U.S. ARMY AEROMEDICAL EVACUATION

STANDARD MEDICAL OPERATING GUIDELINES (SMOG)

CY24 Version

Published 01 February 2024

Revised 19 July 2024

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INTRODUCTION

The CY 2024 SMOG release marks the beginning of current format **(STANDARD MEDICAL OPERATING GUIDELINES & SUPPLEMENTAL HANDBOOK)**. The Aeromedical Evacuation community provided developmental feedback leading to a redesign of current written medical guidance and/or policy. All changes are a result of collaboration between Emergency Medicine professionals, experienced Flight Paramedics, Aeromedical Physician Assistants, Critical Care Nurses, and Flight Surgeons across the Department of Defense (DoD). 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/emergency medical pre-hospital units. It is our vision that all these enhancements 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), Enroute Critical Care Nurses' (ECCN), Aeromedical Physician Assistants' (APA), and Flight Surgeons' ability to follow and execute the medical instructions herein. These medical guidelines are intended for CCFPs and prehospital professionals who manage emergencies and treat patients in both garrison, humanitarian, and combat theater environments IAW the Aircrew Training Manual Task 2120. Unit medical providers are expected to adjust these guidelines to fit their unit's mission and medical air crews' training/experience. Medical directors or designated supervising physicians will endorse these guidelines upon appropriate adjustment. They will also manage individual unit medical missions within their Critical Care Flight Paramedics, Enroute Critical Care Nurses, and advanced practice aeromedical providers' scope of practice. CCFPs should administer medications as listed in these guidelines unless their medical director and/or supervising physician orders 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 medical personnel. Treatment direction, which is more appropriate to the patient's condition than the guideline, should be provided by the physician so long as the medical personnel's 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 removed 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 SMOG Charter members for annual review.

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

MEDICAL DIRECTOR / UNIT COMMANDER REVIEW AND APPROVAL PAGE

The Standard Medical Operating Guideline and Supplemental Handbook specify standard medical treatment guidelines to be used by all Flight Paramedics and Medical Providers performing medical care while serving in this unit in any environment. It is a guideline and not a comprehensive patient care manual.

This SMOG, Supplemental Handbook, and any attached adjustments are hereby established as standard guidelines and protocol for the following unit:

_____

Date of Certification and Approval by all of the below: _____

Unit Trainer Review:

This document has been reviewed by the below noted individuals for correctness and mission applicability:

Unit Standardization Officer/NCO Signature: _____ Date: _____

Unit Training NCO Signature: _____ Date: _____

Authorization:

The Standard Medical Operating Guideline and Supplemental Handbook have been reviewed and approved for use by the undersigned.

Medical Director/Supervising Physician*

Name: _____

Signature of Approval: _____ Date: _____

Unit Commander

Name: _____

Signature of Approval: _____ Date: _____

*Additional Medical Director comments/addenda can be attached and should contain counter signature of Unit Commander to be valid.

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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.health.mil/index.cfm/PI_CPGs/cpgs

https://jts.health.mil/assets/docs/forms/DA4700_OP5_JTS_TACEVACAAR&PCR.pdf

All comments and/or recommendations should be sent to:
medcoesaamoperations@army.mil with the subject line "CCFP-SMOG"

UNIVERSAL PATIENT CARE

Patient History

- Age of the Patient
- Chief Complaint
- Timing of Event / Event Factors
- Other Symptoms or Complaints
- Patient's Past Medical History
- Other Pertinent SAMPLE, OPQRST Questions

Key Concepts

- Use MARCHES for Trauma Patients
  - Massive Bleeding Control
  - Airway
  - Respiratory
  - Circulation
  - Hypothermia Care
  - Eye Injuries
  - Spinal Motion Restriction
- Focused Primary Exam for Non-Traumatic Illness/Injury

Treatment/Actions

- Scene Safety
  - Maintain situational awareness
  - Utilize appropriate PPE
- Initial Assessment
  - Treat obvious and emergent life threats
  - MARCHES or Focused Primary Exam
  - Utilize BLS, ALS, and/or PALS guides as necessary
- Consider Spinal Immobilization
  - Dangerous MOI
  - Low risk MOI but unable to rotate neck 45°
  - Does not apply to situations where imminent danger exists
- Record vital signs and make appropriate transport decision
- Initial Interventions
  - Supplemental O2
  - IV/IO (Saline Lock) as applicable
  - Medication/fluid administration (as indicated)
- Secondary Assessment
  - 12 Lead EKG (as applicable)
  - ETCO2 (as applicable)
  - Secondary interventions
  - Pain management

Notes, Warnings, Cautions

- General supportive measures include airway/respiratory support, continuous hemodynamic monitoring with SPO2 and ETCO2 as appropriate, supplemental O2 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.
- Consider spinal immobilization if:
  - Fall from height (versus fall from standing)
  - Axial load to head
  - High speed collision, rollover, or ejection from any motorized vehicle
  - Explosion or blast injury
  - Trauma resulting in temporary amnesia/loss of consciousness

TACTICAL EVACUATION

Ground "Pick-Up" Phase

- Attempt to gain info prior to landing
- Ensure 360-degree scene security
- Collect medical information and patient documentation
- Triage casualties
- Treat all preventable causes of death IAW TCCC
- Package and secure patients for transport
- Brief and guide litter teams to aircraft
- Load and secure patients

Ground "Pick-Up" Phase

- Goal on ground time < 5min prior to wheels up
- If the tactical situation permits, all known preventable causes of death should be addressed prior to casualty movement
- If military working dos (MWD) are present (injured or uninjured), subdue/muzzle MWD first, then treat all human casualties before treating injured MWDs

"In-Flight" Phase

- Triage casualties as required: reassess patients and interventions
- Hemorrhage Control
  - Check/add tourniquet, pack/dress wound, pressure dressing, hemostatic dressing
  - Initiate blood (DCR)
- Airway/Vent Management
  - Reposition airway, nasopharyngeal airway, RSI (intubation/BIAD), cricothyroidotomy
  - Target SPO2 90-96%
- Chest Trauma
  - Vented occlusive dressing, needle thoracostomy, finger thoracostomy, chest tube
- Hypothermia Management
- Head Injury/Altered Mental Status
  - Monitor and treat for signs and symptoms of ICP (elevate head, 3% hypertonic saline, target ETCO2)
- Pain Management
- Consider Antibiotic Therapy
- Document Care

Notes, Warnings, Cautions

- Damage Control Resuscitation (DCR) Order of Precedence:
  - Control hemorrhage if able
  - Administer blood products
  - Consider TXA 2g < 3hrs from injury
  - Calcium administration during or after 1st unit and after every 4th unit of blood (Calcium may be given before TXA)
  - Consider pressors (as a last resort)
- Replace any limb tourniquets placed over the uniform with one applied directly to the skin, 2-3 inches above the wound
- Maximize blood/fluid therapy prior to considering pressor administration
- At any time, if patient becomes pulseless and apneic go to trauma arrest protocol
- If tactical situation allows, load deceased patients on a separate transport
- Consider full RSI prior to advanced airway managements to prevent aspiration

AIRWAY (ADULT/PEDIATRIC)

Signs and Symptoms of Distress and/or Failure

- SPO2 decreasing <90%, with/without supporting signs/symptoms of:
  - Tachypnea, Tachycardia, Fever, Cough, Adventitious Breath Sounds, or Shock
- Difficulty Breathing or Excess Work of Breathing as demonstrated by:
  - Pursing of Lips, Accessory Muscle Involvement, Cyanosis, Dysphasia, Diaphoresis
- Airway Obstruction due to Trauma, Edema, Excess Secretions, Foreign Body, or Tongue
- Apnea
- Decreased LOC (GCS<8)
- Pediatric patient is defined as <12 years of age.

Procedures

- Reposition airway via Jaw Thrust or Head Tilt Chin Lift. Provide shoulder padding for PEDs if required.
  - Sweep (NOT BLIND) and suction as needed
  - ABD thrust or back slaps (for infants) if indicated
- Assess the need for an advanced airway (GCS <8, suspected deterioration, SpO2 < 90%, TBSA >40%, severe head injury)
- SpO2<90%
  - Start Supplemental O2
  - Place NPA/OPA prn if no contraindications
  - Recheck q5 minutes
  - BVM or assist with respiration prn
- Consider direct Laryngoscopy to visualize foreign body obstruction; If present remove, suction, and/or provide abdominal compressions or back slaps for pediatric patients
- Establish an advanced airway per Procedure in the following sequence (Move to the next procedure per individual competencies, contraindications, and/or attempt failures):
  - Endotracheal Intubation
  - Blind Insertion Airway Device (BIAD)
  - Cricothyroidotomy
- After failed attempt:
  - Reassess Interventions
  - Restart Protocol
  - Consider other causes
- Continuous monitoring of ETCO2, SPO2, and ventilatory waveforms and pressures
  - Repeat sedative, analgesic, and paralytic per dose and time guidelines
- **Advance to FAILED AIRWAY GUIDELINE if:**
  - Unable to adequately open the airway
  - After two (2) failed attempts by the most proficient provider on the scene to place an ET Tube and at least one (1) failed attempt with a supraglottic airway under PAI
  - Intubation contraindicated due to anatomical abnormalities or major airway trauma
  - Continued inability to ventilate patient with mask ventilation using a BVM

Failed Airway

- If able to ventilate with a BVM, insert NPA or OPA dependent on contraindication and continue ventilating with BVM
- If unable to ventilate, perform an age-appropriate cricothyroidotomy (>10 years of age)
- Ventilate patient per age-appropriate respiratory rate to maintain minute ventilation

RAPID SEQUENCE INTUBATION

History

- Airway Compromise or Inability to Protect Airway
- Respiratory Failure (Hypoxic, Hypercapnic)
  - >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 CHECLIST)
  Conduct seven “P” pneumonic (7Ps):

Medications

- Induction Agents:
  - Ketamine 1-2 mg/kg IV
  - Etomidate 0.2-0.4 mg/kg IV
  - Midazolam 0.1 mg/kg IV
  - Propofol 1-2.5 mg/kg IV
- Paralytics:
  - Rocuronium 0.6-1.2 mg/kg IV
  - Vecuronium 0.08-0.15 mg/kg IV
  - Succinylcholine 1-1.5 mg/kg IV
- Maintenance:
  - Ketamine 0.5-2 mg/kg IVP or 0.5-2 mg/kg bolus then 1-3mg/kg/hr.
  - Propofol 10-75 mcg/kg/min
  - Midazolam 0.05 mg/kg IVP or 0.05 mg/kg bolus then 0.05-0.1mg/kg/hr.
- Push Dose Epi:
  - Epinephrine 5-20mcg IV q2-5min

Prepare

- 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, SpO2%, etCO2 capnography, 4-lead
- Equipment: Bougie, Laryngoscope, Video Laryngoscope, Cric Kit
- Evaluate cricothyrotomy landmarks and assess procedural difficulty

Pre-Oxygen

- Preoxygenate / Denitrogenate ≥ 3 minutes or 8 Vital Capacity Breaths with 15 LPM NRB or BVM + PEEP, and NC 4-6 LPM, Oxygenated ≥ 94% if able.

Positioning

- 30° Head-up for Pre-Oxygenation, Ear-to-Sternal Notch for Intubation, C-Spine Consideration.

Pretreat

- Resuscitate with IVF or Blood Products. Consider Push-Dose Pressors (Epi) to ensure SBP>100mmHg.
- 3 - 5 Minute prior to Sedative / Paralytic
- Consider Fentanyl 3mcg/kg slow IV push to prevent Hypertension in head injury, cardiac ischemia, or aortic dissection
- Atropine 0.02 mg/kg IV to prevent bradycardia in Peds (age <1y)

Sedate/Paralyze

- Push sedative first before paralytic push (see medications above)
- Apneic Oxygenate
- Monitor SpO2% and wait for adequate paralysis.

Pass Tube

- Visualize Cords, Pass Tube, Inflate Bulb and Begin Bagging

Post-Tube Management

- Verify Tube Place with etCO2 waveform capnography and secure tube.
- Place patient on Post-intubation Maintenance Sedation (see medications above)

VENTILATOR MANAGEMENT

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.
- Attached ventilator tubing and O2 tubing to machine.
- If patient is a transfer and already on a ventilator, maintain ventilator setting from medical treatment facility.

If Patient "Newly" on the Ventilator, Initial Setting Should Be

- **Mode:** CMV+ or Assist Control (AC)
- **Tidal Volume (Vt)**: 6 cc/kg IBW
  - IBW calculation
    - 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 ≤ 2 hours until Vt = 6 cc/kg IBW
- **Rate (RR):** Initially 14, adjust based on CO2 (if CO2 >45mmHg) and ventilatory needs (do not exceed >35 BPM)
- **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:** 100% (then titrate FiO2 down to achieve SPO2 90-96%, SPO2>93% head injury)
- **PEEP:** 5

***NOTE: FiO2/PEEP (Should be adjusted in concert per the chart below if patient has ARDS or if desaturation is gradual and presumed to be caused by patient pathology)**

To Achieve Oxygenation Goals, set the FiO2 to 30% and start titration FiO2 and PEEP collectively based on the chart. Go up every 5-10 minutes; quicker if low SpO2 sats develop.

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

***NOTE: Hypotensive patients (MAP <70 or SBP <90) may respond negatively to increased PEEP due to decreased venous return. Monitor for increasing 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

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Oxygenation Goal: Normal PaO2 80-100 mmHg or SpO2 90-96%; ARDS PaO2 55-80 mmHg or SpO2 88-95%
Plateau Pressure Goal: ≤ 30 cm H2O

- Check Pplat (0.5 second inspiratory pause), at least q 4h and after each change in PEEP or VT.
- If Pplat > 30 cm H2O: decrease VTby 1ml/kg steps (minimum = 4 ml/kg).
- If Pplat < 25 cm H2Oand VT< 6 ml/kg, increase VT by 1 ml/kg until Pplat > 25 cm H2O or VT = 6 ml/kg.
- If Pplat < 30 and breath stacking, or dys-synchrony occurs: may increase VT in 1ml/kg increments to 7 or 8 ml/kg if Pplat remains < 30 cm H2O.

Alarm Settings:

- High Pressure Alarm: 10 cmH2O above peak airway pressure.
- Low Pressure Alarm: 5 cmH20 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 ventilator for ~ 1-2 minutes and determining intrinsic peak inspiratory pressure. (Labeled as PEAK on 754 Ventilator (top right); Labeled as Ppeak on Hamilton T1 (top left)****

Monitor waveform on machine and patient to ensure no breath stacking occurs. 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.

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% O2 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, assess 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 pneumothorax / hemothorax suspected, perform immediate needle thoracostomy. Assess the need for escharotomy if circumferential burn. Consider additional paralysis and sedation if patient does not tolerate ventilation
- **Equipment:** Ensure that vent did not fail; O2 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 >35 cm H2O):** 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 overdistention 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**

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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 to maintain PEEP if conducting recruitment maneuvers or PEEP is 10 or higher, then 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 SPO2 and ETCO2 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.

CPG ID References: 92 (Mechanical Ventilation Basics); 48 (Mechanical Ventilation During Critical Care Air Transport)

BLOOD AND COMPONENT USE

IMMEDIATE INDICATIONS in Trauma Patients with SERIOUS INJURY

- Systolic BP < 100 or absent radial pulse
- Tachycardia > 100
- Amputation

Clinical Indications

- Uncontrolled hemorrhage
- Evidence of hemorrhagic shock
- Trauma patients with amputations (complete or partial with distal circulation compromise)
- Non-compressible penetrating thoracic region
- Abdominal/transitional zone injuries (significant mechanism of injury)
- Clinical signs of coagulopathy (tachycardia, tachypnea, fever, altered mentation, hypoxemia)
- Severe hypothermia associated with blood loss

Treatment

- Maximize hemorrhage control, treatment of suspected tension pneumothorax, patent airway or airway control, IV/IO access, hypothermia prevented and/or treated
- **Blood Product Order of Precedence**
  - Whole Blood
  - Plasma, RBCs, Platelets in a 1:1:1 Ratio (no particular order)
  - Plasma and RBCs in 1:1 Ratio
  - Plasma (thawed, liquid, reconstituted) alone or RBCs alone
- 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
- Examine units of blood (look for gas, discoloration, clots, and sediment) and verify that the Safe-T-Vue is white
- Initiate large bore IV (18G min, 14G preferred) or IO access (Lidocaine 2% (2-3mL) flush in IO site provides analgesia and increases compliance)
- Blood and blood products must be administered through Y-tubing with filter, flushed with NS prior to use
- Transfuse blood through an approved fluid warming device if available
  - Rapid transfusion can be achieved via pressure bag at least 300mmHg; a 60mL syringe or manual pressure can also be utilized in the event a pressure infuser is not available
- Consider slowing all other concurrent infusions unless they are TXA or RFVIIa
- **Resuscitation Goal**: until palpable radial pulse, improved mental status, or SBP > 100 (>110 w/ head injury) and MAP >60mmHg
- 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. Ionized calcium should be monitored, and calcium should be administered for ionized calcium levels less than 1mmol/L
- Monitor patient every 5 minutes and document any patient signs and symptoms consistent with transfusion reaction (monitor core temperature)
  - If a transfusion reaction occurs, see the Transfusion Reaction protocol.

BLOOD TRANSFUSION REACTIONS

Treatment

- **STOP THE TRANSFUSION!**
- **If a blood transfusion reaction is suspected**
  - Apply O2 (if hypoxic), IV/IO, and cardiac monitor
  - Establish Advanced Airway per individual competencies, contraindications, and/or attempt failures. Maintain SPO2 >93%
- **Anaphylaxis**
  - Epinephrine 0.3mg IM (0.3mL of 1:1000)
  - Diphenhydramine 25mg IV/IO/IM
  - Maintain Airway
  - Administer IV fluids as needed
  - Consider Methylprednisolone 125mg IV/IO
- **Acute Hemolytic Reaction (AHTR)**
  - Diphenhydramine 25-50mg IV/IO/IM
  - Consider osmotic diuresis:
    - 20g Mannitol 20% or 250mL 3% NaCl
- **Febrile Non-Hemolytic Transfusion Reaction (FNHTR)**
  - Consider Acetaminophen 500mg PO or 1G IV
- Continue to reassess the patient and ensure to document on SF 518
- Notify blood bank of all transfusion reactions.

Notes, Warnings, Cautions

- Reactions are very rare (less than 0.1%)
- 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.
- TRALI is the leading cause of transfusion-related mortality; a concern in patients who have undergone recent surgery, massive transfusion, or have an active infection. Goal of treatment is supportive: maintain oxygenation, reduced respiratory distress.
- TACO is essentially pulmonary edema secondary to congestive heart failure occurring in elderly, small children, and those with compromised cardiac function. Large volumes of fluid given rapidly is a common precursor. Goal is diuresis and treating underlying condition. Both TACO and TRALI require immediate resuscitation.

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IV/IO PROTOCOL

• Assess need for IV
  ○ Emergent or potentially emergent medical or trauma condition.
• Peripheral IV x 2
  ○ Catheter ≥ 18ga
  ○ Two failed attempts or > 90 secs proceed to IO.
	• **Intraosseous Device** for Life/limb threatening.
	• IO should only be considered first if patient is deemed difficult to gain IV access.
	• If IV/IO access unsuccessful attempt EJ IV Cannulation.

• Sternal IO Device by precedence:
  ○ Fast-1™
  ○ EZ T.A.L.O.N™
  ○ EZ-IO™
• Locations for EZ T.A.L.O.N.™ and EZ-IO™ by precedence
  ○ Bilateral Proximal Humerus
  ○ Bilateral Proximal Tibia
  ○ Bilateral Distal Tibia
	• Correct needle size for EZ-IO™
	  ○ Yellow - 45mm for humerus and *heavy sternal
	  ○ Blue - 25mm for adult *sternum/tib
	  ○ Pink - 15mm for children and *sternal/tib
	
	*NOTE: Use of EZ-IO in sternal is off label emergency procedure only

Notes, Warnings, Cautions

- **GENERAL RULES**
  - **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.
  - Pressure infusion bag is recommended for IO starting at 300mmHg.
  - Following IV attempt failure and IO attempt failure, external jugular lines can be attempted for life-threatening events with no peripheral access.
  - Ensure open and functioning fluid bolus per specific protocol. At a minimum, maintain a slow “to-keep-open” (TKO) drip.

ABDOMINAL INJURY

Signs and Symptoms

- Altered Mental Status
- Tachycardia
- Absence of palpable pulses
- Pale, moist, mottled skin
- Poor peripheral pulses
- Hypotension
- Hematuria
- Pain, tenderness, distention, dissymmetry
- Absent/diminished bowel sounds
- Grey-Turner sign
- Cullen sign
- Kehr's sign

Treatment

- Blunt Abdominal/Pelvic Injury
  - Serial Physical Exams/Reassessment
  - Pelvic Binder
  - Conduct FAST exam if possible*
  - Focus on resuscitation
- Penetrating Abdominal/Pelvic Injury
  - Hemostatic Dressing/ Pack Pelvic Cavity
  - Pressure Dressing
  - Direct and Indirect pressure
  - Abdominal Dressing
  - Pelvic Binder
  - AAJT- uncontrolled pelvic bleed
- Damage Control Resuscitation
  - Consider implementation of DCR if indications are met (SBP<100) (HR>100) (penetrating chest/abdominal injuries, amputations, pelvic injury)

* FAST exam cannot reliably exclude significant injury but may provide indication of intra-abdominal injury.

Notes, Warnings, Cautions

- Pregnant patient
  - Increased risk of Aspiration and gastric acidity
  - Patient should receive max O2 due to increased O2 consumption and depleted reserves
  - Consider warm LR before crystalloids to better restore fetal oxygenation
  - >20 weeks gestation, tilt at least 15 degrees to prevent Vena Cava Syndrome
- Lateral contusions (seatbelt sign) associated with a 20% occurrence of internal injury.
- Presence of pregnant uterus should be determined. 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

BURNS/ELECTRICAL INJURY

History

- How long ago was the injury?
- Any signs of airway involvement?
- How big/small of a space was the patient in during the incident? (inhalation/carbon monoxide)
- Are there other traumatic injuries associated?
- Any spinal immobilization needed? (fall from a significant height, blast, etc.)

Call the Burn Center: DSN 312-429-2876 (429-BURN)/Comm: 210-916-2876 or 210-222-287

STOP the burning process/remove patient from electrical source. Ensure your safety first!

Differential Diagnosis: cardiac arrest, environmental exposure, seizure, burns (chemical, electrical, thermal, radiation), multiple trauma, carbon monoxide toxicity.

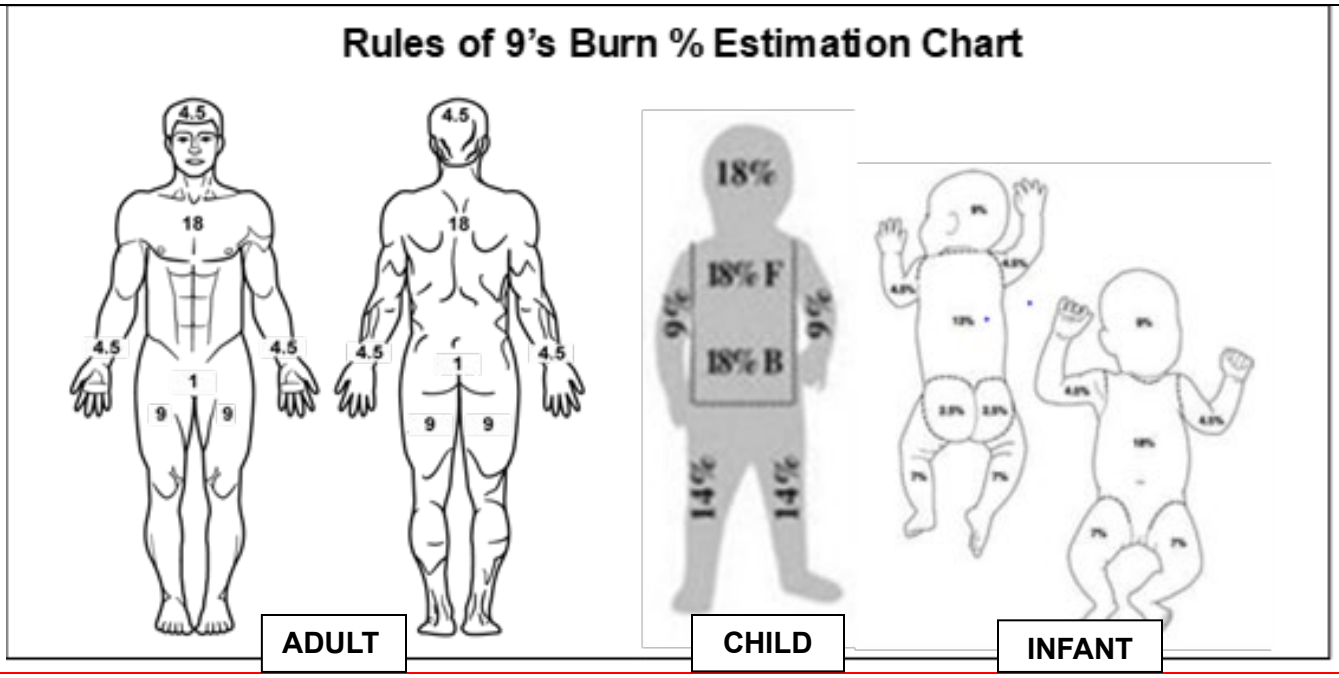
Treatment

- Access for additional injuries and treat life threats (DO NOT overlook TRAUMA), IV/IO, O2, and monitor (electrical injuries must have 12 lead EKG completed to access for Arrythmia's)
- **Electrical:** If arrythmia is present, go to appropriate Cardiac protocol
- Remove any constricting items i.e., rings and bracelets
- Assess airway, if suspected airway involvement move to Airway Guideline.
  - Indications for endotracheal intubation include comatose patient, symptomatic inhalation injury, deep facial burns, and burns over 40% Total Body Surface Area (TBSA). Requires large ETT size 8 adult.
- **Thermal/Electric burn:** If able, remove burning/charred clothing and cover with dry, sterile sheets/dressings.
- **Chemical burn:** Brush off dry chemicals, cut off contaminated clothing, flush area with saline 10-15 minutes.
  - Eyes: flush with saline for 30 minutes.
  - Hydrofluoric Acid- After thorough irrigation, apply a CaGlu gel (75mL KY Jelly + 25mL 10% CaGlu) for 30 minutes.
  - Tear Gas- rinse skin and eyes with NS.
  - Alkali Burns to eye- 1-2 L of NS each eye for 30 minutes.
- Determine/start fluid replacement for burn fluid resuscitation.
- Manage pain and prevent hypothermia. KEEP WARM!
- Monitor urinary output, if able

Notes, Warnings, Cautions

- Urinary output is the MOST reliable guide for adequate resuscitation:
- Adult 30-50 mL/hr (75-100ml/hr electrical burn) Children: <40 kg 0.5-1ml/kg/hr.
- Edema after burn injury causes most Supraglottic airway devices such as laryngeal mask airways (LMAs) to be inadequate.
- Ventricular fibrillation (in AC) and asystole (in DC) are the most common dysrhythmias seen with electrical shock.
- MASCAL where lightning is involved – reverse triage should be performed. Those victims in full arrest should be resuscitated first.
  - Specifically, if there are no spontaneous respirations after airway maneuver, but no other signs of non-survivable injury, administer ventilatory support aggressively as resources allow

BURN FLUID RESUCITATION



ADULT >40KG

- **Burns:** 10mL/hr x %TBSA; patients weighing more than 80kg, add 100 ml/hr to IV fluid rate for each 10 kg > 80 kg. Re-evaluate every 1-2 hours. Adjust IV rate to UOP goal 30-50mL (0.5-1 mL/kg in Peds). Adjust IV rate up or down by 20%.
- **High Voltage Injury:** 10mL/hr x %TBSA (estimate to nearest 10%); patients weighing more than 80kg, add 100 ml/hr to IV fluid rate for each 10 kg > 80 kg. Re-evaluate every 1-2 hours. Adjust IV rate to UOP goal 75-100mL. Adjust IV rate up or down by 20%

PEDIATRIC <40KG

- **Burns**: 3 x %TBSA x body weight (kg) gives the volume for initial 24 hrs. One half is given in first 8 hours. Monitor urine output with goal of 0.5 to 1 mL/kg/hr.
- **High Voltage Injury:** Adjust IV rate to UOP goal 1-2 mL/kg. Adjust IV rate up or down by 20%

Notes, Warnings, Cautions

- **TBSA > 20%, may require acute fluid resuscitation in prehospital: LR (best)>NS (2nd best)>Hextend (only to 1L)**

Notes, Warnings, Cautions

- 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.
- Administer a maintenance rate of D5LR to children <13 years of age. Utilize the 4-2-1 rule: 4 ml/kg for the first 10 kg + 2 ml/kg 2nd 10 kg + 1 ml/kg over 20 kg. This maintenance rate is in addition to the isotonic infusion calculated for burn resuscitation and is not titrated.

