedside.
3) For Tail-to-Tail transfers, the Flight Paramedic/Provider initiating transport will send all documentation from the transferring facility and the patient care documentation from the first leg of the flight with the Flight Paramedic/Provider completing the second leg of the transfer. The Flight Paramedic/Provider completing the second leg of the transfer will initiate their own patient care documentation, circling "2nd Leg" at the top of the form and ensure all documentation is turned over to the MTF upon arrival and hand off of patient care.
4) The patient care documentation will be completed and left with the patient at the receiving facility at the time of patient handover. If unable to complete documentation due to extensive mission requirements, the patient care documentation will be forwarded to the appropriate medical information receiving facility/person IAW local/theater policy.

Any in-flight problems should be addressed per appropriate protocol and per written instruction from transferring physician. Continued problems should prompt contacting medical control as soon as it is possible.

Document procedure, results, and vital signs.

PRE-TRANSPORT CHECKLIST



PEARLS:

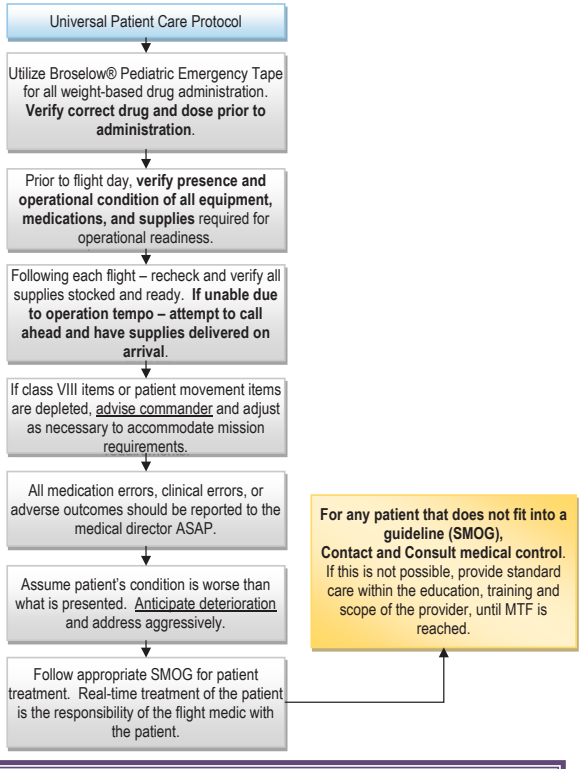
- Any patient with advanced airway and ventilator support should receive sedation and, if indicated, paralytic agent before flight. These should be available in the aircraft for use by *qualified personnel* for use if patient becomes conscious, agitated, combative, etc.
- Spinal immobilization should be ensured in all blunt trauma (e.g., MVA, fall, blast, combination trauma) where spinal instability may be suspected. The medic should document if spinal injuries are cleared and who cleared them.
- A minimum of two IV/IO sites in patients with emergent or emerging conditions. At least one should be present in all patients transported by MEDEVAC for any other causes. Rare exceptions may exist (e.g., minor musculoskeletal injury).
- All critical care patients should have continuous cardiac monitoring while in en route. This may also extend to non-intubated urgent/priority patients under other circumstances (e.g., acute MI, atypical chest pain).
- **Tactical situation and emergent care should take priority over all other procedures/monitoring.** If unable to perform checks and/or procedures during flight due to the Tactical/Environmental Conditions (e.g., enemy, weather) then this must be documented completely in the Patient Care Report and briefed-back to the receiving medical facility. Continue with monitoring and procedures as soon as situation allows.

Facility Transfer Checklist ***Updated December 22***

DO NOW	TAKE WITH	INFLIGHT
M: ☐ Check all bandages, splints, dressings and tourniquets for placement / evidence of ongoing hemorrhage. ☐ Mark bleeding strikethrough ☐ Measurement of abdomen ☐ Request orders for type and cross-matched blood or O-negative blood from the transferring physician.	**M:** ☐ Additional Blood products (1:1:1) ☐ Tubing ☐ Warmer ☐ Golden Hour Container	**M:** ☐ Blood products administration ☐ Check all bandages, splints, dressings and tourniquets for placement / evidence of ongoing hemorrhage ☐ Measurement of abdomen.
A: ☐ Assess and document ET tube size, depth, security, cuff pressure, bite block ☐ Attach ETCO2 monitor ☐ Insert/Assess and document NG/OG tube placement, size, depth, security ☐ Review chest radiograph for ET confirmation and NG/OG placement ☐ Apply C-collar for airway stability	**A:** ☐ Extra ETT / King LT / IGEL ☐ Suction soft-tip ☐ 10ml syringe ☐ Bite block ☐ Tape ☐ BVM	**A:** ☐ Confirm ETT is in appropriate position ☐ Look/feel for symmetric chest wall rise ☐ Verify tube position at teeth ☐ Check ETCO2 ☐ DOPE
R: ☐ Setup Ventilator and confirm ventilator settings ☐ Check baseline lung compliance/resistance with BVM ☐ Auscultate heart/lung sounds ☐ Check placement and function of chest tube/drainage system/ Heimlich valve. ☐ Request arterial blood gas after transport ventilator is attached to patient	**R:** ☐ O2 for transport ☐ Backup ventilator ☐ Suction ☐ Needle for decompression	**R:** ☐ Look and feel for chest excursion ☐ Check Pulse Ox ☐ Check patient's color
C: ☐ Setup Monitor and zero all Pressure Lines ☐ Assess distal pulses and neurovascular status ☐ Ensure IV access x 2 (Minimum). ☐ Remove air from IV bags and pressurize ☐ IV medications arranged for easy access (20ml, 10ml, 5ml, 3ml) ☐ Review CBC/Chemistry results ☐ Check Foley catheter placement, measure output amount, empty bag	**C:** ☐ Vasoactive medications (dopamine, neo, norepinephrine) ☐ Pressure bags ☐ IV fluids and tubing	**C:** ☐ Check temp, pulse BP, and cardiac rhythm ☐ Assess distal pulses and neurovascular status during transport. ☐ Assess IV access ☐ LZC Pressure Lines
H/I: ☐ Conduct baseline neurologic exam ☐ Provide eye and ear protection to patient; HPMK, warmed IV fluids, blankets and/or chemical heat packs. ☐ Review orders and discuss potential en-route problems with the transferring physician. ☐ Ensure patient and all equipment secured ☐ Place transport ventilator on transport O2 ☐ Assess pain control, sedation and need for paralysis. Re-dose medications if needed before flight ☐ Patient loading considerations	**H/I:** ☐ Collect all labs, x-rays, pre aid-station/hospital documentation for transport ☐ Reconcile medications; verify allergies and patient's weight ☐ Secure personal effects. ☐ Sedation meds (propofol, versed, ketamine) ☐ Pain meds (fentanyl, morphine, ketamine) ☐ Paralytic meds (vecuronium, rocuronium) ☐ 3% NaCl,	**H/I:** ☐ Assess neurologic and sedation ☐ Check placement of all tubes, lines and drains & ensure proper functioning ☐ Ensure all wires and tubing are accessible and have adequate slack to allow monitors and IVs to be properly positioned and secured ☐ Serial assessments ☐ Prepare patient and give report to receiving facility

Altitude Considerations	Medications	Patient Packaging
Required waiting time before transport	Type and number of patients	Additional Medical support/non-medical attendant
Respiratory Support	Monitoring (body systems, medical interventions, etc.)	Telephonic consultation
Equipment	Thermal considerations	Transport time and Route of transfer

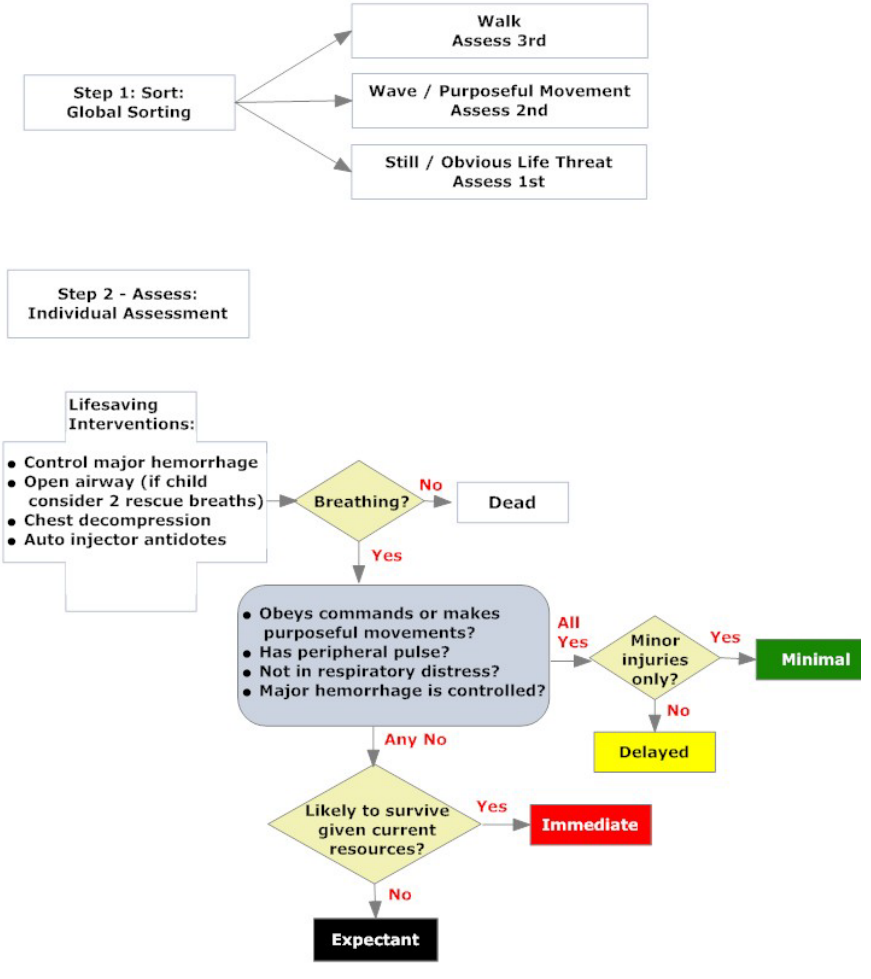
PATIENT SAFETY



Pearls:

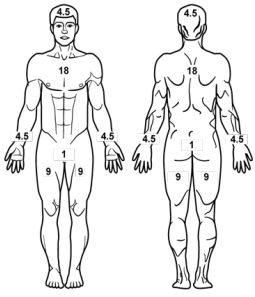
- Supportive care for all patients includes routine monitoring, IV guideline, O_2/airway support, and fluid resuscitation (as required) to maintain or approach "normal" vital signs.
- Always check and double-check medications, dosage, condition, indication, potential adverse reactions, and control measures prior to administration. Record any patient allergies prior to administration of drugs.
- Check medical supplies and equipment prior to accepting/flying mission. Arrival on scene without proper equipment will result in inability to provide optimal care, and may result in adverse outcomes.
- Any medication/clinical errors or other care-associated concerns should be brought to the attention of the medical officer/director ASAP following the mission or at earliest possible time.

SALT Mass Casualty Triage Algorithm (Sort, Assess, Lifesaving Interventions, Treatment/Transport)

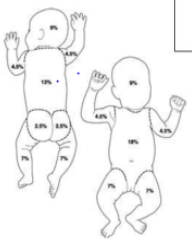


BURN Fluid Resuscitation

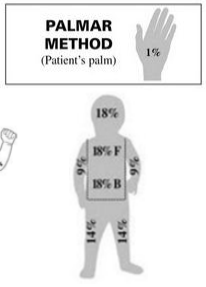
Rules of 9 - Burn % Estimation Chart



ADULTS



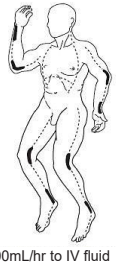
INFANTS



CHILD

Escharotomy-
Dashed line- preferred incision lines.

Bold lines- indicate importance of extending the incision over involved major joints.



Rule of Tens – Fluid Resuscitation Calculations

TBSA >20%, may require acute fluid resuscitation in prehospital
LR(best)>NS(2nd best)>Hextend(only to 1L)

Adults (≥40kg) - **10mL/hr x %TBSA** (estimate to nearest 10%); patients weighing more than 80kg, add 100mL/hr to IV fluid rate for each 10kg >80kg. Re-evaluate every 1-2 hours. Adjust IV rate to UOP goal 30-50mL (0.5-1mL/kg in Peds). Adjust IV rate up or down by 20-25%.

Pediatrics (<40kg) - **3 x %TBSA x body weight (kg)** gives the volume for initial 24 hours. One half is given in first 8 hours. Monitor urine outputwith goal of 0.5 to 1 mL/kg/hr in children.

Example: Pediatric 30kg patient with 50% TBSA 2nd/3rd degree (Chemical or Thermal burn) 3mL LR x 50(%TBSA) x 30(kg) = 4,500mL LR in 1st 24hr
2,250mL (½ of 4,500) is given over 1st 8hr
2,250mL/8hr = 281mL/hr for 1st hr, then titrate by 20-25% to UOP goal

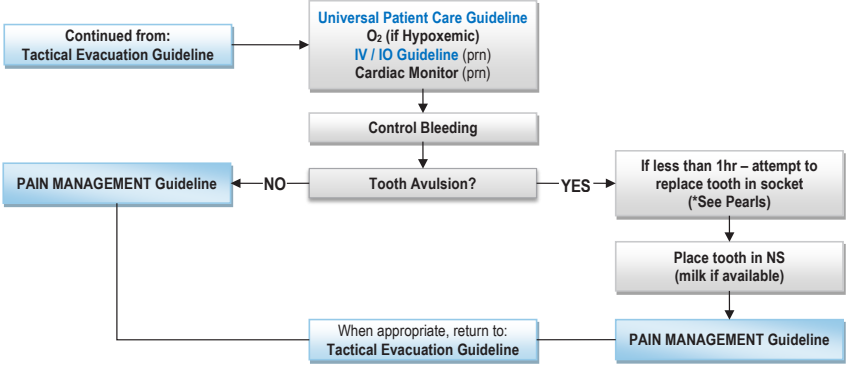
High Voltage Injury: ADULT (>40kg) - 10mL/hr x %TBSA (estimate to nearest 10%); patients weighing more than 80kg, add 100mL/hr to IV fluid rate for each 10kg >80kg. Re-evaluate q1-2hr. Adjust IV rate to UOP goal 75-100mL (1-2mL/kg in Peds). Adjust IV rate up or down by 20-25%.

Pearls: Both under-resuscitation and over-resuscitation with fluids can precipitate significant adverse clinical events for the burn patient. Thus, it is both worthwhile and imperative that medical aircrew calculate and administer burn resuscitation fluids as accurately and fastidiously as possible. Put another way, it is worth your time and effort to accurately estimate burn surface area, ideal body weight, then calculate and administer appropriate fluids while the patient is under your care.

