STAT MedEvac

Critical Care Protocols

Effective July 1, 2016
STAT MedEvac Critical Care Protocols

Approval Date: 06/06/2016

Effective Date: 7/01/2016

Medical Director:

President:
## INTRODUCTION

- Preamble
- Standard Abbreviations

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NOTES

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The STAT MedEvac protocols provide guidance and standing orders for the management of patients as part of prehospital and inter-facility transport.

Principles of the Critical Care Protocols

- These critical care protocols supplement the existing BLS and ALS protocols from the Pennsylvania Department of Health that have been adopted by STAT MedEvac. Where a conflict exists between BLS, ALS, and STAT MedEvac Critical Care protocols, these Critical Care protocols supersede other protocols.
- Standing orders are identified above the symbolic double line in each protocol. Interventions below the double line may be performed under order from a STAT MedEvac Medical Command Physician ("Medical Command").
- Relevant protocols should be followed as identified in this document. If during the course of care a medical crew member believes that a protocol does not apply to a patient or alternate care that deviates from a protocol should be provided, Medical Command should be contacted for alternate orders.
- Deviations from these protocols performed without a Medical Command order must be documented in an incident report to facilitate review and quality improvement.
- If Medical Command cannot be contacted, orders below the double line in individual protocols provide recommendations for continued care. Medical crews may provide care consistent with those additional orders and continue making attempts to contact a Medical Command Physician as soon as possible.
- If orders are provided by outside physicians, medical crews should contact Medical Command for further guidance and to receive specific orders for patient care, except as outlined in Protocol CC904 (Physician Crew Members & Observers).

Principles of Patient Care

- Unless otherwise defined and for the purposes of patient care, patient ages are defined as:
  - Adult – Age ≥15 years
  - Pediatric – Age ≤14 years
- Medication infusions that can be initiated under standing orders within individual protocols and are already infusing at a referring facility may be continued if within the parameters of the protocol (above the double line). Medical Command should be contacted if indicated in the protocol (e.g. order is below the double line) or if administration of the infusion is not within the parameters of the protocol.
- Medications should not be administered if a patient has a relevant allergy, if contraindicated by patient condition, or if outside the parameters provided in these protocols or by Medical Command order.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
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<td>Abdominal aortic aneurysm</td>
</tr>
<tr>
<td>ABG</td>
<td>Arterial blood gas</td>
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<tr>
<td>Afib</td>
<td>Atrial fibrillation</td>
</tr>
<tr>
<td>AGH</td>
<td>Allegheny General Hospital</td>
</tr>
<tr>
<td>AICD</td>
<td>Automatic implantable cardioverter-defibrillator</td>
</tr>
<tr>
<td>ATV</td>
<td>All-terrain vehicle</td>
</tr>
<tr>
<td>BiVAD</td>
<td>Biventricular assist device</td>
</tr>
<tr>
<td>BP</td>
<td>Blood pressure</td>
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<td>BVM</td>
<td>Bag valve mask</td>
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<tr>
<td>C</td>
<td>Celsius</td>
</tr>
<tr>
<td>CABG</td>
<td>Coronary artery bypass graft</td>
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<tr>
<td>CHF</td>
<td>Congestive heart failure</td>
</tr>
<tr>
<td>CHP</td>
<td>Children's Hospital of Pittsburgh</td>
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<tr>
<td>CID</td>
<td>Cervical immobilization device</td>
</tr>
<tr>
<td>cm</td>
<td>Centimeter</td>
</tr>
<tr>
<td>CNMC</td>
<td>Children's National Medical Center</td>
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<td>COPD</td>
<td>Chronic obstructive pulmonary disease</td>
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<td>CPAP</td>
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<td>CPR</td>
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<td>D5W</td>
<td>Dextrose 5% in water</td>
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<td>DNR</td>
<td>Do not resuscitate</td>
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<td>ECMO</td>
<td>Extracorporeal membrane oxygenation</td>
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<td>ED</td>
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<td>ECG/EKG</td>
<td>Electrocardiogram</td>
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<td>EMS</td>
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<tr>
<td>ETA</td>
<td>Estimated time of arrival</td>
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<td>ETCO₂</td>
<td>End-tidal carbon dioxide</td>
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<td>Ethyl alcohol</td>
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<td>Endotracheal tube</td>
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<td>FHR</td>
<td>Fetal heart rate</td>
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<tr>
<td>FiO₂</td>
<td>Fractional inspired oxygen concentration</td>
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<tr>
<td>GCS</td>
<td>Glasgow coma score/scale</td>
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<td>G or gm</td>
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<td>IDDM</td>
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<td>IM</td>
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<td>JVD</td>
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<tr>
<td>kg</td>
<td>Kilogram</td>
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<tr>
<td>LBB</td>
<td>Long backboard</td>
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<tr>
<td>LR</td>
<td>Lactated ringers</td>
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<td>LVAD</td>
<td>Left ventricular assist device</td>
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<td>Carbon dioxide pressure</td>
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<td>PEEP</td>
<td>Positive and end pressure</td>
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<tr>
<td>PIP</td>
<td>Peak inspiratory pressure</td>
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<tr>
<td>PRBC</td>
<td>Packed red blood cells</td>
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<td>PROM</td>
<td>Premature rupture of membranes</td>
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<td>PTA</td>
<td>Prior to arrival</td>
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<tr>
<td>PVC</td>
<td>Premature ventricular contraction</td>
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<td>Oxygen saturation</td>
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<td>WVU</td>
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PATIENT ASSESSMENT AND GENERAL CARE

Criteria:
A. All Patients.

Exclusion Criteria:
A. None.

Procedure:
A. Safety
1. Evaluate scene safety. Refer to BLS Protocol 102 (Scene Safety Guidelines).
2. Utilize appropriate Body Substance Isolation / Universal Precautions. Refer to BLS Protocol 103 (Infection Control / Body Substance Isolation).

B. Patient Assessment
1. Perform initial assessment. If trauma patient, refer to Protocol CC602 (Trauma Assessment).
2. Assess and document vital signs at least every 5 minutes from initiation of care to transfer of care at the receiving facility. Contact the Medical Director on Call (MDOC) after transport for any alteration in frequency of vital signs documentation.
3. Blood pressure may be assessed using the automated blood pressure cuff with the monitor. If the automated blood pressure cuff is inoperable or the monitor appears to be obtaining inaccurate readings, obtain manual blood pressure readings.

C. Airway Management
1. Ensure an open airway. If patient is unable to maintain a patent airway, refer to Protocol CC401 (Airway Management).
2. On scene advanced airway management must be performed by a STAT MedEvac medical crew member and not delegated to ground EMS provider.

D. Medication Administration
1. All medications provided by STAT MedEvac must be administered by a STAT MedEvac medical crew member. Medication doses and concentrations should be verified with a STAT MedEvac medical crew member prior to administration.
2. Unless otherwise specified, doses of bolus weight-based medications (e.g. mg/kg) for patients over 50 kg may be calculated to the closest 5 kg of the patient’s weight.

E. Other Patient Care
1. Wrist restraints must be placed on all patients with an advanced airway and placement documented (including neurovascular status of upper extremities) every 15 minutes.
2. Pediatric patients with weight 4.5 kg to 18 kg must be secured to the stretcher for transport using a Pedi-Mate or pediatric immobilization device. If patient weighs <4.5 kg:
   a) Scene Transport: Secure patient to stretcher using a Pedi-Mate or pediatric immobilization device and pad voids with towels, sheets, or blankets.
   b) Interfacility Transfer: Perform 3-way consultation with Medical Director on Call (MDOC) and Clinical Director on Call to determine best method of transporting the patient and whether additional resources should be utilized.
3. If patient is on a continuous home infusion device or other home medical equipment, contact Medical Director on Call (MDOC).

F. Interfacility Transfers
1. If bedside time is >45 minutes, contact Medical Command to discuss patient care plan.
2. If there is a delay in departing the bedside >30 minutes due to lack of acceptance or bed availability at the receiving facility, contact the Medical Director on Call (MDOC).

3. If CT or MRI imaging was performed at the referring facility, ensure an electronic copy of the imaging is taken to the receiving facility with the patient. If obtaining a copy of imaging will delay transport by >15 minutes, contact the Medical Director on Call (MDOC).

G. Continuity of Care

1. STAT MedEvac medical crew personnel will accept care from a referring facility or agency once a verbal report has been received.

2. The STAT MedEvac medical crew will continue to provide care for that patient at the same level or higher for the duration of the transport.

3. At no time during the transport will the STAT MedEvac medical crew relinquish care to any other provider unless directed by the Medical Director on Call (MDOC).
   a) Care will be rendered by the STAT MedEvac medical crew from the bedside of the referring facility or agency until a full verbal report is provided to the nursing staff at the bedside of the referring facility.
   b) If it is determined that ground transport from a scene is appropriate, the STAT MedEvac crew should continue providing care with the EMS agency during transport to the hospital.

4. Transportation of patients between facilities will be in compliance with federal regulations, including EMTALA.
   a) Ensure medical stability of the patient for transport. If this is in question, contact Medical Command.
   b) Ensure availability of the receiving institution to accept the patient for admission.
   c) Ensure availability of appropriate medical services at the receiving facility.

5. If there is a question regarding the transfer of care to an individual or team other than the designated receiving facility, contact the Medical Director on Call (MDOC).

Performance Parameters:
A. Appropriate use of universal precautions.
B. Appropriate vital signs assessment and documentation.
C. Appropriate verification and administration of medications.
D. Airway management by STAT MedEvac personnel.
E. Appropriate Medical Command contact.
F. Appropriate continuity of care.
OXYGEN ADMINISTRATION

Criteria:
Patient meets all of the following criteria:
A. Patient protecting his/her airway.
B. Does not meet criteria for additional airway control.

Exclusion Criteria:
A. Patient not protecting his/her own airway.
B. Adult patient with respiratory rate <10 or >32 breaths per minute.
C. Pediatric patient with apnea or irregular respirations.
If exclusion criteria are met, refer to Protocol CC401 (Airway Management).

Procedure:
1. If patient has oxygen saturation of <95% or symptoms of respiratory distress:
   a. Administer oxygen via nasal cannula at 2-6 lpm to maintain oxygen saturation ≥95% and relieve respiratory distress.
   b. If oxygen saturation remains <95% or there is continued respiratory distress, apply non-rebreather face mask with oxygen at 15 lpm.
2. If patient has anemia (Hgb <10 g/dl), acute blood loss, carbon monoxide poisoning, or is in active labor, administer a minimum oxygen of 4 lpm by nasal cannula.
3. If unable to assess oxygen saturation, apply non-rebreather face mask with oxygen at 15 lpm and contact Medical Command.
4. If oxygen saturation remains <95% after above interventions, reassess clinical presentation and/or mechanical impairment and refer to appropriate protocol.
5. If oxygen saturation remains <90%, refer to Protocol CC401 (Airway Management).

Performance Parameters:
A. Oxygen use on all appropriate patients.
B. Maintaining oxygen saturation ≥95%.
C. Use of airway protocol in timely manner for saturation ≤90%.
VASCULAR ACCESS AND FLUID ADMINISTRATION

Criteria:
A. Requirement or potential requirement for IV/IO medications, fluid resuscitation, or hydration maintenance (i.e., all advanced life support or critical care patients).

Exclusion Criteria:
A. None.