Reference CPG ID:12 (Burn Care)

CHEST TRAUMA

Signs and Symptoms

- Difficulty breathing
- Rapid respirations with SPO2 decreasing or <93% (In flight and on O2)
- Flail chest
- Unequal rise and fall
- Open wound/impalement over the thorax
- Penetrating abdominal wound
- Bruising across chest or base of neck
- Subcutaneous emphysema or deviated trachea

Treatment

- Penetrating Chest Wound
  - Open
    - Seal open wound with occlusive chest seal (vented)
  - Impalement
    - Stabilize
    - High index of concern for Hemo-pneumothorax
  - Signs of Hemo-pneumothorax
    - Needle Thoracostomy

  Goal: SPO2>90%; Improved RR; Equal rise/fall
- Blunt Chest Trauma
  - Flail Chest
    - Administer Pain Control
    - Consider Endotracheal Intubation, Pos P ventilation
  - Signs of Hemo-pneumothorax
    - Needle Thoracostomy
  - Goal: SPO2>90%; Improved RR; Equal rise/fall

Notes, Warnings, Cautions

- Needle Thoracostomy may need to be repeated
- Failure to improve after Needle Thoracostomy
  - Controlled descent as able
  - Consider Finger/ Tube Thoracostomy
- Consider Spinal Immobilization for Chest Trauma Patients
- Maintain high index of suspicion for Intra-abdominal and retro-peritoneal bleeding in all chest injuries

CRUSH SYNDROME

History

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

History (Complications)

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

Treatment

- Prior to Extraction
  - Consider tourniquet placement for crush injuries if the length of entrapment exceeds 2 hours and crush injury protocol cannot be initiated immediately.
  - Apply two tourniquets side by side and proximal to the site of entrapment immediately prior to extraction.
- Initiate Crush Injury Protocol before extrication if possible and before loosening tourniquets (if tourniquet conversion indicated).
- IV / IO Guideline
  - Initiate aggressive fluid administration of IV / IO crystalloids 2L initial bolus; followed by infusion rate: 1L/hr. Adjust to urine output (UOP) goal of >100-200mL/hr. (via Foley or improvised graduated cylinder)
- Monitor for life-threatening hyperkalemia (PVC's, bradycardia, peaked T-waves, decreased peripheral pulse strength, hypotension).
  - If PVCs become more frequent, the patient develops bradycardia, peripheral pulse strength decrease, or potassium levels are >5.5 mEq/L or rising, treat urgently for hyperkalemia.
    - Calcium: Administer 10 mL (10%) calcium gluconate or calcium chloride IV over 2–3 minutes.
    - Insulin and Glucose: Give 10 units of regular insulin followed immediately by 50mL of D50.Titrate PRN
    - Albuterol: Administer 12mL of albuterol sulfate inhalation solution, 0.083%(2.5mg/3mL) in nebulizer.
- If no signs of hyperkalemia develop, continue fluid administration and continuously monitor.

Notes, Warnings, Cautions

- Crush syndrome can occur in as little as 1 hour of entrapment
- Tourniquets may mitigate life-threatening complications in situation where 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.

EXTREMITY TRAUMA

Signs and Symptoms

- Pain/Swelling
- Deformity
- Altered Sensation/Function
- Diminished Pulse/ Cap refill
- Decreased Temperature
- Bleeding
- Amputation

Signs and Symptoms (cont.)

- Abrasion
- Contusion
- Multi-Trauma
- Fracture
- Dislocation
- Laceration
- Sprain/Strain

Treatment

- Heavy Active Bleeding
  - Check/Add Tourniquet (TQ)
    - Add Deliberate TQ if Hasty is in place
  - Pack and Dress Wound
  - Pressure Dressing
  - Hemostatic Dressing
- Amputation
  - Follow Heavy Active Bleed Guidelines
  - Wrap Amputation in Sterile Dressing with Normal Saline
  - Place in sealed container with ice slurry if available
  - Transport with patient
  - Clean amputated limb
- Convert Limb/Junctional TQ as soon as possible if:
  - No presence of shock
  - Able to monitor wound closely for bleeding
  - Not placed to control hemorrhage on amputated extremity
  - Every effort should be made to convert in less than 2 hours if patient is not in shock
- Wound Care/Protection
  - Bandage/cover injuries
  - Immobilize extremity
  - Ice (if available) for Edema

Notes, Warnings, Cautions

- After Bleeding Controlled:
  - Treat for signs and symptoms of Hypotension/Shock
- Follow DCR protocols regarding hierarchy of fluid administration
- Carefully evaluate and document Neurovascular Status in all fractures/dislocations
- Never attempt to reduce an open fracture unless you have a confirmed loss of pulse
- A pelvic binder is indicated in cases of severe lower extremity injury and may be utilized in conjunction with a traction splint.
- Blood loss can be severe and concealed in long bone fractures-especially the femur
- TQs should be used without hesitation to control major bleeding
- Use only CoTCCC approved Tourniquets
- Reference: CPG ID: 62 Acute Traumatic Wound Management & TCCC Guidelines

EYE INJURY/PAIN

History

- Pain, Swelling, Blood
- Decreased Visual Acuity / Blindness
- Deformity / Contusion
- Foreign Body
- Excessive Tearing

History (Complications)

- Abrasion / Laceration
- Globe Rupture / Orbital fracture
- Retinal Detachment
- Chemical / Thermal Burn
- Infection / Iritis
- CNS Event
- Glaucoma
- Retinal Vessel Occlusion

Treatment

- **Without Known Injury**
  - Evaluate Pupils
  - Consider unrecognized chemical exposure.
    - Irrigate with minimum 2L NS for chemical exposure; 30 min minimum.
- **With Known Injury**
  - If not isolated, move to appropriate guideline to treat life threats.
  - Assess orbital stability / pupils.
- **Chemical Injury**
  - Irrigate with minimum 2L NS for chemical exposure; 30 min minimum.
- **Traumatic Injury**
  - Remove loose debris with NS irrigation. Do not attempt to remove impaled objects or contacts.
  - Cover with rigid eye shield. DO NOT PLACE ANY DRESSING/PADDING UNDERNEATH EYE SHEILD.
  - If penetrating, give moxifloxacin 400mg PO / IV.
- Refer to Pain control Guideline.
- Treat for Nausea / Anxiety
  - Nausea: Ondansetron 4-8 mg IV / IO / IM
  - Anxiety:
    - Diazepam 2-10 mg IV / IO / IM
    - Midazolam 2.5-5 mg IV

Notes, Warnings, Cautions

- 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. Some chemical injuries can require up to 10L. 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.

HEAD INJURY/TBI

Signs and Symptoms

- Head Pain, Swelling, Bleeding
- Head Deformity, Ecchymosis
- Altered Mental Status
- Respiratory Distress/Failure
- Vomiting
- Spinal Injury

Signs and Symptoms (cont.)

- Skull Fracture
- Epidural/Subdural Hematoma
- Subarachnoid Hemorrhage
- Abuse
- Definitions:
  - Mild TBI GCS 13-15
  - Moderate TBI GCS 9-12
  - Severe TBI GCS 3-8

Treatment

- Consider Spinal Immobilization (minimize compression of neck veins)
- Resuscitate, follow Tactical Evacuation Guidelines
- TXA 2g IV/IO in *moderate to severe TBI*
- Levetiracetam 1500mg IV/IO bolus in *severe TBI* (seizure prophylaxis for transport)
- Airway Compromise
  - Establish airway (Airway protocol) with supplemental O2
  - Monitoring Goals:
    - SPO2 > 95%
    - ETCO2 35-45mmHg (normoventilation)
- No Obvious Airway Compromise
  - Jaw Thrust, NPA
  - Supplemental O2 via BVM (SpO2 > 95%)
  - Low threshold to RSI if deteriorating GCS/mental status
- Evidence of Elevated ICP
  - Elevate head of bed to 30 deg
  - 3% Hypertonic Saline 250 mL IV/IO over 10 min
  - Target Vital Signs:
    - SBP>110
    - SPO2> 95%
    - ETCO2 35-45mmHg (normoventilation, do not hyperventilate)
    - CCP >60 (CCP=MAP – ICP)
- Evidence of Impending Herniation (e.g., sluggish, unilateral/bilateral dilated or fixed pupil, presence of Cushing's triad) [Cushing's triad = (relative) bradycardia, hypertension/widening pulse pressures, irregular respirations]:
  - Continue elevated ICP treatment as above
  - Maintain ETCO2 35-45mmHg (normoventilation; avoid hyperventilation)
  - Request online medical control for further guidance in prolonged flight

Notes, Warnings, Cautions

- Ensure Continuous monitoring q5-10 min
- Active seizures: Lorazepam or Midazolam, see Seizure protocol
- Mannitol given as boluses: 1g/kg bolus followed by 0.25mg/kg bolus every 4 hours
- Keep SBP>110: consider LR/NS bolus
- Avoid Hypo/Hyper-capnea through dedicated closely managed ventilation
- Sedation: Ketamine is preferred over propofol due to hemodyanamic effects of propofol. Monitor SBP.
- Paralysis: Not preferred in head injury if avoidable; vecuronium preferred; ensure pain control/sedation is adequate to avoid increased ICP

Reference CPG ID: 63 (TBI Management in Prolonged Field Care)
Reference CPG ID: 30 (TBI Management and Basic Neurosurgery in the Deployed Environment)

TRAUMATIC ARREST

History

- Evidence of trauma without a pulse
- Unresponsive to external stimuli

History (Differential)

- Medical cause of arrest preceding trauma
- Tension pneumothorax
- Hypovolemia
- Cardiac Tamponade

Treatment

- Determine if injuries are incompatible with life.
  - Do not resuscitate if injuries are incompatible with life.
- Address all known points of hemorrhage.
  - Initiate transfusion with 1 unit of blood product (avoid resuscitation with crystalloid)
  - TXA 2g IV/IO within 3 hours of injury
- Begin CPR
- Place advanced airway
  - Start supplemental O2
- Bilateral needle thoracostomy
- Consider Advances Procedures
  - Finger Thoracostomy
  - Tube Thoracostomy
  - Pericardiocentesis
- Place monitor on patient: Prepare Defibrillator
  - Determine Rhythm: Pulse return?
- ROSC not Achieved
  - Continue CPR
  - Continue Blood / IV Fluids
  - Reduce Long Bone Fractures
  - Reduce Pelvic Fracture
  - Reassess known hemorrhage points
- ROSC Achieved
  - Return to Tactical Evacuation or Previous Guideline

Notes, Warnings, Cautions

- **Injuries obviously incompatible with life** include decapitation, massively deforming head or chest injury, traumatic hemi-corpectomy or total body disruption, incineration, lividity/rigor mortis.
- Casualties with torso trauma or polytrauma who have no pulse or respirations during Tactical Field Care should have bilateral needle decompression performed to ensure they do not have a tension pneumothorax prior to discontinuation of care.
- 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.

Ref: CPG ID:82 & TCCC Guidelines

HYPOTENSION/SHOCK

History

- Restlessness / Confusion
- Weakness / Dizziness
- Tachycardia
- Pale, Cool, Clammy Skin
- Delayed Cap. Refill
- Blooding
- Dehydration
- Congenital Heart Disease

History (Complications)

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

Treatment

- Shock Due to Hemorrhage / Trauma:
  - Control hemorrhage
  - Optimize homeostasis (See Notes, Warnings, Cautions))
  - Optimize hypothermia management
  - TXA 2G IV/IO
  - Maintain SBP >100 (>110 TBI), move to appropriate protocol for continued treatment (i.e., Blood Administration, etc.)
- Shock Due to Non-Traumatic & Non-Cardiac
  - 2L or 30mL/kg IVF bolus PRN, additional crystalloid based on reassessment of clinical indication.
  - If inadequate, consider NOREPINEPHRINE 2-20 mcg/min IV/IO
  - Maintain SBP >90, MAP >65
- Shock Due to Cardiac:
  - Treat per appropriate Cardiac Guideline:
    - BRADYCARDIA W/ A PULSE
    - CARDIAC ARREST
    - TACHYCARDIA W/ A PULSE
  - Non-Invasive PPV (BVM) vs. Advanced Airway
  - 500mL IVF Bolus
  - If inadequate, NOREPINEPHRINE 2-20mcg/min IV/IO

Notes, Warnings, Cautions

- Optimize Homeostasis:
  - Hemorrhage trauma with NO significant Head Injury: Should target maintaining SBP >100. Casualties able to maintain SBP >100 do not need immediate fluid resuscitation.
  - Hemorrhage trauma WITH significant Head Injury: Should target maintaining SBP >110.

PEDIATRIC HYPOTENSION/SHOCK

History

- Restlessness / Confusion
- Weakness / Dizziness
- Tachycardia
- Pale, Cool, Clammy Skin
- Delayed Cap. Refill
- Blooding
- Dehydration
- Congenital Heart Disease

History (Complications)

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

Treatment

- Due to Hemorrhage / Trauma:
  - Trauma Fluid Preferences
    - Whole Blood (if available)
    - pRBC's and plasma (if available)
    - (LR/NS) 20mL/kg IVF Bolus
  - 10mL/kg Blood Product
  - If inadequate, consider (as last resort) EPINEPHRINE 1mcg/kg/min IV/IO or NOREPINEPHRINE .05- 0.1 mcg/kg/min slow IV push q10-15min
- Due to Non-trauma & Non-cardiac:
  - 20mL/kg (NS/LR) IVF bolus
  - If inadequate, consider EPINEPHRINE 1mcg/kg/min IV/IO or NOREPINEPHRINE .05 – 0.1 mcg/kg/min IV/IO (max 2mcg/kg/min)
- Due to Cardiac:
  - Treat per appropriate Pediatric Cardiac Guideline:
    - Pediatric BRADYCARDIA W/ PULSE and poor perfusion
    - Pediatric TACHYCARDIA W/ PULSE and poor perfusion
    - Pediatric CARDIAC ARREST
  - Non-invasive PPV (BVM) vs. Advanced airway
  - If rales heard on lung exam, 5 – 10mL/kg IVF over 5 – 10 min
  - If inadequate, consider EPINEPHRINE 1mcg/kg/min IV/IO

Notes, Warnings, Cautions

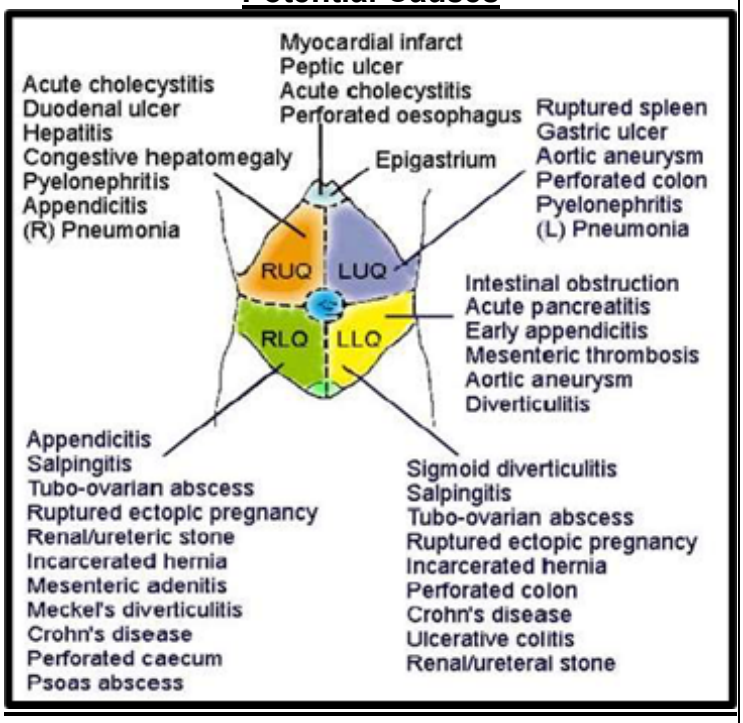
- Hypotension in pediatric patients is defined as **SBP < 70 +[2 x age(yr)]**
- Decreasing heart rate with worsening neuro or clinical exam may be sign of impending collapse in pediatric patients.
- Consider all causes of shock and treat per appropriate protocol.
- **Avoid Pressors** (last resort) as able, unless distributive or cardiogenic shock. Continue IVF for trauma; optimize homeostasis and correct volume.

ABDOMINAL PAIN

Signs and Symptoms

- Pain (RUQ, RLQ, LUQ, LLQ)
- 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

Potential Causes



Rule out MOI as a differential diagnosis. Universal Patient Care Guideline, O2 (if Hypoxemic), IV / IO Guideline, Cardiac Monitor12 Lead ECG (>40yo)

Trauma Considerations

- MOI- Blunt force or penetrating trauma
- Obstetric Patient trauma- follow O/B Emergency Guideline

Blood Products

- Persistent or Worsening Signs of Hypovolemic Shock (Tachycardia, Hypotension, Pulse Pressure)
- Rigid Distended Abdomen and/or Known: AAA, GI Bleed, or Ruptured Ectopic / Abruption
- Reassess unstable patients every 5 min; Stable patients every 15 min.

Medical Considerations

- Identify potential causes of abdominal pain (refer to chart above)
- **Tachycardia / Hypotension / Orthostatic BP**
  - Consider 500ml bolus per (IV/IO guideline)
- **Significant Pain**
  - Pain management guideline
- **Cardiac Emergencies**
  - Cardiac pain guideline
- **Nausea or Vomiting**
  - 500ml IVF Bolus
  - Promethazine 12.5-25mg IV
  - Ondansetron 4-8mg IV

Notes, Warnings, Cautions

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

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

Rule out MOI as a differential diagnosis. Universal Patient Care Guideline, O2 (if Hypoxemic), IV / IO Guideline, Cardiac Monitor (ASAP)

ADULT

- **Hives / Rash Only, No Respiratory Complaint**
  - Administer Diphenhydramine **25-50mg** IV/IO/IM/PO
  - Administer Methylprednisolone 125mg IV/IO
- **Shock / Unresponsive or Respiratory Distress / Failure**
  - Epinephrine-Pen or Epinephrine 1:1000; 0.3-0.5mg IM
  - 500ml IVF if not previously started.
  - Albuterol 90-180mcg 2 puffs MDI or 2.5-5mg via nebulizer
  - Diphenhydramine 25-50mg IV/IO/IM/PO
  - Methylprednisolone 125mg IV/IO

Worse or Unstable

- **Epinephrine IV** infusion at 5-15 mcg/minute (see Epinephrine infusion chart in drug card for procedure)

PEDIATRIC

- **Hives / Rash Only, No Respiratory Complaint**
  - Diphenhydramine; 1-2 mg/kg IM/IV/PO (max dose 50mg)
  - Administer Methylprednisolone 2mg/kg IV
- **Shock / Unresponsive or Respiratory Distress / Failure**
  - Epi-Pen Jr for <30kg or Epinephrine 1:1,000; 0.01mg/kg IM (max 0.3mg)
  - 20 mL/kg IVF Bolus
  - Albuterol metered-dose inhaler
    - 4 – 8 inhalations every 20 min
  - Albuterol by nebulizer
    - Children < 20 kg; 2.5 mg/dose
    - Children > 20 kg; 5 mg/dose
    - Diphenhydramine 25-50mg IV/IO/IM/PO
  - Methylprednisolone 2mg/kg IV; maximum daily dose, 120 mg

Notes, Warnings, Cautions

- 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 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.
- Arrhythmia- See appropriate pediatric cardiac guidelines.
- Non-arrhythmia- See hypotension guideline or respiratory distress guideline.

ALTERED MENTAL STATUS

Signs and Symptoms	Differential Diagnosis
• Any signs of head trauma/injuries? • Any AMS? • Any pertinent medical conditions or medical history? • Are there any bystanders that can provide information about the patient? • Is this abnormal behavior?	• Head trauma/psychiatric disorders • Thyroid dysfunction • Hyper/hypoglycemia • Diabetic ketoacidosis/toxic Ingestion • Environment (hyper/hypothermia) • Hypoxia

Safety of the helicopter/crew/other patients take PRIORITY!

Treatment

- Does the patient have a head injury, unable to protect their airway (GCS<8), violent behavior, and/or AMS?
  - Refer to head injury guideline, airway guideline if applicable.
  - Determine blood glucose, if <70 or >250 go to hypoglycemia or hyperglycemia guideline.
- If patient is an EPW or potential hostile, consider security escort and/or physical restraints.
- Attempt to calm and reassure the **combative patient** and use physical restraints if needed.
- Medications can be used to help calm the patient. Ensure that patient has their ETCO2 monitored after administration.
  - Ketamine 4-5mg/kg IM/IN or 1-2 mg/kg IV/IO can repeat q 10min.
  - Lorazepam 2-4mg IV/IM (can use alone).
  - Midazolam 2.5-5mg IV/IM q15-30 min prn (larger patients may need 10mg if using IM route).
- If patient is still combative after the use of medications, consider RSI guideline.

Notes, Warnings, Cautions

- **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. **(Kerlix 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, SpO2, Pulse and Cap Refill every 5 minutes.**
- 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 and/or 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.

BACK/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

*Rule out MOI as a differential diagnosis. Universal Patient Care Guideline, O2 (if Hypoxemic), IV / IO Guideline (prn), Cardiac Monitor (prn)

Injury Treatment

- **Injury/Trauma**
  - Mechanisms that increase suspicion of possible Spinal Cord Injury:
  - Blunt trauma to head or neck
  - Injury associated with high energy
  - transfer (e.g., blast, motor vehicle)
  - Fall from >3 ft.
  - Fall directly onto head / neck
  - History of back / neck arthritis plus
- Spinal Immobilization Guideline
- Head Injury Guideline
- Multiple Trauma Guideline

Medical Treatment

- **Extremity BP difference/ Suspicion of AAA**
  - 1000mL IVF IV any trauma
  - Consider: Blood Product for AAA
- **Suspicion of ACS/ Chest Pain**
  - Chest Pain Guideline
- **Arrhythmia**
  - Bradycardia with Pulse Guideline
  - Tachycardia with Pulse Guideline
  - Cardiac Arrest Guideline (VF / Pulseless VT or Asystole / PEA)

Notes, Warnings, Cautions

- EXAMINE: Mental Status, HHENT, neck, chest, abdomen, back, extremities and neurologic.
- Abdominal Aortic Aneurysm is a concern in hypertensive / diabetic / >50y populations- feel for pulsatile abdominal mass. Symptoms may mimic kidney stones.
- Patients with trauma and midline tenderness should be immobilized.
- Any bowel/ bladder incontinence is significant and may represent a true medical emergency.

HYPERGLYCEMIA/HYPOGLYCEMIA

Hyperglycemia S/S **BLOOD GLUCOSE >250**	Hypoglycemia S/S **BLOOD GLUCOSE <70 (<100 in neuro injury)**
• Polyuria • Polydipsia • Weakness/fatigue • Nausea/vomiting • Change in LOC • Hypotension • Tachycardia • Seizures/coma • Fruity Breath Odor	• Diaphoresis • Pallor • AMS • Tremor • Palpitations • Anxiety

Treatment
• Place Patient on Cardiac Monitor
• Obtain Blood Glucose
  ○ Blood Glucose >250mg/dL
  • Initiative IV or IO Access
  • Administer 1000ml .09%NS (10-20ml/kg)
  • Monitor blood glucose every 30 minutes.
• Consider Intubation for patients with AMS.
• Nausea or vomiting present, administer:
  ○ Promethazine 12.5-25mg IV
  OR
  ○ Ondansetron 4-8mg IV
	Treatment
	• Place Patient on Cardiac Monitor
	• Obtain Blood Glucose
	  ○ Blood Glucose <70mg/dL
	  • Initiate IV or IO Access
	  ○ Patients with AMS:
	  • Administer 10-25g IV Dextrose (40-100ml of 25% solution or 20-50ml of 50%)
	  • If IV access unobtainable, administer Glucagon 1mg IM. Repeat after 20 minutes as needed.
	  ○ Patients with NO AMS:
	  • Administer oral glucose gel or equivalent until glucose level is >70mg/dL.

Notes, Warnings, Cautions • If insulin is available, treat with low dose infusion, 0.1 units/kg/hr. • 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.	**Notes, Warnings, Cautions** • If administering Dextrose, obtain blood glucose sample from contralateral arm. • Hypoglycemia may be detrimental to patients at risk for cerebral ischemia, such as victims of stroke, cardiac arrest, and head trauma. • Hypoglycemic patients must be alert enough to swallow and protect airway.