- Burns with airway involvement require immediate airway protection with Endotracheal Intubation / surgicalairway.
- Burns covering >40% TBSA, will likely require RSI due to airway edema from inflammation/fluid resuscitation.
- **Infants and Young Children should also receive LR with 5% Dextrose at a maintenance rate and monitor for hypoglycemia.**
- Burn patients are prone to hypothermia–must protect from environment. Also, never use ice to cool large burn areas.
- All burns require 100% O_2 via NRB unless intubated.
- Never use nitrites for suspected cyanide toxicity in enclosed space fires – can worsen hypoxia. Creates methemoglobinemia. If cyanide toxicity is a tangible threat, consider IV **Hydroxycobalmin (CYANOKIT®)**

DENTAL PROBLEMS

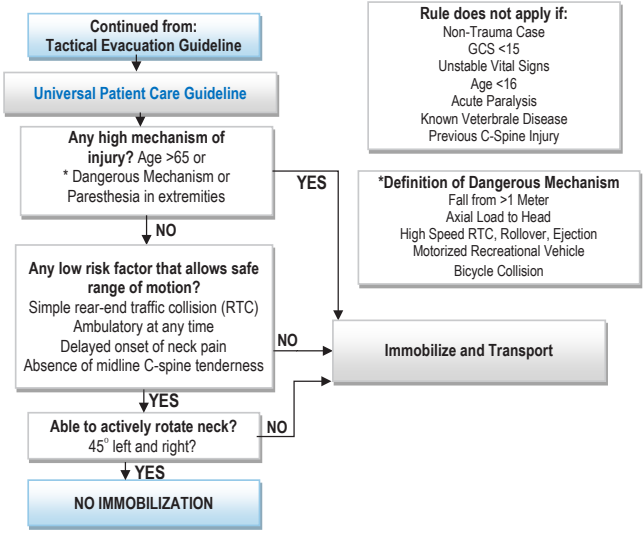
Signs and Symptoms:	Differential Diagnosis:
• Bleeding	• Dental Caries
• Pain	• Infection
• Fever	• Fracture
• Swelling	• Avulsion
• Missing/Fractured Tooth	• Abscess/Cellulitis
	• Gingivitis



Pearls:

- Significant soft tissue swelling to face / mouth can represent cellulitis or an abscess.
- **Avulsion** (Complete Avulsion Only)
  - Gently rinse (do not scrub) tooth with NS and attempt to re-implant with firm pressure into the socket. **Never perform this in children with primary teeth**.
  - As able and without obstructing airway, place bulky dressing over tooth and use as a soft bite block to stabilize tooth. Instruct to bite down gently, do not move jaw.
- **Subluxation** (tooth displaced in socket)
  - Treatment not always required.
  - For obviously loose or displaced tooth consider placing bulky dressing over tooth and use as a soft bite block to stabilize tooth. Instruct to bite down gently, do not move jaw.
- Occasionally, cardiac chest pain can radiate to the jaw.
- Patient with dental abscess may experience significant pain at altitude due to gas volume expansion at lower atmospheric pressure. Consider flying at lower altitude and refer to pain management guideline.

SPINAL EVALUATION & IMMOBILIZATION/CANADIAN C-SPINE RULE (CCR)



CONTRAINDICATIONS:

- Patients with isolated penetrating cervical injury who are conscious and have no neurologic signs should not have a cervical collar placed in the pre-hospital environment.

PROCEDURE:

- Evaluation should take place after the primary survey and all emergent procedures completed. However, during the primary survey, the spine should be protected by manual inline stabilization/limited movement prior to completion of spinal examination. This does not apply to situations in which imminent danger exists and immediate movement is necessary.

Document procedure, results, and vital signs.

- On the battlefield, safety of patient and medical personnel are paramount. In hostile situations, evacuation to a more secure area takes precedence over spine immobilization.

FOLEY CATHETER PLACEMENT

CLINICAL INDICATIONS:

- Bladder distention in an unconscious person, or for blockage/inability to urinate in conscious person.
- Allows for accurate monitoring of output for fluid management.

CONTRAINDICATIONS:

- Known or suspected urethral disruption resulting from pelvic trauma.
- Combative or uncooperative patient.

PROCEDURE:

- Choose appropriate catheter (16-18 for adults) and ready equipment.
- Position patient. Females in supine position with legs abducted. Cleanse urethra and surrounding area with antiseptic solution. Isolate area with drapes provided.
- Insert xylocaine jelly provided into urethra with the syringe provided.
- Insert catheter into urethra. For **females** advance the catheter approx. 3 inches. For **males**, pass catheter into the bladder the full length to the junction of the catheter and inflation port for balloon.
- Once urine is obtained, inflate balloon with 5cc NS, then pull catheter outward until balloon against bladder neck. If no urine return is given and procedures to induce urine return (bladder palpation) do not work, DO NOT inflate the balloon.
- Secure catheter to leg with tape to prevent trauma to urethra. Document procedure.

Document procedure, results, and vital signs.

NASO/OROGASTRIC TUBE

CLINICAL INDICATIONS:

- Enabling gastric decompression, decreasing risk of vomiting and aspiration, obtain sample of gastric contents.
- Allows for gastric lavage in drug overdose or poisoning.

CONTRAINDICATIONS:

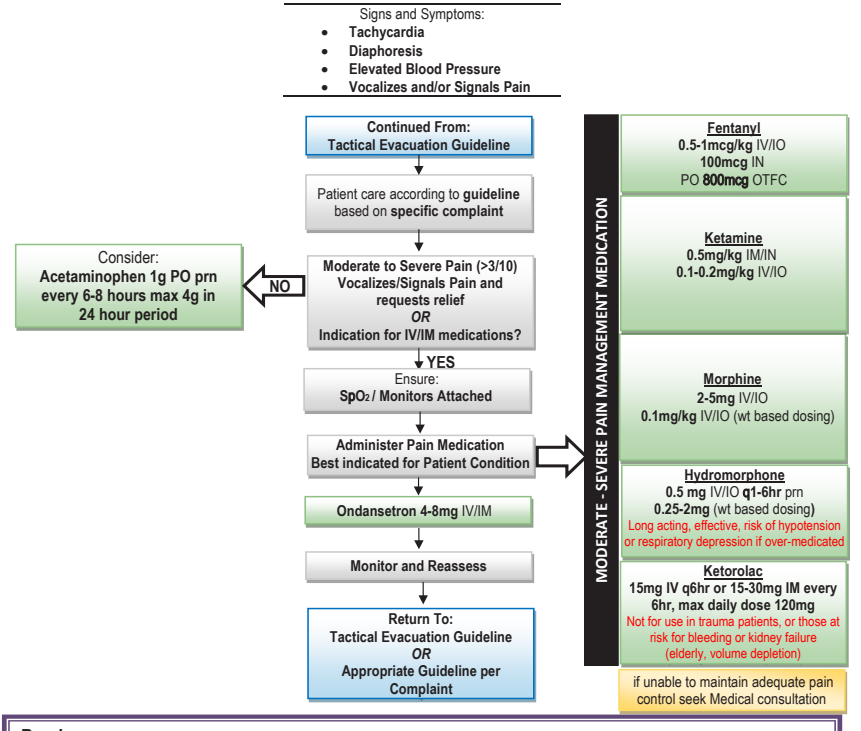
- Nasogastric tubes contraindicated in the presence of massive facial trauma, burns, or suspicion of basilar skull fracture (CSF otorrhea, Battle's sign, raccoon eyes, mechanism). May insert orogastric tube instead.

PROCEDURE:

- If possible, sit patient upright for optimal neck and stomach alignment.
- Measure tubing from bridge of nose to earlobe, then to the point halfway between the end of the sternum and the navel. Mark measured tube with marker.
- Select most patent nare (or the throat) and pass lubricated tube in a posterior – NOT SUPERIOR – direction. If resistance is met, attempt to corkscrew slightly or remove and attempt in other nare.
- Withdraw tube immediately if changes occur in patient's respiratory status, if tube coils in mouth, if the patient begins to cough, or becomes cyanotic.
- Advance tube until mark is reached.
- Verify tube placement by listening over stomach while air is passed or examining aspirate when applied to suction. Secure tube. Watch vital sign for changes.

Document procedure, results, and vital signs.

PAIN MANAGEMENT



Pearls:

- Document patient's medications and all allergies prior to administration of medications.
- PO medications should not be used in any patient with altered mental status or anyone in whom surgery is anticipated, unless directed by transferring provider.
- **Narcotic pain medications can be reversed with Naloxone 0.4-2mg IV.**
- Start with low dosage of pain medications and titrate upward to desired effect.
- Fentanyl and Morphine will cause a decrease in BP through various drug effects. Fentanyl is preferred over Morphine for immediate pain control.
- **Treatment of "Ketamine Associated Psychiatric Distress" or "Ketamine induced agitation,"**
  - **Midazolam 2-5mg IV x1 prn for agitation due to Ketamine administration**
- Morphine and/or Ketamine auto-injectors may be used if available; however IV/IO route is preferred.
- Ketamine can cause slight decrease in blood pressure, especially with hypotensive shock patients, lower doses are recommended in this type of patient.
- Fentanyl OTFC 800mcg may be used if patient is conscious. Do NOT CHEW

Pediatric PAIN MANAGEMENT

Vital Functions and Pain Scale

Signs and Symptoms:

- **Tachycardia, Diaphoresis, Elevated Blood Pressure, Cry, Grimace, Splinting, Guarding**

AVERAGE PEDIATRIC VITAL FUNCTIONS

BROSELOW cm	<61cm	61cm	67cm	75cm	87cm	96cm	109cm	122cm	138cm	149+cm
(approx) weight	3-5kg	6-7kg	8-9kg	10-11kg	12-14kg	15-18kg	19-23kg	24-29kg	30-36kg	37>kg
AGE	MONTHS			YEARS						
	0 1 2 3 4 5 6 7 8 9 10 11			1	2	3 4 5 6 7 8 9 10 11				12-16
HEART RATE	107-181	93-161		88-156	70-142	59-131		52-115		43-108
RESP RATE	25-66	22-64		19-53	17-38	16-29		14-25		12-23
SYSTOLIC BP	60	79-105		85-108	88-110	91-119		97-137		
DIASTOLIC BP		34-81		40-69	45-68	51-89		59-86		
URINE (mL/kg/hr)	2			1.5	1					0.5

Weights and lengths in above chart are estimates, to achieve most accuracy utilize Broselow tape on patient

Pediatric FLACC Pain Scale

(2 Months – 7 Years or Individuals Unable to Communicate)

Score of 5-10 = Moderate-Severe Pain, Consider Narcotic

Criteria	0	1	2
Face	No particular expression or smile	Occasional grimace or frown, withdrawn, uninterested	Frequent to constant quivering chin, clenched jaw
Legs	Normal position or relaxed	Uneasy, restless, tense	Kicking or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting, back and forth, tense	Arched, rigid or jerking
Cry	No cry (awake or asleep)	Moans or whimpers; occasional complaint	Crying steadily, screams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging or being talked to, distractible	Difficult to console or comfort

In hemodynamically unstable or inconsolable child, consider:

Ketamine

(IV/IO Push over 1 min)

- Analgesia:
  - **IM / IN: 0.4mg/kg**
  - **IV / IO: 0.3mg/kg**
- Induction / Dissociative:
  - **IV / IO: 1-2mg/kg**

FENTANYL 0.5-2mcg/kg SIVP
q20-30min (Max 4mcg/kg)

MORPHINE 0.1mg/kg IV SIVP/IM
q120min (Max 0.4mg/kg)

Follow Procedural steps of:
PAIN MANAGEMENT GUIDELINE
Utilize Appropriate Medication in Pediatric Dose.

Acetaminophen 10-15mg/kg PO/PR

ONDANSETRON (for Nausea)

- **≤40kg 0.1mg/kg IV**
- **>40kg 4mg IV**

HYPOTHERMIA PREVENTION AND MANAGEMENT

CLINICAL BACKGROUND:

- Hypothermia, acidosis, and coagulopathy constitute the "triad of death" in trauma patients. The association of hypothermic coagulopathy with increased mortality has been well described. Over 80% of non-surviving patients have had a body temperature of less than 93.2ºF(34°C). This degree of hypothermia causes dysfunction of coagulation proteins, thus exacerbating hemorrhage. The mortality in combat casualties with hypothermia is double that of normothermic casualties with similar injuries.
- Prevention of hypothermia must be emphasized in combat operations and casualty management at all levels of care. Take early and aggressive steps to prevent further body heat loss and add external heat when possible for both trauma and severely burned casualties.
- Hypothermia occurs regardless of the ambient temperature; hypothermia can, and does, occur in both hot and cold climates.
- Prevention of hypothermia is much easier than treatment of hypothermia; therefore prevention of heat loss should start as soon as possible after the injury. This is optimally accomplished in a layered fashion with rugged, lightweight, durable products that are utilized at all subsequent levels of care, including ground and air evacuation, through all levels of care.

CONTRAINDICATIONS:

- Hyperthermia patients that require active cooling

PROCEDURE: Tactical Combat Casualty Care principles should be followed for preventing hypothermia.

- Primary Equipment
    - Hypothermia Prevention and Management Kits (HPMK). HPMK contains:
        - strong, flexible, lightweight Heat Reflective Shell that is impervious to wind & rain
        - Hood cover for Head
        - self-heating, oxygen-activated shell liner (ReadyHeat)
    - Blood Fluid Warmers
    - ReadyHeat Blankets
    - Wool or heat shield blankets

Take aggressive action to prevent hypothermia and maintain normothermic temperatures 97°-99°F (36°-38°C)

- **Blood/Fluid Warmers:** Utilize blood/fluid warmers for all IV/IO administration. Fluids should be warmed to 38° Celsius.

- **Head Cover:** Cover patients head with hood or Thermo-Lite Hypothermia Prevention System Cap. Greatest area of heat loss happens at the top of the patients head.

- **ReadyHeat Blankets:** Place the ReadyHeat Blanket on the torso and back of the casualty with a layer of clothing or a sheet or wool blanket between the casualty's skin and the ReadyHeat Blanket.
- **Cover Patient:** Utilize Heat Reflective Shell, rescue or wool blankets to cover the patient. Use blankets to insulate patient from cold surfaces.
- **Remove Wet Clothing:** Remove wet clothing and attempt to dry patient.
- **Close doors and windows:** Reduce heat loss from convection over the patient and cooling of the environment.
- **Cabin Auxiliary Heater:** Even on mildly warm days, use cabin aux heat to maintain treatment area temperature of >85°–90° Fit
- **Limit Exposure**: only expose areas necessary to visualize and work on the patient. Cover exposed areas as soon as able following procedures.

Continuously monitor patient and record temperature. A core temperature should be taken for best accuracy.

Document procedure, results, and vital signs.

Vital Functions
Assessment Reference Charts

AVERAGE VITAL FUNCTIONS by age

BROSELOW cm	<61cm	61cm	67cm	75cm	87cm	96cm	109cm	122cm	138cm	149+cm
(approx) weight	3-5kg	6-7kg	8-9kg	10-11kg	12-14kg	15-18kg	19-23kg	24-29kg	30-36kg	37>kg
AGE	MONTHS					YEARS				
	0 1 2 3 4 5 6 7 8 9 10 11			1	2	3 4	5 6	7 8	9 10	11 12-16
HEART RATE	107-181	93-161		88-156	70-142	59-131		52-115		43-108
RESP RATE	25-66	22-64		19-53	17-38	16-29		14-25		12-23
SYSTOLIC BP	60	79-105		85-108	88-110	91-119		97-137		
DIASTOLIC BP		34-81		40-69	45-68	51-89		59-86		
URINE (mL/kg/hr)	2			1.5	1					0.5

Weights and lengths in above chart are estimates, to achieve most accuracy utilize Broselow tape on patient

Oxygen Saturation

	Sea Level	5,000 Feet MLS
SpO_2 (Peripheral O_2 Sat)	>94% for patient with Normal Hemoglobin level	>92%
StO_2 (Tissue O_2 Sat)	>75-95%	Same (<75% = Poor Perfusion)
$EtCO_2$	35-45mmHg	

Vital Functions
Assessment Reference Charts

GLASGOW COMA SCALE

SCORE	ADULT	CHILD	INFANT
Eye Opening			
4	Spontaneous	Eye Opening Response Same as Adult	
3	To Speech		
2	To pain		
1	None		
Verbal Response			
5	Oriented	Oriented	Coos and babbles
4	Confused Conversation	Confused Conversation	Irritable, Cries
3	Inappropriate Words	Inappropriate Words	Cries in Response to pain
2	Incomprehensible Sounds	Incomprehensible Words/Sounds	Moans in Response to Pain
1	None	None	None
Best Motor Response			
6	Obeys Commands	Obeys Commands	Moves Spontaneously
5	Localizes Pain	Localizes Pain	Withdraws to Touch
4	Flexion Withdrawal to Pain	Flexion Withdrawal to Pain	Withdraws from Pain Stimulus
3	Abnormal Flexion (Decorticate)	Abnormal Flexion (Decorticate)	Abnormal Flexion (Decorticate)
2	Extension (Decerebrate)	Extension (Decerebrate)	Extension (Decerebrate)
1	None (Flaccid)	None (Flaccid)	None (Flaccid)