Procedure:
1. Establish intravenous access in all patients as follows:
   a. Peripheral vein or external jugular vein - two (2) attempts per crew member. If external jugular vein is used on trauma patient, maintain inline cervical spine immobilization.
   b. Internal Jugular, Subclavian, Femoral - may be performed by Flight Physician.
2. If unable to establish IV access and patient is in extremis or has potential for serious decompensation, establish intraosseous access or central venous access (physician only). In a peri-arrest or cardiac arrest patient, intraosseous access may be established as the primary vascular route.
3. Intraosseous line placement:
   a. Appropriate sites:

<table>
<thead>
<tr>
<th></th>
<th>Proximal Humerus</th>
<th>Proximal Tibia</th>
<th>Distal Tibia</th>
<th>Distal Femur</th>
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<tbody>
<tr>
<td>Adult</td>
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b. Sizing of IO needles:
   1) 45 mm (Yellow): For patients ≥40 kg (proximal tibia) or ≥20 kg (proximal humerus).
   2) 25 mm (Blue): For patients ≥3 kg
   3) 15 mm (Red): For patients 3 kg – 39 kg
   *Ensure that after inserting needle through skin and contacting bone, a black 5 mm mark must be visible prior to entering bone. If not, use a larger needle.

c. If using the humeral site, the arm should be secured to the body to limit motion of the humerus.
d. If patient weighs <10 kg, IO needle should be inserted by hand (not drill) to avoid penetrating the posterior of the bone.
e. If patient is responsive to painful stimuli and not in extremis, slowly administer 2% lidocaine (preservative-free / cardiac) over 2 minutes:
   1) Adult: **40 mg (2 ml) 2% Lidocaine.**
   2) Pediatric: **0.5 mg/kg (0.025 ml/kg) 2% Lidocaine** (maximum dose 40 mg).
   After 60 seconds, flush site with 10 ml NSS, then administer ½ dose above over 60 seconds before using site for infusion or medication administration.
f. A pressure bag should be used with any infusions through an intraosseous line and for any fluid bolus.
4. If unable to establish IV access and patient is not in extremis or is not thought to likely experience serious decompensation, contact Medical Command.
5. If needed for patient monitoring. Flight Physician may establish a radial or femoral arterial line. This may include the following situations:
   a. Intra-aortic balloon pump use as alternate trigger.
   b. Monitoring during administration of vasoactive infusions.
   c. Inability to obtain accurate blood pressure readings with noninvasive blood pressure device (automated or manual).
6. If patient is not already on a maintenance infusion of IV/IO fluids:
   a. Adult: Administer **NSS 100 ml/hr**.
   b. Pediatric: Administer maintenance IV/IO fluids as below (maximum rate: 100 ml/hr).
      - **NSS 4 ml/kg/hr** (for first 10 kg)
      - **NSS 2 ml/kg/hr** (for kg 10-20)
      - **NSS 1 ml/kg/hr** (for each kg over 20)
7. If patient is already on a maintenance infusion of IV/IO fluids (LR, NSS, D5LR, D5NS, or D5½NS [any with up to 40 mEq KCl per 1000 ml fluid])
   a. Adult: If running at ≤200 ml/hr, continue as previously ordered. If maintenance fluids are running at greater than 200 ml/hr, contact Medical Command.
   b. Pediatric: If referring maintenance fluids are consistent with calculated maintenance fluids as above, continue as previously ordered. If not, contact Medical Command.
8. All maintenance fluids containing potassium or being administered to pediatric patients must be administered by an infusion pump.
9. Administration of vasoconstricting infusions (e.g. dopamine, epinephrine, norepinephrine, phenylephrine) may be performed through a peripheral IV, but if available should preferentially be delivered through the following sites in order:
   a. Central line
   b. Intraosseous line
   c. External Jugular IV
   d. Peripheral above the wrist – Most proximal site preferred
   e. Peripheral IV at or below wrist – Should be used as site of last resort; if possible, establish a more proximal IV site if a peripheral IV at or below the wrist is the only available site.
10. When checking a point of care blood test from an existing line (e.g. blood glucose or lactate), waste 5 ml (adult) or 3 ml (pediatric) of blood before drawing the test sample.

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**Performance Parameters:**

A. Use of peripheral vein or external jugular vein for IV placement.
B. Use of central line for IV placement.
C. Use of intraosseous route for patient with potential for serious decompensation.
D. Appropriate administration of maintenance IV/IO fluids.
ADMINISTRATION OF BLOOD PRODUCTS

Criteria:
A. Administration of blood products is indicated by STAT MedEvac protocol or by Medical Command order. Refer to protocols:
   1. CC503 (Aortic Emergencies – Adult)
   2. CC611 (Head Injury)
   3. CC705A-1 (Hypovolemic Shock – Adult).
   4. CC705A-2 (Distributive Shock – Adult).
   5. CC705A-3 (Cardiogenic Shock – Adult).
   6. CC705A-4 (Obstructive Shock – Adult).
   7. CC705P (Shock – Pediatric).
   8. CC708 (Non-Traumatic Intracranial Hemorrhage – Adult)

Exclusion Criteria:
A. Blunt traumatic cardiac arrest patient.

Procedure:
A. Adult Patients
   1. Administer Type O Packed Red Blood Cells as per standing orders in other STAT MedEvac protocols or Medical Command order via large bore IVs.
      a. If Type O Packed Red Blood Cells are not available, administer type-compatible blood as per Red Blood Cell Compatibility Chart below. If no type-compatible blood is available or patient blood type is unknown, contact Medical Command before administering blood.
      b. If patient is female, Rh negative blood is preferred. If only Rh positive blood is available, contact Medical Command.
   2. Consult Medical Command in all cases of blood product administration. If indicated per other protocols, Packed Red Blood Cells transfusion may be started prior to consult.
   3. Monitor patient for signs and symptoms of transfusion reaction every 15 minutes.
   4. Document the presence or absence of a transfusion reaction for each unit of blood product administered.
   5. If symptoms of transfusion reaction are present:
      a. STOP the blood products.
      b. Administer Methylprednisolone (Solu-Medrol) 125 mg IV/IO and Diphenhydramine (Benadryl) 50 mg IV/IO.
      c. Contact Medical Command immediately.
      d. Save the blood product bags and leave with the receiving facility staff.
   6. For patients receiving 5 or more units of any blood product over 1 hour or who are receiving blood product transfusion and have hypocalcemia, contact Medical Command regarding possible administration of Calcium Chloride.

7. Medical Command may order Fresh Frozen Plasma as outlined in other STAT MedEvac protocols. Refer to Plasma Compatibility Chart below. If no type-compatible plasma is available, contact Medical Command before administering plasma.
   a. Type A low titer B may be used in place of type AB plasma.
b. If patient is female, Rh negative plasma is preferred. If only Rh positive plasma is available, contact Medical Command.

8. After initial two units of Packed Red Blood Cells are transfused, contact Medical Command prior to any additional transfusions.

9. For patients acutely receiving 5 or more units of blood products over 1 hour, or who are receiving blood transfusion and have hypocalcemia, Medical Command may order **Calcium Chloride 1 gram IV/IO** through a widely patent IV or IO.

**B. Pediatric Patients**

1. Contact Medical Command for any blood product administration.

2. Administer Type O Packed Red Blood Cells as Medical Command order.
   a. If Type O Packed Red Blood Cells are not available, administer type-compatible blood as per Red Blood Cell Compatibility Chart below. If no type-compatible blood is available or patient blood type is unknown, contact Medical Command before administering blood.
   b. If patient is a female, Rh negative blood is preferred.

3. Orders may include administration of **10 ml/kg Packed Red Blood Cells IV**. Use a syringe and stopcock in-line with tubing to draw the blood from the bag and administer.

4. Monitor patient for signs and symptoms of transfusion reaction. If symptoms of transfusion reaction are present, STOP the blood products and contact Medical Command.

**Notes:**

A. All blood products should preferentially be administered via large bore (≥18 gauge) IVs or central venous lines when available. If unable to establish any IV access, blood products may be administered via IO.

B. Signs of a transfusion reaction include (contact Medical Command if any are present):
   1. Fever
   2. Hypotension
   3. Hives
   4. Dyspnea or wheezing
   5. Tachycardia
   6. Rigors
   7. Abdominal pain, nausea, vomiting, or diarrhea

**Performance Parameters:**

A. Appropriate use of blood products per relevant protocol or Medical Command order.

B. Assessment for and management of a transfusion reaction.

C. Avoiding use of packed red blood cells on the blunt traumatic cardiac arrest patient.
### Red Blood Cell Compatibility Chart

<table>
<thead>
<tr>
<th>Patient’s Blood Type</th>
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### Plasma Compatibility Chart

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</table>
SPINAL CARE

Criteria:
A. Patients with the potential for a spinal injury, including patients with the following symptoms or mechanisms of injury:
   1. Symptoms of:
      a. Neck or back pain
      b. Extremity (upper or lower) weakness or numbness, even if symptoms have resolved.
   2. Mechanism of injury consistent with possible spinal injury, including:
      a. Any fall from standing or sitting with evidence of striking head.
      b. Any fall from a height (above ground level).
      c. Any motor vehicle collision.
      d. Any trauma where victim was thrown (e.g. pedestrian accident or explosion).
      e. Any lightning or high voltage electrical injury.
      f. Any injury sustained while swimming/diving or near drowning where diving may have been involved.
      g. Any unknown or possible mechanism of injury when the history from patient or bystanders does not exclude the possibility of a spine injury.

Exclusion Criteria:
A. No history or no mechanism of injury that would be consistent with spinal injury.
B. Patients with penetrating trauma to the chest, abdomen, head, neck, or back.
C. Patients with non-traumatic back or neck pain related to movement, position or heavy lifting.

Procedure:
1. For scene transports: Refer to BLS Protocol 261 (Spinal Care).
2. For interfacility transports:
   a) If patient is already receiving spinal motion restriction with cervical collar, cervical immobilization device, and long back board, transport with this equipment in place.
   b) If patient has been diagnosed with a spinal fracture / spinal cord injury or has motor/sensory deficit, perform spinal motion restriction with cervical collar, cervical immobilization device, and long back board.
   c) If patient has not been diagnosed with a spinal fracture/spinal cord injury, has no motor/sensory deficit, and is not already on a long back board, place a cervical collar and maintain spinal motion restriction by laying supine, log roll maintaining in-line stability of spine when moving, and secure to stretcher in usual fashion.
3. For any patient for whom spinal motion restriction is indicated but where it may adversely impact the patient’s condition, contact Medical Command.

Performance Parameters:
A. Appropriate application of BLS Protocol 261 (Spinal Care).
B. Appropriate immobilization of patients undergoing interfacility transport.
CROUP/STRIDOR/UPPER AIRWAY DISEASE – PEDIATRIC

Criteria:
A. A pediatric patient with signs and symptoms of stridor and cough from upper respiratory disease.
B. Symptoms/signs may include:
   1. Stridor
   2. Barking cough
   3. Drooling
   4. Unusual position of comfort (sniffing position, torticollis)

May have signs of respiratory infection (e.g. fever, nasal congestion, cough, sore throat)

Exclusion Criteria:
A. Suspected foreign body obstructing airway - Refer to ALS Protocol 3001 (Airway Obstruction).

Procedure:
A. Refer to ALS Protocol 4023P (Croup/Stridor/Upper Airway Disease – Pediatric).
B. Additional/Preferred Procedures:
   1. Maintain calm, reassuring manner.
   2. Avoid noxious stimuli (i.e., invasive tests or IV).
   4. Administer high flow oxygen/cool mist via blow by.
   5. Keep warm.
   6. Administer Racemic Epinephrine aerosol 0.5 ml 2.25% solution (diluted in 3 ml NSS) inhaled; may repeat every 15 minutes if improvement noted.
   7. Allow child to assume position of comfort and do not restrain.
   8. Transport parent with child (if possible). Ensure that both patient and parent are separately and properly restrained.
   9. If patient becomes unconscious or respiratory failure ensues, go immediately to Protocol CC401 (Airway Management).
   10. Contact Medical Command for possible administration of steroids.

Medical Command may order steroids, including either:
   a. Dexamethasone (Decadron) 0.6 mg/kg IV/IO/PO (maximum dose 10 mg; may use IV preparation orally).
   b. Methylprednisolone (Solu-Medrol) 2 mg/kg IV/IO (maximum dose 125mg).