LOWER 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

Potential Causes

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

ADULT

Wheezes

- Monitor O2 and ETCO2
- Place on 100% oxygen via NRB.
- Administer Albuterol **90-180mcg** or **5mg** nebulized
- Monitor for allergic reactions
  - Consider Epinephrine 1:1,000 **0.3-0.5mg** IM (EPI PEN)
- Initiate IV/IO Access
- Administer Methylprednisolone **125mg** IV
- Consider Magnesium Sulfate **2G IV** over20 mins. Dilute in 50-100ml NS or D5W.
- As a **last resort**, administer Ketamine **1mg/kg** IV slow push.

Rales/CHF

- Monitor O2 and ETCO2
- Provide PPV/NIPPV (CPAP/BIPAP) with 100% oxygen support.
- Initiate IV/IO Access
- Administer nitroglycerin SL **0.4mg** q5min if **SBP>90.**
- **Failure to improve:**
  - administer Furosemide 60-80mg IV slow push, place foley if possible.

PEDIATRIC

Wheezes

- Place on 100% oxygen via NRB.
- Administer Albuterol 90mcg **MDI** or **5mg** nebulized (Max 12 doses per 24hrs)
- **Monitor for allergic reactions:**
  - Consider Epinephrine (1:1000)
  - 15-30kg give 0.15mg IM (EPIPEN JR)
  - >30kg give 0.3mg IM (EPIPEN)
  - ***OR***
  - **0.01mg/kg** IM (max 0.3mg)
- Administer Methylprednisolone **1-2mg/kg** IV.
- Administer Magnesium Sulfate **25-50mg/kg** IV over several minutes (Max 2G) diluted in 50-100ml NS.
- Last resort, administer Ketamine **0.5mg/kg** IV slow push.

Rales/CHF

- Monitor O2 and ETCO2
- Provide PPV (if tolerated) with 100% oxygen support
  OR
- 100% NRB if PPV is not tolerated.
- **Failure to improve:**
  - Administer Furosemide 1mg/kg IV slow push, place foley if possible.

Notes, Warnings, Cautions

- SPO2 <90% or respiratory status continues deteriorate, consider definitive airway control.
- 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 PRN 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.

UPPER RESPIRATORY DISTRESS

Signs and Symptoms	Potential Causes
• Shortness of Breath • Pursed Lip Breathing • Decreased Ability to Speak • Tachypnea / Hyperpnea • Wheezing / Rhonchi / Rales • Use Accessory Muscles • Fever / Cough • Tachycardia • Absent Breath Sounds	• Asthma • Anaphylaxis / Allergy • Aspiration • COPD • Pleural Effusion • Pneumonia • Congestive Heart Failure / Cardiac • Pulmonary Embolus • Pneumothorax • Pericardial Tamponade • Hyperventilation • Toxic Inhalation (e.g. Cyanide, CO)

ADULT

- View for obstructions (jaw-thrust for C-spine injury) sweep and suction prn.
- Monitor O2 and ETCO2
- Place on 100% oxygen via NRB
- Administer Albuterol 90-180mcg **MDI 2 puffs** or **2.5-5mg** nebulized.
- **Monitor for allergic reactions:**
  - Consider Epinephrine 1:1,000 0.3mg IM (EPI PEN)
- Initiate IV/IO Access
- Administer Methylprednisolone **125mg** IV.

PEDIATRIC

- View for obstructions (jaw-thrust for C-spine injury) sweep and suction prn.
- Monitor O2 and ETCO2
- Place on 100% oxygen via NRB
- Administer Nebulized Racemic Epinephrine (1:1000) 0.5mL/kg (Max dose 5mL)
- **Monitor for allergic reactions:**
  - Consider Epinephrine
  - 15- 30kg: 0.15mg IM (EPIPEN JR)
  - >30kg: 0.3mg IM (EPIPEN) ***OR***
  - 1:1000, 0.01mg.kg IM (max 0.3mg)
- Administer Methylprednisolone **1-2mg/kg** IV.

Notes, Warnings, Cautions

- SPO2 <90% or respiratory status continues deteriorate, consider definitive airway control.
- 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.

SEIZURE

Signs and Symptoms

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

Initial Treatment

- Provide oxygen support.
- Consider airway control (Definitive if necessary)
- Initiate IV/IO Access
- Place on cardiac monitor
- Monitor Blood Glucose

Adult Treatment

- Active Seizure
  - Administer Midazolam (5mg IV/IO/IN or 10mg IM)
    OR
  - Lorazepam 4mg IV/IM *OR* Diazepam 4mg IV/IM
    - May repeat anticonvulsants two times every 3-5 minutes if seizure has not stopped.
  - Levetiracetam (Keppra)1500mg IV over 15min; followed by maintenance dosing of 1000mg IV/IO every 12 hours.
  - Pregnancy Considerations:
    - Administer Magnesium Sulfate 4G IV over 15min. (Monitor for hypotension)
- Blood Glucose <70
  - Administer 50% Dextrose 25G IV
    OR
  - Glucagon 1mg IV/IM

Pediatric Treatment

- Active Seizure
  - Administer Lorazepam 0.05-0.1 mg/kg IV (max 4mg) *OR* Midazolam 0.2mg/kg IM.
    - May repeat anticonvulsants two times every 3-5 minutes if seizure has not stopped. Must establish definitive airway control prior to subsequent doses.
  - Levetiracetam (Keppra) 60mg/kg, single dose.
- Blood Glucose <40
  - Administer Thiamine 25mg IV/IM *OR* 25% Dextrose 2mL/kg IV
    OR
  - Glucagon 0.05mg/kg IM

Notes, Warnings, Cautions

- For seizure prophylaxis consider Levetiracetam (Keppra) 1500 mg IV over 15 min, after 12 hrs. consider maintenance dose of 1000 mg every 12 hrs.
- 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.
- In pregnant patients, Magnesium should be first line to abort non-epileptic seizures. Midazolam should only be used if this fails (pregnancy class D).
- Be prepared to assist with ventilations with the use of midazolam/lorazepam. If airway controlled and ventilating well – may give total of 4 doses of Midazolam for adults and 4 doses of Lorazepam for pediatrics.

SEPSIS/FEVER

History

- Wound(s) with signs of infection.
- Warm, Flush >100.4°F / 38°C
- Diaphoretic, Chills <96.8°F / 36° C
- Capillary refill time > 3 seconds
- Abnormal vital signs
  - HR > 90
  - BP < 90
  - RR >20/min.
- Altered Mental Status
- Decreased Urine output
- Rash(s), Purpura
- Immunosuppressed

Definition

- Life-threatening organ dysfunction caused by a dysregulated host response to infection.
- Septic shock is a form of distributive shock.
- Keys to Success:
  - Early recognition
  - Identification of the cause of shock
  - Early, decisive treatment of the cause and initiation of cause-specific resuscitation.

Treatment

- Initiate Monitoring: ECG, NIBP, SPO2, ETCO2, Temp
- Supplemental O2, Goal > 93% room air
- Check Glucose (<60 Hypoglycemia Protocol)
- Attain a minimum of 2 IV/IO sites.
- Initiate IV/IO crystalloid therapy – 1000ml Bolus NS/LR achieve goal of SBP > 90 or MAP >65 or 30ml/kg.
- Initiate/Monitor Foley. UOP 0.3-0.5ml/kg/hr.
- Temperature >100.4°F / 38°C consider Acetaminophen 1gram PO/IV (if not provided in the last 6 hours)
- Persistent or Refractory Hypotension after 2L NS/LR, unable to maintain SBP > 90 or MAP > 65?
  - Administer Norepinephrine 2-12mcg/min IV.
  - Add Vasopressin 0.03 units/min SBP < 90 or MAP < 65.
  - Add Epinephrine 2-20 mcg/min SBP < 90 or MAP < 65.
- Consider Antibiotic Therapy Ceftriaxone 2 g slow IV push or in 100 cc NS flow to gravity (immunocompetent) or Cefepime 2 g IV in 100 cc NS flow to gravity (immunocompromised)
- Contact Medical Control for further if able.

Notes, Warnings, Cautions

- Use vasopressin despite less than maximal norepinephrine. Consider adding it when titrating above 8-10 mcg/min IV norepinephrine. Continue it once started and decrease norepinephrine to MAP goal > 65.
- Monitor overall respiratory status. Many patients who are critically ill with sepsis will need ventilatory support at some point in their management.
- Record urine output if foley in place. Decreased urine output is an indicator of patient deterioration.
- 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.
- In Trauma Sepsis, Blood is Preferred
- Caution in over-resuscitation >.5ml/kg/hr UOP, wet lungs, increased work of breathing.

TOXIC INGESTION

Poison Control Number (in US): 1-800-222-1222
Website: https://www.poison.org

Signs and Symptoms

- Mental Status Changes
- Hypo/Hypertension
- Respiratory Depression
- Tachycardia/Arrythmias
- Seizure

Differential Diagnosis

- Cyclic Antidepressants
- Acetaminophen
- Depressants
- Stimulants
- Anticholinergic
- Cardiac Medications
- Solvents/Cleaners

Adult Treatment

- **Blood Sugar <60:** AMS Guideline (50%D50 25g in 500ml NS or Glucagon 1mg/IM)
- **Blood Sugar >60:** Activated Charcoal 1g/kg PO (If alert and <1hr from ingestion)
- **Beta Blocker Overdose:** Glucagon 3-10mg IV/IM Bolus followed by 3-5mg/hr
- **Opiates:** Naloxone 0.4-2mg IV/IO - Watch for Respiratory Depression
- **TriCyclic Anti Depressant:** 12 Lead
  - QRS>100 or Hypotensive?
    - Sodium Bicarbonate 1mEq/kg
    - 100-150 mEq in 1L D5/NS @ 100-200ml/hr
- **Organophosphate:** Atropine 2mg IV/IO q5 + 2-PAM 600mg IV/IM
- Seizure - Midazolam 2.5-5mg IV/IM

Pediatric Treatment

- Blood Sugar <65: AMS Guideline (25% Dex 2ml/kg IV or Glucagon 0.05mg/kg/IM)
- Blood Sugar >60: Activated Charcoal 1g/kg PO (If alert and <1hr from ingestion)
- Beta Blocker Overdose: Glucagon 1mg IV/IM
- Opiates: Naloxone 0.1mg/kg IV - Pediatric Airway Guideline
- TriCyclic Anti Depressant: 12 Lead
  - QRS>100 or Hypotensive?
    - Sodium Bicarbonate 1mEq/kg
    - 100-150 mEq in 1L D5/NS @ 100-200ml/hr
- Organophosphate: Atropine 0.02mg/ IV/IO q5 + 2-PAM 25mg/kg IV/IM
- Seizure - Lorazepam 0.1mg/kg IV

Notes, Warnings, Cautions

- Anticholinergic: Altered mental status, hyperthermia, mydriasis, flushing, anhidrosis, full bladder.
  - Follow TriCylcic dosing
  - Lorazepam for agitation and seizures
- Beta Blockers watch for Hypoglycemia
- Calcium Channel Blockers watch for Hyperglycemia
- Cyclic Antidepressants signs: Hypotension, depressed mental status, respiratory depression, and cardiac arrythmias
- Opiod signs: Depressed mental status, pinpoint pupils, N/V, Respiratory depression, hypotension
- Organophosphate signs: Salivation, Lacrimation, Urination, Diarrhea, Emesis, Altered Mental Status

VOMITTING & DIARRHEA

Signs and Symptoms

- Pain
- Abdominal Distention
- Constipation
- Diarrhea
- Anorexia
- Fever
- Rash

Differential Diagnosis

- CNS Injury / Infection
- Myocardial Infection
- Drugs / Toxins
- Pregnancy
- Gastroenteritis
- Appendicitis
- Bowel Obstruction

Adult Treatment

- IV - O2 - Monitor
- Blood Glucose <60 w/ evidence of alcohol abuse?
  - Thiamine 100mg IV/IM
  - 50% Dextrose 25g IV or Glucagon 1mg IM
- If Glucose is outside <60 start over
- N/V - Promethazine (if >2yr old) 12.5mg IV or Ondansetron 4-8mg IV

Pediatric Treatment

- IV - O2 - Monitor
- Blood Glucose <65 w/ evidence of malnourishment?
  - Thiamine 100mg IV/IM
  - 25% Dextrose 2ml/kg IV or Glucagon 0.5mg IM
- Nausea / Vomiting:
  - Promethazine (if >2yr old) 0.25mg/kg IV
  - Ondansetron (<40kg) 0.1mg/kg IV
  - Ondansetron (>40kg) 4mg IV

Notes, Warnings, Cautions

- Suspicions of underlying conditions should prompt immediate referral to appropriate protocol
- In pregnant patients with N/V - 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

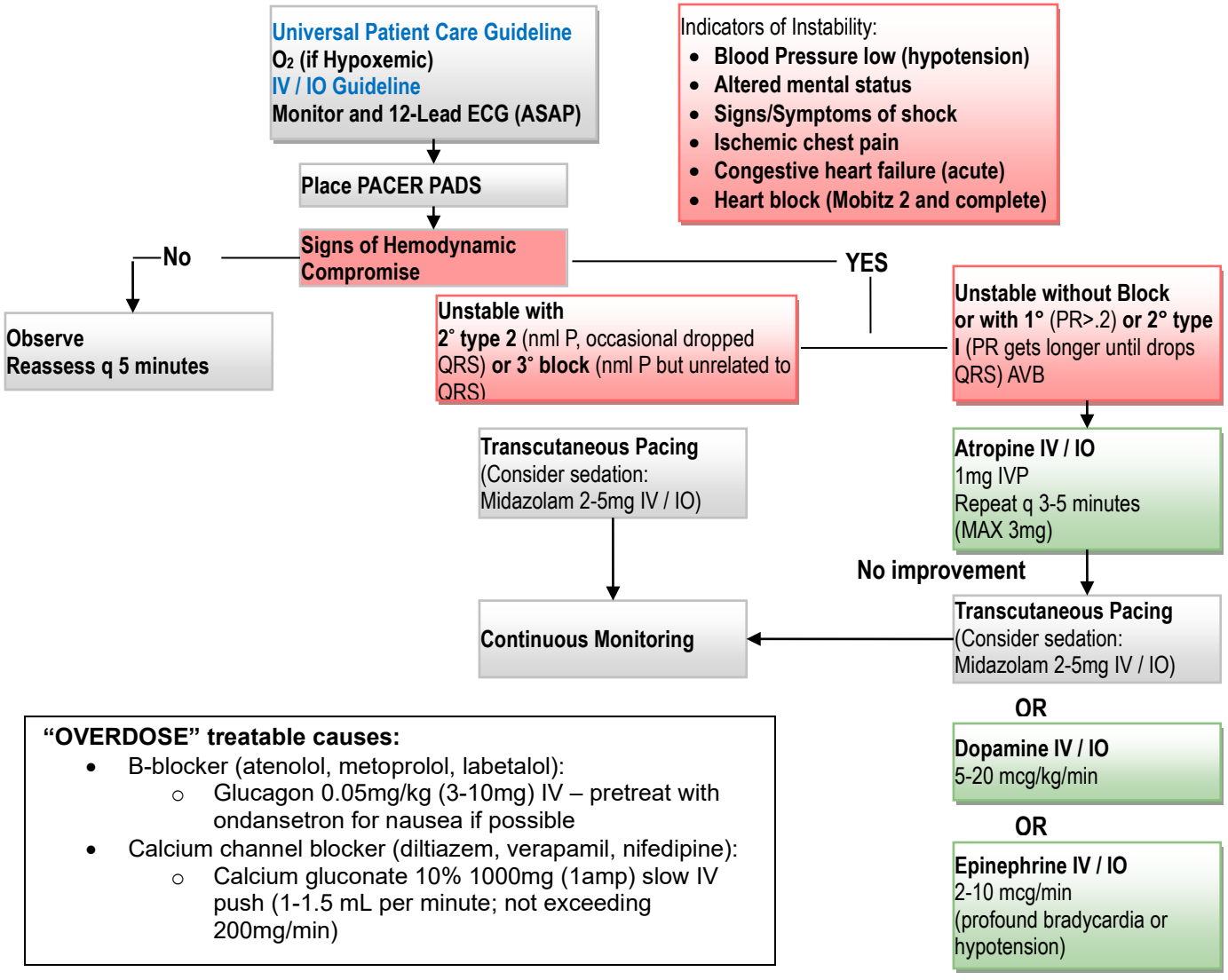
BRADYCARDIA with PULSE

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



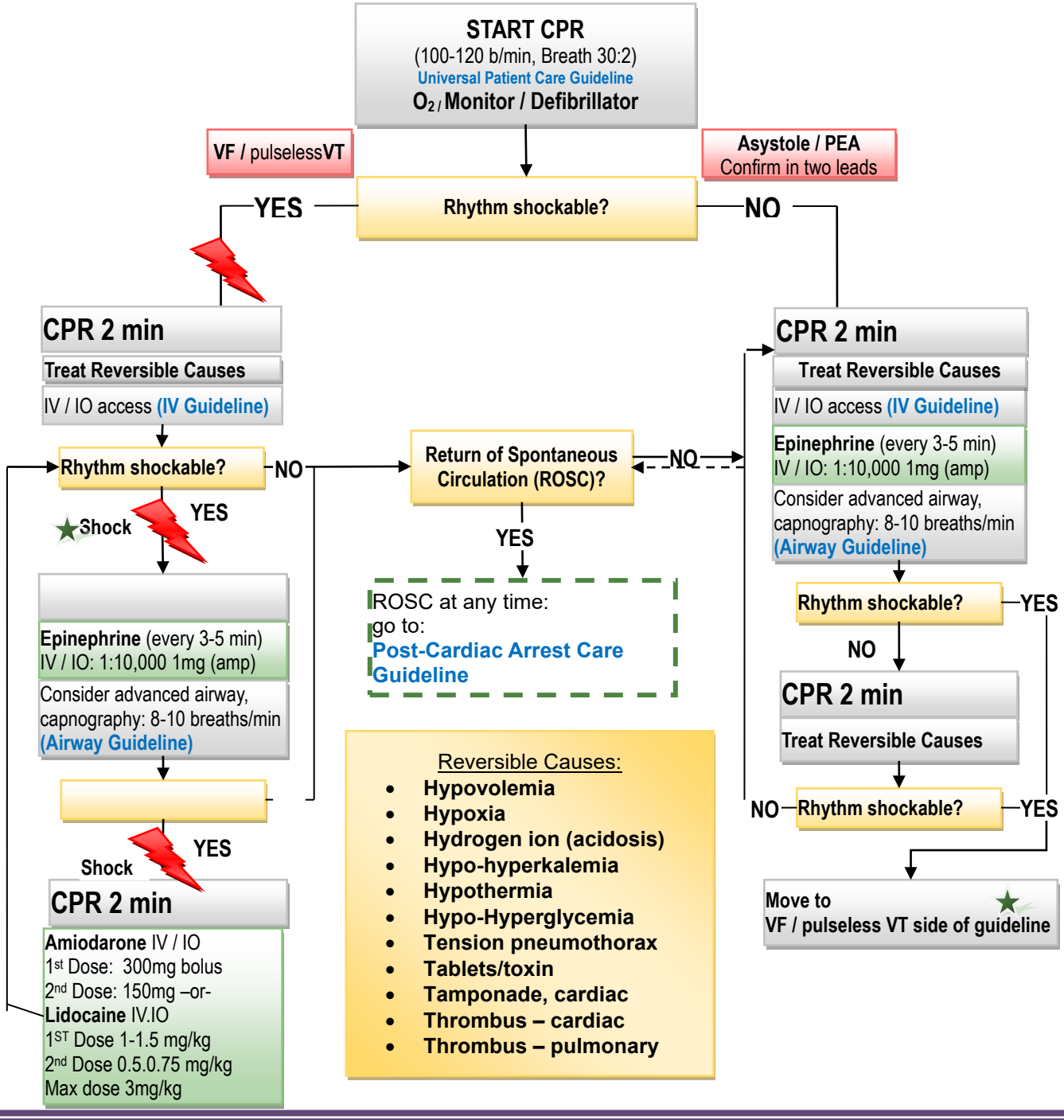
"OVERDOSE" treatable causes:

- 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 (1-1.5 mL 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: 2-10 mcg/min or 0.1-0.5 mcg/kg/minute (7 to 35 mcg/min in a 70 kg patient)
  - 1mg 1:10,000 in 250mL D5W / NS = 4 mcg/mL concentration
- Evaluate for treatable causes of bradycardia (B-blockade, Ca Channel blockade).

CARDIAC ARREST

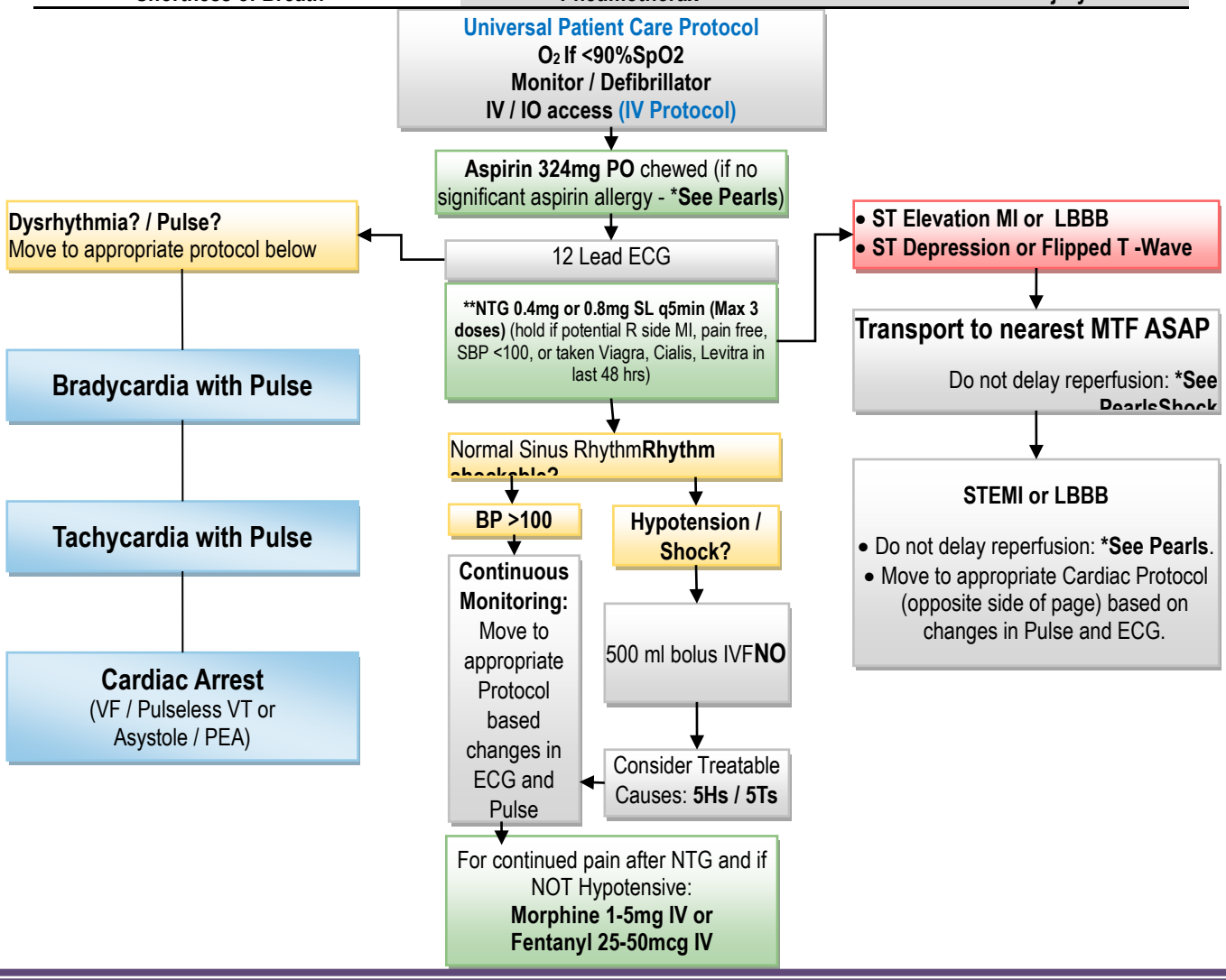


Pearls:

- Reversible causes should be addressed as soon as possible.
- Consider discontinuation of efforts if:
  - Asystole following trauma – especially blunt.
  - Prolonged downtimes without resuscitative efforts - > 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.