For Intubated Patient use **Verbal "T"**
(Example: Eyes open to pain, Intubated, and Localizes would be E2,V1,M5, or **GCS 8T**)

Vital Functions
Assessment Reference Charts

MUSCULOSKELETAL INJURY and PERIPHERAL NERVE ASSESSMENT

UPPER EXTREMITIES

INJURY to Consider	MOTOR Testing	SENSATION Testing	NERVE
Elbow Injury	Index and Little Finger Abduction	Little Finger	Ulnar
Wrist Fracture or Dislocation	Thenar Contraction with Opposition	Index Finger	Median Distal
Supracondylar Fracture of Humerus	Index Tip Extension	None	Median, Anterior Interoseous
Anterior Shoulder Dislocation	Elbow Flexion	Radial Forearm	Musculocutaneous
Distal Humeral Shaft, Anterior Shoulder Dislocation	Thumb, Finger group Extension	First Dorsal Web Space	Radial
Anterior Shoulder Dislocation, Proximal Humerus Fracture	Deltoid	Lateral Shoulder	Axillary

LOWER EXTREMITIES

Pubic Rami Fractures	Knee Extension	Anterior Knee	Femoral
Obturator Ring Fractures	Hip Adduction	Medial Thigh	Obturator
Posterior Tibial	Toe Flexion	Sole of Foot	Knee Dislocation
Fibular Neck Fracture, Knee Dislocation	Ankle Eversion	Lateral Dorsum of Foot	Superficial Peroneal
Fibular Neck Fracture, Compartment Syndrome	Ankle / Toe Dorsiflexion	Dorsal 1st-2nd Web Space	Deep Peroneal
Posterior Hip Dislocation	Plantar Flexion	Foot	Sciatic Nerve
Acetabular Fracture	Hip Abduction	Upper Buttocks	Superior Gluteal
Acetabular Fracture	Hip Extension	Lower Buttocks	Inferior Gluteal

MUSCLE STRENGTH GRADING

SCORE	EXAM RESULT
0	Total Paralysis
1	Palpable or Visible Contraction
2	Full Range of Motion Without Gravity
3	Full Range of Motion Against Gravity
4	Full Range of Motion, but Less than Normal Strength
5	Normal Strength
NT	Not Testable

Vital Functions
Assessment Reference Charts

PEDIATRIC ALS EQUIPMENT
(Always use a Broselow® Pediatric Emergency Tape if available)

BROSELOW cm	<61cm	61cm	67cm	75cm	87cm	96cm	109cm	122cm	138cm	149+cm
(approx) weight	3-5kg	6-7kg	8-9kg	10-11kg	12-14kg	15-18kg	19-23kg	24-29kg	30-36kg	37>kg
AGE	MONTHS				YEARS					
	0 1 2 3 4 5 6 7 8 9 10 11			1	2	3 4	5 6	7 8 9	10 11	12-16
RESUSCITATION BAG	Infant	Child					Child/Adult			Adult
O2 MASK	Newborn			Pediatric			Adult			
ORAL AIRWAY	Infant/Small Child			S Child	Child		Child/S Adult			Med Adult
BAG MASK	Infant	Pediatric					Peds/Adult			
LARYNGOSCOPE	0-1	1 Straight			2 Strait	2Straight/Curved		2-3 St/Curv		3 St/Curved
ET TUBE	2.5-3 Uncufd	3.5 Uncuffed		4 Un cuffed	4.5 Un cuffed	5 Un cuffed	5.5 Un cuffed	6 Cuffed		6.5 Cuffed
STYLET	6						14			
SUCTION	6-8	8		8-10	10					12
BP CUFF	Newborn/Infant			Infant/ Child	Child			Child/ Adult		Adult
IV CATHETER	22-24			20-24	18-22		18-20			16-20
OG/NG TUBE	5-8			8-10	10	10-12	12-14	14-18		18
CHEST TUBE	10-12			16-20	20-24		24-32	28-32		32-40
URINARY CATHETER	5-8			8-10	10	10-12		12		
CERVICAL COLLAR	N/A	Small					S/M	Medium		M/L

Weights and lengths in above chart are estimates, to achieve most accuracy utilize Broselow tape on patient

BROSELOW cm	<61cm	61cm	67cm	75cm	87cm	96cm	109cm	122cm	138cm	149+cm
(approx) weight	3-5kg	6-7kg	8-9kg	10-11kg	12-14kg	15-18kg	19-23kg	24-29kg	30-36kg	40kg 45
pounds	6-11	13-15	17-20lbs	22-25	27-32	34-41	42-52	54-65	67-80	90 101
AGE	MONTHS			YEARS						
	0 1 2 3 4 5 6 7 8 9 10 11			1	2	3 4	5 6	7 8 9	10 11	12-16
FLUID BOLUS	80ml	130	170ml	210ml	260ml	340ml	420ml	500ml		
ZOLL DEFIB ENERGY 1st	8J	10J	15J	20J		30J		50J		75J
2nd	15J	20J	30J		50J		75J	100J	120J	150J
MAXIMUM	30J	50J	75J	100J	120J	150J		200J		

Weights and lengths in above chart are estimates, to achieve most accuracy utilize Broselow tape on patient

ZOLL® Defibrillation Energy Settings for PEDIATRIC Patients

COMMON LABORATORY VALUES

Laboratory	Chemistry Conventional		SI Units	
Anion Gap	8-16mEq/L		8-16mmol/L	
BUN	8-25mg/100mL		2.9-8/9mmol/L	
Calcium	8.5-10.5mg/100mL		2.1-2.6mmol/L	
Carbon Dioxide	24-30mEq/L		24-30mmol/L	
Creatine	**Male**	0.2-0.5mg/dL	**Female**	0.3-0.9mg/dL
Creatine Kinase	**Male**	17-40U/L	**Female**	10-79U/L
Creatinine	0.6-1.5mg/100L		53-133	
Glucose	70-110mg/100mL		3.9-5.6mmol/L	
Sodium	135-145mEq/L			
Potassium	3.5-5.0mEq/L		3.5-5.0mmol/L	
Hematology				
Hemoglobin	**Male**	13-18g/100mL	**Female**	12-16g/100mL
Hematocrit	**Male**	41-50%	**Female**	36-44%
Platelets	140,000-450,000/mL			
Cardiac Markers				
Troponin I*	**Onset**	4-6hr	**Peak**	12-24hr
Troponin T*	**Onset**	3-4hr	**Peak**	10-24hr
Myoglobin	**Male**	10-95ng/mL	**Female**	10-65ng/mL
	Onset	1-3hr	**Peak**	Peak: 6-10hr
INR only if Tx for DVT	0.8-1.2		2.0-3.0	
Normal Blood Gasses				
pH	7.35-7.45			
PCO_2	35-45mmHg			
HCO_3	22-26mmol/L			
Base excess	(-2)-(+2)mEq/L			
CO_2	19-24mEq/L			
SaO_2	96-100%			

***Troponin assays are becoming more analytically sensitive. Each device has different reference ranges associated. Correlate cTn with reference lab. Point of care readers are less sensitive.**

USEFUL CALCULATIONS

PEDIATRIC FORMULAS:

- **ETT Size = (**Age/4)+4 (Age divided by 4 plus 4)
- **ETT Depth =** 3 x ETT Size (Endotracheal)
- **Weight in kg** (>1 year) = (Age (years) x 2) + 8
- **Systolic Blood Pressure minimum** = 70 + [2 x Age (years)]

MEDICATION FORMULAS:

- **mcg/kg/min (micrograms/kilogram/minute)** = [16.7 X Drug Concentration (mg/ml) x infusion rate (ml/h)] Weight (kg).
- **INFUSION RATE (mL/h)** = [Desired mcg/kg/min x Weight (kg) x 60]/Drug concentration (mcg/mL)

HEMODYNAMIC FORMULAS:

- **MAP**: Mean Arterial Pressure = [(2 x DBP) + SBP]/3.
- **SBP** = (Systolic Blood Pressure)
- **DBP** = (Diastolic Blood pressure)
- / = (Divided by)
- **PULSE PRESSURE:** SBP – DBP or (Systolic Blood Pressure minus Diastolic Blood pressure).
- **Cerebral Profusion Pressure (CPP):** MAP-ICP=CPP
- **ICP**= (Intracranial Pressure)
- **Ideal CPP=>65** While ICP cannot often be measured during flights; an assumption that patients with TBI have an ICP of 15-20 will allow hemodynamic optimization in these patients to ensure adequate CPP.

Common Conversions:

- lb = kg x 2.2 or kg = lbs x 0.45
- Fahrenheit = (Celsius x 1.8) + 32 or Celsius = (Fahrenheit -32) x 5/9
- 1tsp = 5mL
- 1tbsp = 15mL
- 1oz = 30mL
- 1g = 1,000mg
- 1mg = 1,000mcg
- 1g = 10,000mcg

OXYGEN CYLINDER LIFE:

Cylinder	D	E	G	H
Liters	**356**	622	5260	6900
Flow (LPM)	**Length of use (min)**	**Length of use (min)**	**Length of use (min)**	**Length of use (min)**
2	**178**	311	2630	3450
4	**89**	155	1315	1725
6	**59**	104	876	1150
8	**44**	78	658	862
10	**35**	62	526	690
12	**30**	52	438	575
15	**23**	41	350	460

NOTE: Current MEDEVAC Oxygen Cylinder is "D" type.

To estimate duration of use for Oxygen Cylinders:

- Duration of Flow = Contents of cylinder/Flow rate.

Cylinder Factors for Calculation of Duration of Oxygen Flow:

- **Cylinder Size** D E G H and K
  Factor 0.16 0.28 2.41 3.14

Once you have the cylinder factor and the amount of pressure remaining in the cylinder, the duration of flow can be calculated with the following equation.

Duration of flow (min) = Pressure (psig) x Cylinder Factor/Flow (L/min)

Lund-Browder Burn Estimate Chart – Adult

Total Area front/back (circumferential)		one side--anterior	one side--posterior	Do not include in total TBSA			
	Adult	adult	adult	1st °	2nd °	3rd °	TBSA
Head	7	3.5	3.5				0
Neck	2	1	1				0
Anterior trunk*	13	13	0				0
Posterior trunk*	13	0	13				0
Right buttock	2.5	na	2.5				0
Left buttock	2.5	na	2.5				0
Genitalia	1	1	na				0
Right upper arm	4	2	2				0
Left upper arm	4	2	2				0
Right lower arm	3	1.5	1.5				0
Left lower arm	3	1.5	1.5				0
Right hand	2.5	1.25	1.25				0
Left hand	2.5	1.25	1.25				0
Right thigh	9.5	4.75	4.75				0
Left thigh	9.5	4.75	4.75				0
Right leg	7	3.5	3.5				0
Left leg	7	3.5	3.5				0
Right foot	3.5	1.75	1.75				0
Left foot	3.5	1.75	1.75				0
	100	48	52	0	0	0	0

Age:	
Sex:	
Weight:	

Patient Identification

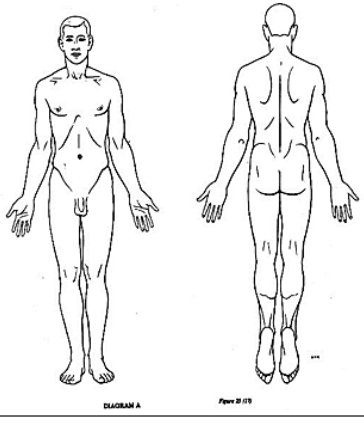
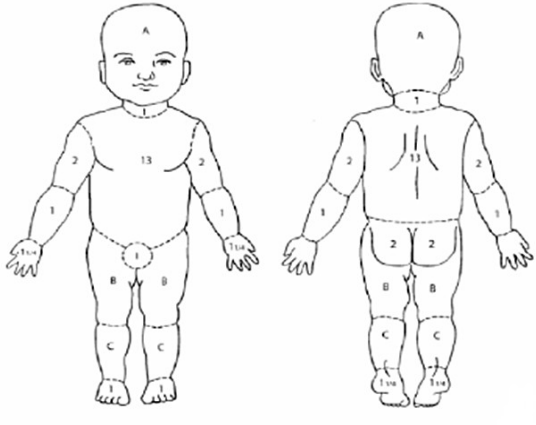


DIAGRAM A

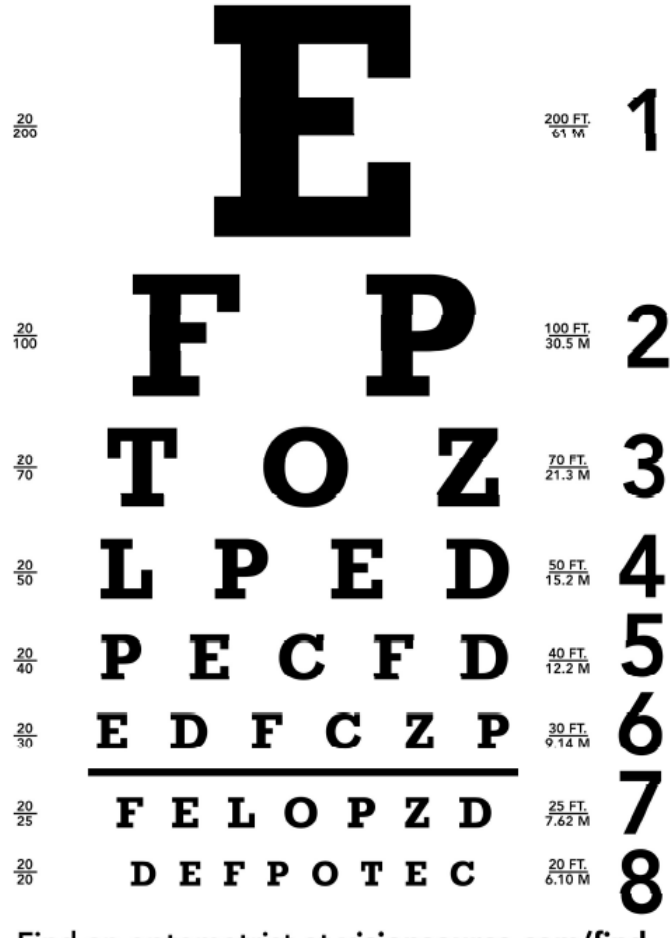
Pediatric Lund Browder Burn Estimate & Diagram

Total Area front/back (circumferential)	1 to 4 years	5 to 9 years	10 to 14 years	15 years	Do not include in total TBSA 1st	2nd °	3rd °	TBSA
Head	17	13	11	9				0
Neck	2	2	2	2				0
Anterior trunk*	13	13	13	13				0
Posterior trunk*	13	13	13	13				0
Right buttock	2.5	2.5	2.5	2.5				0
Left buttock	2.5	2.5	2.5	2.5				0
Genitalia	1	1	1	1				0
Right upper arm	4	4	4	4				0
Left upper arm	4	4	4	4				0
Right lower arm	3	3	3	3				0
Left lower arm	3	3	3	3				0
Right hand	2.5	2.5	2.5	2.5				0
Left hand	2.5	2.5	2.5	2.5				0
Right thigh	6.5	8	8.5	9				0
Left thigh	6.5	8	8.5	9				0
Right leg	5	5.5	6	6.5				0
Left leg	5	5.5	6	6.5				0
Right foot	3.5	3.5	3.5	3.5				0
Left foot	3.5	3.5	3.5	3.5				0

1	
2	
3	



SNELLEN CHART



Find an optometrist at **visionsource.com/find**

EXAMPLE Standing Order Sheet for Critical Care Patient Transfers

PATIENT IDENTIFICATION

(Last, First, Middle Initial; SSN/Identification Number; grade; DOB; treatment facility)

Date:

Sending Facility:

Sending Physician:

Receiving Facility:

Diagnosis:

Condition:

Patient Category:

Allergies:

Height:

Weight (kg):

Fluids: [ ] LR mL/hr [ ] NS mL/hr [ ] 3% Saline mL/hr [ ] D5W [ ] Other_____ [ ] PRBC [ ] FWB [ ] Plasma [ ] LTOWB