Performance Parameters:
A. Appropriate inclusion criteria documented.
B. Racemic Epinephrine use.
C. Need for intubation.
CARDIAC ARREST – TRAUMATIC

Criteria:
A. Patient in cardiac arrest from suspected traumatic cause.

Exclusion Criteria:
A. Patient that meets DOA criteria (including unwitnessed cardiac arrest of traumatic cause, decapitation, rigor mortis, etc.) – See BLS Protocol 322 (DOA) and Contact Medical Command.
B. Patient in cardiac arrest due to medical or non-traumatic causes – Refer to appropriate medical cardiac arrest protocol.

Procedure:
A. Refer to ALS Protocol 3032 (Cardiac Arrest – Traumatic).
B. Additional/Preferred Procedures:
   1. Perform airway management as per Protocol CC401 (Airway Management).
   2. Perform bilateral chest needle decompression for blunt trauma cardiac arrest or penetrating chest injury patients in cardiac arrest.
   3. Do not administer blood to the blunt trauma patient in cardiac arrest due to lack of benefit.
   4. Treat cardiac rhythm per appropriate protocol.
   5. Transport patient to closest appropriate facility by fastest possible means. Crew must contact Medical Command to change mode of transport or destination.
   6. Medical Command may order termination of resuscitative efforts.

Performance Parameters:
A. Airway management.
B. CPR performance.
C. Fluid resuscitation without using blood.
D. Needle decompression.
E. Destination selection.
POST-RESUSCITATION CARE – ADULT

Criteria:
A. Patient that has return of spontaneous circulation (ROSC) after cardiopulmonary arrest. This includes resuscitation after CPR by EMS personnel and after CPR by first responders/laypersons with or without AED use.

Exclusion Criteria:
A. Patient in cardiac arrest who does not sustain a pulse (ROSC) after resuscitation. Continue to follow appropriate cardiac arrest protocol (VF/VT, PEA/Asystole).
B. Patients with ROSC after cardiac arrest from trauma. Continue to follow appropriate trauma protocol(s).
C. Patients with ROSC and active or recent bleeding (including gastrointestinal bleeding). Contact Medical Command for post-resuscitation care orders.
D. Patient whose cardiac arrest was due to hypothermia. Follow ALS Protocol 6081 (Hypothermia).

Procedure:
A. Refer to ALS Protocol 3080 (Post-Resuscitation Care).
B. Additional/Preferred Procedures:
   1. If patient has an advanced airway, sedate the patient as per Protocol CC402 (Sedation for Patients with an Advanced Airway).
   2. Obtain initial temperature reading if available.
   3. If patient has GCS ≤8 or cannot follow commands:
      a. Place an esophageal (preferred) or rectal temperature probe. Assess and document core body temperature every 15 minutes.
      b. Contact Medical Command for consideration of Targeted Temperature Management.
   4. Obtain a venous lactate level during initial assessment if patient is not in extremis. If patient is in extremis, check immediately upon initiating transport. If lactate level is ≥4 mmol/L, address per the relevant shock protocol.
   5. Repeat lactate level every 60 minutes up to 4 times. If repeat lactate level is ≥4 mmol/L, contact Medical Command.
   6. If SBP is <110 mmHg, administer 250 ml NS and administer Norepinephrine (Levophed) 0.05-0.5 micrograms/kg/min. Parameters:
      a. Goal is SBP 110-140 mmHg and improvement in tissue perfusion.
      b. Titrate Norepinephrine (Levophed) by 0.05 micrograms/kg/min every 5-10 minutes to achieve goal SBP. If goal SBP is not reached at 0.1 micrograms/kg/min, contact Medical Command for consideration of additional vasopressor while continuing to titrate Norepinephrine (Levophed) up to 0.5 micrograms/kg/min.
      c. Contact Medical Command if there is development of ventricular dysrhythmia.
   7. If patient has SBP <70 mmHg or otherwise appears to be in a peri-arrest state, administer Epinephrine 100 micrograms IV/IO (1 ml of 1:10,000 Epinephrine administered through a wide open line of normal saline for dilution) while initiating or titrating vasopressor infusion(s). If SBP remains <70 mmHg, repeat every 2 minutes up to 4 doses. If patient requires more than 2 doses of bolus (push-dose) Epinephrine, contact Medical Command to discuss continued management of hypotension.
8. If patient is acidotic with pH <7.1, administer Sodium Bicarbonate 1 mEq/kg IV/IO and Sodium Bicarbonate infusion at 200 ml/hr IV/IO (150 mEq Sodium Bicarbonate in 1000 ml D5W).

9. If patient is known to have a hemoglobin <8 gm/dl, contact Medical Command for blood administration orders. If unable to contact Medical Command and patient continues to be hypotensive transfuse 2 units Packed Red Blood Cells IV. Refer to Protocol CC212 (Administration of Blood Products).

10. Medical Command may order initiation of Targeted Temperature Management with goal core body temperature of 36°C, including:
   a. Removing space blanket and any other coverings from the patient.
   b. Placing ice packs in the axillae and groin.
   c. Infusion of boluses of 500 ml of cold NS (maximum of 2 liters) if patient has presence of shock and no signs of pulmonary edema. Reassess patient’s volume status and response to fluid with each fluid bolus.
   * If core body temperature is <33°C during patient care, re-contact Medical Command.

11. Medical Command may order Vasopressin (Vasostrict) 0.04 units/min IV/IO. Dose is not titrated. This may be particularly useful when patient is acidotic (pH <7.1), as other vasopressors are ineffective in an acidic environment.

12. Medical Command may order Epinephrine 0.05-0.15 micrograms/kg/min. Titrate by 0.02 micrograms/kg/min every 5-10 minutes to achieve goal SBP 110-140 mmHg. If goal not reached at 0.15 micrograms/kg/min, re-contact Medical Command.

13. Medical Command may order administration of Dobutamine at 5-20 micrograms/kg/min to maintain SBP 110-140 mmHg. Titrate by 5 micrograms/kg/min every 5-10 minutes to obtain goal SBP.

14. If shivering occurs, Medical Command may order:
   a. Versed 2 mg IV/IO (adult) or 0.1 mg/kg (pediatric, maximum 2 mg per dose). May repeat as directed.
   b. If shivering continues, administer Vecuronium 0.1 mg/kg IV/IO.

Note:
A. For patients on interfacility transfers who are already receiving vasopressors listed above the medical consult line in this protocol, the medication may be continued based on the titration parameters listed above. For patients already receiving vasopressors listed below the medical consult line or absent from the protocol, contact Medical Command for continuation of the infusion or alternate therapy.

Performance Parameters:
A. Documentation of initial temperature.
B. Maintaining SBP 110-140 mmHg.
C. Providing adequate sedation.
D. Management of shivering.
AIRWAY MANAGEMENT

Criteria:
Patient meets any of the following criteria:
A. Any patient that requires airway management to assure adequate ventilation of a patent airway.
B. Oxygen saturation <90% (approximate PO$_2$ 58 mmHg) while receiving high flow oxygen.
C. Consider airway management in any patient meeting any of the following:
   1. Cardiac or respiratory arrest.
   2. Respiratory rate <10 or >32 breaths/min (Adult), irregular respirations or apnea (Pediatric).
   3. GCS < 8.
   4. No gag reflex.
   5. Partial airway obstruction from blood/secretions or trauma.
   6. PaCO$_2$ > 55 mmHg, unless in chronic respiratory failure.
   7. Severe inspiratory retractions and use of accessory muscles.

Exclusion Criteria:

Procedure:
A. Refer to pertinent BLS/ALS protocols:
   1. ALS Protocol 2032 (Confirmation of Airway Placement).
   2. ALS Protocol 4001 (Airway Management).
B. Additional/Preferred Procedures:
   1. For patients in cardiac arrest:
      a. If patient is not intubated:
         1) First 10 minutes of resuscitation: Open the airway, place an oropharyngeal or nasopharyngeal airway, and apply a nonrebreather mask at 100% oxygen. Alternately, a King airway may be placed followed by a ventilation rate of 8 breaths per minute, if this does not interfere with continuous chest compressions as per ALS Protocol 3031A (General Cardiac Arrest – Adult).
         2) After 10 minutes of resuscitation (if still in cardiac arrest and no advanced airway has been established): Proceed with advanced airway management as per procedure below.
      b. If patient is intubated and not on a ventilator, provide ventilations with bag-valve device and 100% oxygen once every 15 compressions, asynchronously with compressions.
      c. If patient is intubated and already on a ventilator at time of cardiac arrest, or the ventilator can feasibly be utilized, utilize ventilator during cardiac arrest management. Refer to Protocol CC404 (Mechanical Ventilation).
   ** If cardiac arrest is suspected to be due to hypoxia, focus should be on airway management in addition to continuous compressions and intubation may be performed immediately upon cardiac arrest. If endotracheal tube was in place at time of cardiac arrest, confirm appropriate placement as per procedure below.
   2. For patients not in cardiac arrest who require airway management:
      a. Preoxygenate patient using a nonrebreather mask or BVM with high-flow O$_2$ (use BVM in patients without adequate ventilatory function). Insert oral and/or nasal airway in any patient with a compromised airway. Contact Medical Command prior to placement of nasal airway in a conscious child.
b. If patient is in shock with SBP <70 or peri-arrest state, first address perfusion while preparing for airway management. Refer to relevant shock protocols.

c. If airway is presumed to be difficult and patient is >12 kg, consider primary use of the King LTS-D Airway. In the case of upper airway obstruction, seek anesthesia/ENT assistance, if available, before proceeding and contact Medical Command.

d. Apneic Oxygenation: Apply a nasal cannula at 15 L/min O₂ until completion of advanced airway placement.
   1) In patients who are conscious, turn on nasal cannula oxygen source after RSI medication administration.
   2) Exclusion Criteria: Cardiac arrest, active epistaxis, or nasal obstruction.

e. Sedation:
   1) For general medical and trauma patients (excluding patients with hydrocephalus, ventriculo-peritoneal [VP] shunt, or open globe injury): Administer Ketamine (Ketalar) 2mg/kg IV/IO (maximum dose 200 mg)
   2) For patients with hydrocephalus, VP shunt, or open globe injury: Administer Etomidate (Amidate) 0.3 mg/kg IV/IO (maximum dose 30 mg).
   3) If patient is hypotensive, provide sedation and address blood pressure per the appropriate shock protocol.

f. Paralysis: Administer Rocuronium (Zemuron) 1 mg/kg IV/IO (maximum dose 100 mg).

g. Perform endotracheal intubation or placement of a supraglottic airway:
   1) Ventilate with high-flow O₂ using BVM ventilation.
   2) Turn on high-flow O₂ via nasal cannula if not already on (for apneic oxygenation).
   3) Have one size smaller and one size larger ETT ready for use. Select cuffed tube size for pediatric patients based on: (Age/4)+3 cuffed or (Age/4)+4 uncuffed.
   4) If a STAT MedEvac videolaryngoscope is available, this must be used as the primary airway method and must be recorded whenever possible.
   5) If upper airway obstruction: Attempt intubation with an ETT one size smaller than normally appropriate.
   6) Intubate or place supraglottic airway after muscular relaxation. If no jaw relaxation or decreased resistance to ventilation within 2 minutes, ensure patency of vascular access. Repeat Rocuronium (Zemuron) 1 mg/kg IV/IO (maximum dose 100 mg).
   7) Insert to appropriate ETT depth (e.g., internal diameter X 3; 10 + age in years [Pediatric]).
   8) If successful, confirm ETT placement (see below).

h. Remove nasal cannula: After confirmation of advanced airway placement, turn off oxygen and remove nasal cannula prior to securing advanced airway.

3. Patient preparation for intubation:
   a. Perform oral suctioning before laryngoscopy whenever possible.
   b. If patient does not require spinal motion restriction, raise the head of the bed 15-30 degrees for intubation.
   c. If patient requires spinal motion restriction:
      1) Use 15-30 degrees of reverse Trendelenburg if possible.
      2) Maintain manual stabilization and remove cervical collar during intubation procedure, then replace cervical collar.