CHEST PAIN

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



Pearls:

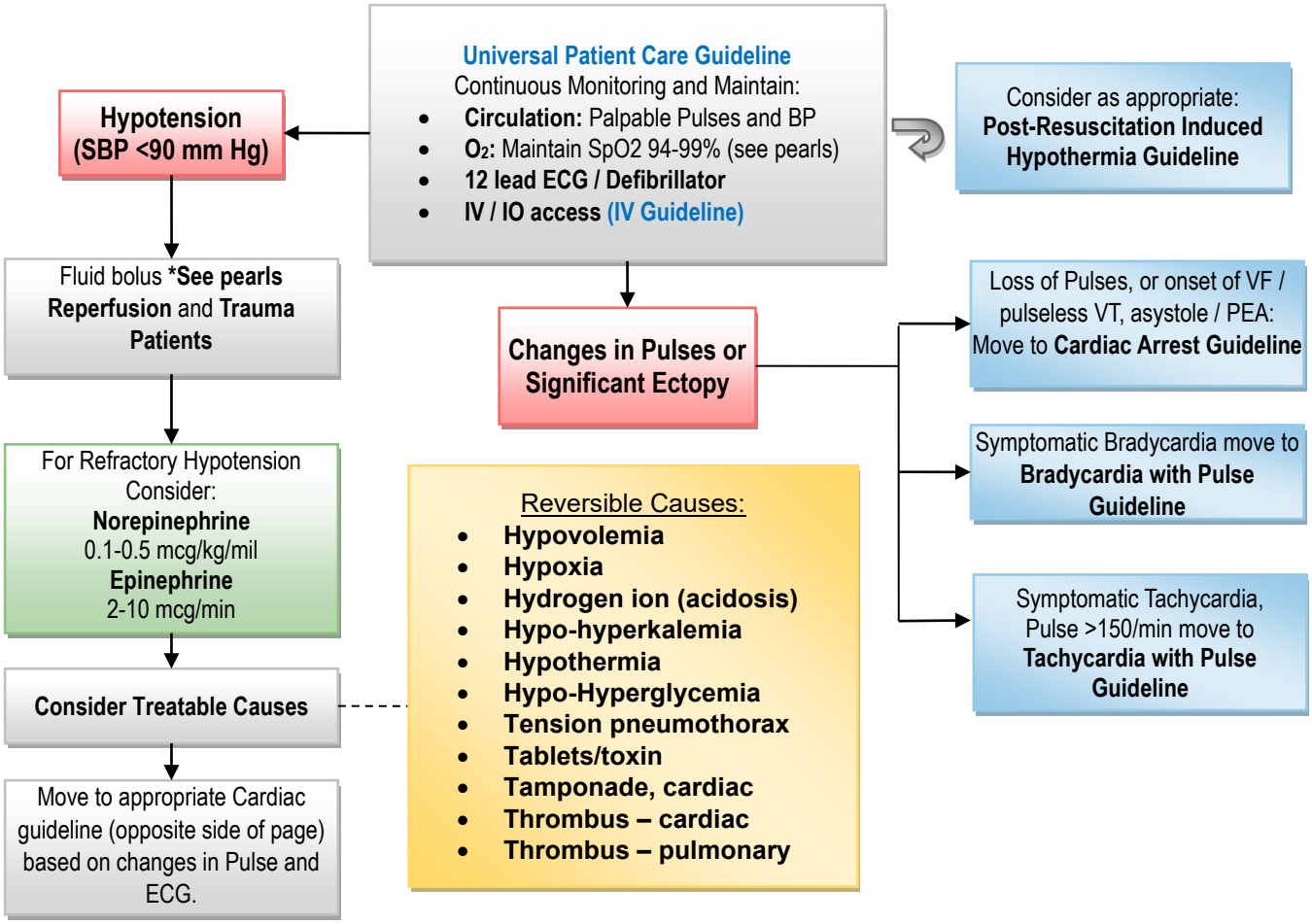
- **Aspirin** (4 x 81mg chewable) should be held only for patients with known significant allergy.
- Patients with suspected AMI should be transferred to the nearest MTF for further treatment / thrombolytics.
- **With right sided MI (ST Elevations in leads II, III, AvF), NTG may cause hypotension, use 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).**CPR 2 min**

POST-CARDIAC ARREST CARE

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

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



Pearls:
- Optimize ventilation and oxygenation. Place ETT, if not already done. Maintain SpO2 94-99% and ETCO2 35-45mmHg. Most patients will require ventilator assistance in the post-resuscitative phase.
- Hyperventilation may cause hypotension and/or recurrence of cardiac arrest in the post-resuscitation phase and must be avoided.
- 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:** 1-2 L IVF and consider use of a pressor IV / IO **Drip** – **EPINEPHRINE 2-10mcg/min** or **NOREPINEPHRINE 0.1-0.5 mcg/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 to norepinephrine.
- ***Trauma patients** post-resuscitation should have fluid resuscitation consistent with hypotensive resuscitation guidelines. Maintain core temperature 32-36 degrees Celsius for at least 24 hours

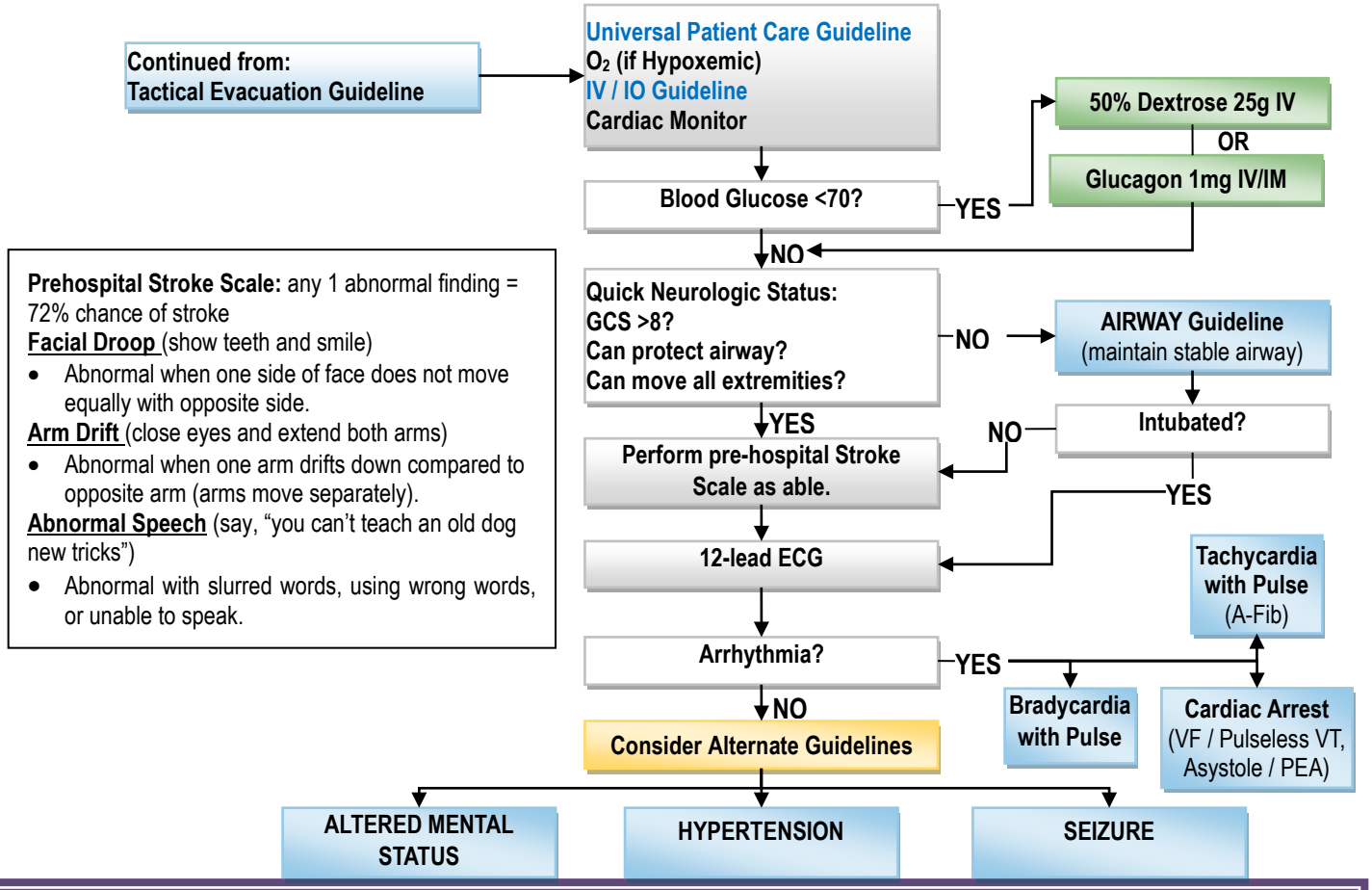
SUSPECTED STROKE / TIA

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 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 **10-20 mg IV for 1-2 minutes**. May repeat 1 time.
- **Aim for no more than a 20% reduction in MAP. MAP = [(2 x Diastolic) + Systolic] / 3** For additional info see: ALS Acute Coronary Syndromes and Stroke.

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)

→ STABLE? → NO

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

STABLE? → YES → "Sinus Tach" → YES → Chest Pain / SOB / Dizziness?

Chest Pain / SOB / Dizziness? → YES → Chest Pain Guideline
Chest Pain / SOB / Dizziness? → NO → Observe, Reassess q 5 minutes

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

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

Consider Sedation: Midazolam 2-5mg IV / IO

MEDICATIONS:

ADENOSINE
- 1st Dose: 6mg rapid IV push:
- 2nd Dose: 12mg

(Follow each dose with 10-20mL NS flush.)

Procainamide
Avoid if prolonged QT or CHF.
- 20 to 50 mg/min until arrhythmia is suppressed, hypotension develops, QRS duration increases by more than 50% or max dose of 17 mg/kg is given
- Maintenance infusion: 1 to 4 mg/min

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

SOTALOL
100mg (1.5mg/kg) over 5 min.

QRS Width? → Narrow QRS? ≤0.12 Second / Wide QRS? >0.12 Second

Narrow QRS? ≤0.12 Second:
- Attempt **vagal maneuver,** if rhythm is regular
- Consider **adenosine** if rhythm is regular
- Consider **calcium channel blocker** OR **β-blocker** if rhythm is not regular, adenosine is ineffective, or tachyarrhythmia recurs
- Consider expert consultation

Wide QRS? >0.12 Second:
- Consider: Adenosine, if rhythm regular and monomorphic
- Consider: Antiarrhythmic: Procainamide, Amiodarone, **OR** Sotalol

If refractory or becomes unstable at any time!

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 0.5-1 gram/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.

***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

PEDIATRIC BRADYCARDIA 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
  - 1-10 y/o lower limit = 70+(years old x 2)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 to 5 seconds
- **Adult** = 1 breath / 5 to 6 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 (Max single dose 1mg)**

Atropine 0.02mg/kg IV / IO (Increased Vagal Tone or Primary AV Block) **May Repeat Once after 3-5 min** (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

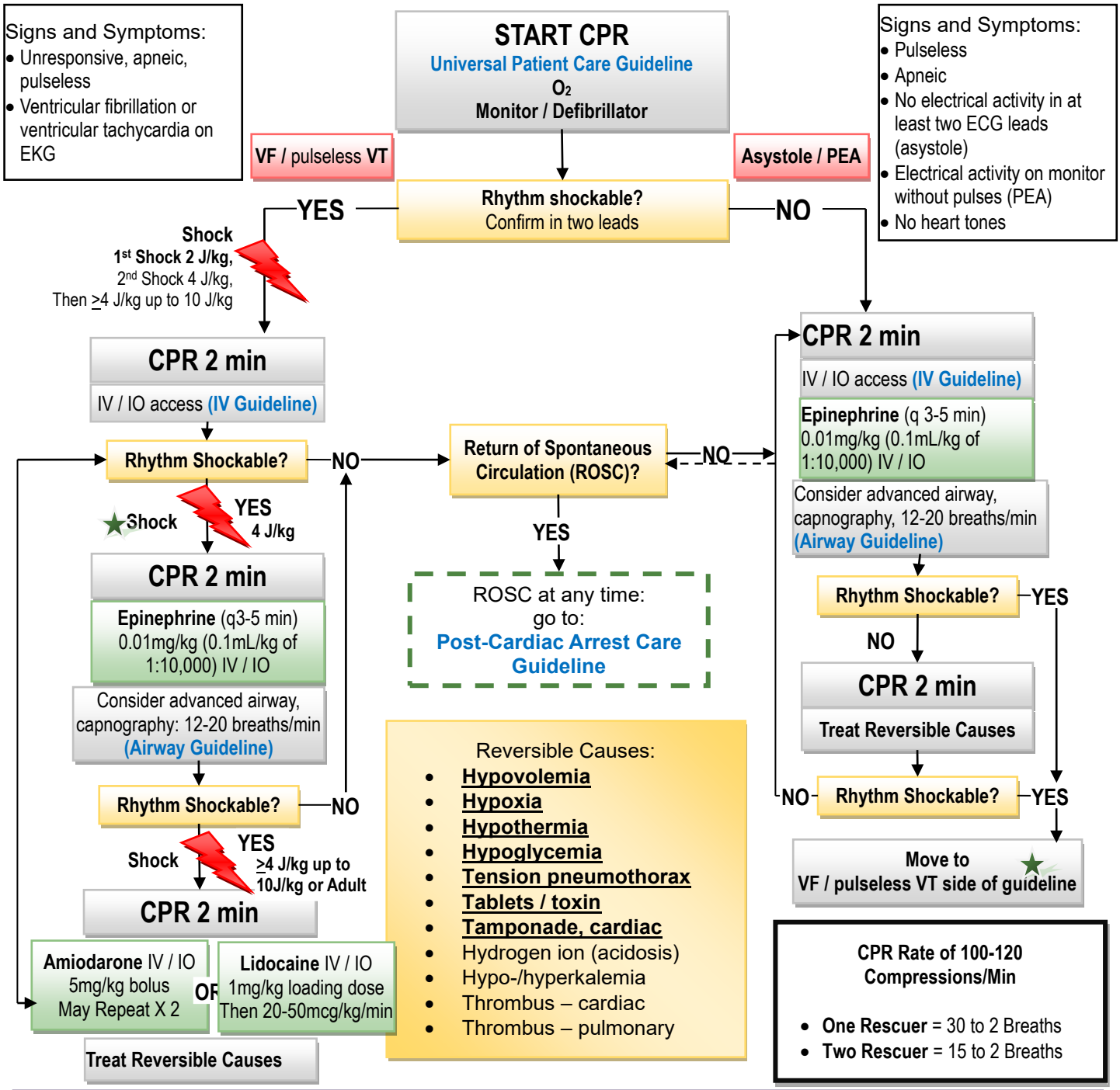
Check Pulse every 2 minutes during CPR
If Pulse is lost, GO TO: **PEDIATRIC CARDIAC ARREST**

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) every 2-3

Pearls:
- Decompensation at any time (e.g., AMS, 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.

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 TACHYCARDIA with Pulse and Adequate Perfusion

Typical HR/min

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

Typical Sinus Tachycardia Rates

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Indicators of CARDIOPULMONARY COMPROMISE

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  - >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

QRS Width?

Wide QRS? >0.09 Second

Probable Ventricular Tachycardia

- **Expert Consultation ASAP**
- Search for and Treat Underlying Causes

If rhythm is regular and QRS monomorphic, consider:
***Adenosine IV / IO** Rapid Push
1st **0.1mg/kg** (max 6mg)
2nd **0.2mg/kg** (max12mg)

Consider Chemical Conversion:
Amiodarone 5mg/kg over 20-60 minutes IV / IO
-or-
Procainamide 15mg/kg IV/IO over 30-60 minutes.

If patient develops inadequate perfusion refer to:
PEDIATRIC TACHYCARDIA with Pulse and Poor Perfusion

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, if ineffective immediately proceed to adenosine.

Adenosine IV / IO Rapid Push
1st **0.1mg/kg** (max 6mg)
2nd **0.2mg/kg** (max12mg)

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

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  - Calcium gluconate 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 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

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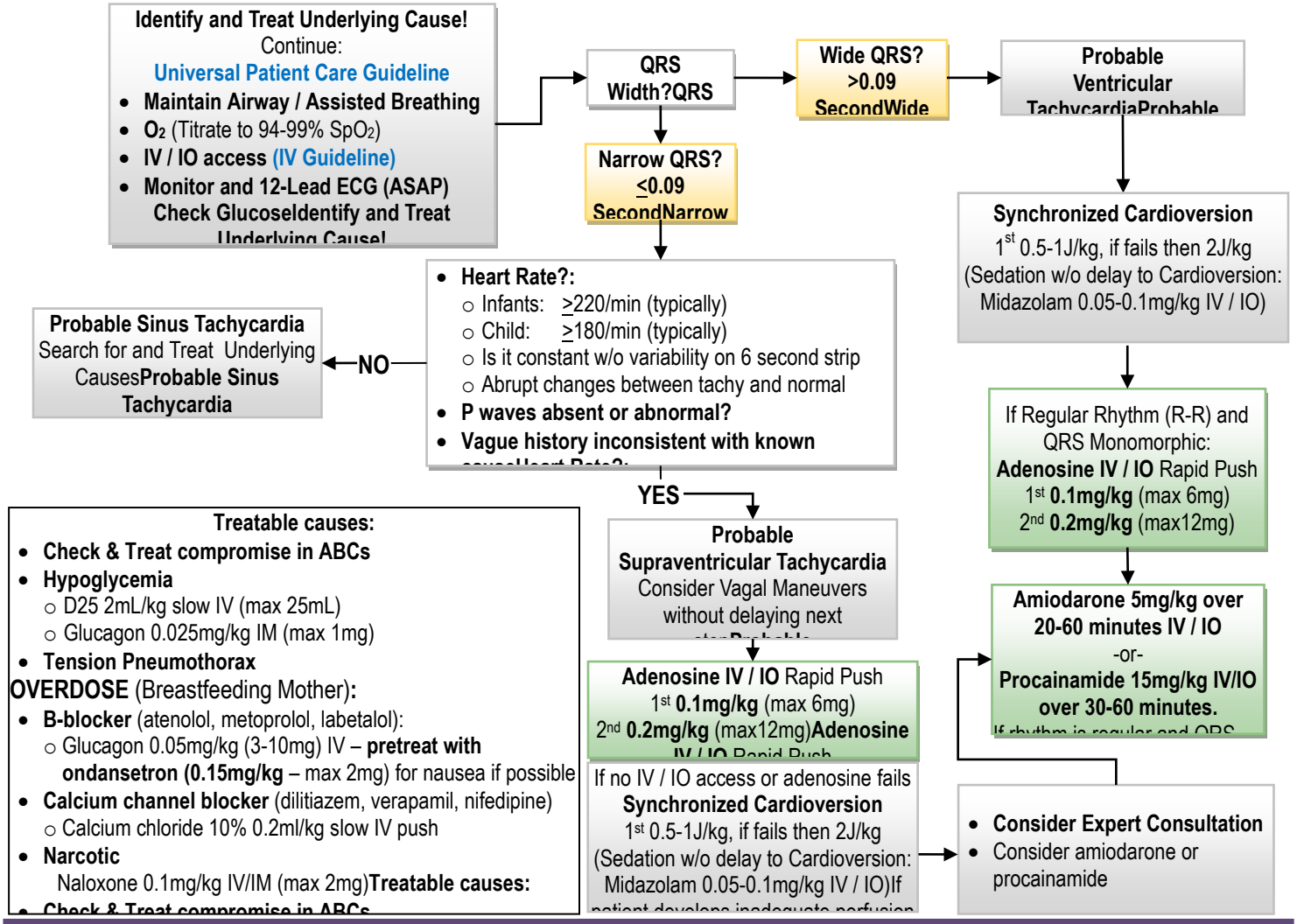
- Signs of Shock



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.

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.

MARCHE^2 Algorithm

TCCC MARCH

MASSIVE HEMORHORAGE

- HASTY tourniquets in the HOT ZONE
- Transition to DELIBERATE tourniquets during DECON in WARM ZONE

AIRWAY

- Assess – excessive secretions indicate **NERVE AGENT**
- Defer most interventions - consider risks in active HOT ZONE of remove mask to access airway

RESPIRATIONS

- Increased respirations consider **ATNAA/CANA NERVE AGENT GUIDELINE**
- Depressed respirations consider **NAXOLONE INCAPACITATING AGENT GUIDELINE**
- Other than antidotes – respiratory interventions is best deferred to WARM ZONE

CIRCULATION

- Circulation intervention should be deferred to WARM ZONE
- Assess for shock
- **IV/IO GUIDELINE**
- **HYPOTENSION/SHOCK GUIDELINE**

CRESS Assessment

Consciousness:
Unconscious, Depressed Consciousness, Agitation

Respirations:
Present or Absent, Labored, Increased or Decreased

Eyes:
Constricted, Dilated, Normal

Secretions:
Dry, Normal, Increased

Skin:
Diaphoretic, Dry, Hot, Cyanosis

CRESS must be reassessed regularly, during zone transitions and at each transfer, to monitor for delayed onset of life threatening symptoms, and analyze antidote or countermeasure effectiveness

CBRN MARCHE^2

Mask

- MASK or CHECK MASK SEAL as immediate HOT ZONE treatment

Antidote

- Utilize CRESS to differentiate chemical agent exposure **RAPID IDENTIFICATION OF CHEMICAL WARFARE AGENT**
- Antidotes are given in the Hot Zone if the casualty has symptoms of poisoning.
- These agents are rapid killers
  - Nerve agent (give ATNAA, CANA).
  - Cyanide (give hydroxocobalamin).
  - Pharmaceutical based sedating agent (naloxone)

Rapid Spot Decontamination

- Indicated for gross contamination on skin and/or wounds or if protective gear is breached
- Rapid exposure and decontamination of contaminated wounds is necessary lifesaving procedure in the HOT ZONE
- Apply RSDL, M100, M295, Sorbent, tech wipe, etc.

Countermeasures

- Appropriate therapy based on type of agent exposure, post initial antidote administration
- Deferred to WARM ZONE

Hypothermia Prevention & Head Injury

- Protect from lethal triad: **HYPOTHERMIA**, acidosis and coagulopathy through HOT/WARM/COLD ZONES
- Active warming or HPMK post decontamination and packaging for further evacuation
- Determine if altered mental status is due to chemical agent or trauma, if trauma **HEAD INJURY/TBI GUIDLINE**

Extricate and Evacuate

- EXTRICATE: egress patient from threat, agent contact, HOT ZONE
- Evacuate: to WARM ZONE – Dirty CCP for decontamination
- COUNTERMEASURES and appropriate supportive care starts in WARM ZONE and continues during Evacuation/COLD ZONE

Notes, Warnings, Cautions

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

CHILDBIRTH

Signs and Symptoms

- Primi/Gravida/Para?
- Any pregnancy complications?
- Vaginal fluid/bleeding?
- Uterine contractions/back pain/stomach pain?
- Duration of contractions and time between
- Crowning/urge to push?
- Any complications expected with the newborn?

Possible Complications

- Preterm labor
- Placenta previa
- Prolapsed cord
- Abnormal presentations (i.e., breech)
- Spontaneous vaginal delivery (i.e. natural outcome)

Treatment

- Childbirth is a normal process and treatment is only supportive unless there are complications.
- O2 if hypoxemic, IV/IO, cardiac monitor, and blood glucose check.
- Place in left lateral decubitus or pad under right hip.
- Hyper or hypotensive? Any abnormal bleeding? Refer to obstetric emergency.
- Visually inspect to see if patient is crowning, if crowning is present, assist with the birth of the child. If no, continue to monitor and transport patient to nearest MTF.
- Prep for birth: Position mother in supine supported position, prepare 2 sets of hemostats and scissors / scalpel, umbilical cord clamp if available, bulb suction.
- Suctioning of newborn nose and mouth with bulb aspirate recommended if obvious obstruction from secretions.
- Delivery: 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. Wrap infant to prevent hypothermia and give to mother.
- Deliver placenta, do not pull. Keep placenta for evaluation by MTF.
- Externally massage uterus (through abdomen) to encourage contraction/limit bleeding.
- Continue to monitor and re-assess mother and neonate enroute to nearest MTF and refer to newborn guideline.

Notes, Warnings, Cautions

- If umbilical cord 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. *Do not place pressure on the cord or monitor pulse via the cord.
- 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).

NEWBORN CARE AND DISTRESS

Signs and Symptoms

- Full term delivery?
- Meconium staining of amniotic fluid?
- Any signs of Dehydration? (sunken fontanelles, tearless, decreased UOP, and dry mouth, skin and tongue)
- Fluid Overload? (SOB, ankle/sacral edema, increased JVP, and crackles in lungs

Determine after 1st 60 seconds of care and repeat q5 min.

Score of 6 or less=**IMMEDIATE RESUSCITATION!**

Severely depressed: 0-3
Moderately depressed: 4-6
Excellent condition: 7-10

APGAR SCORING	0 POINTS	1 POINT	2POINTS
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

Treatment

- Does the patient have good tone? Is the airway open? (Breathing/Crying)
  - Use bulb syringe to clear mouth/nose, dry and stimulate (foot tap/back rub), keep warm, find APGAR score, and monitor SpO2 and treat hypoglycemia (glucose<40)
- Does the patient have a **HR <100**, apnea or gasping, labored breathing or persistent cyanosis?
  - Attempt to clear airway if needed, provide PPV via BVM: 30-60 breaths/min for a SpO2 of 94-99%
  - Intubate if NO chest rise
- Does the patient have a **HR<60**?
  - Provide chest compressions and PPV (120 event/min: 90 compressions interspersed with 30 ventilations)
  - Consider intubation
  - Epinephrine 1:10,000 0.01-0.03mg/kg push q3-5min (0.1-0.3ml of 1:10,0000 10cc Cardiac Epi vial).
  - Consider hypoglycemia (D12.5 1/0ml/kg IV; dilute D50 to ¼ strength or 1ml D50 in 3ml NS).
  - Consider Shock (IVF or Blood 10ml/kg IO).
  - Consider Pneumothorax (Intubation).

Notes, Warnings, Cautions

- If patient has meconium staining of amniotic fluid: suction mouth, then nose until clear with bulb syringe. Deep suction is no longer advised.

OBSTETRIC EMERGENCY

Signs and Symptoms

- Primi/Gravida/Para?
- Any pregnancy complications? (i.e. pre-eclampsia, gestational diabetes, etc.)
- Any abnormal bleeding?
- Uterine contractions/back pain/stomach pain?
- Blurry vision/dizziness?
- Changes in babies activity?

Differential Diagnosis

- Pre-eclampsia/eclampsia
- Placenta previa
- Abruptio placentae
- Spontaneous abortion
- Uterine rupture
- Ectopic pregnancy

Treatment

- O2 if hypoxemic, IV/IO, cardiac monitor, blood glucose check and place in left lateral decubitus or pad under right hip
- Is the patient seizing?
  - Magnesium Sulfate 4g IV over 15 min or 5mg IM each buttocks
  - If blood glucose is WNL and patient is in Status Epilepticus move to (Seizure Guideline)
    - Midazolam 5mg IV/IO or 10mg IM or Lorazepam 2-4mg IV/IM
    - Wait 60 seconds and if not resolved, give an additional dose, if not resolved after second dose move to Altered Mental Status Guideline.
  - If blood glucose is <70 or >250 move to Altered Mental Status Guideline.
- Are they hypertensive? (>/=160/110 or 140-159/90-109) with severe headache, blurred vision, photophobia, hyperreflexia, epigastric pain?
  - Magnesium Sulfate 4g IV over 15 min
- Is the patient experiencing abdominal pain alone refer to Abdominal Pain Guideline.
- Is there vaginal bleeding present? If tachycardic/orthostatic administer blood if available or 2G TXA IV/IO and then 1000ml IVF IV/IO bolus
  - If vitals WNL, is there s/sx of labor? Refer to Childbirth Guideline.
- Continue to monitor, re access and address for changes in BP, seizures, glucose, vision changes and headaches.

Notes, Warnings, Cautions

- 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
- Seizure / headache / vision complaints: can give Midazolam 0.1mg/kg IV every 15-30 or 1mg IV every2-3min 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.

PATIENT REFUSAL

Indication: 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:

Treatment

- Complete primary assessment, obtain set of vitals and determine mental status.
- Any injuries or illnesses found to immediately threaten life, limb, or eyesight (or can be assumed will deteriorate enroute) should be addressed and treated immediately.
- Patients that prevent treatment of these injuries, should be encouraged. Any doubt of capacity should prompt treatment/transport under implied consent. Patient with decision- making capacity refusing treatment of life-threatening injury or illness require further clinical judgement and consultation with medical director prior to informed refusal.
- Injuries or illnesses that do not represent imminent threats to life, limb, or eyesight (or considered unlikely to deteriorate enroute) may be addressed in accordance with the following:
- Determine decision making capacity (patient/parent).
- Is the patient AOx4 and understands issues with their medical condition/status? If no, treat IAW Altered Mental Status Guideline.
- Clearly and repeatedly explain to the patient/parent of concerns and risks of refusal
- Document all findings and discussions with the patient/parent regarding refusing treatment and/or transportation.
- Obtain a signature from a witness (crewmember) and the patient/parent/parties responsible for the patient as to refusal of care.
- See Sample Patient Refusal Form in handbook.