Monitoring: [ ] Vital Signs [ ] Every 5 min Vital Signs [ ] Every 15 min Vital Signs [ ] Every 30 min [ ] Continuous cardiac monitoring, document rhythm strips pre-flight and with any rhythm changes [ ] ICP/CPP [ ] CVP [ ] GCS [ ] ETCO2 [ ] UO_____mL hourly

Activity: [ ] Bed rest

[ ] Spine precautions: C-Collar/C-Spine TLS Spine

Nursing: [ ] Wound VAC dressing to _____mm Hg suction

[ ] NGT to low continuous suction OR [ ] Clamp NGT

[ ] OGT to low continuous suction OR [ ] Clamp OGT

[ ] Chest tube 1 to: water seal (circle: R L Both) OR _____cm H2O Suction (circle: R L Both) [ ] Chest tube 2 to: water seal (circle: R L Both) OR _____cm H2O Suction (circle: R L Both) [ ] Chest tube 3 to: water seal (circle: R L Both) OR _____cm H2O Suction (circle: R L Both) [ ] Chest tube 4 to: water seal (circle: R L Both) OR _____cm H2O Suction (circle: R L Both) [ ] Keep HOB elevated _____ degrees [ ] Keep HOB flat

Respiratory: [ ] Keep O2Sat >_____ %

Oxygen: [ ] Nasal Cannula at _____LPM [ ] Non-rebreather at _____ LPM

Ventilator Settings: Mode: [ ] SIMV [ ] AC [ ] CPAP [ ] BiPAP

Rate: _____breaths per minute I:E ratio:_____

Tidal Volume: _____ mL FiO2:_____ % PEEP: _____cm H2O PIP: _____

FORMS

PATIENT IDENTIFICATION
(Last, First, Middle Initial; SSN/Identification Number; grade; DOB; treatment facility)
Vasoactive Medications:
[ ] Dopamine ___mg/___mL at____mcg/kg/min IV; titrate to MAP > _____mm Hg
[ ] Norepinephrine 4mg/___mL at____mcg/min IV; titrate to MAP >_____ mm Hg
[ ] Phenylephrine 10mg/____mL at____mcg/min IV; titrate to MAP >_____ mm Hg
[ ] Epinephrine __mg (1:10,000)/___mL at____mcg/min IV; titrate to MAP >_____ mm Hg [ ] Other_____
Sedation and Analgesics:
[ ] Ketamine __mg/kg Q___minutes IVP PRN sedation to Riker Sedation-Agitation Scale of 1-2 [ ] Midazolam ___mg Q___minutes IVP PRN sedation to Riker Sedation-Agitation Scale of 1-2 [ ] Haloperidol ___mg Q___minutes IVP PRN sedation to Riker Sedation-Agitation Scale of 1-2 [ ] Lorazepam ___mg Q___minutes IVP PRN sedation to Riker Sedation-Agitation Scale of 1-2 [ ] Fentanyl ____mcg Q___minutes IVP PRN pain
[ ] Morphine ___mg Q___minutes IVP PRN pain
[ ] Other_____
Paralytics:
[ ] Rocuronium _____mg IVP
[ ] Vecuronium _____mg IVP
Intracranial Hypertension:
[ ] 3% Hypertonic Saline 250 cc bolus for any signs of herniation
[ ] Mannitol Infusion Rate: _____
Labs:
[ ] ABG 15 minutes prior to departing sending facility
[ ] Other:
Additional critical information:
Physician Signature:

JTS BURN RESUSCITATION WORKSHEET

United States Army Institute of Surgical Research Phone Numbers
Comm: (210) 916-2876 (BURN)
DSN: 312-429-2876

***Initiate AFTER** completion of trauma assessment and interventions*
***Adults only**: Refer to Burn CPG for pediatric specific recommendations*

1. Contact USAISR Burn Center (DSN 312-429-2876) or email: burntrauma.consult.army@mail.mil

Date/Time contact: _____POC:_____ by:_____

2. Estimated Pre-burn Weight (wt): _____kg (Average Service Members are 82 ± 15 kg)

3. Estimate Total Burn Surface Area (TBSA) using Rule of Nines (refine with Lund-Browder after wounds are cleansed)

Partial thickness (2nd)_____% + Full thickness (3rd)_____% = TBSA_____%

IF TBSA >40%: intubate (use ETT ≥ 7.5 fr to facilitate bronchoscopy)

IF TBSA <15%: formal resuscitation may not be required, provide maintenance and/or oral fluids

4. Standard Burn Resuscitation Fluid: Lactated Ringers (LR) or Plasmalyte

5. Calculate INITIAL Fluid Rate using Rule of 10 (adults):

- **IF wt < 40kg: 2ml x %TBSA_____ x wt(kg)_____ ÷ 16 = _____ml/hr**
- **IF wt ≥ 40kg: %TBSA_____ x 10 = _____ml/hr**
  - **IF wt > 80kg: add 100ml/hr to initial rate for every 10 kg>80: adjusted initial fluid rate = _____ml/hr**
  - **(Example: 100kg patient with 50% TBSA burn = 50% x 10 = 500 ml + 200 ml = 700 ml for first hour)**

6. If Inhalation Injury Present: administer aerosolized heparin in albuterol (5,000 units Q4 hours)

7. Titrate Resuscitation Fluid: maintain target UOP 30-50ml/hr (Q 1 hour)

- **If rhabdomyolysis present: use target UOP 75-100 ml/hr (Contact USAISR Burn Center DSN 312-429-2876)**
- **Goals: UOP >30 but <50ml/hr; adequate tissue perfusion (normalized lactate/base deficit), MAP >55 mmHg**
- **Minimum fluid rate 125mL/hr LR**
- *** Avoid fluid boluses**
- **** Too much fluid as dangerous as too little**

High risk for over resuscitation/abdominal compartment syndrome:

- **If hourly rate >1500mL/hr x 2 hrs OR**
- **If total 24 hr volume exceeds: wt(kg) x 250ml= _____ml (includes all infused fluids)**
  - **Contact USAISR Burn Center (DSN 312-429-2876)**
  - **Consider adjuncts (below)**
  - **Check bladder pressures Q4hrs (>20 mmHg notify physician)**
  - **Avoid surgical decompression (significant mortality risk in burns)**

Adjuncts:

1. **Colloids: 5% albumin/FFP (Hextend only if others unavailable)**
   - *** Colloids not preferred until hour 8-12; can consider earlier in difficult resuscitation**
   - **Infuse at ml/hr according to chart below based on adult patient weight and burn size**
2. **Vasopressors: Contact USAISR Burn Center (DSN 312-429-2876)**

5% Albumin Infusion (ml/hr)	30-49%TBSA	50-69% TBSA	70-100% TBSA
<70 kg	30	70	110
70-90 kg	40	80	140
>90 kg	50	90	160

Ensure adequate volume (CVP trend 6-8 cm H_2O); maintain MAP > 55 mmHg

JTS BURN RESUSCITATION WORKSHEET

- Maintain ionized Ca >1.1 mmol/L
- Start with vasopressin 0.04mg/min. **DO NOT TITRATE**
- Second line pressor: norepinepherine 2-20mcg/min
- Refractory shock: consider epinephrine or phenylephrine infusion
- Refractory shock: consider adrenal insufficiency, give hydrocortisone 100mg IV Q8 hrs
- Manage acidemia (pH<7.2): use ventilator interventions first, then bicarbonate or THAM infusion
- Renal replacement therapy if available (Contact USAISR Burn Center DSN 312-429-2876)

Assessment/Interventions:

- Complete full secondary trauma exam
- Ensure thermoregulation; administer warmed fluids; cover with space blanket; elevate burned extremities
- Superficial burn (1st degree): Sunburn, no blister, blanch readily; NOT included in TBSA
- Partial thickness (2nd degree): Blanch, moist, blisters, sensate
- Full thickness (3rd degree): Leathery, white, non-blanching, dry, insensate, thrombosed vessels
- Protect eyes with moisture shields if corneas exposed or blink reflex slow; apply ophthalmic erythromycin ointment at least Q2hrs.
- **Prompt intubation for facial burns, suspected inhalation injury, TBSA >40%**
  - Anticipate induction-associated hypotension
  - Secure ETT with cloth tie, not adhesive tape
  - Reassess ETT position at teeth Q1 hr as edema develops and resolves
  - Intubated patients require oro/naso-gastric tube for decompression
  - Administer IV proton-pump inhibitor
- Monitor bladder pressure at least Q4hrs for large burns or high volume resuscitations
  - Abdominal compartment syndrome: decreased UOP, increased pulmonary pressures, difficulty ventilating, bladder pressure remains > 20 mmHg
  - Avoid decompressive laparotomy; consider percutaneous peritoneal drainage
  - Reduce crystalloid volume using colloid or vasopressors
- Monitor pulses hourly: palmar arch, dorsalis pedis, posterior tibial with Doppler
  - Consider escharotomy if signal diminished; refer to Burn CPG for technique (Call USAISR Burn Center DSN 312-429-2876)
- Monitor extremity compartment pressures as clinically indicated
  - Elevate burned extremities at all times
  - Extremity compartment syndrome: pain, paresthesia, pallor, paralysis, pulselessness (late sign)
  - Fasciotomy may be required
- Wound care
  - Thoroughly cleanse burn wounds, preferably in Operating Room
  - Select topical antimicrobial in consultation with Burn Surgeon (Call USAISR Burn Center DSN 312-429-2876) based on product availability, expected transport time, etc
  - Acceptable to cover burns with dry sheets or clean dressings for first 48 hours
- All definitive burn surgery done at USAISR Burn Center for US Service Members (DSN 312-429-2876)

JTS Burn Resuscitation Flow Sheet – page 1 of 3

Date		Initial Treatment Facility				
Name		SSN	Pre-burn estimated weight (kg)	%TBSA (Do not include superficial 1st degree burn)	Calculate Rule of Tens (if >40<80kg, %TBSA x 10 = starting rate for LR	Calculate max 24hr volume (250ml x kg) Avoid over-resuscitation, use adjuncts if necessary
Date &Time of Injury				BAMC/ISR Burn Team DSN (210) 916-BURN: Yes No		

Tx Site/ Team	HR from burn	Local Time	Crystalloid* (LR) / Colloid	Total	UOP (Target 30-50ml/hr)	Base Deficit/ Lactate	Heart Rate	MAP (>55) / CVP (6-8mmHg)	Pressors (Vasopressin 0.04 u/min) Bladder Pressure (Q4)
	1st								
	2nd								
	3rd								
	4th								
	5th								
	6th								
	7th								
	8th								
	9th								
	10th								
	11th								
	12th								
	13th								
	14th								
	15th								
	16th								
	17th								
	18th								
	19th								
	20th								
Total Fluids:					*Titrate LR hourly to maintain adequate UOP (30-50ml/hr) and perfusion				

JTS Burn Resuscitation Flow Sheet – page 2 of 3

Date		Initial Treatment Facility					
Name		SSN	Pre-burn estimated weight (kg)	%TBSA (Do not include superficial 1st degree burn)	Calculate Rule of Tens (if >40<80kg, %TBSA x 10 = starting rate for LR		Calculate max 24hr volume (250ml x kg) Avoid over-resuscitation, use adjuncts if necessary
Date &Time of Injury				BAMC/ISR Burn Team DSN 312-429-2876: Yes No			

Tx Site/ Team	HR from burn	Local Time	Crystalloid* (LR) / Colloid	Total	UOP (Target 30-50ml/hr)	Base Deficit/ Lactate	Heart Rate	MAP (>55) / CVP (6-8mmHg)	Pressors (Vasopressin 0.04 u/min) Bladder Pressure (Q4)
	25th								
	26th								
	27th								
	28th								
	29th								
	30th								
	31st								
	32nd								
	33rd								
	34th								
	35th								
	36th								
	37th								
	38th								
	39th								
	40th								
	41st								
	42nd								
	43rd								
	44th								
	45th								
	46th								
	47th								
	48th								
Total Fluids:					*Titrate LR hourly to maintain adequate UOP (30-50ml/hr) and perfusion				

JTS Burn Resuscitation Flow Sheet – page 3 of 3

Date		Initial Treatment Facility				
Name		SSN	Pre-burn estimated weight (kg)	%TBSA (Do not include superficial 1st degree burn)	Calculate Rule of Tens (if >40<80kg, %TBSA x 10 = starting rate for LR	Calculate max 24hr volume (250ml x kg) Avoid over-resuscitation, use adjuncts if necessary
Date &Time of Injury				BAMC/ISR Burn Team DSN 312-429-2876: Yes No		

Tx Site/ Team	HR from burn	Local Time	Crystalloid* (LR) / Colloid	Total	UOP (Target 30-50ml/hr)	Base Deficit/ Lactate	Heart Rate	MAP (>55) / CVP (6-8mmHg)	Pressors (Vasopressin 0.04 u/min) Bladder Pressure (Q4)
	49th								
	50th								
	51st								
	52nd								
	53rd								
	54th								
	55th								
	56th								
	57th								
	58th								
	59th								
	60th								
	61st								
	62nd								
	63rd								
	64th								
	65th								
	66th								
	67th								
	68th								
	69th								
	70th								
	71st								
	72nd								
Total Fluids:									

*Titrate LR hourly to maintain adequate UOP (30-50ml/hr) and perfusion

DA Form 4700, Evacuation Patient Care Record (PCR)

1. **BACKGROUND and PURPOSE**
   a. Pre-Hospital, Pre-Medical Treatment Facility (pre-MTF), or inter-MTF evacuation documentation of medical interventions by ground vehicle and rotary-wing based medical personnel (CASEVAC/MEDEVAC) is critical to ensuring continuity of care and providing meaningful analyses of medical interventions, techniques, tactics, and procedures rendered during transport.
   b. As medical providers, it is critically important to document patient care for follow on providers in order to achieve the best patient outcomes. Additionally, well documented care can improve not only individual care, but as part of a Process Improvement system, good documentation can identify places where casualty care can be improved on a system-wide level.
   c. Use of the DA Form 4700, Evacuation Patient Care Record (PCR) will allow for individual care improvement as well as a method to enable appropriate patient care documentation. This will enable process improvement and quality assurance for medical providers rendering care during patient evacuations. It is designed specifically for documentation of care for all patients transported via ground or rotary-wing platforms in order to document all evaluation and care provided for casualties.