4. Guidelines for intubation attempts:
   a. Maximum 3 attempts at intubation (NO more than 2 attempts per crew member). If unable to intubate, access anesthesia or emergency physician assistance (if interfacility
transport). If the intubation is difficult and patient is >12 kg, consider using the King LTS-D airway prior to the 3rd intubation attempt.

b. If unsuccessful with intubation and patient is >12 kg, insert the King LTS-D airway.

1) If unsuccessful with King LTS-D placement (inability to ventilate or maintain O₂ saturations >90%) or for patients with contraindications to insertion of the King LTS-D airway (e.g. complete obstruction or caustic ingestion):
   a) Consider using a different sized King LTS-D airway if unable to establish an appropriate seal due to airway size.
   b) Patients ≥8 years or ≥25 kg: Perform cricothyroidotomy.
   c) Patients <8 years or <25 kg: Perform bag valve mask ventilation with high flow oxygen and contact Medical Command.

c. If unsuccessful with intubation and patient is <12 kg, perform bag valve mask ventilation with high flow oxygen and contact Medical Command.

5. ETT and King LTS-D (or other supraglottic airway device) confirmation:
   a. Required for all patients with advanced airways, including patients with advanced airways placed prior to crew arrival.
   b. Confirm tube placement by the absence of sounds over the epigastrium, auscultation of breath sounds in axillae and anterior chest, and continuous waveform end-tidal CO₂ monitor.
   c. In case of continuous end-tidal CO₂ monitor failure: Use colorimetric end-tidal CO₂ detector, observing for color change after 5 ventilations.

6. After advanced airway placement:
   a. Place all patients on ventilator. Refer to Protocol CC404 (Mechanical Ventilation) or consult Medical Command for ventilator settings for pediatric patient.
   b. Refer to Protocol CC402 (Sedation for Patients with an Advanced Airway) and Protocol CC403 (Paralysis for Patients with an Advanced Airway). Continuously assess patient for adequate sedation.
   c. Continuously monitor ETCO₂.
   d. Confirm proper endotracheal tube position after each patient transfer.
   e. Secure advanced airway with a commercial device as follows:
      1) For patients ≥5 kg, use a Thomas Tube Holder.
      2) For patients <5 kg, use a Neobar. Maintain manual stabilization of airway and head during any patient movement.
      3) If the appropriate device as above cannot be used, contact the Medical Director on Call (MDOC).
   f. In patients without spinal motion restriction, keep head of the bed elevated 15-30 degrees if possible.

7. If oxygen saturation remains <95% after intubation (e.g. CHF, pneumothorax, mechanical failure): troubleshoot using the hypoxia checklist (Appendix E) and treat appropriately.

8. Gastric tube placement (orogastric or nasogastric tube):
   a. If orotracheal tube has been placed, consider inserting a gastric tube and apply intermittent low suction.
   b. If a King LTS-D has been placed, insert a gastric tube through the gastric port and apply intermittent low suction.

Notes:
A. Contraindications to Ketamine: Patient with hydrocephalus, VP shunt, or open globe injury.

Effective 07/01/2016
B. If intubation is unsuccessful in patients ≥8 years or ≥25 kg, cricothyroidotomy may be performed immediately when anatomic or situation circumstances are poor for the use of the King LTS-D.
C. Consider bimanual laryngoscopy to bring the cords into view.
D. Intubation Preparation:

```
Intubation Preparation
Nasal Cannula
Second Oxygen Source
BVM and O₂ On
Suction On and Functioning
Functional IV
Pulse Ox and ECG Monitor
10ml Syringe
Tube(s)
Cuff Check
Stylet
Blade(s)
Handle
Light
Confirmation Device
Commercial Tube Holder
Back-Up Plan
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E. RSI Medication Dosing:

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<td>0.3mg/kg</td>
<td>1.5mg</td>
<td>3mg</td>
<td>4.5mg</td>
<td>6mg</td>
<td>7.5mg</td>
<td>9mg</td>
<td>10.5mg</td>
<td>12mg</td>
<td>13.5mg</td>
</tr>
<tr>
<td>Ketamine</td>
<td>2mg/kg</td>
<td>10mg</td>
<td>20 mg</td>
<td>30mg</td>
<td>40mg</td>
<td>50mg</td>
<td>60mg</td>
<td>70mg</td>
<td>80mg</td>
<td>90mg</td>
</tr>
<tr>
<td>Rocuronium</td>
<td>1mg/kg</td>
<td>5mg</td>
<td>10mg</td>
<td>15mg</td>
<td>20mg</td>
<td>25mg</td>
<td>30mg</td>
<td>35mg</td>
<td>40mg</td>
<td>45mg</td>
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<tr>
<td>Vecuronium</td>
<td>0.1mg/kg</td>
<td>0.5mg</td>
<td>1 mg</td>
<td>1.5mg</td>
<td>2 mg</td>
<td>2.5mg</td>
<td>3 mg</td>
<td>3.5mg</td>
<td>4 mg</td>
<td>4.5mg</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dose (IV)</th>
<th>50 kg</th>
<th>60 kg</th>
<th>70 kg</th>
<th>80 kg</th>
<th>90 kg</th>
<th>100 kg</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Etomidate</td>
<td>0.3 mg/kg</td>
<td>15 mg</td>
<td>18 mg</td>
<td>21 mg</td>
<td>24 mg</td>
<td>27 mg</td>
<td>30 mg</td>
<td>30 mg</td>
</tr>
<tr>
<td>Ketamine</td>
<td>2 mg/kg</td>
<td>100 mg</td>
<td>120 mg</td>
<td>140 mg</td>
<td>160 mg</td>
<td>180 mg</td>
<td>200 mg</td>
<td>200 mg</td>
</tr>
<tr>
<td>Rocuronium</td>
<td>1 mg/kg</td>
<td>50 mg</td>
<td>60 mg</td>
<td>70 mg</td>
<td>80 mg</td>
<td>90 mg</td>
<td>100 mg</td>
<td>100 mg</td>
</tr>
<tr>
<td>Vecuronium</td>
<td>0.1 mg/kg</td>
<td>5 mg</td>
<td>6 mg</td>
<td>7 mg</td>
<td>8 mg</td>
<td>9 mg</td>
<td>10 mg</td>
<td>10 mg</td>
</tr>
</tbody>
</table>
```
F. Difficult Airway Algorithm:

Performance Parameters:

A. Appropriate application of protocol in a timely manner.
B. RSI medication dosages correct.
C. Confirmation techniques utilized after intubation and with each move.
D. Appropriate performance of cricothyroidotomy.
E. Appropriate King LTS-D use.
SEDATION FOR PATIENTS WITH AN ADVANCED AIRWAY

Criteria:
A. All patients with an advanced airway (e.g. endotracheal tube, supraglottic airway).

Exclusion Criteria:
A. Patients who are hemodynamically unstable (Adult – SBP < 100 mmHg; Pediatric – SBP < 70 + [2 x age] mmHg). Contact Medical Command for further orders.

Procedure:
1. All patients should receive ongoing assessment and documentation of sedation using the Richmond Agitation Sedation Scale (RASS) at least every 10 minutes (see below). Goal for adequate sedation is a RASS Score of -4.
2. For patients who are not already receiving a sedative infusion (e.g. Propofol or benzodiazepine infusion), including newly intubated patients:
   a. For general medical and trauma patients (excluding patients with hydrocephalus, ventriculo-peritoneal [VP] shunt, or open globe injury):
      1) Administer Ketamine (Ketalar) 2 mg/kg IV/IO (maximum dose 200 mg).
      2) Begin an infusion of Ketamine (Ketalar) 2 mg/kg/hr IV/IO. Titrate by 1 mg/kg/hr every 10 minutes up to 4 mg/kg/hr as needed for sedation.
      3) If additional sedation or pain control is needed (including during titration of Ketamine) and SBP ≥100 mmHg (Adult) or ≥70 + [2 x age] mmHg (Pediatric), Fentanyl 1 microgram/kg IV/IO (maximum dose 100 micrograms) may be administered and repeated in 10 minutes (maximum of 2 total doses).
   b. For patients with patients with hydrocephalus, VP shunt, or open globe injury and if SBP is above ≥100 mmHg (Adult) or ≥70 + [2 x age] mmHg (Pediatric):
      1) Administer Midazolam (Versed) 0.1 mg/kg IV/IO (maximum 2 mg) and Fentanyl 1 microgram/kg IV/IO (maximum dose 100 micrograms).
      2) If SBP ≥100 mmHg and additional sedation or pain control is needed:
         a) Repeat Fentanyl 1 microgram/kg IV/IO (maximum dose 100 micrograms) every 10 minutes as needed (maximum of 4 total doses).
         b) May repeat Versed 0.1 mg/kg IV/IO (maximum dose 2 mg) in 10 minutes (maximum of 2 total doses).
         c) If patient has received a nondepolarizing paralytic (e.g. Rocuronium or Vecuronium), remains paralyzed 10 minutes after first dose of sedation, and has SBP ≥100 mmHg, administer the second dose of Fentanyl and Versed for continued sedation based on the dosing parameters above. Administer additional sedation as above as needed for continued sedation.
   c. If additional sedation or analgesia is needed contact Medical Command.
3. For interfacility transfers of patients who are already receiving or have been ordered by the referring physician to receive Propofol (Diprivan), administer this infusion and titrate to achieve adequate sedation (contact Medical Command if infusion is outside of the following parameters):
   a. Dosing Range: 10-50 micrograms/kg/min. Titrte by 10 micrograms/kg/min increments every 10 minutes to attain adequate sedation.
   b. SBP must be ≥100 mmHg (Adult) or ≥70 + [2 x age] mmHg (Pediatric). If SBP is below this, decrease Propofol to ½ existing dose and contact Medical Command.
c. If additional sedation or pain control is needed (including during titration of Propofol), *Fentanyl 1 microgram/kg IV/IO* (maximum dose 100 micrograms) may be administered and repeated in 10 minutes if SBP remains above ≥100 mmHg (Adult) or ≥70 + [2 x age] mmHg (Pediatric) (maximum of 2 total doses).

d. If additional sedation or analgesia is needed, or if SBP <100 mmHg contact Medical Command.

4. For interfacility transfer of patients already receiving a different sedative infusion, contact Medical Command for continuation of the sedative infusion or alternate sedation. Obtain orders for specific titration parameters.

5. Contact Medical Command if patient needs additional sedation not included above, including the *initiation of Propofol (Diprivan)* that has not been ordered by the referring physician.

6. Medical Command may order additional doses of *Fentanyl 1 microgram/kg IV/IO* (maximum dose 100 micrograms) in 10 minute intervals.

7. Medical Command may order the titration of *Propofol (Diprivan) 10-100 micrograms/kg/min* in 10 minute intervals to achieve adequate sedation.

8. For patients with SBP <100 mmHg, Medical Command may order *Ketamine 2 mg/kg IV/IO* (Maximum dose 200 mg). Duration of action of Ketamine is 10-20 minutes. For continued sedation, Medical Command may order *Ketamine 2 mg/kg/hr IV/IO*. Titrate by 1 mg/kg/hr in 10 minute intervals to achieve adequate sedation (maximum 4 mg/kg/hr).

9. For patients receiving Dexmedetomidine (Precedex) at a referring facility, Medical Command may order continuation of *Dexmedetomidine (Precedex) 0.2-1.5 mcg/kg/hr IV/IO*, titrated by 0.2 mcg/kg/hr increments in 10 minute intervals to achieve adequate sedation.