Notes, Warnings, Cautions

- 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.

MWD AIRWAY MANAGEMENT

History

- Dyspnea
- Labored breathing
- Stridor
- Stertor
- Altered level of consciousness
- Trauma to the airway
- Disruption of mouth, pharynx, larynx, or trachea

Differential Diagnoses

- Upper airway obstruction (foreign body)
- Laryngeal paralysis
- Pneumo/hemo/pyothorax
- Diaphragmatic hernia
- Pleural effusion
- Pulmonary contusions
- Pulmonary edema
- Pneumonia

Treatment

- Inspect, wipe and/or suction mouth and pharynx.
- Ventilate with 100% oxygen.
  - If unable, move to next step.
- Endotracheal Intubation (Size 9-11)
  - If unable, move to next step.
- Suction Airway
  - If airway still not clear, move to next step.
- Perform Tracheostomy
- Evaluate for pleural space and parenchymal problems.

Notes, Warnings, Cautions

- Unconscious MWDs: Use tracheal insufflation, orotracheal intubation, or tracheostomy. If there is an obstruction, then bypass the obstruction until the patient is more stable.
- 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.

100% Oxygen Supplementation Examples

Conscious or fractious muzzled dogs (10-15 L/min)
Orotracheal intubation or tracheostomy (2 L/min)

MWD ANALGESIA & SEDATION

Indications

- Trauma or pain
- Need for chemical restraint
- Continued sedation
- Anxiety
- Fractious

Indications

- Mild Sedation
  - Relax MWD for examination, handling, reducing anxiety
  - MWD will be calm but still reactive to noise and stimulation
- Deep Sedation
  - First line protocol for fractious MWD
  - MWD will not be able to walk, may be aroused with stimulation and may maintain laryngeal and palpebral reflexes

Treatment

- Mild Sedation
  - Midazolam 0.3 mg/kg IM/IN and Hydromorphone 0.2 mg/kg or Morphine 0.2mg/kg IM/IN
- Deep Sedation
  - Midazolam 0.3 mg/kg AND Ketamine 5 mg/kg
  - Hydromorphone 0.1 mg/kg IM or Morphine 0.1mg/kg IM IN
- Analgesia
  - Intermittent IV or IM supplementation
    - Hydromorphone 0.1-0.2 mg/kg (q2-4 hrs)
    - Morphine Sulfate 0.2-0.5 mg/kg (q4-6 hrs)
    - Fentanyl 2-10 **mcg**/kg (once as loading dose then must consider CRI – duration ~ 30 minutes).
  - Continuous Rate Infusion (CRI)
    - Fentanyl 2-10 **mcg**/kg/hour
    - Morphine 0.1-0.25 mg/kg/hour
    - Hydromorphone 0.02-0.05 mg/kg/hour
  - Opioid Reversal
    - NALOXONE 0.01-0.02 mg/kg slow IV to effect if needed – will reverse analgesia AND sedation

Notes, Warnings, Cautions

- Dosages for analgesics in dogs are significantly higher than for people.
- 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, gastric dilatation and volvulus (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.
- Note that all protocols have analgesia incorporated into them. Additional analgesia can be provided by the IV/IM or PO route, as necessary.

MWD CPR

Indications to Initiate CPR

- Pulselessness
- Apneic

History

- Cardiopulmonary Arrest Confirmed
- Causes:
  - Traumatic
    - Blast
    - Blunt force
    - Penetrating
  - Non-traumatic
    - Anesthesia
    - Near-drowning
    - Electrocution

Treatment

- Chest compressions (100 per min), over widest part of the chest
- Clear airway and intubate ASAP.
  - Perform tracheostomy if airway is obstructed.
- Manually ventilate (8-10 breaths per min) 100% O2
- Attain ECG
- Attain IV/IO access - critical.
- VF or VT
  - Defibrillate- 2-5 J/kg biphasic.
    - Immediate chest compressions x 1 cycle (2 min)
    - Defibrillate twice more, with 1 compression cycle between each defibrillation.
  - Drug therapy if defibrillation not successful
    - Epinephrine 0.01 mg/kg IV/IO or
    - Vasopressin 0.8 U/kg IV/IO once and Lidocaine 2 mg/kg IV/IO or
    - Amiodarone 5-10 mg/kg IV/IO
- Asystole/Bradycardia/PEA
  - Drug therapy
    - Atropine 0.04 mg/kg IV/IO (only if bradycardia preceded arrest)
    - Epinephrine 0.01 mg/kg IV/IO and Vasopressin 0.8 U/kg IV/IO once

Notes, Warnings, Cautions

- 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 GASTRIC DILATION-VOLVULUS

History

- Abdominal distention/tympany
- Non-productive retching
- Attempted vomiting without result
- Pain when palpating stomach/abdomen.
- Inability/reluctance to lay comfortably.
- Anxiety
- Signs of compensatory shock

Definition

- 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.
- GDV is a surgical emergency.

Treatment

- Initiate Monitoring: ECG, NIBP, SPO2, ETCO2
- Supplemental O2
- Attain (2) IV/IO sites – FORELIMBS.
  - **Remember:** venous return is impeded from pressure in the abdomen. Hindlimb IVs will not be effective.
- Initiate IV/IO crystalloid therapy FIRST, repeat bolus every 10 – 20 minutes up to 4 times over the course of an hour.
  - For quick reference, ADD a ZERO to the dog's body weight (in pounds) to approximate a safe but effective bolus volume. For example, a 45# dog would need about a 450 mL bolus, and a 75# dog would need about 750 mL as a bolus.
- **If refractory to crystalloids:** Give Hydroxyethyl starch (HES, "Hetastarch", "VetStarch") bolus (10-20 mL/kg) to maintain BP. **Repeat** this bolus once if no response to therapy.
- **If refractory to HES:** Give hypertonic saline (HTS) IV bolus of 4 mL/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
  - 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.
  - 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. If no gas or air, attempt once more.
  - (DO NOT ATTEMPT THIRD if unsuccessful)
  - Apply gentle external pressure to abdominal wall to assist exiting air.
  - Remove catheter once air is evacuated.
- Provide analgesia.

Notes, Warnings, Cautions

- 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 de-rotate the stomach.

MWD HEAT INJURY

MILD Heat Injury	MODERATE Heat Injury	SEVERE 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).	(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.	(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

Treatment

- Mild: Heat Stress
  - Remove patient from source of heat, discontinue exercise, cool by fans or air condition, give cold water to drink.
- Moderate: Heat exhaustion
  - 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.
  - Give IV fluids 3-5 mL/kg/hr if not in shock
- Severe: Heat Stroke
  - Remove patient from all heat and stop all activity
  - 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, seizures, rebound hypothermia

Notes, Warnings, Cautions

- **PANTING** is the only significant cooling mechanism for dogs.
- **NO** specific body temperature defines heat stroke in MWD's. Normal rectal temperature is 99.5° 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 0.3 mg/kg IV, IO or intranasal prn
- MWDs are commonly have **prolonged clotting times, and platelet abnormalities following heatstroke.** Monitor for bleeding and disseminated intravascular coagulation. Given lack of canine blood products, **any MWD with evidence of bleeding should be evacuated URGENTLY to a veterinary facility.**

MWD NORMAL PARAMETERS

- Temperature (rectal)- **99.5° to 103° F (working temperatures up to 107° F)**
- Heart Rate/ Pulse- **60 to 120 bpm**
- Respiratory Rate- **16 to 32 bpm** (Controlled panting is normal)
- Blood Pressure- **Systolic 120 mmHg**, **Diastolic 80 mmHg**, Mean 90 to 100 mmHg
- Average MWD weighs 30-35 kg (German shepherd dogs, Belgian Malinois, Labrador retrievers).
- 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)
- IO catheterization access points are:
  - Greater trochanter of the humerus
  - Medial tibia just distal to tuberosity (figure 4)
- Arterial Pulse is palpated at the femoral artery on the medial aspect of the proximal thigh in the inguinal area (figure 5) 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.
- 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 6)
- 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)

All drug dosages should be calculated based on measured or estimated body weight. DOG HANDLER CARRIES DRUG CARD FOR THE DOG

For further reference see Clinical Practice Guidelines for Military Working Dogs, 12 Dec 2018

MWD NORMAL PARAMETERS

Figure 1- Vein best punctured on superior surface of limb toward the elbow

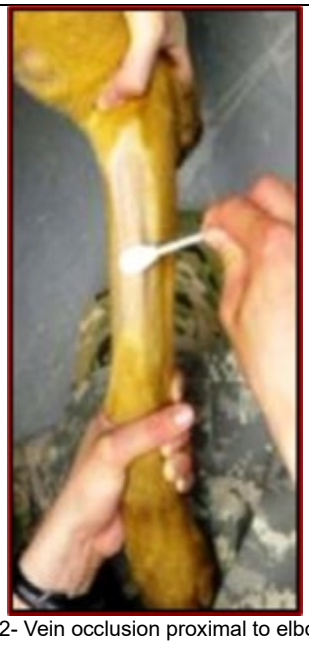


Figure 2- Vein occlusion proximal to elbow joint while elbow is in extension

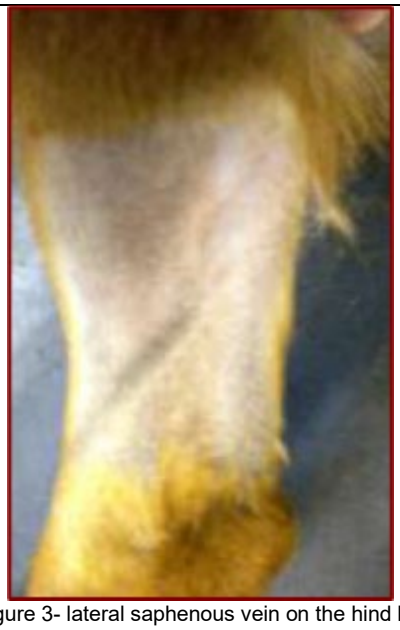


Figure 3- lateral saphenous vein on the hind leg

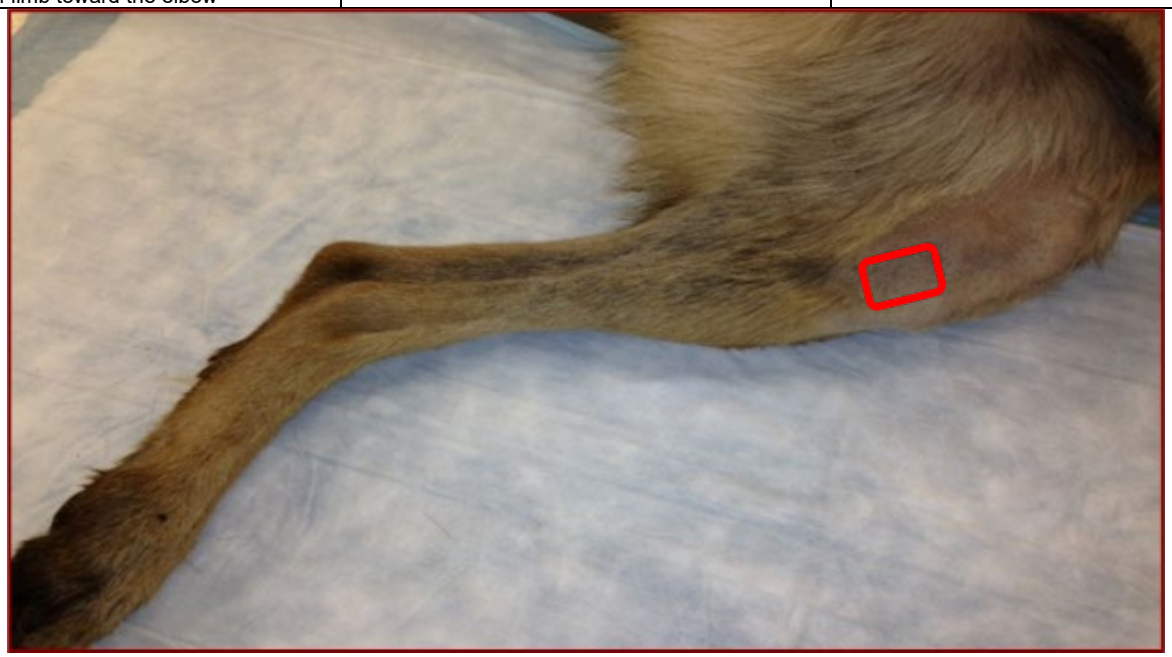


Figure 4- medial tibia IO catheter location just distal to tuberosity

Figure 5- location for palpation of the femoral arterial pulse

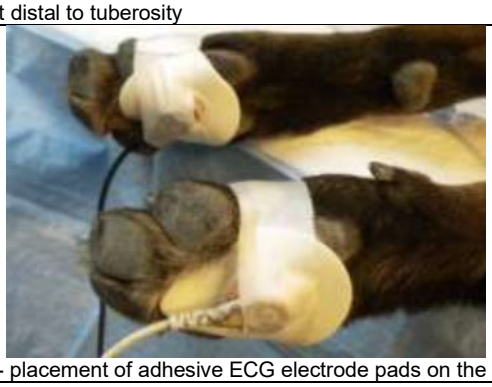


Figure 6- placement of adhesive ECG electrode pads on the footpads

MWD SHOCK FLUID THERAPY

Indications

- Hypotension
  - Systolic < 90 mmHg
  - MAP < 65 mmHg
- Hypovolemia
  - Massive hemorrhage (external, cavitary)
  - Severe dehydration (heat injury, GI loss)
  - Cavitary pressure impeding arterial perfusion or venous return

Clinical Signs

- Early, compensatory shock
  - Tachycardia, tachypnea, alert mentation, rapid pulse, normal to decreased pule quality, decreased CRT (<2 sec), normal to bright red MM.
- Late, decompensatory shock
  - Bradycardia, prolonged or poor CRT (>2 seconds), pulses poor or absent, hypothermia, stupor

Treatment

- Attain multiple IV/IO sites.
- Calculate total fluid volume required (**90 mL/kg**) in one hour. Or see Notes below
- Give a Hydroxyethyl starch (HES) IV/IO bolus 10-20 mL/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/IO bolus 4 mL/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.
- Consider TXA 10 mg/kg in 100 mL NS or LRS, IV over 15 min but NOT LATER THAN 3 HOURS post injury.

Notes, Warnings, Cautions

- Quick calculation for a bolus shock dose: ADD a ZERO to the dog's body weight (in pounds) to approximate a safe but effective bolus volume. For example, a 45# dog would need about a 450 mL bolus, and a 75# dog would need about 750 mL as a bolus.
- **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 > 65 mmHg or a systolic of > 90 mmHg. Neonatal or pediatric blood pressure cuffs must be used.

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
EXTREMETY WOUNDS			
Skin, soft tissue, **without** open fractures	Cefazolin 2g	q 6-8hrs	24 hours
Skin, soft tissue, **with** open fractures, exposed bone, or open joints	Cefazolin 2g	q 6-8hrs	24 hours, then with each subsequent I&D until soft tissue coverage
THORACIC WOUNDS			
Penetrating chest injury	Cefazolin 2g	q 6-8hrs	24 hours
ABDOMINAL WOUNDS			
Penetrating abdominal injury **with suspected/known** hollow viscus injury and soilage; may apply to rectal/perineal injuries as well	Cefazolin, 2g IV PLUS metronidazole 500mg IV	q 6-8hrs q 8-12hrs	Stop 24 hours after control of contamination
MAXILLOFACIAL AND NECK WOUNDS			
Open maxillofacial fractures, maxillofacial fractures **with** foreign body or fixation device	Cefazolin 2g g	q 6-8hrs	24 hours
CENTRAL NERVOUS SYSTEM WOUNDS			
Penetrating brain injury	Cefazolin, 2g IV PLUS (consider) metronidazole 500 mg	q 6-8hrs q 8-12 hrs	5 days or until CSF leak is closed, whichever is longer
Penetrating spinal cord injury	Cefazolin, 2g IV PLUS (consider) metronidazole 500 mg	q 6-8hrs q 8-12 hrs	
EYE WOUNDS			
Eye injury, burn or abrasion	Erythromycin ophthalmic ointment Or Bacitracin ophthalmic ointment	q 6hrs or PRN for symptomatic relief	Until epithelium healed. No systemic treatment required
Eye injury, penetrating	Levofloxacin 750 mg IV/PO PLUS vancomycin 15-20 mg/kg IV	q 24 hrs q 8-12hrs	7 days or until evaluated by an ophthalmologist. No topical agents.
BURNS			
Pre hospital	Not indicated		
DELAYED EVACUATION TO SURGICAL CARE			
PO tolerable Not PO tolerable	Moxifloxacin 400 mg PO x 1 dose. Or Ertapenem 1 g IV/ IM	X 1 dose X 1 dose	Single dose therapy

COMMON LABORATORY VALUES

LABORATORY	CHEMISTRY CONVENTIONAL		SI UNITS	
Anion Gap	8-16 mEq/L		8-16 mmol/L	
BUN	8-25 mg/100mL		2.9-8/9 mmol/L	
Calcium	8.5-10.5 mg/100mL		2.1-2.6 mmol/L	
Carbon Dioxide	24-30 mEq/L		24-30 mmol/L	
Creatine	Male	0.2-0.5 mg/dL	Female	0.3-0.9mg/dL
Creatine Kinase	Male	17-40 U/L	Female	10-79 U/L
Creatinine	0.6-1.5 mg/100L		53-133	
Glucose	70-110 mg/100mL		3.9-5.6 mmol/L	
Sodium	135-145 mEq/L			
Potassium	3.5-5.0 mEq/L		3.5-5.0 mmol/L	

HEMATOLOGY				
Hemoglobin	Male	13-18 g/100 mL	Female	12-16 g/100mL
Hematocrit	Male	41-50%	Female	36-44%
Platelets	140,000-450,000/ml			

CARDIAC MARKERS				
Troponin I*	Onset	4-6 hrs.	Peak	12-24 hrs.
Troponin T*	Onset	3-4 hrs.	Peak	10-24 hrs.
Myoglobin	Male	10-95 ng/ml	Female	10-65 ng/ml
	Onset	1-3 hrs.	Peak	Peak: 6-10 hrs.
INR only if Tx for DVT	0.8-1.2		2.0-3.0	

***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.**

NORMAL BLOOD GASSES	
pH	7.35-7.45
Pco2	35-45 mm Hg
HCO3	22-26 mmol/L
Base excess	(-2)-(+2) mEq/L
CO2	19-24 mEq/L
SaO2	96-100%

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 ☐ETCO2

O2 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

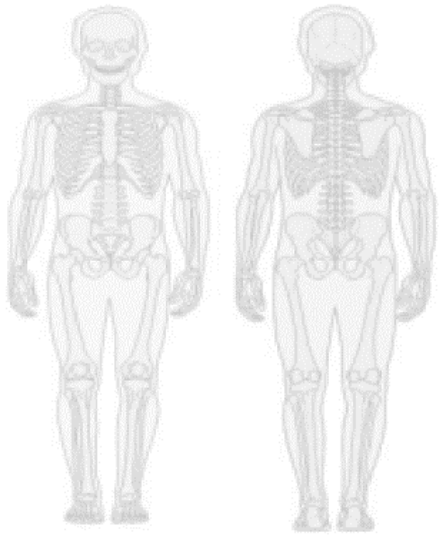
Respiratory Effort
☐ Unlabored ☐ Labored
☐ Agonal ☐ Assisted

Vent Settings

	Time	Mode	Rate	TV	FiO2	PEEP	PIP	ETCO2
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 _____ Sex ◯ M ◯ F Allergy _____ Other _____

☐ HISTORY/PHYSICAL ☒ TREATMENT
☐ DIAGNOSTIC STUDIES ☐ FLOW CHART
☐ OTHER EXAMINATION OR EVALUATION
☐ OTHER, Specify

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

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.healthcare-ops.list.jts-prehospital@health.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 _____ Sex ◯ M ◯ F Allergy _____ Other _____

☐ HISTORY/PHYSICAL ☒ TREATMENT
☐ DIAGNOSTIC STUDIES ☐ FLOW CHART
☐ OTHER EXAMINATION OR EVALUATION
☐ OTHER, Specify

TACTICAL EVACUATION-AFTER ACTION REPORT & PATIENT CARE RECORD

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 _____ Sex ◯ M ◯ F Pt Cat _____

Date _____ Allergy _____ Other _____

K9 TACTICAL COMBAT CASUALTY CARE (K9TCCC) CARD

EVAC CAT: ☐ Urgent ☐ Priority ☐ Routine

EVAC TYPE: ☐ Fixed ☐ Rotary ☐ Ground ☐ MEDEVAC ☐ CASEVAC

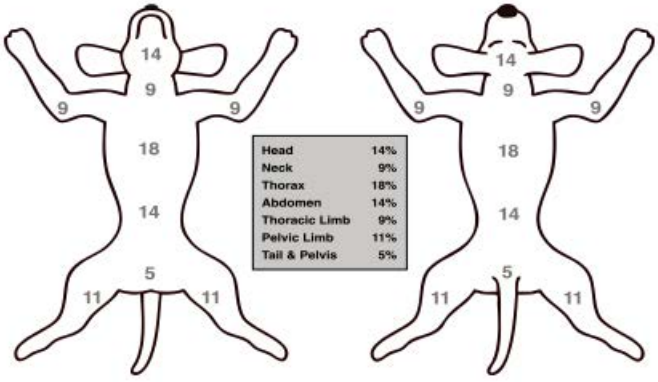
UNIT: _____ **K9 NAME:** _____ **TATTOO:** _____

DATE: *(DD-MM-YY)* _____ **TIME:** _____ **SEX:** ☐ M ☐ F

Mechanism of Injury: *(Mark **X** all that apply)*

☐ IED ☐ GSW ☐ MINE ☐ BURN ☐ GRENADE ☐ ARTILLERY ☐ FALL ☐ MVC ☐ OTHER: _____

Injury: *(Mark all injuries that apply with an **X**)*



	Head	14%
	Neck	9%
	Thorax	18%
	Abdomen	14%
	Thoracic Limb	9%
	Pelvic Limb	11%
	Tail & Pelvis	5%

Vital Signs: *(fill in the blank)*

Time					
Pulse Rate/Location (60-80)					
Respiratory Rate (16-30)					
Temperature (99-102.5°F)					
Capillary Refill (< 2 sec)					
Blood Pressure (120/80)					
Pulse Ox% (> 95%)					
Pain Score (0-10)					

NOTES: _____

_____

_____

FIRST RESPONDER NAME *(Last, First)*: _____ **AOC/MOS:** _____

K9 TACTICAL COMBAT CASUALTY CARE (K9TCCC) CARD

Treatments: *(Mark **X** all that apply, and fill in the blank)*

M: Muzzle - ☐ Handler provided ☐ Hasty ☐ Other: _____

M: Dressing - ☐ Hemostatic ☐ Pressure ☐ Other: _____

TQ - ☐ Wide Elastic ☐ Extremity _____ Time _____ ☐ Other: _____

A: ☐ Intact ☐ ETI/OTI ☐ TRACH ☐ CRIC ☐ Other: _____

R: ☐ O^2 ☐ Chest Seal ☐ NDC ☐ Chest Tube ☐ Other: _____

C: Catheter - ☐ IV ☐ IO Location: _____

RESUSCITATION	Name	Volume/Dose	Route	Time
K9 Blood Product				
Crystalloid Fluid 500ml IV bolus, repeat only once				

H: ☐ Hypothermia – Prevention ☐ Hyperthermia – External Cooling

H: ☐ Head Injury ☐ Elevate Head/Neck/Torso ☐ Other: _____

Medications for a 30kg K9 *(Mark **X** if given and write route and time)*

DRUG OPTIONS	DRUG NAMES	DOSE (30kg)	ROUTE	TIME
ANALGESIA Mild Pain: ketamine + benzo OR opioid alone; Mod/Severe Pain: ketamine + opioid OR ketamine + benzo + opioid	☐ Ketamine (analgesia) IV/IO/IM	50mg		
	☐ Ketamine (sedation) IV/IO/IM	100mg		
	☐ Midazolam IV/IO/IM	10mg		
	☐ Hydromorphone IV/IO/IM	3mg		
SEDATION ketamine + benzo OR ketamine + opioid	☐ Fentanyl IV/IO IM	150mcg 300mcg		
	☐ Morphine IM	10mg		
	☐ Other:			
ANTIBIOTIC	☐ Cefazolin/Ceftriaxone IV/IM	750mg		
	☐ Cefotaxime IV/IM	750mg		
	☐ Ertapenem IV/IM	750mg		
	☐ Other:			
OTHER	☐ TXA IV/IO	0.5gm		
	☐ Naloxone IV/IO IM/IN	2mg 4mg		
	☐ Calcium IV/IO	1 gram		
	☐ 3 or 5% Hypertonic Saline (HTS) IV/IO	150ml		
	☐ Other:			

OTHER: ☐ Splint ☐ Wound Dressing ☐ Other: _____

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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

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)

PRE-FLIGHT CHECKLIST

(for Critical Care and Post-Surgical Transfers)

Once the decision is made to transfer a patient and an accepting physician has been obtained, the following steps will be taken to prepare the patient for transport:

Initials	Evaluation Steps
	1. Sending location/physician: _____Accepting location/physician:_____ Flight nurse called: name / time: _____
	2. Anesthesia called: intubation if indicated. ETT secured/marked
	3. Patient meets criteria for en route critical care transport: risk documented by sending physician **(POST-OPERATIVE and CC INTRAFACILITY TRANSFER, Pre-Transfer Patient Status Requirements)**
	Preparation Steps
	Positioning and Proper Monitoring:
	1. Patient moved to litter (collapsible handles), positioned, padded, strapped, equipment (with necessary attachments) added and secured.
	2. For head-injured patients, a pre-sedation neurologic examination will be performed. GCS and neurological exam documented on the en route care form, suggest placing patient sitting at 30°-45º. (For eye injured patients, fox shield in place. For burn patients, **JTTS burn sheet initiated**.)
	3. Ventilator switched to PMI vent at least 20-30 min prior to flight and set with transfer settings ordered by physician.
	4. IV / IO access verified, patent, and secured.
	5. Arterial line inserted and secured, if indicated. Transducer accessible.
	6. Ventilator tubing checked to be free from obstruction, with $ETCO_2$ and secondary lines attached.
	7. Orogastric or nasogastric tube is inserted (unless contraindicated), placement verified with chest x-ray, and attached to low-intermittent suction.
	8. Chest tubes to water seal/suction (place Heimlich valve for non-atrium chest drainage systems).
	9. Wound vacuum disconnected and stowed.
	10. Foley catheter secured, urine output measured and documented.
	Equipment, Medication, Chart, and Personnel Preparation:
	11. Medications needed for flight prepared and organized.
	12. Flight equipment bag obtained and checked. Backup pulse oximeter readily available.
	13. Complete chart photocopied (including x-ray cd), patient belongings bagged and tagged. Transfer Document, or other theater / unit approved transfer document, has been initiated.
	14. Earplugs and eye protection for patient and flight nurse.
	15. If facility sends medical attendant, attendant must have relevant personal protective equipment. In a combat environment this includes: Uniform, Kevlar, IBA, Weapon, ID Card, and equipment for transport.
	Ventilator Management:
	16. Blood gas (preferably ABG) obtained, 15 min after initial settings and ventilator changes. All efforts will be made to have a documented blood gas within 30 minutes prior to flight time.
	17. Adjust ventilator settings and check O_2 tank for length of flight. Resuscitator bag under patient's head with tubing connected to O_2 source, vent tubing free from obstruction.
	Final Verification:
	18. Transferring Physician, Flight Paramedic, ECCN (or Flight Provider) verbally agrees to flight care plan.
	19. Critical Care Transfer Orders reviewed and signed by transferring physician. **(STANDARD ORDER SET for CRITICAL CARE TRANSFERS)**
	20. Enroute CC Transfer Document with completed preflight and enroute care data handed over to and confirmed by receiving provider / facility. **(CENTCOM Transfer Document)**

Facility Transfer Checklist

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

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

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: _____

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:

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=>60** 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:

- lbs. = kg x 2.2 or kg = lbs. x 0.45
- Fahrenheit = (Celsius x 1.8) + 32 or Celsius = (Fahrenheit -32) x 5/9
- 1 tsp. = 5 ml
- 1 tbsp. = 15 ml
- 1 oz. = 30 ml
- 1g = 1,000 mg
- 1mg = 1,000 mcg
- 1 g = 10,000 mcg

COMMON VENTILATOR FORMULAS

- Calculation to target ETCO2: (Current Rate x Current ETCO2) / Desired ETCO2 = New Rate. NOTE: You may incur a pressure limitation alarm after adjusting to New Rate for ETCO2 targeting on the Hamilton T1 vent.