2. **POLICY**
   a. Commanders will ensure that all providers evacuating patients (to include both deployed and garrison operations, regardless of AOR) use the PCR to document enroute care. Such care relates to both battle and non-battle injuries.
   b. Once completed, the PCR will be entered into the patient's medical record and the Department of Defense Trauma Registry (DoDTR). Evacuation unit commanders must establish a clear process to ensure transmission of the medical information recorded to the Joint Trauma System for data capture and entry into both the patients' medical record and the DoDTR.
   c. Medical personnel providing care during evacuation will complete all entries as fully as possible.
   d. All abbreviations authorized for use in DoD health records or DoD trauma registries may also be used on the PCR.
   e. This PCR can be completed manually or electronically after care is provided and is designed to work equally well for either. Manual entries may be made using a non-smearing pen or marker.
   f. Free-text may be entered in any block despite appearance of drop-down menus.
   g. Blocks where information is not applicable should be left blank or can be marked "N/A"
   h. In an effort to accurately capture all patient care delivered, providers can document treatments relevant to their transport performed by personnel prior to their assumption of patient care. This care should be documented in the appropriate locations on the form with the time marked as "PTA" (Prior to arrival). (Ex: Ground medic places TQ on RUE prior to MEDEVAC arrival. TQ location, type, etc. should be annotated with time as "PTA").
   i. This form should be completed within 72 hours upon completion of evacuation mission and submitted to JTS ASAP following Medical Director review. Forms can be submitted via NIPR e-mail to: DHA.JBSA.j-3.List.JTS-Prehospital@mail.mil
   j. Additionaly JTS has the Military Enroute Care Registry (MERCuRY) (army.mil). Performance Improvement Events Data worksheet. See instructions on worksheet. Complete the MERCuRY worksheet in conjunction with the DA 4700 before submitting to the Joint Trauma System. (https://jts.amedd.army.mil/assets/docs/forms/MERCuRY_PI_28_Oct_2021.pd)

3. The most current version of the form, along with instructions for use can be found on the JTS site under the documents tab, or at the following address:
   https://jts.amedd.army.mil/index.cfm/documents/forms_after_action

MEDICAL RECORD-SUPPLEMENTAL MEDICAL DATA

For use of this form, see AR 40-66; the proponent agency is the Office of the Surgeon General

REPORT TITLE

Tactical Evacuation After Action Report & Patient Care Record, *Page 1*

JTS APPROVED *(Date)* *(12 Jul 2018) -V4.1*

Event: Date ____ Time ____ | Time Zone ◯L ◯Z | MM (___) ____ | Pt # ____ of ____ | Tail to Tail ◯Y ◯N | Leg # ____ of ____

9-Line: Time ____ Platform ____ Dispatch Cat ____ Assessed Cat ____

Trauma MIST Report: *M=Mechanism of Injury, I=Injury, S=Signs & Symptoms, T=Treatments* / **Disease Diagnosis:** ____

M ____ I ____ S ____ T ____

Comments ____

Pickup: Time ____ Role ____ Other ____ Region ____ Other ____ Location ____

Dropoff: Time ____ Role ____ Other ____ Region ____ Other ____ Location ____

Capability ☐ EMT-B ☐ EMT-I ☐ EMT-P ☐ EMT-FPC ☐ RN ☐ CRNA ☐ PA ☐ MD/DO Other ____

Circulation-Hemorrhage Control

☐ Direct Pressure
☐ Hemostatic Dressing
☐ Kerlix Dressing
☐ Pressure Dressing
Other ____

Tourniquet
Prior TQ: Reassess/tighten
◯Y ◯N ◯N/A

Time On ____ ☐ CAT ☐ SOFTT ☐ Other ____ ☐ RUE ☐ LUE ☐ RLE ☐ LLE # ____
Time On ____ ☐ CAT ☐ SOFTT ☐ Other ____ ☐ RUE ☐ LUE ☐ RLE ☐ LLE # ____
Time On ____ ☐ CAT ☐ SOFTT ☐ Other ____ ☐ RUE ☐ LUE ☐ RLE ☐ LLE # ____
Time On ____ ☐ CAT ☐ SOFTT ☐ Other ____ ☐ RUE ☐ LUE ☐ RLE ☐ LLE # ____
Time On ____ ☐ AAJT ☐ CRoC ☐ JETT ☐ SAM ☐ Other Junctional ____ #____

TQ Comments ____

Airway

☐ Self ☐ NPA ☐ OPA ☐ Cric ☐ Trach ☐ ETT ☐ SGA Type ____

Tube Size ____ Pos ____ @ ____ Confirmed ☐BS ☐Vis ☐$ETCO_2$

O_2 Source ☐ NC ☐ NRB ☐ BVM ☐ Vent LPM ____

Intubated ☐ Prior to transport ☐ By transport crew **Suction** ☐ ETT ☐ Yaunker

Breathing

Needle Decompression
Time ____ ☐ R ☐ L ☐ Mid-ax ☐ Mid-clav
Time ____ ☐ R ☐ L ☐ Mid-ax ☐ Mid-clav
Time ____ ☐ R ☐ L ☐ Mid-ax ☐ Mid-clav
Time ____ ☐ R ☐ L ☐ Mid-ax ☐ Mid-clav

Chest Tube Time ____ ☐ R ☐ L

Chest Equal Rise and Fall
◯Y ◯N ◯N/A

Respiratory Effort
☐ Unlabored ☐ Labored
☐ Agonal ☐ Assisted

Vent Settings

	Time	Mode	Rate	TV	FiO_2	PEEP	PIP	$ETCO_2$
Initial								
Change								
Change								
Change								

Annotate Injuries

(AMP)utation
(BL)eeding
(B)urn % TBSA ____
(C)repitus
(D)eformity
(DG)Degloving
(E)cchymosis
(FX)Fracture
(GSW)Gunshot Wound
(H)ematoma
(IMP)Impaled Object
(LAC)eration
(P)ain
(PP)Peppering
(PW)Puncture Wound
(SQA)Subcutaneous Air
(TBI)Suspect
Other ____

Circulation - Assessment

Rhythm / Ectopy
☐ NSR ☐ SVT
☐ ST ☐ VT
☐ SB ☐ VF
☐ PEA
☐ Paced
☐ Asystole
☐ A-FIB
☐ A-FLUT

Pulses *A, D, +1, +2, +3*
RAD ____
BRAC ____
CAR ____
FEM ____
PED ____
TEMP ____

Circulation - Resuscitation

Transfusion Indication
☐ Amputation
☐ HR > 120
☐ SBP < 90

Blood Infusion

Time	Component	ABO/RH	Unit Number	Exp. Date	Blood Age

IV Lines

Peripheral
Hand ☐ R ☐ L ga ___
Arm ☐ R ☐ L ga ___
EJ ☐ R ☐ L ga ___

IO Type / Site
☐ Fast-1 ☐ EZ IO Other ____
Humerus ☐ R ☐ L
Tibia ☐ R ☐ L
☐ Sternum

Central Line Location
☐ Triple lumen ____
☐ Cordis ____

Arterial Line
Wrist ☐ R ☐ L
Groin ☐ R ☐ L

PREPARED BY *(Name, Rank & Title)* ____

DEPARTMENT/SERVICE/CLINIC *(Treating Unit)* ____

DATE ____

PATIENT'S IDENTIFICATION *(Name: last, first, middle; grade; date; hospital or medical facility)*

Last Name ____ First Name ____ MI ____

BR# ____ Rank ____ Unit ____ Pt Cat ____

SSN ____ DOB ____ Gender ◯M ◯F Allergy ____ Other ____

☐ HISTORY/PHYSICAL ☒ TREATMENT
☐ DIAGNOSTIC STUDIES ☐ FLOW CHART
☐ OTHER EXAMINATION OR EVALUATION
☐ OTHER, Specify

DA FORM 4700, FEB 2003 EDITION OF MAY 78 IS OBSOLETE. **JTS TACEVAC AAR & PCR OP 05 (MCMR-SRJ) NOV 2014** APD PE v1.01ES

MEDICAL RECORD-SUPPLEMENTAL MEDICAL DATA

For use of this form, see AR 40-66; the proponent agency is the Office of the Surgeon General

REPORT TITLE

Tactical Evacuation After Action Report & Patient Care Record, *Page 2*

JTS APPROVED (Date) (12 Jul 2018) -V4.1

Vital Signs

	Time	HR	BP	RR	SpO_2	$ETCO_2$	Temp	F C	AVPU	GCS: Eyes 1-4	Verbal 1-5	Motor 1-6	Total	Pain 0-10
First			/					○ ○						
			/					○ ○						
			/					○ ○						
Last			/					○ ○						

PERRLA ☐ R Size (mm) ____ ☐ L Size (mm) ____

Field Ultrasound Results ____ Other Diagnostics ____

Additional Interventions

	Time		Time	
Foley	____	Comment ____	**Gastric Tube**	____ ☐ Oral ☐ Nasal Comment ____
Protection	____	☐ Eye Shield ☐ Protective Eyewear ☐ Right ☐ Left Comment ____		
Immobilization	____	☐ C-Collar ☐ C-Spine ☐ Spine Board ☐ Pelvic Splint ☐ Pelvic Binder, Type ____		
	____	☐ Splint, Type/Location ____		
Warming	____	☐ Hypothermia Prevention, Product ____		
	____	☐ Hypothermia Prevention, Product ____		
Other Interventions	____	____		
	____	____		

Medications and Fluids *Route = IM, IN, IO, IV, PO, PR, SL, SQ*				**Medications and Fluids** *Route = IM, IN, IO, IV, PO, PR, SL, SQ*			
Time	Drug / Fluid	Dose	Route	Time	Drug / Fluid	Dose	Route

Documents Received ☐ TCCC Card ☐ Patient Chart ☐ None Other ____

Narrative Summary of Care

Enroute Care Provider

Last Name	First Name	Rank	Capability	Signature

Email PCR to: DHA.JBSA.J-3.List.JTS-Prehospital@mail.mil **MM (** ___ **)** ____

PREPARED BY *(Signature & Title)*	DEPARTMENT/SERVICE/CLINIC *(Treating Unit)*	DATE

PATIENT'S IDENTIFICATION *(Name: last, first, middle; grade; date; hospital or medical facility)*

Last Name ____ First Name ____ MI ___

BR# ____ Rank ____ Unit ____ Pt Cat ____

SSN ____ DOB ____ Gender ○ M ○ F Allergy ____ Other ____

☐ HISTORY/PHYSICAL ☒ TREATMENT
☐ DIAGNOSTIC STUDIES ☐ FLOW CHART
☐ OTHER EXAMINATION OR EVALUATION
☐ OTHER, Specify

DA FORM 4700, FEB 2003 EDITION OF MAY 78 IS OBSOLETE. **JTS TACEVAC AAR & PCR OP 05 (MCMR-SRJ) NOV 2014** APD PE v1.01ES

TACTICAL EVACUATION-AFTER ACTION REPORT & PATIENT CARE RECORD

Page 3

IAW AR 40-68 (RAR) 22 May 2009 Paragraph 3–7. This page is a quality assurance document. Do not file in medical records.

Casualty's Protective Equipment *(Check all worn)*

☐ Helmet, Ballistic	☐ Plate Front	☐ Neck Protector *(Back)*	☐ Groin Shield	☐ Blast Gauge
☐ Tactical Vest *(IOTV)*	☐ Plate Back	☐ Throat Protector *(Front)*	☐ Pelvic Undergarment Tier 1	☐ Blast Sensor Helmet
☐ Eye Protection	☐ Plate Right Side	☐ Deltoid Right	☐ Pelvic Undergarment Tier 2	☐ Blast Sensor Other
☐ Ear Protection	☐ Plate Left Side	☐ Deltoid Left		

AAR Discussion Event Date _____ ☐ Tactical situation complicated care *(Explain in discussion)*

Sustains	Improves

PATIENT'S IDENTIFICATION (*Name: last, first, middle; grade; date; hospital or medical facility)*

Last Name _____ First Name _____ MI ___

BR# _____ Rank _____ Unit _____

SSN _____ DOB _____ Gender ◯ M ◯ F Pt Cat _____

Date _____ Allergy _____ Other _____

The *National Defense Authorization Act* for fiscal year 1987 (Public Law (PL) No. 99-661), section 1102, Title 10, (10USC 1102) this document was created by or for the DOD in a medical QA program and is confidential and privileged. PL 99-661 and subsequent guidance predicated on this law (10 USC 1102) preclude disclosure of, or testimony about, any records or findings, recommendations, evaluations, opinions, or actions taken as part of a QA program except in limited situations. Under the provisions of 10 USC 1102, this information is exempt from release in accordance with Exemption 3 of the FOIA. Additional detailed information regarding the confidentiality of QA documents and records is contained in appendix B.

Military Enroute Care Registry (MERCuRY)

Performance Improvement Event(s) Data

Joint Trauma System, Version 1.1, 28 Oct 2021

Last Name | First Name | Date

PSSN/SSN ☐ PSSN ☐ SSN

Mission # | Mission Leg #

Documentation

- ☐ Standard form not used
- ☐ Patient identification not completed
- ☐ Dispatched versus assessed category differ
  - ☐ Dispatched category higher than assessed
  - ☐ Dispatched category lower than assessed
- ☐ MIST report mechanism not correct
- ☐ MIST report injuries not correct
- ☐ Mission times not recorded
  - ☐ Pick up time not recorded
  - ☐ Drop off time not recorded
  - ☐ Both times not recorded
- ☐ Role of care not documented
  - ☐ Pick up not recorded ☐ POI mission
  - ☐ Drop off not recorded ☐ Transfer mission
  - ☐ Both not recorded

Circulation /Hemorrhage Control

- ☐ Tourniquet not placed when indicated
- ☐ Tourniquet not reassessed
- ☐ Tourniquet conversion not attempted when indicated
- ☐ Tourniquet time not recorded
- ☐ Tourniquet indicated and successfully performed
- ☐ Type of tourniquet
  - ☐ Limb ☐ Junctional

Airway

- ☐ Deviation from airway management protocol
- ☐ Advanced non-surgical airway placement
  - ☐ Indicated and successfully performed
  - ☐ Performed when not indicated
  - ☐ Not performed when not indicated
  - ☐ Attempted unsuccessfully
- ☐ Cricothyroidotomy
  - ☐ Indicated and successfully performed
  - ☐ Performed when not indicated
  - ☐ Not performed when indicated
  - ☐ Attempted unsuccessfully

Breathing

- ☐ Needle decompression
  - ☐ Indicated and successfully performed
  - ☐ Performed but respiratory distress not resolved
  - ☐ Performed when not indicated
  - ☐ Two or more on the same side
  - ☐ Site not recorded
- ☐ Thoracostomy - finger or tube
  - ☐ Indicated and successfully performed
  - ☐ Performed when not indicated
  - ☐ Not performed when indicated
  - ☐ Attempted unsuccessfully
  - ☐ Two or more on the same side
- ☐ Ventilator management, no ETCO2 recorded
- ☐ Deviation from ventilator management protocol
- ☐ Vent setting changed but no outcome recorded
- ☐ Unplanned extubation enroute

Circulation

- ☐ Rhythm not recorded
- ☐ Blood product transfusion protocol
  - ☐ Indicated and successfully performed
  - ☐ Performed when not indicated
  - ☐ Not performed when indicated
  - ☐ Capability not available
- ☐ IV/IO not inserted enroute when indicated
- ☐ IV/IO insertion unsuccessful
- ☐ Tube or line dislodged enroute

Vitals

- ☐ Appropriate level of monitoring not utilized
- ☐ Vital signs not documented
  - ☐ Blood pressure
  - ☐ Heart rate
  - ☐ Respiratory rate
  - ☐ Sa02
  - ☐ Temperature
- ☐ Hypoxia (SaO2<88%)
  - ☐ Indicated intervention for hypoxia not performed
- ☐ Hypotension (SBP<90 mmHg)
  - ☐ Indicated intervention for hypotension not performed
- ☐ GCS or AVPU not documented
- ☐ GCS or AVPU changes not documented
- ☐ Pain assessment not completed

Additional Interventions

- ☐ Immobilization not performed when indicated
  - ☐ C-collar
  - ☐ Pelvic binder
  - ☐ Spinal motion restriction
  - ☐ SAM splint for extremity
  - ☐ Rigid eye shield
- ☐ Hypothermia prevention not initiated when indicated

Medications

- ☐ Pain medication not given per protocol
- ☐ Pain medication given, outcome undocumented
- ☐ TXA not given <3 hr after injury when indicated
- ☐ Antibiotic not given per protocol
- ☐ Other medication delay or complication (please specify)

Notes

Other

- ☐ Documentation from sending provider did not accompany patient (TCCC card or patient chart)
  - ☐ Absent documentation from ground team
- ☐ Diversion of flight or unplanned destination
- ☐ Incomplete hand off from ground team
- ☐ Equipment problem, unable to be resolved enroute
- ☐ Environmental issues affecting patient outcome
- ☐ Death or CPR enroute
- ☐ Missing needed gear or medications
- ☐ Events enroute precluding adequate patient monitoring/assessment/treatment
- ☐ Other (please specify in Notes)

Notes & Comments

Instructions

1. Complete the Mercury in conjunction with the 4700 before submitting to the Joint Trauma System.
2. Enroute care should be assessed for compliance with standard guidelines to include: Tactical Combat Casualty Care guidelines, Standard Medical Operating Guidelines, JTS Intratheater transport clinical practice guide.
3. At least two unique patient identifiers are needed for documenting patient identification.
4. One identifier must be last name, BR#, or SSN. The second identifier can be first name, BR#, SSN, DOB, or unit.
5. Hemorrhage control, Airway, Breathing, Circulation, Vitals, Additional Interventions, Medications: Evaluate enroute interventions only. Do not evaluate interventions performed prior to MEDEVAC.
6. Other-incomplete handoff from ground team: Review narrative for comments relating to incomplete or inadequate handoff.