### Notes:

A. **Contraindications to Ketamine:** Patient with hydrocephalus, VP shunt, or open globe injury.

B. Goal for adequate sedation is a **RASS Score of -4** (see chart below).

### Richmond Agitation Sedation Scale (RASS)

<table>
<thead>
<tr>
<th>Score</th>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+4</td>
<td>Combative</td>
<td>Overtly combative, violent, immediate danger to staff</td>
</tr>
<tr>
<td>+3</td>
<td>Very agitated</td>
<td>Pulls or removes tube(s) or catheter(s); aggressive</td>
</tr>
<tr>
<td>+2</td>
<td>Agitated</td>
<td>Frequent non-purposeful movement, fights ventilator</td>
</tr>
<tr>
<td>+1</td>
<td>Restless</td>
<td>Anxious but movements not aggressively vigorous</td>
</tr>
<tr>
<td>0</td>
<td>Alert and calm</td>
<td>Not fully alert, but has sustained awakening (eye opening / eye contact) to voice (≥10 seconds)</td>
</tr>
<tr>
<td>-1</td>
<td>Drowsy</td>
<td>Briefly awakens with eye contact to voice (&lt;10 seconds)</td>
</tr>
<tr>
<td>-2</td>
<td>Light sedation</td>
<td>Movement or eye opening to voice (but no eye contact)</td>
</tr>
<tr>
<td>-3</td>
<td>Moderate sedation</td>
<td>No response to voice, but movement or eye opening to physical stimulation</td>
</tr>
<tr>
<td>-5</td>
<td>Unarousable</td>
<td>No response to voice or physical stimulation</td>
</tr>
</tbody>
</table>

**Procedure for RASS Assessment**

1. Observe patient
   a. Patient is alert, restless, or agitated. (score 0 to +4)
2. If not alert, state patient’s name and say to open eyes and look at speaker.
   a. Patient awakens with sustained eye opening and eye contact. (score −1)
   b. Patient awakens with eye opening and eye contact, but not sustained. (score −2)
   c. Patient has any movement in response to voice but no eye contact. (score −3)
3. When no response to verbal stimulation, physically stimulate patient by shaking shoulder and/or rubbing sternum.
   a. Patient has any movement to physical stimulation. (score −4)
   b. Patient has no response to any stimulation. (score −5)

**Performance Parameters:**

A. Use of proper dosage of medications.
B. Appropriate additional doses of sedatives to ensure adequate sedation.
C. Appropriate Medical Command Contact.
D. Use of sedation or analgesia for patients with hypotension.
PARALYSIS FOR PATIENTS WITH AN ADVANCED AIRWAY

Criteria:
A. All patients with an advanced airway (e.g. endotracheal tube, supraglottic airway).

Exclusion Criteria:
A. None.

Procedure:
1. Confirm that the advanced airway is positioned appropriately. Refer to Protocol CC401 (Airway Management).
2. It is essential that all intubated patients receive adequate sedation. Refer to Protocol CC402 (Sedation for Patients with an Advanced Airway).
3. If needed due to immediate patient or provider safety (e.g. threatened extubation or harm to crew member that cannot otherwise be mitigated), consider administration of a paralytic: **Rocuronium (Zemuron) 1 mg/kg IV/IO** (maximum dose 100 mg), while ensuring the following:
   a. Ensure that appropriate sedation is being provided for the patient as soon as possible. Patients may require multiple doses or titration of sedatives.
   b. Contact Medical Command for any patient who receives a paralytic other than for rapid sequence induction (RSI), except scene trauma patients, for possible change in ventilator settings due to loss of respiratory drive.
   c. Avoid use of post-RSI paralytic agents on patients with recent seizure whenever possible. Contact Medical Command for any patient who receives a nondepolarizing paralytic (e.g. Rocuronium, Vecuronium), who has had a seizure within the last 24 hours for discussion of antiepileptic use.
   d. Avoid use of post-RSI paralytic agents on patients with head injuries, intracranial hemorrhage, or spine injuries whenever possible. If paralysis is necessary, document the best neurologic exam possible prior to paralysis.
   e. Avoid use of post-RSI paralytic agents on patients with metabolic acidosis (pH <7.2) or overdose whenever possible. These patients may require ventilator adjustment to provide respiratory compensation for metabolic acidosis. Consult Medical Command.
4. For patients who are asynchronous with the ventilator in spite of adequate sedation, contact Medical Command. Medical Command may order either of the following:
   a. **Rocuronium (Zemuron) 1 mg/kg IV/IO** (maximum dose 100 mg).
   b. **Vecuronium (Norcuron) 0.1 mg/kg IV/IO** (maximum dose 10 mg).

Performance Parameters:
A. Appropriate confirmation of advanced airway placement prior to paralysis.
B. Use of proper dosage of medications.
C. Appropriate Medical Command Contact.
D. Appropriate documentation of neurologic exam.
MECHANICAL VENTILATION

Criteria:
A. All patients with advanced airways (e.g. orotracheal intubation or King LTS-D airway).

Exclusion Criteria:
B. For pediatric patients weighing <3 kg, consult Medical Director on Call (MDOC) for ventilator orders.

Procedure:
1. Confirm endotracheal tube placement or King Airway placement as per Protocol CC401 (Airway Management).
2. Support ventilation as needed with BVM and high flow oxygen.
3. Mechanical Ventilator Settings:
   a. Contact Medical Command for ventilator settings if:
      1) Patient has a possible or suspected metabolic acidosis, including patients with the following:
         a) Known arterial pH <7.3.
         b) Post-cardiac arrest.
         c) Diabetic ketoacidosis.
         d) Medication or drug overdose.
      2) Patient is breathing spontaneously and outside of ETCO₂ range defined below.
      3) Patient is suspected or known to have baseline CO₂ retention with ETCO₂ or PaCO₂ ≥60 mmHg.
      4) Patient has known or suspected pneumothorax.
   b. Contact Medical Director on Call (MDOC) for ventilator settings if:
      1) Patient is on APRV or Bi-Level ventilation.
      2) Patient is being ventilated in a prone position.
      3) PEEP >10 cmH₂O.
   c. Patients not in cardiac arrest and not meeting criteria above:
      1) Initiate ventilation utilizing Standing Orders for Adaptive Support Ventilation below.
      2) If patient is breathing over the ventilator and ETCO₂ remains below goal or if patient develops increased respiratory rate and/or work of breathing associated with these changes, contact Medical Command.
   d. Patients in Cardiac Arrest when ventilator is in place or accessible:
      1) Set ventilator with the following parameters.
         Mode: PSIMV+
         IntelliSync: Off
         Psupport: 0 cmH₂O
         Rate: 8 bpm
         Pcontrol: 15 cmH₂O
         PEEP: 5 cmH₂O
         TI: 1.65 seconds
         Flow Trigger: 5.0 l/min
         Oxygen: 100%
      2) Return to appropriate non-cardiac arrest ventilator settings (per protocol or medical command order) upon return of spontaneous circulation.
4. Refer to Appendix F (Ventilator Reference) for ventilator set up.
5. If patient experiences hypoxia (SpO₂ <95%), increase oxygen to 100% and refer to Appendix E (Hypoxia Checklist).
6. When disconnecting patient from ventilator (e.g. when suctioning or to transition to another ventilator), place the ventilator on standby immediately prior to disconnecting from patient.
7. Ensure adequate sedation as per Protocol CC402 (Sedation for Patients with an Advanced Airway).
8. If any of the medical consult criteria are met while undergoing ventilation, ventilator settings are not tolerated by the patient, or peak airway pressure >40 cmH₂O, contact Medical Command.

9. If patient is breathing spontaneously and having a high respiratory drive, Medical Command may order initiation of Pressure-Regulated Synchronized Intermittent Mandatory Ventilation (PSIMV+). Refer to Appendix F (Ventilator Reference) for ventilator set up.
   a. Medical Command may order:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Initial</th>
<th>Titration</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSIMV+</td>
<td>10 cmH₂O</td>
<td>5-15 cmH₂O to achieve tidal volume between 6-8 ml/kg Ideal Body Weight (IBW). Note: Inspiratory Positive Airway Pressure (IPAP) = Pinsp + PEEP.</td>
</tr>
<tr>
<td>On</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

   | Rate | 12 | N/A (unless under order) |
   | PEEP | 5 cmH₂O | Titrate between 5-10 cmH₂O to maintain SpO₂ ≥95% if needed while delivering 100% O₂. Pinsp should always be equal to or greater than PEEP. |
   | TI | 1.65 sec | N/A (unless under order) |
   | Flow Trigger | 5.0 l/min | N/A (unless under order) |
   | Oxygen | 100% | Titrate between 40-100% to maintain SpO₂ ≥95%. |

   b. Note: The benefit of PSIMV+ in patients with spontaneous respiration and metabolic acidosis or other condition where autoregulation of ETCO₂ is desired is that the patient may regulate their own respiratory rate and therefore their minute volume. Key to titration of this pressure setting is ensuring that adequate support is maintained for each breath to achieve adequate tidal volumes and general support of respiration.
   c. If the patient has a significant change in mental status, spontaneous respirations, or minute ventilation (e.g. 20% decrease), contact Medical Command. Medical Command may order change to ASV ventilation to maintain previous minute ventilation or specific ETCO₂ goal.

10. If indicated due to poor patient compliance with ventilation in spite of adequate sedation, Medical Command may order paralytics. Refer to Protocol CC403 (Paralysis for Patients with an Advanced Airway).
### Notes:

**A. Standing Orders for Adaptive Support Ventilation:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Patient meets medical consult criteria</th>
<th>New advanced airway not already on ventilator</th>
<th>Interfacility patient already on a ventilator</th>
</tr>
</thead>
<tbody>
<tr>
<td>%MinVol</td>
<td>Per order</td>
<td><em>Initial</em>: 100%</td>
<td><em>Initial</em>: 100%-150% to match the total minute volume being delivered with the facility’s ventilator**</td>
</tr>
</tbody>
</table>

**Goal ETCO₂**: Per order

35-45 mmHg

**FiO₂**

*Goal*: SpO₂ ≥95% unless other order

*Titrates*: FiO₂ 40-100% to achieve goal SpO₂

**Goal**: SpO₂ ≥95%

*Titrates*: FiO₂ 40-100% to achieve goal SpO₂

**Goal**: SpO₂ ≥95%

*Titrates*: FiO₂ 40-100% to achieve goal SpO₂

**PEEP**

*Initial*: 5 cmH₂O unless other order

*Titrates*: 5-10 cmH₂O to achieve goal SpO₂

*Initial*: 5 cmH₂O

*Titrates*: 5-10 cmH₂O to achieve goal SpO₂

* Initial: 5 cmH₂O unless other order

*Titrates*: 5-10 cmH₂O to achieve goal SpO₂

*Refer to Appendix F (Ventilator Reference) for ventilator set up.

**If the existing minute volume cannot be matched at 100%-150% target minute volume, contact Medical Command.**

***Consult required if:***

1. Patient is breathing spontaneously and outside of the goal ETCO₂ range.
2. Patient is suspected or known to have baseline CO₂ retention with ETCO₂ or PaCO₂ ≥60 mmHg.
3. Goal ETCO₂ or SpO₂ above cannot be obtained based on these titration parameters, contact Medical Command.