- Calculation for vent adjustments due to abdominal/thoracic pressure: Current Minute Ventilation / New Rate (Current Rate + 1 or 2) = New Tidal Volume. Now set New Rate and New Tidal Volume. NOTE: Pressure alarm may not go away and may need to recalculate after several minutes if SpO2 has not improved.

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Y-SITE COMPATABILITY CHART

	Solutions						Medications																														
	NS	D5W	LR	Sodium Bicarb	Mannitol	Albumin	Amiodarone	Calcium Chloride	Dexmedetomidine	Diltiazem	Dobutamine	Dopamine	Epinephrine	Esmolol	Fentanyl	Furosemide	Heparin	Insulin (regular)	Ketamine	Lorazepam	Magnesium	Metoprolol	Midazolam	Morphine	Nicardipine	Nitroglycerin	Norepinephrine	Pantoprazole	Phenylephrine	Phenytoin	Potassium Cl	Propofol	Vasopressin	Vecuronium
Amiodarone	V	C*	N	N	C			C	C	C	C	C	C	C	C	N	N	C	C	C	N	C	C	C	C	C	C	N	C	N	C		C	C
Calcium Chloride	C	N	V	N	C		C		C	C	C	C	C	C	C	C	C	C		C	N	C	C	C	C	C	C	N	C	N	C	N	C	C
Dexmedetomidine	C	C	C	C	C		C	C		C	C	C	C	C	C	C	C	C		C	V	C	C	C	C	C	C	N	C	C	C	C	C	C
Diltiazem	C	C	N	V	C	C	C	C	C		C	C	C	C	C	N	V	N		C	C	C	C	C	C	C	C	N	C	N	C		C	C
Dobutamine	C	C	C	N	C		C	C	C	C		C	C	C	C	N	N	V	C	C	C	C	N	C	C	C	C	N	C	N	C	V	C	C
Dopamine	C	C	C	N	C		C	C	C	C	C		C	C	C	N	C	N	C	C	C	C	C	C	C	C	C	N	C	N	C	V	C	C
Epinephrine	V	C*	C	N	C		C	C	C	C	C	C		C	C	C	C	V	C	C	C	C	C	C	C	C	C	N	C	N	C	V	C	C
Esmolol	C	C	C	C	C	C	C	C	C	C	C	C	C		C	N	C	C		C	C	C	C	C	C	C	C	N	C	V	C	C	C	C
Fetanyl	C	C	N	C	C		C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	N	C	N	C	C	C	C
Furosemide	C	C	C	C	C	C	N	C	C	N	N	N	C	N	C		C	V	V	C	N	C	N	N	N	N	N	V	N	N	C	C	N	N
Heparin	V	C*	V	N	C		N	C		V	N	C	C	C	C	C		C	N	C	C	C	C	C	N	C	C	N	C	N	C	C	C	C
Insulin (Regular)	V	N	N	N	C		C	C	C	N	V	N	V	C	C	V	C		N	V	C	C	V	C	C	C	N	V	N	N	C	C	V	C
Ketamine	C	C	N	N	C	C	C	C			C	C	C		C	V	N	N		V	C		C	C		V				N	C	C		
Lorazepam	C	V	N	C	C	C	C	C	C	C	C	C	C	C	C	C	C	V	V		C	C	C	C	V	C	C	N	C	N	C	C	C	C
Magnesium	C	C	C	N	C		N	N	V	C	C	C	C	C	C	N	C	C	C	C		C	C	C	C	C	C	N	C	N	C	V	C	C
Metoprolol	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C	C		C	C	C	N		N	C	N	C		C	C
Midazolam	C	C	N	N	C	N	C	C	C	C	N	C	C	C	C	N	C	V	C	C	C	C		C	C	C	C	N	C	N	C	V	C	C
Morphine	C	C	C	C	C		C	C	C	C	C	C	C	C	C	N	C	C	C	C	C	C	C		C	C	C	V	C	N	C	V	C	C
Nicardipine	C	C	V	N	C		C	C	C	C	C	C	C	C	C	N	N	C		V	C	C	C	C		C	C	N	C	N	C		C	C
Nitroglycerin	C	C	C	C	C		C	C	C	C	C	C	C	C	C	N	C	C	V	C	C	N	C	C	C		C	V	C	N	C	V	C	C
Norepinephrine	C	C*	C	N	C		C	C	C	C	C	C	C	C	C	N	C	N		C	C	C	C	C	C	C		N	C	N	C	C	C	C
Pantoprazole	C	C	C	N	N		N	N	N	N	N	N	N	N	N	V	N	V		N	N	N	N	V	N	V	N		C	N	C	N	C	N
Phenylephrine	C	C	C	C	C		C	C	C	C	C	C	C	C	C	N	C	N		C	C	C	C	C	C	C	C	C		N	C	N	C	C
Phenytoin	V	N	N	N	N		N	N	C	N	N	N	N	V	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N		N	N	N	N	N
Potassium Cl	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	N		C	C	C
Propofol	C	C	C	C	C			N	C		V	V	V	C	C	C	C	C	C	C	V		V	V		V	C	N	N	N	C			V
Vasopressin	C	C	C	C	C		C	C	C	C	C	C	C	C	C	N	C	V		C	C	C	C	C	C	C	C	C	C	N	C			
Vecuronium	C	C	C	C	C		C	C	C	C	C	C	C	C	C	N	C	C		C	C	C	C	C	C	C	C	N	C	N	C	V		

Ateplase (tPA)	C*	N	N	
Tenecteplace (TNK)	C*	N	N	
Transexamic Acid	C*	C	C	
Cefazolin	C	C	C	C
Ceftrixazone	C	C	N	C
Pipercillian / Tazo	C	C	V	C
Meripenem	V	N	N	N
Vancomycin	C	C	C	V
Levaquin (Pre-mix)	C	C	C	V

Y- Site Compatibility

C = Compatible

C* = Compatible and perferred for reconstitution

V = Variable (not preferred)

N = Non - Compatable

Vasopressors should preferably run by themselves.

Not commonly carried in MEDEVAC.

IVP through open port or with mIVF (NS/LR) not with medication line or 3% line as you will bolus medication already in the line.

VITAL FUNCTIONS ASSESSMENT REFERENCE CHART

GLASGOW COMA SCALE			
SCORE	**ADULT**	**CHILD**	**INFANT**
Eye Opening			
4 3 2 1	Spontaneous To Speech To pain None	Eye Opening Response Same as Adult	
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

MUSCULAR STRENGTH GRADING	
SCORE	**EXAM RESULTS**
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 CHART

PEDIATRIC ALS EQUIPMENT

(Always use a Broselow Pediatric Emergnecy Tape if available)

BROSELOW cm / (approx) weight	<61cm 3-5kg	61cm 6-7kg	67cm 8-9kg	75cm 10-11kg	87cm 12-14kg	96cm 15-18kg	109cm 19-23kg	122cm 24-29kg	138cm 30-36kg	149+cm 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.

ZOLL DEFIBRILLATION ENERGY SETTINGS FOR PEDIATRIC PATIENTS

BROSELOW cm / (approx) weight / pounds	<61cm 3-5kg 6-11	61cm 6-7kg 13-15	67cm 8-9kg 17-20lbs	75cm 10-11kg 22-25	87cm 12-14kg 27-32	96cm 15-18kg 34-41	109cm 19-23kg 42-52	122cm 24-29kg 54-65	138cm 30-36kg 67-80	149+cm 40kg 90	45 101
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.

VITAL FUNCTIONS ASSESSMENT REFERENCE CHARTS

AVERAGE VITAL FUNCTIONS BY AGE

BROSELOW cm (approx) weight	<61cm 3-5kg	61cm 6-7kg	67cm 8-9kg	75cm 10-11kg	87cm 12-14kg	96cm 15-18kg	109cm 19-23kg	122cm 24-29kg	138cm 30-36kg	149+cm 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

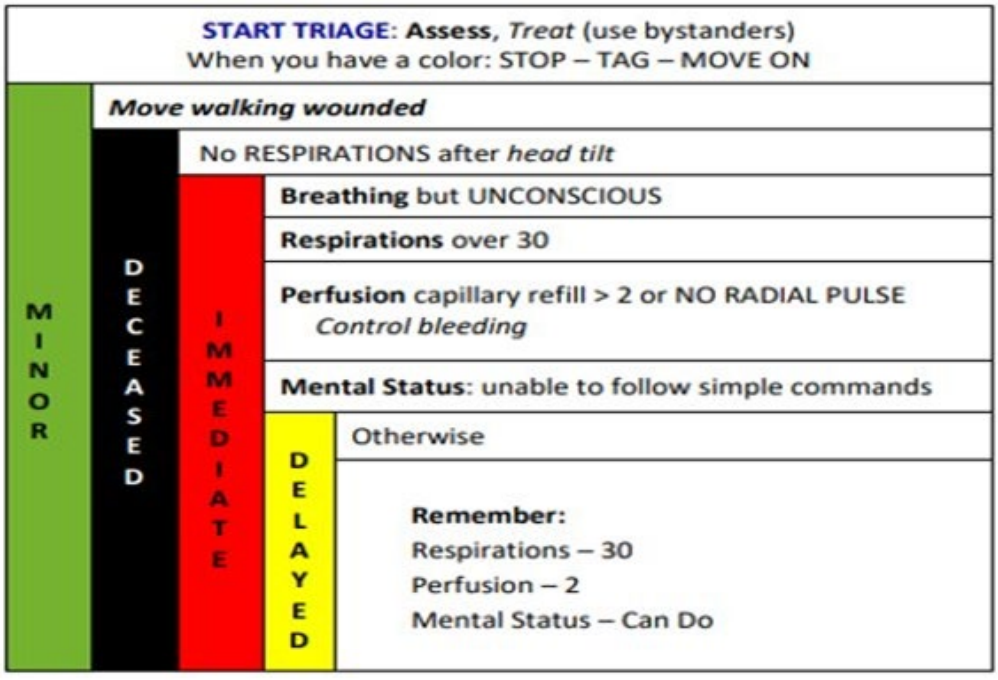
	Sea Level	5,000 Feet MLS
SpO2 (Peripheral O2 Sat)	>94% for patient with Normal Hemoglobin level	>92%
StO2 (Tissue O2 Sat)	>75-95%	Same (<75% = Poor Perfusion)
EtCO2	35-45 mmHg	

MASCAL TRIAGE

Triage Principles

- Priorities change based on time from injury
- Activities in first hour are CRITICAL
- Don't waste time with formal triage tools
- Extricate/stop threat, stop external bleeding, clear airway
- Need for transfusion and ventilator support within the first hour identify a resource-intensive patient
- Damage control surgery has little impact after the first hour
- (COMBAT) Assume minimals will stay armed/engaged if no mental status-altering meds are given for pain
- Expectant category is ONLY used in combat operations and/or when the requirements to adequately treat these patients exceed the available resources. In peacetime, it is generally assumed that all patients have a chance of survival.

Each Patient Triage Assessment Should Be Complete in Less Than 60 Seconds	
Category	**Examples**
Category I: Immediate (red chemlite)	▪ (Any MARCH issue) ▪ Airway obstruction ▪ Flail/open chest wound ▪ Tension- Pneumothorax/hemothorax ▪ Massive hemorrhage ▪ 20-70% Burns ▪ Unstable Vital Signs ▪ Severe TBI (unconscious alive Pt)
Category II: Delayed (green chemlite)	▪ Open fractures w/PMS intact ▪ Soft tissue injuries ▪ Moderate TBI (stable vital signs) ▪ Open abdominal wounds
***Category III: Minimal (no chemlite) remain armed continue to engage**	▪ Minor abrasions, burns, sprains lacerations ▪ Moderate/Mild anxiety ▪ Fractures/dislocations w/PMS ▪ Mild TBI
****Category IV: Expectant or Hero (blue chemlite)**	▪ Massive head or spinal injury ▪ Third degree burns > 70% BSA ▪ Injuries incompatible with life



Notes, Warnings, Cautions

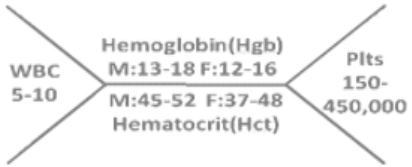
- CPG ID: 91 (Prolonged Casualty Care Guidelines)

TABLE OF CONTENTS

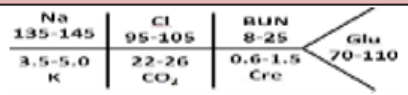
DRUG	STANDARD DOSING	SMALL ADULT (60KG)132LBS	ADULT (80KG)176LBS	LARGE ADULT (100KG)220LBS	INDICATIONS	RESTRICTIONS/ WARNINGS	DURATION	REPEATABILITY/ MAX DOSE
ANTI-FIBRINOLYTIC								
Tranexamic Acid (TXA)	2000 mg IV/IO	2 Grams in 100cc NS over 10min or slow IVP			Int/Ext Hemorrhage	Give <3 hrs from injury/surgery	UNK	NO REPEAT
ANALGESIA								
Ketamine ** LOW-DOSE	0.1-0.3 mg/kg IV/IO >1 min	6-18 mg	8-24 mg	10-30 mg	Analgesia	HTN, Emergence	10-30 min	Q 10-30 min PRN for pain
Fentanyl (Sublimaze)**	0.5-1 mcg/kg IV/IO >3-5 min	30-60mcg	40-80mcg	50-100mcg	Analgesia, Sedation, AMI	Resp depression	30-60 min	Q 30-60 min PRN
Ketorolac (Toradol)	15 mg IV or 15-30mg IM	15mg IV or 15-30mg IM			Musculoskeletal Pain	Not for Battlefield Trauma	4-6hrs	15mg Q 6 hrs; MAX 120mg/day
Morphine **	2-5 mg IV/IO or 0.1 mg/kg IV	6mg	8 mg	10mg	Pain, Anxiolytic, AMI	Resp/BP drop; Head Tx	Variable	PRN for sedation if BP/Resp stable
SEDATION ** = Controlled Substance								
Ketamine ** HIGH DOSE	1-2 mg/kg IV/IO	60-120mg	80-160mg	100-200mg	Dissociative Sedation/ RSI	HTN, emergence, avoid sub- dissociative doses	10-20 min	0.5-2mg/kg Q 10-20 PRN for sedation or 1-3 mg/kg/hr infusion
Propofol (Bolus)	1-2.5 mg/kg bolus IV/IO	60-150mg	80-200mg	100-250mg	RSI/General Anesthesia (Non-analgesic)	Hypotension (up to 30% of MAP)	5-10 min	q5-10 min PRN
Propofol (Constant Infusion)	10-75 mcg/kg/min IV/IO	600-4500 mcg/min	800-6000 mcg/min	1000-7500 mcg/min	General Anesthesia Maint. (Non-analgesic)	Hypotension (up to 30% of MAP)	Infusion	Titrate to effect. MAX DOSE 100 mcg/kg/min.
Etomidate	0.2-0.4mg/kg IV/IO push	12-24mg	16-32mg	20-40mg	RSI (Non-analgesic)	Repeat doses can cause adrenal suppression	5-10 min	NO REPEAT
Midazolam (Versed)**	0.05-0.1 mg/kg IV/IO >1 min	3-6mg	4-8mg	5-10mg	Sedation, Seizures	BP/Resp drop	10-30 min	PRN q 15-30min if BP/Resp stable
PARALYTICS								
Rocuronium (Zemuron)	0.6-1.2 mg/kg IV/IO push	36-72mg	48-96mg	60-120mg	RSI/ Maint of paralysis	Must maintain PT airway 30-60min	25-40 min	PRN q 25-40 min for paralysis
Succinylcholine	1-1.5 mg/kg IV/IO push	60-90mg	80-120mg	100-150mg	RSI	RSI Only	5-9 min	NO REPEAT
Vecuronium	0.1 mg/kg IV/IO push Reconstitute w/ 10 ml NS	6mg	8mg	10mg	Maint of paralysis	Must maintain PT airway 40-90 min	30-60 min	PRN q 30-60 min for paralysis
PRESSERS								
Epinephrine 1mg/10mL	1 mg/500 ml NS= 2mcg/ml	2-20mcg IVP q 2-5min 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)	4 mg/500 ml= 8 mcg/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)	10 mg/10 0ml NS= 100mcg/ml or 10 mg/250 ml NS= 40mcg/ml	50-200mcg (1-5 ml) q 5-10 min IVP/IO			Hypotension	Must be diluted/ Max resus w/ blood 1st	5-10 min	PRN to maintain SYS BP; start w/ low doses and titrate PRN
OD/Tox Ingestions (See also Sodium Bicarbonate, Calcium Chloride)								
Glucagon Kit	5 mg IV/IO/IM	5mg slow IV Push			Beta/Ca-ch blocker OD	Dosage is higher than kits	UNK	Titrate infusion for hemodynamics
Naloxone (Narcan)	0.4-2 mg IV/IO/IM	0.4-2mg titrated to appropriate ventilation			Opioid OD	Use minimum needed	20-60 min	Q 2-3 min PRN (Max 10mg)
ANTI-EMETICS								
Zofran(Ondansetron)	4-8 mg IV/IO/IM/PO	4-8mg			Antiemetic	Can cause QT prolongation	4-6hrs	Max 8mg q 6 hrs
Promethazine (Phenergan)	12.5-25 mg IV/IO/IM	12.5-25mg			Antiemetic/Sedation	Altered LOC/ Vesicant	4-6hrs	Max 25mg q 4 hrs
ANAPHYLAXIS								
Epinephrine 1mg/1mL	0.3-0.5 mg IM	1 Auto-Injector or 0.3mg IM			Anaphylaxis	Hold for 10 sec	5-10min	Add doses Q 5-10 min until improve
Diphenhydramine (Benadryl)	25-50 mg	25mg PO; 25-50mg IV/IO			Antihistamine	Minor sedation	4-8hrs	Max 50mg
Methylprednisolone/Solu-Medrol	125 mg IV/IO	125mg			Anaphylaxis/Asthma	Do not use for head Tx		NO REPEAT
RESPIRATORY (See also: Methylprednisolone)								
Albuterol(Nebulizer)	2.5-5 mg	2.5-5mg (mixed in 3ml NS)			Bronchodilator	Cardiac arrhythmia	1-4hrs	
Albuterol(MDI)	4-8 Puffs	4-8 Puffs			Bronchodilator	Cardiac arrhythmia	1-4hrs	
Epinephrine 1mg/1mL	0.3-0.5 mg SQ/IM *or* 0.5 ml Neb	0.3-0.5mg SQ/IM *or* 0.5ml w/ 3ml NS			Bronchodilator	No IV use	5-15m	Neb over 15 min
HYPOGLYCEMIA								
D50	10-25 Grams IV/IO	20-50ml			Hypoglycemia	Intracranial hemorrhage	UNK	Titrate; avoid over-correction
Glucagon Kit	1 mg	1 Kit (1mg) IV/IM			Hypoglycemia	Only if D50 not available	UNK	REPEAT every 20min PRN
CARDIAC (See also Morphine or Fentanyl for AMI pain)								
Aspirin, Chewable, 81mg	324 mg PO	4 X 81mg Tablets (Chewed)			Angina/ AMI	Must be chewed	4-6hrs	NO REPEAT
Nitroglycerin Tablet/Spray	0.4 mg SL	1 Tab/Spray SL Q 5 min---MAX 3			Angina/ AMI	Maintain SYS BP>90	20-30 min	May repeat up to max of 3 Doses
Epinephrine 1mg/10mL	1 mg	1mg (1 amp) IV/IO Q 3-5 min for Arrest			Pulseless Arrest	Profusing Tachycardia's	3-5 min	Repeat Q 3-5min w/ CPR-No Max
Amiodarone (Cardiac Arrest)	300 mg 1st Dose 150 mg 2nd Dose	300mg IV/IO bolus. If no change in 3-5min give 150 mg IV/IO.			Refractory Pulseless V-Fib/V-Tach	Sinus Bradycardia, 2nd/3rd Deg Block	3-5 min	Max 2 doses
Amiodarone (Infusion)	150 mg over 10-15min, followed by 1 mg/min for 6hrs	150mg infusion over 10-15min; followed by 360mg (1mg/min) infusion over 6hrs			Hemodynamically unstable V-Tach/SVT	Sinus Bradycardia, 2nd/3rd Deg Block	Maintain drip	May repeat 150mg infusion q 10 PRN. Do not exceed 15mg/min
Adenosine	6 mg/ 12 mg 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	1-2 min	Give 2nd dose if no rhythm change in 1- 2 min
Atropine	1 mg IV/IO	1mg q 3-5 min			Symptomatic Bradycardia	Glaucoma	5-15min	MAX 3mg (3 doses)
Epinephrine 1mg/10mL	2-10 mcg/min	2-10mcg/minute infusion titrated to desired effect			Symptomatic Bradycardia	Use if refractive to Atropine/Pacing	Maintain drip	HR >60, MAP >65
Magnesium Sulfate	1-2 Gram IV/IO	1-2 Gram diluted in 50ml D5W over 15 min(Torsades w/ pulse/VF/V-Tach)			Torsades De Pointes (with or without pulse)	AV Blocks	30 min	May repeat doses, MAX 4g in 1 hour

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	1 mEq/kg IV/IO	60mEq	80mEq	100mEq	TCA OD; Prolonged Cardiac Arrest	Do not mix with other meds/ Flush line after	1-2hrs	Maint Infusion of 100-150mEq in 1L D5W @ 100-200ml/hr for TCA OD
Labetalol	10-20 mg IV/IO over 1-2min	10-20mg IV/IO over 1-2min			HTN Urgency/Emergency	Lower MAP by <20%	15-60 min	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; 1Gram >5min for Ca Ch Blocker OD; 1G>5min after Blood			Hyperkalemia/ Beta&Calcium Channel Blocker OD	Not used in routine treatment of cardiac arrest	30min-4 hrs	20mg/kg/hr infusion for Beta OD; 1000mg Q 10-20 x 3 doses PRN for Ca Chan Blocker OD
CBRNE								
Atropine	1-6 mg	1-6mg			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 (600 mg 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 15 min, re- inject subsequent doses (Max 1800mg 2 Pam)
Multi-Use/ Seizures/ Other								
Diazepam	Anxiety: 2-10 mg IV/IM q 6hrs///Seizures: 5-10mg q 5-10min (MAX 30mg)///Seizures following Nerve agent Exposure: 10-20 mg 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	2-4 mg IV/IO	Seizures = 4mg q 3-5 prn; Agitated/Combative Patient = 2-4mg q 30-60			Seizures/ Agitated or Combative Patient	IM not recommended due to erratic absorption	30-120min	Slow IV Push, max rate 2mg/min
Magnesium Sulfate	1-2 Gram 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	30 min	2 Grams/hr infusion needed following loading dose for Eclampsia
Mannitol (20%)	1 Gram/kg IV over <20 min	60G	80G	100G	Mod to severe head Tx	Avoid in HoTN Pt's	3-8hrs	Follow with 0.25 Gram/kg IVP q 4hrs
FLUIDS								
Resuscitation (Crystaloid)	≤20 ml/kg	250-500 ml Bolus to achieve systolic BP >90			Hypo-tension/volemia	Blood is 1st fluid choice	PRN	Titrate to maintain SBP >90
Maintenance	1-2 ml/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 10 ml * %TBSA (Based on 40- 80kg adult)	10ml * % BSA Per Hour	10ml * % BSA 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%)	0.1-1 ml/kg/hr	250ml bolus followed by 50-100ml/hr			ICP Reduction	Use only in Head Injuries	N/A	MAX 250ml
Blood Products and Management								
PRBC (1u=250ml)	10 ml/kg	1-2 units PRN to achieve Sys BP ~90 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)	10 ml/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	500 mg PO or 1 G IV	500mg PO or 1Gram IV infusion			Febrile Reaction	Infuse slowly	6hrs	Use only for Non-Hemolytic react

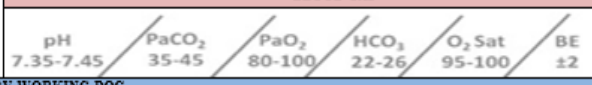
HEMATOLOGY



CHEMISTRIES



BLOOD GAS



VENTILATOR MANAGEMENT

Initial Vent Settings	
MODE	AC/ ASV (Hamilton T1 only)
RATE	14BPM
FiO2	1.0 (100%)
I:E	1:02
TIDAL VOLUME	6mL/kg (Ideal body weight)
PEEP	5 cm/H2O

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

Troubleshooting

D.O.P.E.-- Displacement; Obstructions; Pneumothorax; Equipment Failure

MILITARY WORKING DOG

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

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	NOTES
Analgesia--Intermittent IV/IO/IM	HYDROMORPHONE 0.1-0.2mg/kg Q2-4hrs OR MORPHINE 0.2-0.5 mg/kg Q4-6hrs	
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 Q2-4hrs	
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--	
ASYSTOLE/PEA/BRADYCARDIA	ATROPINE 0.04mg/kg IV/IO AND EPINEPHRINE 0.01 mg/kg	

ALTITUDE ILLNESS

Signs and Symptoms

Acute Mountain Sickness (AMS)	High Altitude Cerebral Edema (HACE)	Hight Altitude Pulmonary Edema (HAPE)
• Headache • Nausea • Vomiting • Lethargy • Dizziness	• Worse Mountain Sickness • Ataxia • Altered Mental Status	• Cough • Dyspea • Pink Frothy Sputum • Consider DifDx

Treatment

- **For all**:
  - O2 (100% FiO2) / IV/IO Access / Cardiac monitor
  - **Descend as soon as possible** (Consider Gamow bag if unable)
  - Hypothermia prevention
  - Note to aircrew – fly lowest allowable altitude
- **HAPE -** Pulmonary Symptoms
  - Nifedipine 30mg ER PO q12hrs (or 20mg imm. rel. PO q8hrs)
  - Consider Assisted Ventilation
- **HACE** - Headache with altered mental status or Ataxia
  - Dexamethasone 8mg IV/IO/PO x1, then 4mg q6hrs
    - Pediatric: 0.15 mg/kg IM/IO q6hrs
  - Acetazolamide 250mg PO q12hrs
- **AMS** - Headache without altered mental status or Ataxia
  - Acetazolamide 250mg PO q12hrs (avoid with sulfa allergy/sickle cell)
  - Severe AMS: Add Dexamethasone 4mg IV/IO/PO
- For altitude-related headache (in isolation or with AMS/HACE) consider
  - Acetaminophen 650-100mg PO
  - Ibuprofen 600-800mg PO

Notes, Warnings, Cautions

- The treatment of choice for all altitude-related illnesses is supplemental O2 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.
- HAPE and HACE are severe and cases should be hospitalized. AMS may be managed well with outpatient treatment.
- **High-Altitude Pulmonary Edema (HAPE)** patients may have crackles / fever / hypoxia. Be prepared to consider asthma, PE, pneumonia or other diagnoses as well.
- **High-Altitude Cerebral Edema (HACE)** patients have AMS and may have tremors, HACE may occur 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 & INSECT BITES / STINGS

Signs and Symptoms

- Rash, Skin break, Wound, Retained Stinger
- Pain, swelling, erythema.
- Bleeding or Discharge
- Shortness of breath / Wheezing / throat tightness
- Hypotension or Shock

Treatment

- Universal patient care Guidelines
- O2 (if hypoxemic)
- IV/IO in non-effected limb
- Cardiac monitor
- Position patient supine
- Elevate bitten extremities
- Wash wound w/ soap + water
- Mark suspected bite area (Circle area affected to monitor for spreading)
- Ice/Cold packs for swelling and pain
- Follow local / surgeon policy / CPG
- Allergic reaction?
  - If yes us *allergic reaction guideline*
- If needed *Pain management guideline*
- Spider, Scorpion, and Snakebites
  - Confirm receiving facility has adequate supply of the appropriate regionally specific antivenoms.