INSTRUCTIONS: DD Form 1380, Tactical Combat Casualty Care (TCCC) Card
[Formerly: U.S. Field Medical Card]

1. **BACKGROUND and PURPOSE**
   a. Pre-Hospital or Pre-Medical Treatment Facility (pre-MTF) documentation of medical interventions by first responders at the point of injury (POI) is critical to ensuring continuity of care and providing meaningful analyses of medical interventions, techniques, tactics, and procedures rendered at the POI.
   b. In a deployed, combat, or training setting, all personnel have the potential to be casualties and all personnel have the potential to be first responders.
   c. In accordance with Joint Publication 4-02, Health Service Support, dated 26 July 2012: "First responder care capability is also known as tactical combat casualty care. Tactical combat casualty care [or TCCC] occurs during a combat mission and is the military counterpart to pre-hospital trauma life support. Pre-hospital trauma care in the military is most commonly provided by enlisted personnel and includes self-aid and buddy aid and combat life savers.... Tactical combat casualty care focuses on the most likely threats, injuries, and conditions encountered in combat and on a strictly limited range of interventions directed at the most serious of these threats and conditions...."
   d. DD Form 1380 promotes Department of Defense goals of capturing documentation of pre-MTF medical interventions at the POI using a MIST format (Mechanisms of injury; Injuries; Signs & Symptoms; and Treatments). It is designed for use by all first responders, including non-medical personnel.

2. **POLICY**
   a. Commanders will ensure that all first responders carry and use DD Form 1380 to document pre-MTF care at the POI. Such care relates to both battle and non-battle injuries.
   b. Once completed, DD Form 1380 must be visibly attached to the patient. Upon arrival at a Role 2 or Role β MTF, DD Form 1380 will be included with the paper medical record, then scanned and entered into both the patient's electronic health record and the trauma system's trauma registry. Role 2 and Role 3 MTF commanders must establish a clear process to ensure entry of the medical information recorded on DD Form 1380 into the both the electronic health record and the trauma registry.
   c. DD Form 1380 will be a component of the individual/improved first aid kit (IFAK), joint first aid kit (JFAK), and other first aid kits utilized. Corpsmen, combat medics, and tactical evacuation personnel should carry multiple blank versions of the form.
   d. First responders will complete all entries as fully as possible on the DD Form 1380 unless under extreme conditions whereby the casualty and/or provider's safety may be at additional risk.
   e. Detailed instructions for preparing DD Form 1380 are provided in Table 1 and Table 2.
   f. All abbreviations authorized for use in DoD health records or DoD trauma registries may also be used on DD Form 1380.
   g. All entries on the DD Form 1380 will be made using a non-smearing pen or marker.
   h. All entries on the DD Form 1380 should be printed clearly, including the first responder's name.

Table 1: Instructions for completing DD Form 1380 (Front of Card)

Item	Instructions
Battle Roster #	Write first letter of casualty's first name, then first letter of casualty's last name, then write the last four numbers of casualty's Social Security number. For example, John Doe 123-12-1234 is Battle Roster # "JD1234".
Evacuation (EVAC)	Mark an "X" on the casualty's evacuation priority/precedence (Urgent; Priority; or Routine).
Name	Write casualty's name (Last, First).
Last 4	Write last four numbers of casualty's Social Security number.
Gender	Mark an "X" on the casualty's gender (Male (M) or Female (F)).
Date	Write date of injury in DD-MMM-YY format. For example, "29-JUN-13".
Time	Write 24 hour time of injury, and indicate whether local (L) or zulu (Z) time. For example, "1300Z".
Service	Write casualty's branch of service (USA, USAF, USCG, USN, USMC). For U.S. civilians, write "US CIV". For non-U.S. personnel, write "NON US or a standard abbreviation for casualty's nationality.
Unit	Write casualty's unit name.
Allergies	Write casualty's known drug allergies. If no drug allergies, write "NKDA" (no known drug allergies).
Mechanism of Injury	Mark an "X" on the mechanism or cause of injury (artillery, blunt, burn, fall, grenade, gunshot wound (GSW), improvised explosive device (IED), landmine,

INSTRUCTIONS: DD Form 1380, Tactical Combat Casualty Care (TCCC) Card
[Formerly: U.S. Field Medical Card]

Item	Instructions
	motor vehicle crash/collision (MVC), rocket-propelled grenade (RPG), other (specify)). Mark all that apply.
Injury	Mark an "X" at the site of the injury(ies) on the body picture. For burn injuries, circle the burn percentage(s) on the figure. If multiple mechanisms of injury and multiple injuries, draw a line between the mechanism of injury and the anatomical site of the injury.
TQ: R Arm (tourniquet, right arm)	If a tourniquet is applied to the right arm, write type of tourniquet used and the time of tourniquet application.
TQ: L Arm (tourniquet, left arm)	If a tourniquet is applied to the left arm, write type of tourniquet used and the time of tourniquet application.
TQ: R Leg (tourniquet, right leg)	If a tourniquet is applied to the right leg, write type of tourniquet used and the time of tourniquet application.
TQ: L Leg (tourniquet, left leg)	If a tourniquet is applied to the left leg, write type of tourniquet used and the time of tourniquet application.
Time, Pulse (rate & location), Blood Pressure, Respiratory Rate, Pulse Ox % O2 Sat, AVPU, Pain Scale (0-10)	Record vital signs (pulse rate and location, blood pressure, respiratory rate, oxygen saturation), level of consciousness (AVPU: Alert, responds to Verbal stimulus, responds to Pain stimulus, Unresponsive), and level of pain (on numeric rating scale of 0 to 10, with 0 being no pain and 10 being the worst pain) with time.

Table 2: Instructions for completing DD Form 1380 (Back of Card)

Item	Instructions
Battle Roster #	Write first letter of casualty's first name, then first letter of casualty's last name, and then write the last four numbers of casualty's Social Security number. For example, John Doe 123-12-1234 is Battle Roster # "JD1234".
Evacuation (EVAC)	Mark an "X" on the casualty's evacuation priority/precedence (Urgent; Priority; or Routine).
C	Mark an "X" for all Circulation hemorrhage control interventions. For tourniquets (TQ), mark category (Extremity, Junctional and/or Truncal) and write name of TQ(s) used. For dressings, mark category (Hemostatic, Pressure, and/or Other) and write type of dressing(s) used.
A	Mark an "X" for all Airway interventions (Intact, NPA (nasopharyngeal airway), CRIC (cricothyroidotomy), ET Tube (endotracheal tube), SGA (supraglottic airway) and write type of device(s) used.
B	Mark an "X" for all Breathing interventions (O2 (oxygen), Needle-D (needle decompression), Chest-Tube, Chest-Seal) and write type of device(s) used.
C: Fluid	Circulation resuscitation interventions. Write name, volume, route, and time of any fluids given.
C: Blood Product	Circulation resuscitation interventions. Write name, volume, route, and time of any blood products given.
Meds: Analgesic	Medications. Write name, dose, route, and time of any analgesics given.
Meds: Antibiotic	Medications. Write name, dose, route, and time of any antibiotics given.
Meds: Other	Medications. Write name, dose, route, and time of any other administered medications.
Other	Mark an "X" for other treatments administered (combat pill pack, eye shield (mark right (R) or left (L)), splint, hypothermia prevention) and type of device(s) used.
Notes	Use this space to record any other pertinent information and/or clarifications.
First Responder Name	Print the first responder's name (Last, First).
First Responder Last 4	Write last four numbers of first responder's Social Security number.

3. **ISSUANCES**
   a. DoDI 6490.02E, Comprehensive Health Surveillance
   b. DoDI 6040.45, Service Treatment Record (ST) and Non-Service Treatment Records (NSTR)
   c. DHB Memorandum Battlefield Trauma Care RDT&E Priorities 2011-01 (June 14, 2011)
   d. AR 40-66, Medical Record Administration and Healthcare Documentation

TACTICAL COMBAT CASUALTY CARE (TCCC) CARD

BATTLE ROSTER #: _____

EVAC: ☐ Urgent ☐ Priority ☐ Routine

NAME (Last, First): _____ LAST 4: _____

GENDER: ☐ M ☐ F DATE (DD-MMM-YY): _____ TIME: _____

SERVICE: _____ UNIT: _____ ALLERGIES: _____

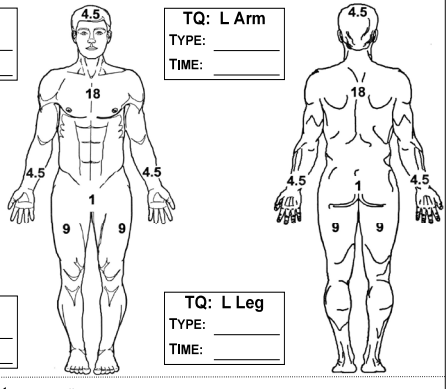
Mechanism of Injury: (X all that apply)

☐ Artillery ☐ Blunt ☐ Burn ☐ Fall ☐ Grenade ☐ GSW ☐ IED
☐ Landmine ☐ MVC ☐ RPG ☐ Other: _____

Injury: (Mark injuries with an X)

TQ: R Arm
TYPE: _____
TIME: _____

TQ: L Arm
TYPE: _____
TIME: _____



TQ: R Leg
TYPE: _____
TIME: _____

TQ: L Leg
TYPE: _____
TIME: _____

Signs & Symptoms: (Fill in the blank)

Time				
Pulse (Rate & Location)				
Blood Pressure	/	/	/	/
Respiratory Rate				
Pulse Ox % O2 Sat				
AVPU				
Pain Scale (0-10)				

DD Form 1380, JUN 2014 TCCC CARD

BATTLE ROSTER #: _____

EVAC: ☐ Urgent ☐ Priority ☐ Routine

Treatments: (X all that apply, and fill in the blank) *Type*

C: TQ- ☐ Extremity ☐ Junctional ☐ Truncal _____

Dressing- ☐ Hemostatic ☐ Pressure ☐ Other _____

A: ☐ Intact ☐ NPA ☐ CRIC ☐ ET-Tube ☐ SGA _____

B: ☐ O2 ☐ Needle-D ☐ Chest-Tube ☐ Chest-Seal _____

C:	*Name*	*Volume*	*Route*	*Time*
Fluid				
Blood Product				

MEDS:	*Name*	*Dose*	*Route*	*Time*
Analgesic (e.g., Ketamine, Fentanyl, Morphine)				
Antibiotic (e.g., Moxifloxacin, Ertapenem)				
Other (e.g., TXA)				

OTHER: ☐ Combat-Pill-Pack ☐ Eye-Shield (☐ R ☐ L) ☐ Splint

☐ Hypothermia-Prevention Type: _____

NOTES:

FIRST RESPONDER

NAME (Last, First): _____ LAST 4: _____

DD Form 1380, JUN 2014 (Back) TCCC CARD

TACTICAL COMBAT CASUALTY CARE AFTER ACTION REPORT (TCCC AAR)

Complete within 72hr after mission and submit to the Joint Trauma System via email: DHA.JBSA.j-3.List.JTS-Prehospital@mail.mil

Event Date: _____ Time: _____ ☐ Local ☐ ZULU Country: _____ Theater _____

Injury ☐ Battle Injury (BI): ☐ WIA ☐ KIA ☐ DOW ☐ Non-Battle Injury (NBI): ☐ Alive ☐ Dead

Evacuation Category ☐ URG ☐ PRI ☐ ROU

☐ Litter	Type:	Time of Pick Up:	
☐ Ground Vehicle	Type:	Time of Pick Up:	
☐ Aircraft	Type:	Time of Pick Up:	
☐ Watercraft	Type:	Time of Pick Up:	

Casualty Demographics (mini. requirement:last name & last 4 SS# **Last Name:** _____ First Name: _____ Rank: _____

Gender ☐ M ☐ F **SSN/DoD ID:** _____ DOB: _____ Unit: _____ BR#: _____ Mission # _____

Point-of-Injury (POI) Provider Info

Non-Medic (NM) First Responder Last Name:		First Name:	Rank/Title:
Other POI Provider (OP) Last Name:		First Name:	Rank/Title:
Medic (M) Last Name:		First Name:	Rank/Title:

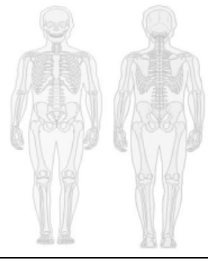
M - Mechanism of Injury

- ☐ Airborne Operation
- ☐ Aircraft Crash
- ☐ Blast – Dismounted IED or Mine
- ☐ Blast – Mounted IED or Mine
- ☐ Blast – RPG or Grenade
- ☐ Blast – Indirect Fire (Mortar/Artillery/Missile)
- ☐ Blast – Other
- ☐ Collapse/Crush/ Compartment from Structure
- ☐ Fire/Explosion
- ☐ Fall, Height: _____ ft
- ☐ Fragmentation / Shrapnel
- ☐ GSW – Gunshot Wound
- ☐ Vehicle Accident/Collision
- ☐ Environmental: _____
- ☐ Other: _____

I - Injuries

- ☐ (A)mputation
- ☐ (B)leeding
- ☐ (Bu)rn, TBSA: _____ %
- ☐ (C)repitus
- ☐ (D)eformity
- ☐ (DG)Degloving
- ☐ (E)cchymosis
- ☐ (FX)Fracture
- ☐ (GSW) Gun Shot Wound
- ☐ (H)ematoma
- ☐ (LAC)eration
- ☐ (P)ain
- ☐ (PP)Peppering
- ☐ (PW)Puncture Wound

Annotate Injuries



S - Signs

Initial Check Time _____

☐ A ☐ V ☐ P ☐ U GCS: _____ /15 (E _____ /4

V _____ /5, M _____ /6) RR: _____ HR: _____ BP: _____

pOx (%): _____ Pain level (_/10): _____ EtCO2 (mmHG): _____

Last Check Time _____

☐ A ☐ V ☐ P ☐ U GCS: _____ /15 (E _____ /4

V _____ /5, M _____ /6) RR: _____ HR: _____ BP: _____

pOx (%): _____ Pain level (_/10): _____ EtCO2 (mmHG): _____

Eye Opening - 4: spontaneous, 3: to speech, 2: to pain, 1: no response

Motor Response - 6: follows commands, 5: localizes pain, 4: withdraws from pain, 3: decorticate flexion, 2: decerebrate extension, 1: no response

Verbal Response - 5: alert and oriented, 4: disoriented conversation, 3: speaking but nonsensical, 2: moans, unintelligible sounds, 1: no response

T - Treatments

Massive Hemorrhage Control (TQ/Hemostatic Adjunct)

Time		Location		Type		Time off	
Time		Location		Type		Time off	
Time		Location		Type		Time off	
Time		Location		Type		Time off	

Airway

Time		Type		Size		Depth		@	
Time		Type		Size		Depth		@	
Time		Type		Size		Depth		@	
Time		Type		Size		Depth		@	

Respiration/Breathing ☐ Spontaneous ☐ Labored ☐ Assisted ☐ Assisted with BVM **Time**

☐NM ☐M ☐OP ☐Chest Seal Type: _____ _____

☐NM ☐M ☐OP ☐Needle Decompression Location ☐2ICS/MCL ☐5ICS/AAL # of attempts ___ Cath/Needle size _____ _____

☐NM ☐M ☐OP ☐Chest Tube ☐Finger Thoracostomy ☐Output ☐Air Blood (ml) _____ _____

General instruction for Canine Trauma Combat Casualty Care Card

PURPOSE: The Canine Tactical Combat Casualty Care (cTCCC) card is for documenting a trauma or disease non-battle injury (DNBI) at the point of injury anywhere a canine is deployed in support of DoD operations. The cTCCC card will be filled out by the handler or provider who attends to the canine's trauma or DNBI. After medical treatment and resuscitation care is provided, the cTCCC card can be handed off to the nearest veterinary treatment facility or supporting veterinary unit to be scanned, uploaded and emailed to dog.consult@us.af.mil or the unit providing care can email directly. Once the MWD Trauma Registry is online, the first veterinary unit can input the information into the registry and scan the cTCCC card to upload into ROVR. The cTCCC card becomes part of the canine's permanent DoD medical record. For US Special Operations Command (SOCOM) canines, the cTCCC card will be filled out and returned to the handler or operator. The handler or operator will route the card to their respective veterinarian to be inputted into the MWD Trauma Registry and the canine's record.