**B. All patients with an advanced airway (whether meeting inclusion or exclusion criteria of this protocol) must be placed on a ventilator.** Ventilator settings should be obtained based on this protocol and/or through Medical Command consultation as appropriate. Any deviation from this procedure should be in consultation with Medical Command.
C. Dynamic Lung Diagrams:

<table>
<thead>
<tr>
<th>Pulmonary Mechanics and Causes</th>
<th>ASV Graph</th>
<th>Dynamic Lung Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normal Pulmonary Mechanics</strong></td>
<td><img src="image" alt="ASV Graph" /></td>
<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td><strong>Obstructive Disease</strong></td>
<td><img src="image" alt="ASV Graph" /></td>
<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td>- Tube obstruction</td>
<td><img src="image" alt="ASV Graph" /></td>
<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td>o Biting tube</td>
<td><img src="image" alt="ASV Graph" /></td>
<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td>o Kinked tube</td>
<td><img src="image" alt="ASV Graph" /></td>
<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td>o Secretions / mucous plug</td>
<td><img src="image" alt="ASV Graph" /></td>
<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td>- Airway obstruction</td>
<td><img src="image" alt="ASV Graph" /></td>
<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td>o Foreign object in airway</td>
<td><img src="image" alt="ASV Graph" /></td>
<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td>- Bronchospasm</td>
<td><img src="image" alt="ASV Graph" /></td>
<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td>o Asthma</td>
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<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td>o COPD</td>
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<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td><strong>Restrictive Disease</strong></td>
<td><img src="image" alt="ASV Graph" /></td>
<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td>- ARDS</td>
<td><img src="image" alt="ASV Graph" /></td>
<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td>- Pulmonary fibrosis</td>
<td><img src="image" alt="ASV Graph" /></td>
<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td>- Pneumothorax</td>
<td><img src="image" alt="ASV Graph" /></td>
<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td>- Mainstem intubation</td>
<td><img src="image" alt="ASV Graph" /></td>
<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td>- Pneumonia</td>
<td><img src="image" alt="ASV Graph" /></td>
<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
<tr>
<td>- Obesity</td>
<td><img src="image" alt="ASV Graph" /></td>
<td><img src="image" alt="Dynamic Lung Graph" /></td>
</tr>
</tbody>
</table>

**Performance Parameters:**

A. Appropriate use of ventilator for patients with advanced airways.
B. Initial ventilator settings are appropriate.
C. Contacting Medical Command and Medical Director on Call (MDOC) when appropriate.
NON-INVASIVE VENTILATION (NIV) – ADULT

Criteria:
Patient meets all of the following criteria:
A. Patient in respiratory distress presumed to be from acute decompensated Congestive Heart Failure (CHF), Chronic Obstructive Pulmonary Disease (COPD), or Asthma who is awake and alert and able to follow commands.
B. Patient has any of the following, in spite of administration of high-flow oxygen:
   1. Pulse oximetry <90%.
   2. Respiratory rate >25 bpm.
   3. Use of accessory muscles during respiration.
C. Either:
   1. Patient being placed on NIV by STAT MedEvac crew.
   2. Patient placed on NIV by EMS or the referring facility prior to STAT MedEvac arrival.

Exclusion Criteria:
A. All patients unable to comply with instructions for NIV.
B. All patients with SBP <90 mmHg.
C. All patients who are actively vomiting.
D. All patients who do not tolerate the NIV mask.

Procedure:
2. If patient is not already receiving NIV but meets criteria for NIV as above:
   a. Place patient on high flow oxygen until NIV is prepared.
   b. Explain to the patient the need for NIV and the need for the tight-fitting mask.
   c. Size the patient for the appropriate mask.
   d. Set ventilator to NIV-ST mode with the following parameters. Refer to Appendix F (Ventilator Reference) for ventilator set up.
      1) Initiate Inspiratory Positive Airway Pressure (IPAP) of 10 with PEEP of 5 by setting Pinsp 5 and PEEP 5. Note that $IPAP = Pinsp + PEEP$.
      2) Set oxygen to 100%. Titrate between 40-100% to maintain $SpO_2 \geq 95\%$.
      3) Titrate Pinsp between 5-15 cmH$_2$O to achieve improved work of breathing and improved oxygenation.
      4) Titrate PEEP between 5-10 cmH$_2$O to maintain $SpO_2 \geq 95\%$ and improve work of breathing. Pinsp should always be equal to or greater than PEEP.
3. If patient is already receiving NIV (CPAP or BiPAP) from a referring EMS agency or referring facility prior to STAT MedEvac arrival:
   a. Ensure that the patient understands the continued need for NIV and the need for the tight-fitting mask.
   b. Size the patient for the appropriate mask (prior mask must be replaced with STAT MedEvac mask).
   c. Set ventilator to NIV-ST and match the previous settings. Refer to Appendix F (Ventilator Reference) for ventilator set up.
      1) Note that $Inspiratory Positive Airway Pressure (IPAP) = Pinsp + PEEP$.
         Example: Patient is on Inspiratory Positive Airway Pressure (IPAP) of 10 cmH$_2$O and...
Expiratory Positive Airway Pressure (EPAP) of 5 cmH₂O. Place patient on Pinsp of 5 cmH₂O and PEEP of 5 cmH₂O.

2) Titrate the Pinsp between 5-15 cmH₂O to achieve improved work of breathing and improved oxygenation.

3) Set PEEP between 5-10 cmH₂O to maintain SpO₂ ≥95% and improve work of breathing.

4) Set oxygen between 40-100% to maintain SpO₂ ≥95%.

4. If the patient does not tolerate NIV using the initial settings or SaO₂ <95% after initiation of NIV, contact the Medical Director on Call (MDOC), who may order titration of the NIV settings or advanced airway management.

5. If patient is agitated, consult Medical Command for possible anxiolytic or further airway control orders. Avoid anxiolytic if SBP <100 cmH₂O or patient has decreased mental status.

6. If there is a request to continue CPAP instead of BiPAP by a referring facility, contact Medical Command for an order to maintain CPAP. Refer to Appendix F (Ventilator Reference) for ventilator set up.

Performance Parameters:
A. Proper use of inclusion criteria.
B. Initial ventilator settings are appropriate.
C. Contacting Medical Command and Medical Director on Call (MDOC) when appropriate.
ASTHMA/COPD/BRONCHOSPASM

Criteria:
A. Patient with signs and symptoms of acute respiratory distress from bronchospasm or restrictive airway disease:
   1. Symptoms/signs may include:
      a. Wheezing – will have expiratory wheezing unless they are unable to move adequate air to generate wheezes.
      b. May have signs of respiratory infection (e.g. fever, nasal congestion, cough, sore throat).
      c. May have acute onset after inhaling irritant.
   2. This includes:
      a. Asthma exacerbation.
      b. COPD exacerbation.
      c. Wheezing from suspected pulmonary infection (e.g. pneumonia, acute bronchitis).

Exclusion Criteria:
B. Patient with obstructed airway – Refer to ALS Protocol 3001 (Airway Obstruction).

Procedure:
A. Refer to ALS Protocol 4022 (Asthma/COPD/Bronchitis).
B. Additional/Preferred Procedures:
   1. Ensure airway patency; administer high flow oxygen.
   2. Monitor continuous end-tidal CO₂ using nasal capnography. Contact Medical Command for readings above 50 mmHg.
   3. Administer Albuterol (Proventil) 5mg/3ml nebulized treatment. **Repeat in 15 minutes to maximum of 2 treatments.**
   4. Administer Ipratropium (Atrovent) 0.5mg/3ml nebulized treatment with first Albuterol treatment.
   5. Administer Methylprednisolone (Solu-Medrol):
      a. Adult: **Methylprednisolone (Solu-Medrol) 125 mg IV/IO.**
      b. Pediatric: **Methylprednisolone (Solu-Medrol) 2 mg/kg** (maximum dose 125 mg).
   6. If patient is in extremis or unresponsive to above therapy, administer epinephrine:
      a. Adult: **Epinephrine 1:1,000 0.3 mg (0.3 ml) IM;** may repeat at 15 minute intervals up to 3 total doses. **NOTE: Caution should be undertaken in administering epinephrine to patients >50 years of age or those with a past medical history of hypertension, angina or thyroid disease.** In these patients, contact Medical Command for consideration of alternate treatment.
      b. Pediatric: **Epinephrine 1:1,000 0.01 mg/kg (0.01 ml/kg) IM** (maximum dose 0.3 mg or 0.3 ml); may repeat at 15 minute intervals up to 3 total doses.
   7. If adult patient who remains dyspneic, consider non-invasive positive pressure ventilation (NIPPV). Refer to Protocol CC405 (Non-Invasive Positive Pressure Ventilation).
   8. If the patient is in extremis or has any of the following:
      a. There is no improvement.
      b. The patient does not tolerate the mask.
      c. The patient has a change in level of consciousness.
THEN move to Protocol CC401 (Airway Management).

9. In patients >50 years of age or those with a past medical history of hypertension, angina or thyroid disease, Medical Command may order **Ketamine 2 mg/kg IV/IO** if patient is intubated for bronchodilation.
10. If patient is not responding to above therapy, contact Medical Command for further medication orders.

**Note:**

A. **Contraindications to Ketamine:** Patient with hydrocephalus, VP shunt, or open globe injury.

**Performance Parameters:**

A. Appropriate use of medications.
B. Appropriate use of NIPPV.
C. Appropriate use of intubation.
D. Medical Command contact.
SUSPECTED ACUTE CORONARY SYNDROME – ADULT

Criteria:
Patient meets either of the following criteria:
A. Adult patients with symptoms of possible cardiac ischemia, which may include:
   1. Retrosternal chest heaviness/pressure/pain.*
   2. Radiation of pain to arm(s), neck, or jaw.
   3. Associated shortness of breath, nausea/vomiting, or sweating.
   4. Possibly worsened by exertion.
   5. Patient with history of recent cocaine/amphetamine use.
   6. ST depression in multiple leads.
   * Diabetics, women, and elderly patients may more commonly have atypical symptoms without retrosternal chest pain.
B. Patients diagnosed with an acute myocardial infarction.

Exclusion Criteria:
A. Patient not diagnosed with an acute myocardial infarction and chest pain/symptoms probably not of cardiac origin. May include:
   1. Pleuritic chest pain – worsens with deep breath or bending/turning.
   2. Patients less than 30 years old.

Procedure:
A. Refer to ALS Protocol 5001 (Suspected Acute Coronary Syndrome).
B. Additional/Preferred Procedures:
   1. If patient has not received aspirin in the previous 24 hours, administer Aspirin 324 mg (81mg x 4) by mouth.
   2. If systolic BP >100 mmHg, administer Nitroglycerin 0.4 mg (1 spray or 1 tablet) sublingually every 3-5 minutes until pain relieved.
      * Do not administer nitroglycerin to a patient who has taken Sildenafil (Viagra/Revatio) or Vardenafil (Levitra) within 24 hours.
      **Do not administer nitroglycerin to a patient who has taken Tadalafil (Cialis) within 48 hours.
   3. If no relief after 3 doses of sublingual Nitroglycerin (including medications prior to arrival) and SBP >100 mmHg, administer Fentanyl (Sublimaze) 1 microgram/kg IV/IO (maximum dose 100 micrograms) every 5 minutes as needed for pain. Continue to administer nitroglycerin sublingually asynchronously as above or by infusion as below, while monitoring for hypotension. Maximum is up to 4 doses of Fentanyl. If pain continues, contact Medical Command for further orders.
   4. If SBP <90 mmHg treat per Protocol CC705A-3 (Cardiogenic Shock).
   5. If patient is already receiving a Nitroglycerin infusion and SBP >100 mmHg, continue Nitroglycerin infusion, based on the following parameters (Nitroglycerin infusion should be transferred at the bedside):
      a. Dosing Range: 10-200 micrograms/min. Contact Medical Command if patient is receiving a dose outside of this range.
      b. Titrate within dosing range by increments of 10 micrograms/min every 10 minutes until:
         1) Chest pain is relieved.
         2) Systolic BP <100 mmHg; hold Nitroglycerin infusion and contact Medical Command.
3) Decreased perfusion (e.g. cyanosis, decreased level of consciousness); hold Nitroglycerin infusion and contact Medical Command.
4) Maximum dose reached; contact Medical Command.

**Note:** **DO NOT DELAY transfer of patient to initiate a Nitroglycerin infusion at the bedside (unless patient was already on a Nitroglycerin infusion prior to transfer). Proceed with administering sublingual Nitroglycerin and/or Fentanyl as above until en route to the destination.**

6. If chest pain continues after administration of 3 doses of Nitroglycerin sublingually and 1 dose of Fentanyl IV/IO and you are on route to the destination, initiate a Nitroglycerin infusion, based on the parameters above.