Notes, Warnings, Cautions

- 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.
- 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

DECOMPRESSION SICKNESS

History

- Recent history of scuba diving
- Hypobaric chamber training
- High altitude parachutist training/operational. >18,000 ft (HALO, HAHO)
- High altitude exposure

Signs and Symptoms

- **The Bends (Type 1)**
  - Pain in the joints, muscles, and related tissues. Initially mild and/or intermittent but can become deep, gnawing, and eventually severe.
  - Pain tends to be progressive and becomes worse during ascent.
  - Larger joints such as the knees and shoulders are most frequently affected. The hands, wrists, and ankles also are commonly involved.
  - Unusual generalized fatigue, headache, malaise (constitutional bends)
- **Skin manifestations (Type 1)**
  - Paresthesia tingling, itching, and cold and warm sensations.
  - A mottled red rash might appear on the skin.
  - Rarely a welt might appear and be accompanied by a burning sensation.
  - Bubbles might develop just under the skin and cause localized swelling.
  - Affected regions with excess fat beneath the skin, soreness and abnormal fluid accumulation might be present for 1 or 2 days.
- **Chokes (Type 2)**
  - Symptoms occurring in the thorax caused in part by innumerable small bubbles that block smaller pulmonary vessels.
  - Burning sensation under the sternum.
  - As the condition progresses, a stabbing pain is felt, chest tightness, and inhalation becomes rapid and markedly difficult.
  - Uncontrollable desire to cough. Cough is ineffective and nonproductive.
  - Sensation of suffocation; breathing becomes shallower.
  - Cyanosis
- **CNS (Type 2)**
  - Brain or spinal cord is affected by nitrogen bubble formation.
  - Visual disturbance (lights are flashing/flickering when they are steady).
  - Dull to severe headache.
  - Partial paralysis / one-sided numbness and tingling
  - Loss of orientation, and Inability to hear or speak.
  - Inner ear disturbance's (vestibular DCS) vertigo, nausea, vomiting. More likely associated with diving than altitude exposure.

Treatment

- If DCS occurs while in flight descend to a lower altitude or to the ground level
- Place patient on 100% O2 (for denitrogenating)
- Monitor vital signs and conduct a Neuro exam. Note any changes.
- Minimize any reactor movement.
- Start IV. 250ml/hr NS or LR.
- Definitive treatment is to bring patient to a **HYPERBARIC** chamber.
  - Contact a flight surgeon for coordination.
  - Bring patient to closes Hyperbaric chamber with a low flight profile.

Notes, Warnings, Cautions

- Onset can occur as long as 48 hours after exposure to altitudes above 18,000 ft.
- De-nitrogenation (Nitrogen concentration is reduced by breathing 100% O2. This allows no new nitrogen into the body while existing nitrogen is removed from the lungs eliminating much of the nitrogen dissolved in body tissues.)
- All Types of DCS should be treated as an emergency.

HOT/COLD WEATHER INJURY

HOT Weather Signs & Symptoms

- AMS
- LOC
- Pale or clammy skin
- Hypotension or shock
- Seizure
- Nausea or Vomiting

COLD Weather Signs & Symptoms

- Cold, Clammy skin
- Shivering or lack of shivering
- Mental status change
- Extremity pain or numbness
- Bradycardia or Arrhythmia
- Hypotension or Shock

HOT Weather Treatment

- Remove from heat source/ loosen or remove clothing.
- AMS -*AMS guidelines*
  - Glucose check
- Consider intubation if needed.
- 1L IV Bolus or PO Fluids
- Monitor 12 lead EKG for arrhythmias.
- Be prepared for Seizure – *Seizure guidelines*
- AMS & core temp > 40C /104F
  - Start aggressive cooling (Tepid water to skin and fanning / Ice packs in groin, axilla, and neck / D/C once temp <40 C /104 F)
  - Consider benzodiazepines to block/stop shivering & rebound hypothermia.
    - Midazolam 0.1 mg/kg
- AMS & core temp < 40C/104F
  - Tepid water or room temp water to skin
- Continuous monitoring

COLD Weather Treatment

- Remove wet clothing
- Assess: Mental status, Rectal temperature, Glucose
- Core Temp < 35C/95F With AMS (arrhythmia, absence of shivering)
  - HPMK kit / Hypothermia blankets
  - Dry clothing
  - Hot Packs to groin, axilla, abdomen (avoid burning pt)
  - Warmed IV fluids – 1L IVF Bolus
- Core Temp < 35C/95F (Alert, w/o Arrhythmia, actively shivering)
  - Dry blankets
  - Hypothermia Blanket
  - Warm PO fluids
- Monitor 12-lead EKG

Notes, Warnings, Cautions

HOT Weather

- Best method to cool pt is sublimation-sprinkling w/ water + fanning to evaporate on skin
- Elevated risk groups: Elderly, Very young, Highly active
- Sweating does not exclude heat stroke / heat illness

COLD Weather

- “no patient is dead until they are warm and dead”
- Hypothermia is defined as core temp <35C/95F
- Pulse may be very slow in hypothermia patient – wait at least one minute to feel pulse
- At temps < 30C/86F one defibrillation can be attempted, but withhold further attempts until temp > 30C/86F

SUBMERSION INJURY

Signs and Symptoms

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

Treatment

- O2 (100% FiO2 for all injuries)
- IV/IO, Guideline
- Cardiac monitor / check for Arrhythmias
- *Spinal immobilization protocol*
- If hypothermic use *Hot/Cold weather Guideline*
- If patient has injuries use *Multiple Trauma Guideline*
- Reassess Airway

Notes, Warnings, Cautions

- If Decompression Illness or arterial gas embolism is suspected and neurological deficits (including altered mental status) are present, consider high-flow oxygen, lidocaine 1.5 mg/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.

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 <4 g/day)
PO:
• Regular release: **325-500 mg** every 4-6 hours or **1000 mg** 3-4 times daily (maximum: 4 g/day)
 	
IV:
• **500-1000 mg** every 6 hours
	Pain or fever:
	PO:
	• Infants and Children <12 years**: 10-15 mg/kg/dose** every 4-6 hours as needed; do not exceed 5 doses (4 g/day) in 24 hours
	
	IV:
	• Infants and children <2 years **15 mg/kg** every 6 hours
	• Children 2-12 years: **15 mg/kg** every 6 hours s
	  ○ Max single dose: 15 mg/kg/dose (≤750 mg/dose)
	  ○ Max daily dose: 75 mg/kg/day (≤3.75 g daily)
	
	Note: Children ≥12 years & Adolescents: Refer to adult dosing

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	**PEDIATRIC** Always Reference LB tape
Altitude illness (Acute Mountain Sickness): PO: • **125-250 mg** 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: • **250-375 mg** once daily	**Altitude illness (Acute Mountain Sickness):** PO: (IM not recommended due to alkaline pH) • **2.5 mg/kg/dose** every 8-12 hours ○ 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.

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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 24hrs 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: • **162-325 mg** (chew nonenteric-coated aspirin as a single 325 mg tablet or x4 81 mg chewable tablets)	**N/A:** **Contraindicated in children under 16 yrs. (Reye's Syndrome)**

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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 (e.g., 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** **PEDIATRIC** Always Reference BROSELOW Tape

Acute Poisoning:

PO, NG/OG:

- Single dose: **25-100 grams**

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)

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

PO, NG/OG:

- Single dose: **1 gram/kg**
- Multidose: Initial dose: **1Gram/kg** initially, followed by multiple doses of **0.5 Gram/kg** every 2 hours

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 (ARC, 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: **6 mg;** if not effective within 1-2 minutes, **12 mg** may be given if needed (maximum single dose: 12 mg). **Notes**): Follow each dose with **10-20 mL** normal saline flush. **Note:** Initial dose of adenosine should be reduced to 3 mg if patient is currently receiving carbamazepine or dipyridamole, has a transplanted heart or if adenosine is administered via central line (ARC, 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 1-2 seconds, see **Note**): Follow each dose with 10-20 mL normal saline flush. • Initial: **0.1 mg/kg** (maximum initial dose: 6 mg); if not effective within 1-2 minutes, administer **0.2 mg/kg** (maximum single dose: 12 mg). Follow each dose with 5-10 mL 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 2-15 minutes

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 (90-180 mcg/puff):

- **6 puffs**

Solution for nebulization:

- **5 mg**

Respiratory Distress (acute, severe):
Metered-dose inhaler:

- **1-2 puffs**

Solution for nebulization:

- **2.5-5 mg**

Bronchospasm:

Metered-dose inhaler (90 mcg/puff):

- **6 puffs** every 4-6 hours as needed

Solution for nebulization:

- **5 mg**
- Children ≥12 years: Refer to adult dosing.

Exacerbation of asthma (acute, severe):
Metered-dose inhaler (90 mcg/puff):

- Children <12 years: **4-8 puffs** every 20 minutes for 3 doses, then every 1-4 hours as needed
- Children ≥12 years: Refer to adult dosing.

Solution for nebulization:

- **2.5-5 mg** every 20 min
- Children ≥12 years: Refer to adult dosing.

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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 (ALS/PALS): 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** **PEDIATRIC** Always Reference BROSELOW Tape

ADULT

Pulseless VT or VF (ALS):
IV/IO push

- **300 mg** rapid bolus if pulseless VT or VF continues after subsequent defibrillation attempt or recurs, administer **supplemental dose of 150 mg.**

Recurrent, Hemodynamically unstable VT (ARC):2020
Initial Dose:
IV/IO slow push

- **150mg IV** over 1st 10 minutes (May repeat **150 mg** every 10 minutes PRN if VT recurs

Maintenance Infusion following initial dosing:

- **1 mg per min** over 6 hours

PEDIATRIC

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

- Loading dose: **5mg/kg** over 20 to 60 minutes (Fast push or bolus can precipitate cardiac failure!)
- Max single dose: 300mg

AMIODARONE

Initial Dose: l50mg over l0min

MIX 150 mg/100 ml
CONCENTRATION 1.5 mg/ml

Dose	Rate	Micro	Macro		
		60	20 gtt/ml	15 gtt/ml	10 gtt/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 Q 10 min PRN if VT recurs

Maint Dose: 1mg/min over 6 hrs (360mg over 360min)

MIX 360 mg/500 ml
CONCENTRATION 0.72 mg/ml

Dose	Rate	Micro	Macro		
		60	20 gtt/ml	15 gtt/ml	10 gtt/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 6hrs.

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ATROPINE Sulfate

Lactation: Yes, Use Caution

Trade Name: **AtroPen**

Class I 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 I 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

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

Organophosphate or carbamate insecticide or nerve agent poisoning:

IV/IO: (Nerve agent) Atropine **20mg in 250mL**, titrate to dry respiratory secretions.

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

- *Initial:* **1-6 mg**; repeat every 3-5 minutes as needed, doubling the dose if previous dose did not induce atropinization. Maintain with repeat doses as needed for 2 2-12 hours based on recurrence of symptoms.

IM *(**AtroPen®**):* 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** 2 mg doses in rapid succession.

Symptomatic Bradycardia

IV/IO

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

Organophosphate or carbamate insecticide:

- IV/IO: Initial: **0.05-0.1 mg/kg**; repeat every 5-10 minutes as needed, double dose if previous dose does not induce atropinization. Maintain with repeat doses as needed for 22-12 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 restrict to 10- 20% of original dose (approximately 2- 4mg/hr)

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CALCIUM Chloride 10% ♀Safe, Lactation Safe

Class I 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+ >6.5 mEq/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 I 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 I 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

- **20 mg/kg** over 5-10 minutes followed by an infusion of 20 mg/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 every 10-20 minutes with 3-4 additional doses; or a continuous infusion of 2-6 grams/hour may be initiated

Hypocalcemia prophylaxis from massive transfusion

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

Damage Control Resuscitation: IV/IO, **SLOW**

1000 mg after 1st blood unit and after every 4th unit.

May be given before TXA

PEDIATRIC

Cardiac arrest or cardiotoxicity in the presence of hyperkalemia, hypocalcemia, or hypermagnesemia:

IV/IO, **SLOW**

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

Calcium channel blocker overdose (unlabeled use):

IV/IO

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

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

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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 I.V. 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
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 **3 Grams** (3000mg) over 5 minutes; may repeat every 10-20 minutes 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 repeated every 4 hours. Assess for pain relief and monitor EKG. (NO Calcium Chloride!)	**Cardiac arrest or cardiotoxicity in the presence of hyperkalemia, hypocalcemia, or hypermagnesemia:** IV/IO, **SLOW** **60-100 mg/kg/dose** (maximum: 3000 mg/dose) **Calcium channel blocker overdose (unlabeled use):** *Hypotension/conduction disturbances:* IV/IO **45 mg/kg** (maximum 3000mg/dose) over 10-15 minutes; may repeat every 10-15 minutes **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.

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CEFAZOLIN

♀C, Lactation Yes

Trade Name: **Ancef**

Class I 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 I 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	**PEDIATRIC**

Infection Control:
Routine dosing may be based on body mass:
1g if weight <80kg
2g if weight 81-160 kg (177-352 lbs),
3g if weight > 160 kg (>352 lbs)
Max dose is 12g per day
 	
War wounds (dirty wounds), 2g in 250 mL NS IV over 5 min every 8 hours for 24 hours is adequate for most dirty wounds of the head and neck, torso, and extremities.
 	
IV:
Adults:
• 1-2g every 6-8hrs
  ○ Max daily dose: 12 g/day
Note: See antibiotic chart far dosing in accordance with injury.
	Infection Control:
	
	IV:
	• 20-30 mg/kg IV q 6-8h (maximum, 100 mg/kg/day)
	  ○ Max daily dose: 100 mg/kg/day

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

Class I 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 I 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: **4 mg** every 6 hours • HACE: **8 mg** as a single dose; followed with: 4 mg every 6 hours until symptoms resolve	**Acute mountain sickness (AMS)High altitude cerebral edema (HACE)** (unlabeled use): PO, IM, IV: • **0.15 mg/kg dose** every 6 hours ○ consider use in high altitude pulmonary edema because of associated HACE with pulmonary edema

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DEXTROSE 50% — Lactation? — Trade Name: **Glutose I B-D Glucose**

Class I 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: 10 minutes Maximum

effect: Treatment of Hyperkalemia IV: 30 minutes

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 I 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: • **4-20 g** as a single dose; may repeat if necessary. IV: • **10-25 g** (40-100 mL of 25% solution or 20-50 mL of 50% solution) **Note:** Society of Critical Care Medicine recommends: Treat blood glucose <70 mg/dL (<100 mg/dL in patients with neurologic injury) immediately by stopping insulin therapy (if receiving) and administering 10-20 g (20-40 mL of 50% solution) IV; repeat blood glucose measurement in 15 minutes with repeat dextrose as needed; **avoiding overcorrection**.	**Hypoglycemia:** Oral: • **4-20 g** as a single dose; may repeat if necessary. IV: • Newborns: **5ml/kg D10** (Max 25 G/dose) • Infants and Children: **2ml/kg D25** (Max 25 g/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 I Mechanism of Action

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

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 I 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

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

- **2-10 mg** 2-4 times/day if needed.

Status Epilepticus:
IV: (SLOW)

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

Sedation in ICU patient:
IV:

- Loading dose: 5**-10 mg;** Maintenance dose: **0.03-0.1 mg/kg** every 30 minutes to 6 hours

Muscle Spasm:
IV:

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

Nerve Agent Exposure (CBRNE)
IM:

- **10-20mg** for seizures associated with Nerve Agent exposure (up to 40mg may be needed); or if 3 MARK 1 kits were used on a casualty

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

- Children: **0.04-0.3 mg/kg dose** every 2-4 hours to a maximum of 0.6 mg/kg within an 8-hour period if needed.

Status Epilepticus:
IV:

- Infants >30 days and Children <5 years: **0.2-0.5 mg** given slowly every 2-5 minutes (maximum total dose: 5 mg); repeat in 2-4 hours if needed.
- Children 25 years: **1 mg** given slowly every 2-5 minutes (maximum total dose: 10 mg); repeat in 2-4 hours if needed.

Muscle spasm associated with tetanus:
IV, IM

- Infants >30 days and Children <5 years: **1-2 mg dose** every 3-4 hours as needed.
- Children 25 years: **5-10 mg dose** every 3-4 hours as needed

DILTIAZEM

Lactation? (Not Recommended) Trade Name: **Cardizem**

Class I 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 [ORS 20.12 seconds], must determine whether origin is supraventricular or ventricular)

Adverse Reactions I Precautions

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

Dose and Administration: ADULT PEDIATRIC Always Reference BROSELOW Tape

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

Supraventricular tachycardia (alternative agent):

Note: For hemodynamically stable patients if vagal maneuvers and/or adenosine are unsuccessful.

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

Atrial tachyarrhythmias, rate control:

Very limited data available: Infants, Children, and Adolescents

IV:

- Initial bolus: **0.25 mg/kg** over 5 minutes (maximum dose: 20 mg/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 to 0.15 mg/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:

- **25mg** every 4-6 hours or **50mg** every 6-8 hours- motion sickness

IV Push:

- **25-50mg** once, administered after epinephrine for anaphylaxis Note: Diphenhydramine is not the 1st line medication for anaphylaxis

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/IM:

- **25mg** once

Motion Sickness:

Oral:

0.5-1 mg/kg every 6 hours

IV/IM:

- **1.25mg/kg** every 6 hours

Anaphylaxis reaction:

Adolescents: IV, IM, Oral:

- **25 - 50 mg/dose**

Allergic reaction:

Children

- Ages 2 to <6 years: Oral: 6.25 mg every 4-8 hours
- Ages ≥6 to <12 years: Oral: 12.5 to 25 mg every 4-8 hours
- Adolescents: IV, IM, Oral: 25 to 50 mg/dose

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: 1-2 minutes

Indications

Labeled Indications: Short term management of cardiac decompensation.

Contraindications

- Hypersensitivity to dobutamine or sulfites (some contain sodium metabisulfite), or any component of the formulation.
- Hypertrophic cardiomyopathy with outflow tract obstruction

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
- Hypotension and ventricular ectopy

Dose and Administration: ADULT

Cardiac Decompensation:

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

- **2-5 mcg/kg/min**, start low and titrate to targeted MAP > 60 mmHg.
- **Usual dosage is 2-10mcg/kg/min- max dose 20mcg/kg/min**
- **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 hour)
2.5	0.15
5	0.3
7.5	0.45
10	0.6
12.5	0.75
15	0.9
20	1.2

PEDIATRIC Always Reference BROSELOW Tape

Cardiac Decompensation:

Continuous IV or intraosseous infusion:

- Initial: **0.5 to 1 mcg/kg/minute**; titrate gradually every few minutes until desired response achieved; usual range: 2 to 20 mcg/kg/minute

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

Contraindications

- Hypersensitivity to sulfites
- Ventricular Fibrillation
- Pheochromocytoma
- Uncorrected tachyarrhythmias

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 micro drip chamber only):

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

Dopamine Dosage Efficacy:

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

Note: Doses >20 mcg/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 20 mcg/kg/min are inadequate. (***phenylephrine***, ***norepinephrine***, ***epinephrine***.)

PEDIATRIC Always Reference BROSELOW Tape

Hemodynamic Support:

IV:

- **2-20mcg/kg/min**; titrate to desired response. Infusion may be increased by 5-10mcg/kg/minute until optimal response is obtained.

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

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Dopamine						
Dosing Range: 5-20mcg/kg/min (300-1200mcg/kg/hr)						
MIX 800 mg/500 mL CONCENTRATION 1600 mcg/mL						
Pt. Weight	Dose	Rate	Micro (60	Macro		
				20 gtt/mL	15 gtt/mL	10 gtt/mL
kg	mcg/kg/mi	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 800 mg/500 mL CONCENTRATION 1600 mcg/mL						
Pt. Weight	Dose	Rate	Micro (60	Macro		
				20 gtt/mL	15 gtt/mL	10 gtt/mL
kg	mcg/kg/mi	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.						

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EPINEPHRINE 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, induces systemic vasoconstriction and increases heart rate and contractility

Indications

- Allergic Reactions, Anaphylaxis
- Asthma (Bronchoconstriction)

Contraindications

- Not for IV use, must first dilute into 10mL NS syringe for Cardiac / IV use.
- Hypersensitivity to sympathomimetic amines, glaucoma and non-anaphylactic shock

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:

- **0.3-0.5 mg** every 5-10 min

Nebulization:

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

Anaphylaxis / Hypersensitivity reaction:
IM:

- **0.3-0.5 mg** in mid-outer thigh every 5-10 minutes until clinical improvement

IV Infusion**:**

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

Acute Hemolytic reaction
IM:

- **0.5mg** IM in lateral thigh
    - Repeat every 5-15min for moderate bronchospasm or facial/laryngeal edema.

PEDIATRIC Always Reference BROSELOW Tape

Bronchodilator:
infants and Children:

- **0.01 mg/kg** (0.01 mL/kg) (maximum single dose: 0.5 mg) every 3-5 min for 3 doses

Nebulization:

- Children <4 years: Croup: 0.05-0.1 mL/kg (maximum dose: 0.5 mL); dilute in 2-3 mL of NS. May repeat dose every 20 min
- Children ≥4 years: Adult dosing

Anaphylaxis / Hypersensitivity reaction:

Infants and Children:
SubQ/IM:

- **0.01 mg/kg** (0.01 mL/kg of **1mg/mL** solution) (maximum single dose: 0.3 mg) every 5-15 minutes

Autoinjector, Children <15kg:

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

Autoinjector, Children ≥15 kg:

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

Epinephrine 1mg/1ml (1:1,000)					
Anaphylaxis					
Dosing Range: 5-15mcg/min (150-450mcg/hr)					
MIX 1 mg/500 mL CONCENTRATION 2 mcg/mL					
Dose	Rate	Micro 60 gtt/mL	Macro		
			20 gtt/mL	15 gtt/mL	10 gtt/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 1:10,000

♀C, **Lactation?** (Caution)

Trade Name: **Adrenalin**

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: 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

Asystole/pulseless arrest, pulseless VT/VF (ARC ALS 2020):

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 dose with 20mL flush

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

IV Continuous Infusion:

- **Bradycardia: 2-10 mcg/minute** titrate to desired effect (HR >60, MAP >65)
- **Hypotension/Shock: 2-10 mcg/min** titrated to clinical end point (BP, end organ perfusion)

Push-Dose: Refractory Anaphylaxis:

IV/IO: Utilize the 0.1 mg/mL solution further diluted in 10mL of NS.

- **0.05-0.1 mg,** administered over 1-10 minutes, may repeat once after 3 minutes if patient remains unresponsive to initial dose.

PEDIATRIC Always Reference BROSELOW Tape

Asystole, PEA, pulseless VT/VF, Unresponsive and Symptomatic Bradycardia in Infants (ARC ALS 2020):

IV:

- **0.01 mg/kg** (0.1 mL/kg of **1mg/10mL** [0.1 mg/mL]) (maximum single dose: 1 mg) every 3-5 minutes as needed or until ROSC

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

IV: Continuous Infusion

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

Epinephrine 1mg/10ml (1:10,000)					
Pressor for Hypotension					
Dosing Range: 2-20mcg/min (120-600mcg/hr)					
MIX 1 mg/500 mL CONCENTRATION 2 mcg/mL					
Dose	Rate	Micro (60	Macro		
			20 gtt/mL	15 gtt/mL	10 gtt/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),
Bactericidal – 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)
- Gastrointestinal: Diarrhea (Adults 9-12%).

Dose and Administration: ADULT	**PEDIATRIC**

Infection Control:
Give 1g in 250 mL NS IV over 5 min, provides 24 hours of coverage.
 	