PAGE 1:

GENERAL INSTRUCTIONS

- To be completed by the handler, human medical provider, veterinary technician or veterinarian fulfilling the role at the point of injury.
- Time Zones: Record all time local 24 hour military format, hh:mm
- A+ (plus sign) means positive test result; a - (minus sign) means negative test result.

EVACUATION CATEGORY (mark as appropriate)

URGENT – Patient who should be evacuated as soon as possible and within **two** hours to save life, limb or eyesight

PRIORITY – Patient who should be moved within **four** hours or their condition will deteriorate to such a degree that will be urgent

ROUTINE – Patient whose condition is not expected to worsen significantly and who will require evacuation in the next **24** hours

EVACUATION MODE & TYPE (mark as appropriate)

PATIENT IDENTIFICATION

UNIT. Record the unit the canine is assigned

ANIMAL NAME. (self-explanatory)

TATTOO. (self-explanatory)

DATE. (DD-MM-YY)

TIME. Record all time local 24 hour military format, hh:mm

GENDER. (mark as appropriate)

MECHANISM OF INJURY (mark as appropriate – use other for DNBI or if unknown – describe)

INJURY (mark the diagram where the trauma/injury or disease is located – if there are more than one injury, identify each with the mechanism of injury)

VITAL SIGNS (input vital signs at least hourly)

Pain Score:

0 – Pain free

1 – Very minor annoyance-occasional minor twinges

2 – Minor annoyance-occasional

3 – Annoying enough to be distracting

4 – Can be ignored if you are really involved in your work, but still distracting,

5 – Can't be ignored for more than 30 minutes.

6 – Can't be ignored for any length of time, but you can still go to work and participate in social activities.

7 – Make it difficult to concentrate, interferes with sleep, you can still function with effort

8 – Physical activity severely limited. You can read and converse with effort. Nausea and dizziness may occur.

9 – Unable to speak, crying out or moaning uncontrollable- pain makes you pass out

10 – Unconscious. Pain makes you pass out.

FIRST RESPONDERS (self-explanatory)

PAGE 2:

TREATMENTS (mark as appropriate) and annotate location where appropriate

M (Massive Hemorrhage): (mark as appropriate)

A (Airway Control): self-explanatory

R (Respiratory Support): self-explanatory

C (Circulation): FLUIDS (fill out as appropriate and complete as possible)

C (Fracture): self-explanatory

H (Hypo/hyperthermia): self-explanatory

H (Head Injury): self-explanatory

MEDICATIONS (MEDS) (Circle the medication given and write the time given in the notes)

NOTES (Include any additional information (location/country, euthanized/KIA, treatment regiments that were used to the treat the patient etc.)

DISPOSITION OF THE FORM – (The form is to be kept with the patient until it can be put into the patient's record.) Pass the card to the next treatment facility. 1) Scan and email the card to dog.consult@us.af.mil. 2) Put the card into the patient's hard copy record. CAVEAT: For US Special Operations Command (SOCOM) canines, the cTCCC card will be filled out and returned to the handler or operator. The handler or operator will route the card to their respective veterinarian to be inputted into the MWD Trauma Registry and the canine's record.

DEFINITIONS

IED – Improvised explosive device
GSW – Gunshot wound
TQ – Tourniquet
ET – Endotracheal tube
TXA – Tranexamic acid

CANINE-TACTICAL COMBAT CASUALTY CARE CARD (cTCCC)

EVAC CAT: ☐Urgent ☐Priority ☐Routine

EVAC TYPE: ☐Fixed ☐Rotary ☐Ground ☐MEDEVAC ☐CASEVAC

UNIT: _____ **NAME:** _____ **TATTOO:** _____

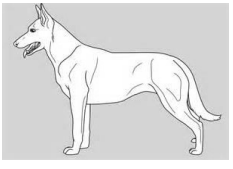
DATE: (DD-MM-YY)_____ **TIME:** _____ **GENDER:** ☐**M** ☐**F**

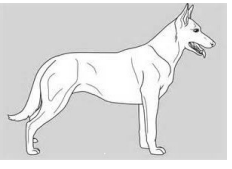
Mechanism of Injury: (Mark **X** all that apply

☐IED ☐GSW ☐MINE ☐BURN ☐GRENADE ☐ARTILLERY ☐FALL

☐OTHER: _____

Injury: (Mark all injuries that apply with an **X**)





Signs and Symptoms: (fill in the blank)

Time					
Pain Score (0-10)					
Temperature (99-102.5)					
Pulse Rate/Location (60-80)					
Respirations (16-30)					
Blood Pressure (120/80)					
Pulse Ox% (> 95%)					
Capillary Refill (< 2 sec)					

NOTES: _____

_____

_____

DD FORM 3073 OCTOBER 2019 (Send card to dog.consult@us.af.mill) Page of

CANINE-TACTICAL COMBAT CASUALTY CARE CARD (cTCCC)

Treatments: (Mark **x** all that apply) and fill in the blank) ***Location*:**

M: Dressing - ☐Hemostatic ☐Pressure ☐TQ Other: _____

A: ☐Intact ☐ET-Tube ☐Tracheostomy _____

R: ☐O^2 ☐Needle-D ☐Chest-Tube ☐Chest-Seal _____

C:

Total Crystalloid Shock Volume of fluids is 90 mls/kg:
Administer 20ml/kg over 10-20 min. Reassess (as with human casualty):
If lack of response after 2-3 boluses consider adjunct therapy (HES/HTS.)

CRYSTALLOID	Volume	Route	Time
HYDROXYETHYL STARCH (HES): 5mL/kg over 5-10min. After ½ shock crystalloid not effective.			
HYPERTONIC SALINE (HTS): 4mL/kg (If two or three ¼ shock boluses and 1-2 boluses of HES not effective)			
TXA: 10mg/kg IV in 100mL NaCl or LRS given in first 3hrs. Followed by a 10-15mg/kg CRI over 8 hours.			

C: ☐Splint ☐Other Bandage _____

H: ☐Hypothermia-Prevention ☐Hypethermia-External Cooling

H: ☐Head Injury

Pain Meds and Antibiotics (Circle if given and write the time in the notes.)

DRUG (conc)	DOSE	RTE	60lb/ 27.3kg	70lb/32kg	80lb/36.4kg
Ketamine (100mg/mL)	2-5mg/kg	IV/IM	1mL	1.5mL	2mL
Midazolam (5mg/mL)	0.1-0.3mg/kg	IV/IM	3mL	4mL	5mL
Morphine (10mg auto inj.)	0.2-0.5mg/kg	IM	1 *auto*	1 *auto*	2 *auto*
Meloxicam	0.1-0.2mg/kg	IV/SQ/PO	5*mg*	6*mg*	7*mg*
Cefazolin/Ceftriaxone	25mg/kg	IV/IM	600*mg*	800*mg*	900*mg*
Cefotaxime	25mg/kg	IV/IM/SQ	600*mg*	800*mg*	900*mg*
Ertapenem (100mg/mL)	15mg/kg	IV/SQ	4mL	5mL	6mL

NOTES: _____

_____

FIRST RESPONDER:

Name (Last, First): _____ **AOC/MOS:** _____

DD FORM 3073 OCTOBER 2019 (Send card to dog.consult@us.af.mill) Page of

MEDEVAC REQUEST CARD GTA 08-01-004

LINE	ITEM	EVACUATION REQUEST MESSAGE
1	Location of Pickup Site.	
2	Radio Frequ., Call Sign, & Suffix.	
3	No. of Patients by Precedence.	
4	Special Equipment Required.	
5	Number of Patients by Type.	
6	Security of Pickup Site (Wartime).	
6	Number and Type of Wound, Injury, or Illness (Peacetime).	
7	Method of Marking Pickup Site.	
8	Patient Nationality and Status.	
9	NBC Contamination (Wartime).	
9	Terrain Description (Peacetime).	

August 2016 Use of previous version authorized until exhausted

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DISTRIBUTION: US ARMY TRAINING SUPPORT CENTERS (TSCs)
HEADQUARTERS, DEPARTMENT OF THE ARMY,
ATTN: ATIC-SAA, GTA Program, Fort Eustis, VA 23604-5166

LINE ITEM	EXPLANATION
1. Location of Pickup Site.	Encrypt grid coordinates. When using *DRYAD Numeral Cipher, the same SET line* will be used to encrypt 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).
2. Radio Frequency, Call Sign, 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.
3. No. of Patients by Precedence.	Report only applicable info & encrypt brevity codes. A = Urgent, B = Urgent-Surg, C = Priority, D = Routine, E = Convenience. (If 2 or more categories reported in same request, insert the word "break" btwn. each category.)
4. Spec Equipment.	Encrypt applicable brevity codes. A = None, B = Hoist, C = Extraction equipment, D = Ventilator.
5. No. of Patients by Type.	Report only applicable information and encrypt brevity code. If requesting MEDEVAC for both types, insert the word *"break"* between the litter entry and ambulatory entry: L + # of Pnt -Litter; A + # of Pnt - Ambul (sitting).
6. Security Pickup Site (Wartime).	N = No enemy troops in area, P = Possibly enemy troops in area (approach with caution), E = Enemy troops in area (approach with caution), X = Enemy troops in area (armed escort required).
6. Number and type of Wound, Injury, Illness (Peacetime).	Specific information regarding patient wounds by type (gunshot or shrapnel). Report serious bleeding, along with patient blood type, if known.
7. Method of Marking Pickup Site.	Encrypt the brevity codes. *A* = Panels, *B* = Pyrotechnic signal, *C* = Smoke Signal, *D* = None, *E* = Other.
8. Patient Nationality and Status.	Number of patients in each category need not be transmitted. Encrypt only applicable brevity codes. A = US military, B = US civilian, C = Non-US mil, D = Non-US civilian, E = EPW.
9. NBC Contamination, (Wartime).	Include this line only when applicable. Encrypt the applicable brevity codes. N = nuclear, B = biological, C = chemical.
9. Terrain Description (Peacetime).	Include details of terrain features in and around proposed landing site. If possible, describe the relationship of site to a prominent terrain feature (lake, mountain, tower).

Reference: ATP 4-02.2, *Medical Evacuation.*

NATO AEROMEDICAL EVACUATION 9 LINE

NATO MEDEVAC "9-Line" REQUEST					DTG: UNIT:
1	LOCATION (GRID OF PICKUP ZONE)				(1)
2	CALL SIGN & FREQ:				(2)
3	NUMBER OF PATIENTS/ PRIORITY:				(3) P1 ..... P2 ..... P3 .....
	PRIORITY 1(P1) - URGENT; to be at hospital facility (R2/ R3) within 60 minutes				PRIORITY 2 (P2)- To be at hospital facility (R2/ R3) within 4 hours of notification
	PRIORITY 3 (P3) - To be at hospital facility R2/R3 within 24 hours of notification				
4	SPECIAL EQUIPMENT REQUIRED:				(4)
	A - NONE	B - HOIST (Winch)			C - EXTRICATION / D - VENTILATOR
5	PATIENTS BY TYPE				(5) L ..... A ..... E .....
	S- STRETCHER (On Litter)	W-WALKING (Ambulatory)			E-ESCORTS/O-Other (Give details)
6	SECURITY AT PICKUP ZONE (PZ)				(6)
	N - NO ENEMY	E - ENEMY IN AREA			
	P - POSSIBLE ENEMY	X - HOT PICKUP ZONE - ARMED ESCORT REQUIRED			
7	PICKUP ZONE (PZ) MARKING METHOD				(7)
	A - PANELS	B - PYRO	C - SMOKE	D - NONE	E - OTHER (explain)
8	NUMBER OF PATIENTS BY NATIONALITY/STATUS				(8) A ..... B ..... C ..... D ..... E ..... F .....
	A - NATO MILITARY B - NATO CIVILIAN				C - NON-NATO SECURITY FORCES
	D - NON-NATO CIVILIAN E - POW/DETAINEE				F - EMBEDDED INTERPRETER
	G- CIV CAS (caused by friendly forces)				H-CHILD
9	TACTICAL CONSIDERATIONS/OTHER INFORMATION				(9)

DO NOT DELAY LAUNCH OF MEDEVAC SUPPLY FURTHER INFORMATION ONCE AVAILABLE:		
M	MECHANISM OF INJURY (and at what time if known)	(M) (Time: .....)
I	INJURY OR ILLNESS SUSTAINED	(I)
S	SYMPTOMS AND VITAL SIGNS **C-Catastrophic bleed** **A-Airway B-Breathing Rate** **C-Pulse D-Consciousness** **E-Other signs**	(C)..... A ..... B ..... C ..... D ..... E .....
T	TREATMENT GIVEN & TIME (e.g. Tourniquet and time applied, Morphine)	(T)
A	AGE OF CASUALTY	
T	TIME OF WOUNDING	

NOTES:

Specify if critical medical supplies are needed to be brought in with MEDEVAC
"9-liner" is not used for requests to move casualties who are killed in action at the scene

APRV'S MSN		AVN AUTH'S LAUNCH	
W/U	W/D	W/U	W/D

Drug Box Layout, Drug Box Drug Cards and Drug Box Pocket Labels

1. 3mL Syringe x5
2. 5mL Syringe x4
3. 10mL Syringe x3
4. Saline Lock x6
5. IV Catheter 16GA x3
6. IV Catheter 18GA x3
7. Draw Needles x8
8. Alcohol Pads x10
9. 1 Inch Tape x1
10. 1 Inch Tape x1
11. Tegaderm Kit w/Constricting Band x4

TOP

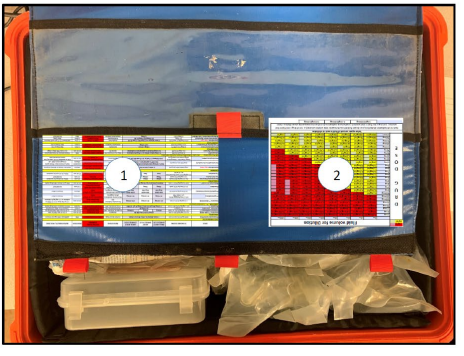
1. TXA x3
2. VASOPRESSIN x2
3. NOREPINEPHRINE x2
4. PHENYLEPHRINE x2
5. EPINEPHRINE x2
6. DOPAMINE x2
7. SOLU-MEDROL x2
8. DIPHENHYDRAMINE x3
9. ONDANSETRAN x3
10. AMIODARONE x3
11. NARCAN x3
    FLUMAZENIL x1

FRONT DIVIDER

Drug Box Layout, Drug Box Drug Cards and Drug Box Pocket Labels

BACK OF DIVIDER

1. Quick Drug Reference Card per SMOG
2. Fluid Volume for Dilution card per SMOG



BOTTOM

1. ACLS Drugs
   - -Epinephrine x4
   - -Adenosine x2
   - -Sodium Bicarb x2
   - -Lidocaine x3
   - -D50 x1
   - -Atropine x2
   - -Calcium Chloride x2

2. SHARPS SHUTTLE x1
   SALINE FLUSHES x10

3. IV TUBING x4
   BLOOD TUBING x2

4. NORMAL SALINE 100mL x3

5. NARCOTICS BOX
   Ketamine x2
   Midazolam x2
   Rocuronium x2
   Vecuronium x2
   Succinylcholine x1
   Fentanyl x3
   Etomidate x1

6. NORMAL SALINE 500mL x2
   LACTATED RINGERS x1
   3% HYPERTONIC SALINE x1

3mL SYRINGE x5	5mL SYRINGE x4	10mL SYRINGE x3	SALINE LOCK x6
IV CATHETER 16GA x3	IV CATHETER 18GAx3	DRAW NEEDLES X8	ALCOHOL PAD x10
1 inch TAPE	1 inch TAPE		TEGADERM x4

TOP

BACK OF DIVIDER

TXA x3	VASOPRESSIN x2	NOREPINEPHRINE x2	PHENYLEPHRINE x2
EPINEPRHINE x2	DOPAMINE x2	SOLU-MEDROL x2	DIPHENHYDRAMINE x3
ONDANSETRAN X3	AMIODARONE x3	NARCAN x3 FLUMAZENIL x2	

SALINE FLUSHES x10
ACLS DRUG:
EPINEPHRINE x4
ADENOSINE x2
SODIUM BICARB x2
LIDOCAINE x3
D50 x2
ATROPINE x2
CALCIUM CHLORIDE x2
BOTTOM
IV TUBINGx4
BLOOD TUBINGx2
NORMAL SALINE 100ML x3
NORMAL SALINE 500ML x2
LACTATED RINGERS x1
3% HYPERTONIC SALINE x2
NARCOTICS BOX:
KETAMINE x2
ROCURONIUM x2
VECURONIUM x2
FENTANYL x3
MIDAZOLAM x2
ETOMIDATE x1
SUCCINYLCHOLINE x1

STANDING ORDERS - Air Ambulance, Emergency Medicine Tasks

PURPOSE

The intended purpose of these guidelines is to serve as a baseline for the Aviation Medical Company's Aviation Medicine SOP (Standing Orders and Aeromedical Treatment Guidelines). Practices in Aviation Medicine undergo constant scrutiny and change. As such, this guide should not be considered an all-inclusive and always up-to-date source of the newest and most relevant policies, procedures, and practices in Aviation Medicine. It will require continued monitoring for relevant clinical and operational updates needed to reflect current aviation and clinical practice standards.