7. For interfacility transfers of patients already receiving Heparin infusion, continue this infusion based on the following parameters **(Heparin infusion may be held and restarted in transport to expedite transfer):**
   a. Dosing Range: **100-2000 units/hr IV/IO.** Contact Medical Command if patient is receiving a dose outside of this range.
   b. Monitor for any signs of bleeding. If bleeding is identified, stop Heparin infusion and contact Medical Command.

8. For interfacility transfers of patients already receiving Eptifibatide (Integrilin) infusion, continue this infusion based on the following parameters **(Integrilin infusion may be held and restarted in transport to expedite transfer):**
   a. Dosing Range: **1-2 micrograms/kg/min.** Contact Medical Command if patient is receiving a dose outside of this range.
   b. Monitor for any signs of bleeding. If bleeding is identified, stop Eptifibatide (Integrilin) infusion and contact Medical Command.

9. For patients experiencing an anterior ST-elevation myocardial infarction (STEMI) and meeting the following criteria:
   a. Inclusion: Anterior or Septal STEMI (≥2 mm ST-elevation in 2+ contiguous precordial leads – V1 to V5).
   b. Exclusion: Signs of pulmonary edema or cardiogenic shock, SBP <120 mmHg, AV block, heart rate <60 bpm, or already received beta-blocker or calcium-channel blocker within the previous 24 hours.

   Administer Metoprolol (Lopressor) **5 mg IV/IO** over 1-2 minutes and repeat every 5 minutes for three doses (15 mg total dose) unless any of the exclusion criteria above are met. If any exclusion criteria are met at any time, do not administer additional doses of Metoprolol (Lopressor).

10. For patients experiencing a STEMI, if interfacility transport time is expected to be >1 hour and patient is being transported for primary PCI, contact the Medical Director on Call (MDOC) from the bedside to discuss whether thrombolitics should be administered at the referring facility.

11. If patient has three or more consecutive PVCs, administer Amiodarone **150 mg IV/IO** over 10 minutes. After bolus, begin an Amiodarone infusion at **1mg/min.** Monitor for hypotension. If SBP <90 mmHg, stop Amiodarone infusion and contact Medical Command.

12. If the patient has been diagnosed with a STEMI and is being transported for primary PCI, refer to Protocol **CC508** (Remote Ischemic Conditioning).
Notes:
A. The **Goal Bedside Time** for patients with STEMI is **less than 10 minutes**.
B. Standard dose of **Alteplase (Activase)** for acute myocardial infarction is:
   a. 15 mg IV/IO x 1, then
   b. 0.75 mg/kg IV/IO (max 50 mg) over 30 min, then
   c. 0.5 mg/kg IV/IO (max 35 mg) over 60 min
   *Alteplase (Activase) should be reconstituted with sterile water to 1 mg/mL prior to administration. Remove excess medication from bottle prior to initiating administration.*
C. For patients who are receiving transdermal nitroglycerin paste prior to arrival (up to 1 inch) and have SBP ≥100 mmHg, leave nitroglycerin paste (including while administering sublingual nitroglycerin). If a nitroglycerin drip is initiated, wipe off nitroglycerin paste.

Performance Parameters:
A. Bedside time < 10 minutes for patient experiencing STEMI.
B. Administration of ASA for all patients without a contraindication.
C. Aggressive treatment of the patient’s pain.
D. Appropriate administration/continuation of infusions.
E. Appropriate application and documentation of Remote Ischemic Conditioning.
CONGESTIVE HEART FAILURE – ADULT

Criteria:
A. Patients presenting with shortness of breath from pulmonary edema/CHF, as indicated by:
   1. Severe dyspnea, tachypnea, bilateral rales, tachycardia, cough with frothy sputum, or orthopnea.
   2. No fever.
   3. May be associated with restlessness, agitation, pedal edema, diaphoresis, or pallor.
   4. Patient may have history of diuretic or digitalis use.
   5. Diagnosis based on chest x-ray.

Exclusion Criteria:
A. Patients presenting with shortness of breath from non-CHF etiologies:
   1. Pneumonia: WARNING – Patients with SOB from pneumonia may have symptoms similar to those of CHF, but these patients may be harmed by diuretics. Fever may be present in these patients.
   2. COPD exacerbation: These patients may take bronchodilators without a history of diuretic use.
   3. Pneumothorax: CPAP/BiPAP is contraindicated in these patients.

Procedure:
A. Refer to ALS Protocol 5002 (Congestive Heart Failure).
B. Additional/Preferred Procedures:
   1. Administer Nitroglycerin 0.4 mg SL based on the following parameters:
      a. Initial dose 0.4 mg sublingually.
      b. Additional doses every 3-5 minutes:
         1) 3 doses 0.4 mg SL if SBP >180 mmHg
         2) 2 doses 0.4 mg SL if SBP 140-180 mmHg
         3) 1 dose 0.4 mg SL if SBP 100-140 mmHg
      c. Administer Nitroglycerin until:
         1) Dyspnea relieved.
         2) Systolic BP <100 mmHg.
         3) Decreased perfusion (e.g. cyanosis or decreased level of consciousness).
      d. Do not administer nitroglycerin to a patient who has taken Sildenafil (Viagra/Revatio) or Vardenafil (Levitra) within 24 hours. Do not administer nitroglycerin to a patient who has taken Tadalafil (Cialis) within 48 hours.
   2. If dyspnea continues or patient is already receiving a Nitroglycerin infusion and SBP >100 mmHg, initiate/continue Nitroglycerin infusion, based on the following parameters:
      a. Dosing Range: 10-200 micrograms/min. Contact Medical Command if patient is receiving a dose outside of this range.
      b. Titrate within the dosing range by increments of 10 micrograms/min every 10 minutes until:
         1) Dyspnea is relieved.
         2) Systolic BP <100 mmHg; hold Nitroglycerin infusion and contact Medical Command.
         3) Decreased perfusion (e.g. cyanosis, decreased level of consciousness); hold Nitroglycerin infusion and contact Medical Command.
         4) Maximum dose reached; contact Medical Command.
3. If patient remains dyspneic, consider non-invasive positive pressure ventilation (NIPPV). Refer to Protocol CC405 (Non-Invasive Positive Pressure Ventilation).
   IF any of the following:
   a. There is no improvement.
   b. The patient does not tolerate the mask.
   c. The patient has a change in level of consciousness.
   THEN move to Protocol CC401 (Airway Management).

4. If volume overload is suspected (e.g. increased weight gain or edema), Medical Command may order Furosemide (Lasix) 40 mg IV/IO.
5. If patient becomes hypotensive, Medical Command may order administration of:
   a. Norepinephrine (Levophed) 0.05-0.5 micrograms/kg/min. Increase Norepinephrine (Levophed) by 0.05 micrograms/kg/min every 5-10 minutes to achieve goal SBP 90-140 mmHg. If goal not reached at 0.5 micrograms/kg/min, recontact Medical Command.
   b. Dobutamine 5-20 micrograms/kg/min to maintain SBP 90-140 mmHg. Titrate by 5 micrograms/kg/min every 5-10 minutes to obtain goal SBP. If goal not reached at 20 mcg/kg/min, recontact Medical Command.

Note:
A. For patients who are receiving transdermal nitroglycerin paste prior to arrival (up to 1 inch) and have SBP ≥100 mmHg, leave nitroglycerin paste (including while administering sublingual nitrolycerin). If a nitroglycerin drip is initiated, wipe off nitroglycerin paste.

Performance Parameters:
A. Administration of nitrates for all patients without a contraindication.
B. Appropriate continuation of Nitroglycerin infusion for interfacility transfers.
C. Appropriate use of NIPPV for all patients without a contraindication.
AORTIC EMERGENCIES – ADULT

Criteria:
Patient meets either of the following criteria:
A. Known or suspected aortic dissection (most commonly in the thoracic aorta).
B. Aortic aneurysm measuring ≥5 cm or any ruptured aortic aneurysm (most commonly in the abdominal aorta).
C. Traumatic aortic disruption.

Exclusion Criteria:
A. Patient with aortic aneurysm <5 cm as primary diagnosis; contact Medical Command.

Procedure:
1. Goal Systolic Blood Pressure:
   a. **Aortic dissection**: SBP 90-120 mmHg.
   b. **Ruptured or leaking aortic aneurysm**: SBP 90-120 mmHg.
   c. **Non-ruptured aortic aneurysm**: Contact Medical Command for goal SBP.
   d. **Traumatic aortic disruption**: Contact Medical Command for goal SBP.
2. If patient is already receiving one of the following infusions for management of hypertension in patient with aortic dissection or ruptured/leaking aortic aneurysm, continue the infusion based on the following parameters to achieve SBP 90-120 mmHg:
   a. **Labetalol (Trandate)** 1-8 mg/min IV/IO. Titrate by 1 mg/min every 10 minutes to maintain goal SBP. If HR <60 bpm, contact Medical Command.
   b. **Nicardipine (Cardene)** 5-15 mg/hr IV/IO. Titrate by 2.5 mg/hr every 10 minutes to maintain goal SBP.
3. If patient has SBP above goal and is not already on a vasoactive infusion, initiate **Nicardipine (Cardene)** 5-15 mg/hr IV/IO. Titrate by 2.5 mg/hr every 10 minutes to reach SBP goal above.
4. For pain management, if SBP is >100 mmHg administer **Fentanyl (Sublimaze)** 1 microgram/kg IV/IO (maximum dose 100 micrograms) every 10 minutes until pain is controlled (pain described as 5/10 or less). Reassess blood pressure between each dose. Maximum is up to 4 doses of Fentanyl. If pain continues, contact Medical Command for further orders.
5. If SBP decreases to <90 mmHg, contact the Medical Director on Call (MDOC) for additional orders and to ensure communication with the receiving physician.

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6. If SBP is <90 mmHg, Medical Command may order:
   a. **Norepinephrine (Levophed)** 0.05-0.5 micrograms/kg/min to maintain goal SBP 90-120 mmHg. Titrate Norepinephrine (Levophed) by 0.05 micrograms/kg/min every 5-10 minutes to achieve goal SBP.
   b. Transfusion of 1 or 2 units of **Packed Red Blood Cells IV**. Refer to Protocol **CC212** (Administration of Blood Products).
7. If patient remains hypotensive, contact the Medical Director on Call (MDOC) for additional orders.
Performance Parameters:

A. Appropriately following the inclusion and exclusion criteria of the protocol.
B. Appropriate use of antihypertensives.
C. Patient’s pain is treated appropriately.
D. Appropriate Medical Command contact.
INTRA-AORTIC BALLOON PUMP – ADULT

Criteria:
A. Patient requires or is receiving cardiac support via an intra-aortic balloon pump.

Exclusion Criteria:
A. None.