IV:
Adults:
• 1 g IV every 24 hrs. for 7-14 days.
	Infection Control: Children <12 years & ≥12 years
	
	IV:
	Pediatrics:
	• <12years old: 15 mg/kg IV every 12 hrs.
	  ○ Max daily dose: 500mg/dose
	• ≥12 years old: 1000mg once daily
	  ○ Max daily dose: 1000mg once daily.

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ETOMIDATE ♀C, Lactation? (caution) Trade Name: **Amidate**

Class / Mechanism of Action

General Anesthetic
Ultra short acting non-barbiturate sedative/hypnotic used for induction of anesthesia. 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
- Labor/Delivery
- Septic Schock

Adverse Reactions / Precautions

- **NO Analgesic properties!**
- Apnea/Respiratory Depression
- Hypo/hyperventilation
- Dysrhythmias
- Hypo/hypertension
- Nausea/Vomiting
- Transient involuntary skeletal muscle movement
- Pain at injection site
- Inhibits adrenal steroid production; may increase mortality if repeat dosing is required

Dose and Administration: ADULT	**PEDIATRIC**
RSI: IV: • **0.2-0.4 mg/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: • **0.2-0.4 mg/kg** over 30-60 seconds will produce rapid sedation lasting 10-15 minutes. ○ Max dose: 20 mg **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
- MAOI taken in the past 14 days.
- Hypotension
- Hypoxia
- Hypoventilation

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.**
- CNS depression, Confusion Paradoxical excitation, delirium, drowsiness, apnea/dyspnea, bradycardia, dysrhythmias, hypotension, syncope, nausea/vomiting, abdominal pain, dehydration, fatigue.

Dose and Administration:

ADULT

Pain Management:

IV: Slow (Unlabeled)

- **0.5-1mcg/kg** PRN for breakout pain q 30-60 min IN/IM:
- **1mcg/kg mcg**

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 Midazolam for best effect)
- **0.5-2mcg/kg** IVP q 20-60min

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

PEDIATRIC

RSI:

IV:

- **0.2-0.4 mg/kg** over 30-60 seconds will produce rapid sedation lasting 10-15 minutes.
  - Max dose: 20 mg

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.

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FENTANYL (SUBLIMASE)					
Dosing Range: 0.5-1 mcg/kg/hr					
MIX 1 mg/100 mL CONCENTRATION 10 mcg/mL					
Dose	Rate	Micro (60 gtt/mL)	Macro		
			20 gtt/mL	15 gtt/mL	10 gtt/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

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

Edema, heart failure:

IV, IM:

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

Continuous IV Infusion:

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

Edema, heart failure: Infants and Children

IV, IM:

- Initial: **1 mg/kg/dose**; if response not adequate, may increase dose in increments of 1 mg/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 every 6-12 hours; maximum dose: 6 mg/kg/dose

GLUCAGON

♀B **Lactation?** (Caution)

Class / Mechanism of Action

Antidote, Hypoglycemia Antidote, Diagnostic agent
Hyperglycemic agent, pancreatic hormone, insulin antagonist; 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
- Hyperglycemia

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, IN, SubQ: • **1 mg**; may repeat in 20 minutes as needed. **Beta-blocker / Calcium channel blocker overdose (myocardial depression)** unresponsive to standard measures (unlabeled use): IV: • **5mg** bolus slow IV push	***Hypoglycemia:** IV, IM, IN, SubQ: • **Children <20 kg:** 0.5 mg repeated in 20min 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: • **Children <25kg:** 0.5mg slow IV push q5min prn • **Children >25 kg:** 1mg slow IV push q5min prn

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 **60 units/kg** (MAX: 4000 units)
  - Maintenance: 12 units/kg/hour (MAX: 1000 units/hour) as continuous infusion.

Treatment of venous thromboembolism:

IV: (unlabeled dosing)

- DVT/PE: **80 units/kg or 1mg/kg** (or alternatively 5000 units) IV push followed by continuous infusion of 18 units/kg/hour.
- COVID VTE Prophylaxis: 7,500 iu SQ every 8 hours

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: **75 units/kg** IV push followed by continuous infusion of 20 units/kg/hour

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. • Use only for burns as an adjunct; colloid not preferred until hour 8-12; may use earlier is difficult resuscitation.		

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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
- MAOI use in past 14 days
- GI obstruction
- Hypotension
- Hypoxia
- Head injury
- Hypoventilation

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
- Dizziness
- Headache
- Syncope

Dose and Administration:

ADULT	PEDIATRIC Always Reference BROSELOW Tape
Acute pain (moderate-to-severe): IV: (Slow) • **0.5mg (range 0.25-2mg) IV/IO q 1-6hr as prn** • **Critically ill require lower dose, opioid tolerant may require higher dose** • Continuous infusion: Usual dosage range: **0.5- 3 mg/hour (See infusion chart next page)**	**Acute pain (moderate-to-severe):** IV: (Slow) • Children: **0.015mg/kg** IV q 4-6 PRN Adolescents >50kg: Refer to adult

HYDROMORPHONE (DILAUDID)					
Dosing Range: 0.5-3mg/hr (8.3-50mcg/min)					
MIX 2 mg/100 mL CONCENTRATION 20 mcg/mL					
Dose	Rate	Micro 60 gtt/mL	Macro		
			20 gtt/mL	15 gtt/mL	10 gtt/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 nontoxic cyanocobalamin which is excreted within urine

Indications

Labeled Indications:
- IM: Treatment of pernicious anemia and B12 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 persistent red colored urine and skin, rendering pulse oximetry values inaccurate

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

Cyanide Poisonings:
IV/IO: (**Note:** If cyanide poisoning is suspected, antidotal therapy must be given immediately)
- Initial: **5 grams** as single infusion given over 15 min
  - Repeat a second 5-gram dose based on severity and clinical response.
  - Maximum cumulative dose: 10 grams

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 200 mL 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/IO: (Unlabeled Use)
- Initial: **70mg/kg (max 5 grams)** 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.

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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 sustained increases in blood pressure (non-traumatic intracerebral hemorrhage, hypertension associated with acute coronary syndrome; NOT contraindicated in TBI)
- Children <3 mo. age

Adverse Reactions / Precautions

- Rapid IV administration may cause hypotension, apnea, or laryngospasm. Large doses (>1 mg/kg) may cause hypotension and respiratory depression
- Use with caution in patients with cardiovascular disease. Continuously monitor cardiac function
- Preferred general anesthetic / sedative (pre-hospital) for head injury patient (does not raise ICP)
- Dosing between 0.5-0.9 mg/kg IV (and equivalent IM dose) can give patients the feeling of unreality leading to agitation and should be avoided

Dose and Administration: ADULT

LOW DOSE:

Analgesia:

IV/IO Push (over 1 min)
- **0.1-0.3 mg/kg,** repeat q 10-30 prn

IM/IN
- **0.5 - 1.0 mg/kg,** repeat q 10-30 prn

HIGH DOSE:

RSI / Induction of anesthesia; Combative Patients:

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

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

Maintenance of anesthesia:

IV:
- **0.5-2 mg/kg** dose every 10-20 minutes

IV Continuous Infusion
- **0.5-2mg/kg bolus then 1-3 mg/kg/hr**. Titrate levels by 0.25mg/kg/hr. PRN to achieve appropriate sedation. **(See infusion chart next page)**

Dose and Administration: PEDIATRIC Always Reference BROSELOW Tape

Analgesia:

IM:
- **0.5 mg/kg,** repeat q 10-30 prn

IV:
- **0.1 – 0.2 mg/kg,** repeat q 10-30 prn

Induction of anesthesia (unlabeled dosing):

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

Maintenance of anesthesia:

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

IV Continuous Infusion:
- **0.5-1 mg/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*

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KETAMINE (KETALAR)						
Dosing Range: 1-3mg/kg/hr (17-50mcg/kg/min)						
MIX 500 mg/500 mL CONCENTRATION 1 mg/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 = 80-240mg/hr (80-240ml/hr)						

KETAMINE (KETALAR)						
Dosing Range: 1-3mg/kg/hr (17-50mcg/kg/min)						
MIX 500 mg/500 mL CONCENTRATION 1 mg/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 = 80-240mg/hr (80-240ml/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
- 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:

- **15-30 mg** every 6 hours (maximum daily dose: 120 mg)

IV:

- **15 mg** every 6 hours (maximum daily dose: 120 mg)

Adults ≥65 years and/or adults ≤50 kg

IM:

- **15-30 mg** every 6 hours (maximum daily dose: 60 mg)

IV:

- **15 mg** every 6 hours (maximum daily dose: 60 mg)

Pain management (acute; moderately severe):

Children 2-16 y/o:

- Moderate discomfort: **1 mg/kg** IM
- Severe discomfort: **0.5 mg/kg** IV
- Febrile seizure: **1 mg/kg** IV

Adolescents >17:

- Refer to adult dose

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

Class / Mechanism of Action

Beta Blocker with alpha blocking activity
Blocks alpha and beta1/beta2 adrenergic receptor sites. Onset IV: 2-5 minutes

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)

Intermittent IV:

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

Continuous Infusion:

Initial loading dose: 10-20 mg over 2 minutes, followed by 0.5-2.0 mg/min

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

***Hypertension emergencies:**

IV Continuous Infusion

- 0.25-3 mg/kg/hour; administration requires the use of an infusion pump.

Intermittent bolus doses of 0.2-1 mg/kg/dose have been reported. Maximum dose 40mg/dose.

*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

Ringer's Lactate (Lactated Ringers)

Class: Isotonic crystalloid solution.
Mechanism of Action: Replaces water and electrolytes.
Indications: Hypovolemic shock; keep open IV. Standard burn resuscitation
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. Should not use in head injury patients.
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. Burn resuscitation use Rule of 10's to calculate infusion rate.
(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 (60 gtt/mL) set at a rate of "to keep open" (TKO).

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

Traumatic brain injury (severe acute) (short-term seizure prophylaxis):

- Loading dose: 1500 mg over 15 minutes
- Maintenance dose: 1000 mg over 15 minutes every 12 hours

Status epilepticus:

- IV: 2000 mg over 15 minutes

PEDIATRIC Always Reference BROSELOW Tape

Status epilepticus, refractory: (Limited data available)

Infants, Children, and Adolescents:

- IV: 60 mg/kg over 15 minutes as a single dose; 4,500mg max dose.

Traumatic brain injury, Seizure prophylaxis:

- IV: 20-55 mg/kg/day in divided doses twice daily.

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 (2nd or 3rd) 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 A Fib.
- 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): (ARC 2020)**:**

IV, IO:

- Initial dose: **1 to 1.5mg/kg**
- For refractory VF may give additional **0.5 to 0.75mg/kg** IV push, repeat in 5 to 10 minutes
  - Maximum of 3 doses or total of 3mg/kg
  - Follow with continuous infusion 1-4mg/minute after ROSC

Perfusing Arrhythmia (if amiodarone is not available): Stable VT, wide complex tachycardia, significant ectopy:

IV, IO

- **1 to 1.5mg/kg.** Repeat 0.5 to 0.75mg/kg every 5 to 10 minutes
  - Maximum cumulative dose 3 mg/kg
  - Follow with continuous infusion 1-4 mg/min (20-50 mcg/kg/minute)

Flush after initiation of IO:

- May add 2-3 ml 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, 2020)

IV, IO:

- Initial dose**: 1mg/kg** loading dose.

Maintenance Infusion (Peds):
IV, IO: Continuous Infusion

- **20 to 50 mcg/kg per min** infusion (repeat bolus dose if infusion initiated > 15 min after initial bolus therapy)

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

Acute Seizures:
IV:

- **4 mg** at a maximum rate of 2mg/min; may repeat at 3-5 min.

Note: Not recommended IM for seizure due to erratic absorption.

Anxiety:
IV:

- **0.5-2 mg** slow IV push

Rapid tranquilization of agitated / combative patient (Off-label use):
IV, IM:

- **2-4mg** every 30-60 minutes**;** may be used alone or administered with an antipsychotic (i.e., haloperidol)

PEDIATRIC Always Reference BROSELOW Tape

Acute Seizures / Status epilepticus (unlabeled use):
IV/IO:

- **0.1 mg/kg**; slow push. May repeat x1 dose in 5-10 minutes. Maximum dose is 4mg/dose.

Agitation:
IV/IM

- **0.02-0.1 mg/kg/dose** q 20-30 min PRN. (Maximum dose: 2mg/dose).

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:

- **1-2 g** over 15 minutes; if no response or torsades de pointes recurs, may repeat dose to a total of 4g in 1 hour.

Wheezing in Respiratory Distress (3rd line drug):
IV:

- **2 Grams single dose** over 20min

Seizure (Refractory to Benzodiazepines):
IV:

- **1-2 Grams** over 30 min

Eclampsia/pre-eclampsia, severe (unlabeled):
IV:

- **4-6 g** over 15-30 minutes followed by 1-2 g/hour continuous infusion for 24 hrs

Torsades de pointes: (PALS 2020)
IV, IO:

- **25-50 mg/kg/dose** over several minutes
  - maximum single dose: 2000 mg

Respiratory Distress (Status Asthmaticus):
IV:

- **25-50 mg/kg** over 30 min (max 2 grams)

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 O2 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 • **1 g/kg** IV bolus over <20 minutes. • Follow with **0.25 g/kg** IVP every 4 hours **Note:** Always have urinary catheter in place and monitor output. **Note:** 3% Hypertonic Saline is preferred over Mannitol	**Increased intracranial pressure** (unlabeled dosing): IV: • **0.25-1 g/kg/dose.** • Maintenance dose of **0.25-0.5 g/kg** IV q 4-6hrs 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: **1-2 mg/kg** initial dose**;** followed by **0.5-1 mg/kg** q 6 hrs**.** (maximum: 60 mg/day) **Allergic Reaction** IV • **2 mg/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
5-10 mg IV/IO slow push; repeat dose x1 every 20-30 minutes 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 <100 mm Hg; 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 to 5 mg** over 2-5 minutes; repeat dose every 5 minutes as needed; maximum total dose: 15 mg. **Supraventricular tachycardia/Ventricular arrhythmias (off-label use):** **Note:** For hemodynamically stable patients if vagal maneuvers and/or adenosine are unsuccessful. IV: • **2.5 to 5 mg** over 2-5 minutes; repeat dose every 5 minutes as needed to achieve a ventricular rate of 90 – 100; maximum total dose: 15 mg. **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.**

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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: 1-5 minutes, IM: 15 minutes, Intranasal: 4-8 minutes

Duration: IV, less than 2 hours. (20-30 Minutes 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

Induction for RSI; Continued sedation; Hyperthermia:

IV:

- **Induction 0.1mg/kg** IV/IO
- **Continued Sedation .05-.1 mg/kg I**V/IO
- **Infusion sedation** 0.05 mg/kg bolus IV, then titrate 0.05-0.1mg/kg/hr. IV gtt

Transcutaneous Pacing / Cardioversion, Anxiety, Agitation.

IV

- **2.5-5mg** q 15-30 min 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

.

PEDIATRIC Always Reference BROSELOW Tape

Procedural sedation; Transcutaneous Pacing; Cardioversion:

IV:

0.05-0.1mg/kg q 15-30 min PRN

Intranasal (unlabeled route):

0.2-0.5 mg/kg (maximum total dose: 10 mg or 5 mg per nare

Induction/RSI (Not preferred drug)

IV:

- **0.1-0.3 mg/kg**

Seizure

IV, IM:

- **0.2 mg/kg Q 15-30 min PRN**

Status epilepticus, prehospital treatment (unlabeled use):

IV:

- Infants: **1-2 mg**
- 13-40 kg**: 4 mg once**
- >40 kg: Refer to adult dosing

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MORPHINE ♀C, Lactation Yes(Caution)

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** **PEDIATRIC** Always Reference BROSELOW Tape

Chest Pain/AMI:
IV/IO:

- **2-5 mg** q 5-15 min 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 (0.1 mg/kg, range 2.5 – 10mg)** every 1-6 hours 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: (Slow)

- **0.1-0.2 mg/kg** q 2-4 hr. PRN, not to exceed 10 mg per dose

Continuous infusion:

- **10-30 mcg/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:
• 400 mg once daily
  ○ Max daily dose: 400 mg/day
	Infection Control:
	
	PO:
	Pediatrics:
	
	<15yrs old:
	• 10 mg/kg/day PO
	  ○ Max daily dose: 400 mg/day
	
	>15yrs old:
	• 400 mg once daily
	  ○ Max daily dose: 400 mg/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:

- **0.4-2 mg**; may dose every 2-3 minutes if needed.
  - If no response after 10 mg total, look for other cause of respiratory depression.
  - Following reversal, may need to readminister after 20-60 minutes.

Reversal of respiratory depression with therapeutic opioid doses:
IV, IM, SubQ:

- **0.1-0.4 mg** titrated to adequate respiratory rate. If not improved after 0.8 mg 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 ≤20 kg (unlabeled dose): **0.1 mg/kg/dose** (maximum dose: 2 mg); repeat every 2-3 minutes PRN
- ≥5 years or >20 kg: Adult Dosing

Reversal of respiratory depression with therapeutic opioid doses:
IV, IM, SubQ:

- **0.001-0.015 mg/kg/dose**; repeat as needed.

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: • **10 mg** every 4-6 hours **Pulmonary hypertension** (unlabeled use) PO: • **30 mg** (Extended Release) twice daily; may increase cautiously to 120-240 mg/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: **0.5 mg/kg/dose** (maximum: 20 mg/dose) every 8 hours **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 48hrs
- 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 PEDIATRIC Always Reference BROSELOW Tape

Angina/coronary artery disease:

PO:

- Sublingual: **0.4 mg** every 5 minutes for maximum of 3 doses in 15 minutes
- Translingual: **1 spray** (0.4mg per spray) onto or under tongue every 3-5 minutes for maximum of 3 doses in 15 minutes

CHF related Respiratory Distress:

PO:

- Sublingual: **0.4 mg** every 5 minutes for maximum of 3 doses in 15 minutes 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)

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** q 5min if SBP > 70 + 2 x Age

CHF or Cardiogenic Shock:

IV Drip:

- Children: **0.25 - 0.5 mcg/kg/min**; titrate by 1 mcg/kg/min q 15-20 min as tolerated (Typical dose=1-5mcg/kg/min)(Max 10mcg/kg/min)
- Adolescents: **5-10 mcg/min** (not per kg) (max 200 mcg/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: 1-2 minutes

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

Hypotension/shock:

IV: Administer as continuous infusion with infusion pump. Do not use in same line as sodium bicarbonate. It will inactivate norepinephrine.

- Initial: **2-20 mcg/minute**; titrate to SBP goal.
  - Maintenance: **2-4 mcg/minute**

Post ROSC Hypotension:

- Initial: **0.1-0.5 mcg/kg/minute** 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)

PEDIATRIC

Hypotension/shock:

IV: Continuous infusion

- Initial: **0.05-0.1 mcg/kg/minute**; titrate to effect
  - Max dose: 2 mcg/kg/minute

NOREPINEPHRINE (LEVOPHED)					
Dosing Range: 2-20mcg/min (120-1200mcg/hr)					
MIX 4 mg/500 mL CONCENTRATION 8 mcg/mL					
Dose	Rate	Micro (60 gtt/mL)	Macro		
			20 gtt/mL	15 gtt/mL	10 gtt/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 every 2 minutes PRN to target MAP >60mmHg					

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, reduces the amount of fluid in the cranial cavity, decreases ICP, 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):
    o **Bolus**: 250mL IV Bolus over 15 min.
    o **Infusion**: 50-100 cc/hr
• Dosing (Pediatrics):
    o **Bolus**: 5 cc/kg IV Bolus over 15 min.
    o **Infusion**: 0.5 cc/kg/hr
• Should be administered through a central line due to its high osmolarity and tonicity.

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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 5-30 minutes 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**	**PEDIATRIC** Always Reference BROSELOW Tape
Nausea and Vomiting: IV/IO/IM/PO • **4-8 mg** **Treatment of severe or refractory hyperemesis gravidum** (unlabeled use): IV: • **8 mg** administered over 15 minutes every 12 hours	**Nausea and Vomiting** (Children 1 month to 12 years)**:** IV: • ≤40 kg**: 0.1 mg/kg** as a single dose over 2-5 minutes • >40 kg**: 4 mg** as a single dose over 2-5 Minutes

Oxygen

Class: Atmospheric gas.
Mechanism of Action: Reverses hypoxemia
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, as an antidote for confirmed or suspected carbon monoxide poisoning).
Contraindications: Coincidental paraquat (herbicide) inhalation rare, supplemental oxygen enhances the toxicity damaging the alveolar cells; COPD patients may become hypopneic with high O2 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
Dosage and Administration:

- Assure adequate ventilation (spontaneous or supported) supplemental oxygen therapy, ideally by end- tidal CO_2 measurement (Goal EtCO2 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 O2 Saturation remains < 95%, apply non-rebreather face mask with oxygen at 15 LPM.
    - If O2 Saturation remains < 90%, refer to **Airway guideline**.
- Patient on Ventilator:
    - Adjust ventilator settings based on ventilatory goals for patient: ETCO2, peak pressures, SpO2, and patient clinical condition.
    - Adjust FiO2 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.

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)

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 5-10 minutes.

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:

- **50-200 mcg/dose** q 5-10 minutes
  - Max 1000 mcg
  - 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 - 200 mcg/min;** titrate to MAP > 60 mm Hg.
  - To titrate, increase rate by 10 mcg/min every 2 minutes.
  - Maximum dose is 200 mcg/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:

- **5-20 mcg/kg/dose** every 10-15 minutes as needed

IV Infusion:

- **0.1-0.5 mcg/kg/minute**

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.

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

Antiemetic:
IV push over >1 minute

- **12.5 mg, not to exceed 25 mg**
  - May repeat 12.5mg once after 10 minutes if first dose ineffective
  - Subsequent dose of 25mg may be given every 4 hours
  - Can dilute with 10-20mL of NS

Sedation, analgesia/hypnotic adjunct:
IM, IV:

- **25-50 mg** in combination with analgesic or hypnotic (at reduced dosage)

Allergic conditions (including allergic reactions to blood or plasma):
IM, IV:

- **25 mg**, may repeat in 2 hours when necessary

PEDIATRIC Always Reference BROSELOW Tape

Antiemetic:
IM, IV:

- Children ≥2 years: **0.25 mg/kg** 4-6 times/day as needed (maximum: 12.5 mg/dose)

Preoperative analgesia/hypnotic adjunct:
IM, IV:

- Children ≥2 years: **1.1 mg/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 burn 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: • **1-2.5 mg/kg** every 5-10min PRN. **Maintenance of general anesthesia:** IV Infusion: • **10-75 mcg/kg/min** via infusion pump or Dial-a-Drip. Titrate to minimum effective dose. **(See infusion chart next page)** ○ MAX DOSE: 100 mcg/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. Note: Not preferred in Burn patients in the first 48-72 hrs	**Sedation/ RSI:** IV Push: • **1-2.5 mg/kg** every 5-10min PRN. **Maintenance of general anesthesia,** IV Infusion: Healthy children 2 months to 16 years: • **125-300 mcg/kg/minute** (or 7.5-18 mg/kg/hour)

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PROPOFOL (DIPRIVAN)						
Dosing Range: 10-75mcg/kg/min (600-3000mcg/kg/hr)						
MIX 500 mg/50 mL CONCENTRATION 10 mg/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	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 500 mg/50 mL CONCENTRATION 10 mg/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	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: 1-2 minutes (can be fast with higher doses and/or faster pushes), Duration: approximately 25-40 minutes (increases with higher doses)

Indications

Labeled Indications: Rapid Sequence Intubation/Paralysis and routine endotracheal intubation, facilitates mechanical ventilation in ICU patients

Contraindications

- Hypersensitivity (e.g., 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 (e.g., acetylcholinesterase inhibitors) or potentiate (e.g., 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 **0.6-1.2 mg/kg**) **Note:** In adult patients with morbid obesity (BMI >40 kg/m2), use dose of 1.2 mg/kg using ideal body weight (IBW) **Maintenance dosing:** (unlabeled and unreferenced dose) IV Push: • **1 mg/kg IV/IO q30-45min** PRN or 8-12 mcg/kg/min IV/IO (Dosing ranges from **0.6-1.2 mg/kg**)	**RSI:** IV: • **1mg/kg** (Dosing ranges from **0.6 - 1.2 mg/kg**.) **Maintenance bolus dosing:** (unlabeled and unreferenced dose) IV Push: • **1 mg/kg every 30-45 minutes** (Dosing ranges from **0.6 - 1.2 mg/kg**.)

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 0.5 mEq/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

RSI/ Neuromuscular blockade:

IV:

- **1-1.5 mg/kg**

Note: Pretreatment with 10% dosage of non-depolarizing agents prior to neuromuscular-blockade with Succinylcholine is **NO LONGER ADVISED**

Dose and Administration: PEDIATRIC Always Reference BROSELOW Tape

RSII / Neuromuscular blockade:

IV:

- <10kg:
    - Initial: **1.5-2 mg/kg/dose**
- >10kg:
    - Initial: **1-1.5 mg/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 (TXA)

♀B, **Lactation: Yes** (Caution)

TradeName: **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 moderate or severe TBI or altered mental status associated with 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 timeframe is as soon as possible)**
- Hypersensitivity to tranexamic acid
- Non-traumatic 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

Trauma-associated hemorrhage (unlabeled use):

IV:

- Initial Dose: **2 grams of TXA** in 100 cc NS or LR via IV/IO Bolus, or 2 gram IV/IO push (1 gram over 1 minute per push) but **NOT** later than 3 hours after injury.
- If patient received **1 gram of TXA** prior and <3hrs from time of injury: **1-gram 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: **2 grams of TXA** in 100 cc NS or LR via IV/IO Bolus or 2 gram IV/IO push (1 gram over 1 minute push) but **NOT** later than 3 hours after start of suspected hemorrhage.

PEDIATRIC Always Reference BROSELOW Tape

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) ≥65 mmHg. 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>65 mmHg	**Hypotension / Shock:** Limited data available; efficacy results have varied. IV Infusion: • **0.17 to 8 milliunits/kg/minute (0.01 to 0.48 units/kg/hour)**

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 (e.g., acetylcholinesterase inhibitors) or potentiate (e.g., 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: **0.1 mg/kg** Dose range **(0.08-0.15 mg/kg)** • Maintenance: **0.1 mg/kg** Dose range **(0.08-0.15 mg/kg)** every 30-60 minutes PRN 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.	**RSI and maintenance of paralysis:** IV Push: • Induction: **0.1-0.15 mg/kg** • Intermittent bolus dosing: **0.1 mg/kg** every 30-60 minutes PRN IV Continuous infusion: • **1-2.5 mcg/kg/minute**

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