Primarily, this guide should serve as a resource for tactical and non-tactical prehospital, interfacility and post-surgical enroute medical care on an Army aeromedical platform. Initial patient evacuation and prehospital trauma guidelines are written in a manner to support the principles of Tactical Combat Casualty Care (TCCC). This assumes that a combat trauma patient will respond to care most effectively when the order of care addresses circulation (stopping and preventing hemorrhage) prior to addressing the patient's airway and breathing. When these guidelines are adapted for use within US Army civilian missions (noncombat), unit medical directors should consider the necessity of writing and appending these guidelines, order of care, and standard operating procedures to address the differences in initial interventions of the civilian trauma patient verses the combat trauma patient.

SCOPE OF PRACTICE

This guide is intended for use by Aviation Medical Personnel to include: Critical Care Flight Paramedics, Flight Surgeons, Aeromedical Physician Assistants (APAs), Aeromedical Nurse Practitioners (ANPs), and En Route Critical Care Nurses performing MEDEVAC on an Army Aviation platform. Preferably, only medical personnel trained in and holding certifications in the National Registry of Paramedics (NRP), Emergency Medicine, or Critical Care should be eligible to use all treatment guidelines within this book. However, local training programs may be adopted that may enable individually trained physicians, Physician Assistants, and Non-NRP Flight Medics a knowledge base sufficient to satisfy use of these treatment guidelines in an austere/combat environment. Specific certifications of importance might include: TCMC, ATLS®, ACLS/ALS, PALS, PHTLS, ITLS, and PEPP, among others. Any individual who is not fully trained, has not demonstrated competency in each of these guidelines, or has not been approved (credentialed) to use these guidelines by the local Aviation Medicine Medical Director should not be authorized to perform the respective guideline(s) without direct (on-hand) oversight. All personnel using these guidelines should adhere to the steps and standards as outlined in each of the standard medical operating guidelines (SMOG) and procedures. Moreover, all unit medical personnel providing care aboard US Army Air Ambulances (including Unit Flight Surgeons and APAs) will, at a minimum, adhere to this standard of care unless superseded by theater and/or regional clinical practice guidelines under the authorization of an appropriate local command medical officer/surgeon.

Following the concept set forth in the National Emergency Medical Services (EMS) Scope of Practice Model, an individual may only perform a skill or role for which that person is:

- educated (has been trained to do the skill or role), AND
- certified (has demonstrated competence in the skill or role), AND
- licensed [has legal authority issued by the State (Army EMS is the 51st State) to perform the skill or role], AND
- credentialed (has been authorized by medical director to perform the skill or role).

Depending on the military environment (deployed or austere location), licensing and credentialing may be satisfied through a local training and standardization policy that demonstrates an individual medical provider's capabilities and knowledge of the treatment guidelines within this handbook. Approval of each individual provider's usage of these treatment guidelines must be provided by the unit medical director. This approval should be documented and maintained in the Soldiers training record.

It must be remembered that any use of these guidelines is prohibited outside of the individual's military employment. Furthermore, any civilian based medical care provided by aviation medicine personnel must satisfy the National EMS Scope of Practice Model noted previously. It must also be realized that any usage of these guidelines within the civilian environment may be limited to support through a legitimate local EMS credentialing provider. This would normally be the local Medical Treatment Facility Emergency Medical Systems credentialing authority. The unit medical director may or may not satisfy this requirement in civilian medicine due to state laws, policies, or standards.

USAGE INTENT

This guide contains the specific Treatment Guidelines, Procedures, and Medications that will be used within Army Aeromedical Evacuation.

The Critical Care Flight Paramedic Standard Medical Operating Guideline will be reviewed at a minimum semi-annually or upon change of command or medical director. A single copy of the Review and Approval Page or a substitute document will be distributed to aforementioned individuals for review and approval signatures.

It is the responsibility of the Unit Commander, the Medical Director, the Training NCO, and the Standards NCO to ensure that all Flight Paramedics remain current in all required certifications needed to perform their duties as Flight Paramedics and/or those needed to perform the skills of a Nationally Registered Paramedic. This should include, at a minimum, certifications in NRP, ALS/ACLS, and BLS. However, it is highly recommended that paramedics maintain certifications in PALS/PEPP and PHTLS/ITLS. Copies or originals of all current certifications or a memo of training status/credentials will be maintained in the individual Soldier's training record.
A medical practitioner's clinical competence is at least equal in importance to the maintenance of formal certifications. Competence is the ability to actually perform required interventions and administer appropriate therapies. A competent practitioner has the knowledge base and critical-thinking skill required to determine when to perform an intervention and when it is best NOT to do so. Commanders and Unit Medical Directors/ Flight Surgeons should ensure that clinical skill competency is maintained, demonstrated, and remediated (when required) to ensure the maintenance of skills and mandated certifications of medical aircrew members under their direction. It is recommended that all medical personnel conducting aeromedical evacuation

perform simulated critical care and POI training cases on a monthly basis in order to develop competency and retain critical care medical proficiency.

The Flight Paramedic Standard Medical Operating Guideline is not intended to be a comprehensive patient care manual. Rather, it specifies standard clinical treatment guidelines for discrete emergency conditions which should be used as a baseline practice standard for Flight Paramedics and other attached medical aircrew members providing enroute emergency care on a rotary wing platform in the prehospital environment while conducting intratheater, CONUS, or other tactical/operational contingency missions.

QUALITY MANAGEMENT PROGRAM Procedures

Physician Medical Direction

Prehospital emergency care constitutes the practice of medicine, either directly by a qualified physician or indirectly through delegation-of-authority under the physician's medical direction. This practice is distinctly different from hospital-based medical, nursing, and paramedical practice in which practitioners conduct full-spectrum care within their respective scope-of practice, executing physician's orders, or through autonomous practice in the case of Physician Assistants (PA), Nurse Practitioners (NP), and Clinical Nurse Specialists (CNS).

Medical direction of Flight Paramedics and other medical aircrew with regard to procedures, guidelines, medications, documentation (Patient Care Reports), testing, credentials, etc., is the primary responsibility of the qualified (as defined by AR 40-3) assigned Flight Surgeon (FS) (normally a Battalion Surgeon), with the assistance of the Aeromedical Physician Assistant (APA) and designated company Medical Training NCO. The Brigade Surgeon has responsibility for overall medical oversight. All medical aircrew should maintain currency on recent literature and equipment pertaining to pre-hospital aeromedical evacuation and enroute care.

Advanced-Care Provider Clinical Oversight

Although they cannot act as a medical director, the role of PAs, NPs and CNSs in the practice of prehospital emergency care is emerging and holds great promise as a means of extending the medical director's capacity to ensure the best quality of care for patients or casualties. While Federal Regulations and most State Laws pertaining to EMS require physician medical direction for the prehospital conduct of advanced life support (ALS) scope-of-practice skills, many high performance domestic EMS systems have implemented mid-level "clinical director" programs, employing PAs and advanced practice nurses with emergency or critical care expertise, to provide initial quality management program (QMP) review, assist with on-line decision support for pre-hospital practitioners, oversee readiness training and continuing education, and to augment the medical aircrew when needed on ground and air critical care transport platforms. PAs, with the approval of the Brigade Surgeon, can provide the necessary clinical oversight in the absence of a unit level Flight Surgeon in order to ensure the CCFPs are trained and proficient for their deployed mission.

Quality Assurance

Published Standard Medical Operating Guidelines (SMOG) are written patient care guidance in algorithm format with discrete basic life support (BLS) and advanced life support (ALS) scopes of practice, respectively, based on each patient / casualty's specific medical condition. Once endorsed by local commanders and unit medical directors, all medical aircrew are expected to use these guidelines in the care of patients they transport to the next higher level of care. Periodically, medical aircrew should undergo testing on information and procedures contained within these guidelines. After each patient that has been aero-medically evacuated to a Role 2 or Role 3 medical treatment facility, each medical aircrew member is responsible for documenting the care rendered during transport via the appropriate unit, theater, or DA / DD approved / mandated electronic or written patient care documentation form

Direct Supervision

In addition to the written guidelines, designated unit medical directors are responsible for the direct supervision of medical aircrew members participating in en route care within the unit, his/her performance in situations in which the patient's medical condition(s) does not meet standard-of-care as defined by these guidelines, or who experience adverse events en route, merit retrospective review and determination of root cause and corrective action, or endorsement of their decision, as appropriate.

Quality Management/Process Improvement

After each Aeromedical Evacuation mission, for each patient receiving enroute care, the medical aircrew team conducts an informal After Action Review (AAR). The initial formal control measure is the requirement for the FS or APA to review and co-sign each patient care report (PCR) (e.g., DD 1380, run sheet, Enroute Critical Care Transfer document, DD4700) before it is submitted as a part of the patient record. After both the lead medical aircrew member and unit medical director have signed the PCR, a copy will be kept and others will be distributed in accordance with current Army policy guidelines, local unit policy, and by the medical training NCO and/or medical director.

Additional quality control measures are encouraged and can foster a rich and open learning environment between local emergency medicine/trauma facilities and members of the air ambulance company. One such option might include a monthly aeromedical evacuation conference chaired by the local MTF Trauma Surgeon in which medical aircrew member's present cases to a forum of providers and other medics with emphasis on best practices and lessons learned.

UPDATE and APPROVAL PROCESS

1. The Critical Care Flight Paramedic Standard Medical Operating Guidelines will be updated generally on an annual basis, or sooner in response to clinical or operational needs.

2. Based upon the above timeframes, the Director, Department of Aviation Medicine (DAM) should initiate an update by sending the SMOG for inputs from senior aeromedical clinicians (flight surgeons, aeromedical physician assistants, and aeromedical nurse practitioners), emergency medicine physicians, EMS trained physicians, and critical care flight paramedic end-users.

3. Suspense for submitting updates back to an identified editor will be a minimum of 30 calendar days. Extensions may be granted on a case by case basis.

4. The editor will consolidate all inputs and discuss with a designated physician (as identified by the Director, DAM).

5. After all accepted/applicable inputs have been updated; the SMOG will receive final approval from Director, DAM.

6. Once final approval is given, the SMOG will undergo OPSEC/PAO review prior to posting.

POINT OF INJURY CARE, TCCC Evacuation Phase Guideline

INDICATIONS: In combat, the period of care provided at the Point of Injury (POI) is the most critical period throughout a casualty's movement across the medical system. Timely, appropriate, and effective care at the POI will afford a casualty the greatest chance of surviving preventable causes of death regardless of necessary follow-on surgical interventions and specialty medical treatment.

GUIDELINE (see TACTICAL EVACUATION Guideline). This guideline serves as the starting point for initiation of care for all patients evacuated from the POI pick-up sight. All subsequent procedural steps of care will be determined by navigation through continued guideline flow charts. All care will be provided in accordance with these flow charts.

POLICY NOTE: In the event these guidelines are adapted for use within US Army civilian missions (non-combat), it is recommended that unit medical directors consider the necessity of writing and appending these guidelines, order of care, and standard operating procedures to address the differences in initial interventions of the civilian trauma patient verses the combat trauma patient.

MEDICAL DIRECTOR / UNIT COMMANDER

REVIEW AND APPROVAL PAGE

It is the responsibility of the Unit Commander, the Medical Director, the Training NCO, and the Standards NCO to ensure that all Flight Paramedics remain current in all required certifications needed to perform their duties as Flight Paramedics and/or those needed to perform the skills of a Nationally Registered Paramedic. This includes, at a minimum, certifications in NRP, ACLS/ALS, and BLS. Copies or originals of all current certifications will be placed maintained in the individual Soldiers training record. It is recommended that all CCFP level providers maintain PALS certifications and Flight Paramedic- Certified (FP-C) certifications.

The Standard Medical Operating Guideline is not intended to be a comprehensive patient care manual. Rather, it specifies standard medical treatment guidelines to be used by all Flight Paramedics and Medical Providers performing medical care while serving in this unit in an austere, deployed, or garrison environment.

This document has been reviewed by the below noted individuals for correctness, and mission applicability.

Unit Standards Officer/NCO Signature_____ Date_____

Approval/Review Date_____ Initials_____

Unit Training NCO Signature_____ Date_____

Approval/Review Date_____ Initials_____

The Standard Medical Operating Guideline has been reviewed and approved for use by the undersigned.

Medical Director or designated physician

Signature of Approval_____ Date_____

Approval/Review Date_____ Initials_____

Approval/Review Date_____ Initials_____

Unit Commander Signature of Approval_____ Date_____

Approval/Review Date_____ Initials_____

Approval/Review Date_____ Medical Director's Initials_____

Additional Medical Director comments and addendums can be attached and should contain counter signature of unit commander for validity.

The Critical Care Flight Paramedic Standard Operating Guidelines are dedicated to our past, present and future DUSTOFF aircrews who unhesitantly go into harm's way so that other may live. May you forever be protected by angel's wings within the heaven's on which men fly.

Summary of Changes

Page numbers added to all pages. ***NOTE***: Clicking on page numbers sends the reader to the Table of Contents. Items listed on the Table of Contents link directly to the page described. All other previous hyperlinks are disabled.

Protocols Updated

- *Introduction and Table of contents*
- Head Injury/TBI
- Sepsis
- Stroke
- All Cardiac (adult and Ped) Protocols. Now reflect American Red Cross standards
- All Pediatric Protocols. Now reflect American Red Cross PALS standards
- Hypertension
- All MWD Protocols.
- Airway Pearls
- Rapid Sequence Intubation
- Ventilator Management
- Enroute Damage Control Resuscitation
- Pain Management
- Standing Orders
- CDR/Medical Director Approval

Drug Cards Updated

- SMOG Drug Card/Chart
- Atropine
- Calcium Chloride
- Epi 1:10,000 Drip Chart
- Ketamine
- Labetalol
- Midazolam
- Propofol
- Rocuronium
- Tranexamic Acid (TXA)
- Vecuronium

NOTE:

There are many changes throughout the SMOG. Individuals should not just rely on the summary of changes page alone to be up to date on all contents within the SMOG. It is strongly encouraged that individuals go through all the SMOG in its entirety.

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(727) 748-7141 (office)
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US ARMY MEDEVAC
CRITICAL CARE FLIGHT PARAMEDIC
STANDARD MEDICAL OPERATING GUIDELINES
CY2023 VERSION

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