Procedure:
**Do not remove or turn off referral IABP until IABP transfer is completed.**
1. **Assess the Patient** for:
   a. IABP insertion site, catheter size and type.
   b. Assess IABP settings.
   c. Assess platelet count, PTT, and INR.
   d. Assess IABP augmentation prior to arrival.
   e. Verify left radial and/or brachial pulses, urine output, and pedal pulses.
   f. Confirm IABP settings with referring staff.
2. **Power Up IABP** and connect to AC power source.
3. **Verify Adequate Helium Supply**.
4. **Verify IABP is in Autopilot/Operator Mode and Assist Ratio of 1:1**. If patient is receiving a different assist ratio (e.g. 1:2), contact the Medical Director on Call (MDOC).
5. **Transfer of IABP**:
   a. **Apply ECG Electrodes**: Apply 5 fresh ECG electrodes to the patient and mark them. Do not disconnect any existing electrodes until ready to transfer the patient to the transport IABP. Connect the ECG cable to the IABP ECG source.
   b. **Connect Arterial Line & Cables**: Connect arterial line cable to IABP console. Secure arterial line transducer to mid-axillary line and zero.
   c. **Fiber Optic Catheters**: If fiber optic catheter is used, slide in the fiber optic sensor and key card. The fiber optic catheter is zeroed prior to insertion. Verify catheter is zeroed by checking light bulb in upper left corner of display:
      1) Green → Zeroed.
      2) Blue → Not zeroed and needs to be calibrated. Refer to “Calibrating Fiber Optic Catheter” in Appendix G (IABP Reference).
   d. **Connect Helium Drive Line** tubing to IABP.
   e. **Verify Balloon Volume**: Verify that the balloon volume of catheter matches the volume on the pump.
   f. **Datascope IABP Adapter**: If Datascope IABP, verify balloon volume and connect appropriate size Arrow pump adapter.
   g. **Confirm Helium Filling Volume**: Ensure that the helium filling volume is correct for the balloon catheter size. Adjust the fill volume on the IABP console and select “Apply” after change is made.
   h. **Verify Trigger** recognition (ECG or A-line).
   i. **Select Desired Assist Ratio** (1:1 to 1:4).
   j. **Mode Selection**: Check that the IABP is in the Autopilot Mode.
   k. **Pump Status to “ON”**: Select Green pump status ON key.
   l. **Ensure Proper Trigger**:
      1) The AutoCat Wave IABP will automatically select the best trigger for augmentation. Monitor and record the selected trigger. Most often, it will select the R wave of the
ECG as the trigger. *It is important to provide the IABP with a good ECG signal.* The arterial pressure waveform or pacing spikes may also be used. If you need to change the trigger: Put into Operator Mode and select trigger, *then it must stay in Operator Mode.*

2) If CPR is in progress, manually select *arterial pressure (AP)* as the trigger during resuscitation until spontaneous circulation is restored.

### m. Ensure Proper Timing.

1) Timing Quick Check:
- SBP: Unassisted > Assisted
- DBP: Unassisted > Assisted
- MAP: Unassisted < Assisted
- AUG > Unassisted SBP

2) Place the IABP into *Operator Mode* and change the augmentation to 1:2.

3) Select “freeze” on right side of the screen and return IABP to 1:1 and “autopilot” while evaluating timing.

4) Move purple cursor (right side of screen) down to evaluate timing (inflation should begin at the onset of diastole and end at the onset of systole, just prior to the dicrotic notch.

5) Autopilot mode will usually result in proper timing of inflation and deflation of the intra-aortic balloon. If timing is not optimal, manual adjustment may be required by putting the IABP into Operator Mode and using the arrows located at left (inflation) and right (deflation) of the screen. **If you change the timing, the IABP must stay in Operator Mode**

6. **Secure Affected Lower Extremity**: Secure the affected lower extremity with a soft restraint on the same side as the balloon catheter insertion site. Prevent balloon flexion at the hip (do not sit patient up >30°; patient should be log-rolled only).

7. **Remove Referring ECG Electrodes**: The referring facility’s ECG electrodes may be disconnected/removed once all transfer to the transport IABP is complete.

8. **Assess and Document**:
   a. Insertion site/type of catheter.
   b. Platelet count, PTT, and PT/INR.
   c. Augmented pressures and trigger mechanism with each vital signs assessment and with any changes in the augmentation and trigger mechanism.
   d. Left radial or brachial pulse and pedal pulses distal to the intra-aortic balloon pump insertion site (every 15 minutes). Loss of pulse may indicate a displaced catheter.
   e. Urine output. Urine output <30 ml/hr may indicate a displaced catheter.


10. **In the Event of IABP Device Failure**: Attach a 60 ml Luer Slip-Tip syringe to the balloon catheter and cycle the balloon manually once every 10 minutes. Notify the Medical Director on Call (MDOC) immediately for further instructions.

11. For interfacility transfers of patients already receiving *Heparin infusion*, continue this infusion based on the following parameters:
   a. Dosing Range: 100-2000 units/hr. Contact Medical Command if patient is receiving a dose outside of this range.
   b. Monitor for any signs of bleeding. If bleeding is identified, stop Heparin infusion and contact the Medical Director on Call (MDOC).
12. **Contact the Medical Director on Call (MDOC)** for any changes required to augmentation rates or changes in patient condition after transfer from bedside to AutoCat transport IABP.

13. **In the Event of Double Sensing or Timing Failure**: Check the ECG leads and connections. Contact the Medical Director on Call (MDOC) for additional troubleshooting instructions. Medical Director on Call (MDOC) may order switching to *Operator Mode* and/or changing the trigger.

**Note:**

A. Ensure IABP is plugged into the aircraft or ambulance and that the inverter is working and “On” for all IABP transports.

**Performance Parameters:**

A. Use of fresh ECG electrodes.

B. Documentation of trigger, timing, and augmentation.

C. Use of soft restraints on the extremity with the balloon pump inserted.

D. Documentation of appropriate catheter and balloon size.
VENTRICULAR ASSIST DEVICE – ADULT

Criteria:
A. Patient has an existing portable implanted ventricular assist device.

Exclusion Criteria:
A. Patient has a newly implanted ventricular assist device. Contact Medical Command for additional orders.

Procedure:
1. Assess pump function and circulation:
   a. Listen to motor of pump over heart and/or left upper quadrant and observe green light on system control device.
   b. Assess perfusion based on mental status, capillary refill, and skin color. The absence of a palpable pulse is normal for patients with a functioning VAD; they may not have a palpable blood pressure.
   c. Obtain blood pressure using Doppler.
2. Check the Controller for any alarms and refer to Appendix H (Ventricular Assist Device Reference).
3. Bring patient’s power unit and batteries during the transport.
4. Provide cardiac monitoring. If patient experiences a dysrhythmia, contact Medical Command.
5. If patient has evidence of hypoperfusion (defined as poor perfusion based on altered mental status, prolonged capillary refill, or poor skin color):
   a. Establish vascular access. Refer to Protocol CC211 (Vascular Access and Fluid Administration).
   b. Initiate 500 ml NSS bolus under pressure and contact Medical Command.
   c. Reassess patient after each intervention.
6. Management of cardiac arrest with Left Ventricular Assist Device (LVAD) in place:
   a. For patients with LVAD in place who have clinical signs of cardiac arrest, consider that patient may have continuous (non-pulsatile) flow and may not have a palpable or dopplerable pulse. Focus of resuscitation should be on volume resuscitation, medication administration, and airway management. Refer to ALS Protocol 3031A (General Cardiac Arrest – Adult). Contact Medical Command as soon as possible for further direction.
   b. Check the controller to see if there is a green light (functioning appropriately) or not. If no green light, refer to Appendix H (Ventricular Assist Device Reference).
   c. Check for POLST or DNR forms. Contact Medical Command if patient’s wishes are to withhold resuscitative care.
   d. Patients with newly placed LVAD (fresh post-operative wounds) → Chest compressions should generally be avoided due to possibility of displacing a functional LVAD.
   e. Patients with an established LVAD (healed post-operative wounds) → Chest compressions are appropriate as part of resuscitation, particularly if LVAD is non-functional (no green light) in spite of troubleshooting. Displacement is less likely with established LVADs.
7. If patient continues to have evidence of hypoperfusion (defined as poor perfusion based on altered mental status, prolonged capillary refill, or poor skin color): Contact Medical Command.
   a. Medical Command may order an additional 500 ml NSS bolus.
   b. Medical Command may order **Norepinephrine (Levophed) 0.05-0.5 micrograms/kg/min** until there is improvement in tissue perfusion. Increase Norepinephrine (Levophed) by 0.05 micrograms/kg/min every 5-10 minutes to achieve improvement in tissue perfusion. If goal not reached at 0.5 micrograms/kg/min, recontact Medical Command.

**Performance Parameters:**
   A. Appropriate assessment of perfusion.
   B. Appropriate management of hypoperfusion.
REMOTE ISCHEMIC CONDITIONING

Criteria:
Patient meets all of the following criteria:
A. Patient is experiencing an ST-elevation myocardial infarction (STEMI).
B. Patient is being transported for emergent primary percutaneous coronary intervention.
C. Patient is being transported from a referring facility or scene.

Exclusion Criteria:
A. Patient has received thrombolytics for treatment of this STEMI event.
B. Patient has a history of venous or arterial thrombosis in either arm.
C. Patient has a history of mastectomy.
D. Patient’s SBP <100 mmHg or is receiving a vasopressor.

Procedure:
1. Refer to Protocol CC501 (Suspected Acute Coronary Syndrome) for primary management of the patient.
2. Perform Remote Ischemic Conditioning as soon as feasible, preferably upon departing the referring facility or scene.
   a. Discuss with the patient:
      1) Basic principles of remote ischemic conditioning (decreasing total damage on the heart once the blocked blood vessel is opened).
      2) Procedure involves 4 cycles of inflation/deflation of blood pressure cuff for 5 minutes each.
      3) Discomfort is similar to a prolonged blood pressure reading, but if there is excess discomfort, pain medication may be administered or the procedure can be stopped.
   b. Place the automated blood pressure cuff on the arm with the primary intravenous line site without overlapping the IV site.
   c. Place a manual blood pressure cuff with timer on the non-IV arm (over biceps). If there are IV sites on both arms, place the manual BP cuff on the left arm without overlapping the IV site.
   d. Inflation Cycle: Inflate the manual BP cuff to 200 mmHg and clamp. Immediately set the timer for 5 minutes. After 5 minutes, deflate the manual BP cuff. Immediately set the timer for 5 minutes.
   e. After 5 minutes with the manual BP cuff deflated, repeat an Inflation Cycle as above for a total of 4 cycles.
   f. Assess the patient’s discomfort related to the procedure with each cuff inflation.
   g. If SBP >100 mmHg, patient may receive Fentanyl (Sublimaze) 1 microgram/kg IV/IO (maximum dose 100 micrograms) every 5 minutes as needed for pain/discomfort inclusive of pain control as per Protocol CC501 (Suspected Acute Coronary Syndrome). Maximum is up to 4 doses of Fentanyl. If pain continues, contact Medical Command for further orders.
   h. If the patient reports excessive discomfort from the manual BP cuff, deflate the BP cuff and document the time. Discontinue additional inflation cycles.
   i. Continue blood pressure measurements using the automated cuff as per standard procedure.
   j. If at the time of transfer the procedure BP cuff is inflated, ensure that it is deflated within 5 minutes of inflation.
3. Upon completion of the transport, document use of Remote Ischemic Conditioning via an electronic reporting form and in the activity log of the patient record.

Notes:
A. The **Goal Bedside Time** for patients with STEMI is **less than 10 minutes**. Performance of Remote Ischemic Conditioning should not delay transport to the PCI center.
B. If the transport time on interfacility transfer of a STEMI patient is expected to be >1 hour, contact the Medical Director on Call (MDOC) from the bedside to discuss whether thrombolytics should be administered at the referring facility and whether or when Remote Ischemic Conditioning should be initiated.

Performance Parameters:
A. Bedside time <10 minutes for patient experiencing STEMI.
B. Appropriate application and documentation of Remote Ischemic Conditioning.
C. Appropriate management of patient discomfort.
CARDIAC DYSRHYTHMIAS

Criteria:
Patient meets either of the following criteria:
A. Symptomatic patients with tachycardia or bradycardia and associated symptoms, which may include chest pain or hypotension.
   1. Adult patients: Heart rate >100 bpm or <60 bpm.
   2. Pediatric patients: Heart rate outside of normal parameters in Appendix I (Pediatric Reference).
B. Patients with ventricular ectopy, including 3 or more consecutive PVCs, non-sustained ventricular tachycardia (VT) or multifocal premature ventricular contractions (PVC).

Exclusion Criteria:
A. Patient without pulse – Follow appropriate cardiac arrest protocol.
B. History or evidence of trauma – Follow appropriate trauma protocol.

Procedure:
1. Refer to the appropriate ALS protocols:
   a. ALS Protocol 5021A (Bradycardia - Adult).
   b. ALS Protocol 5021P (Bradycardia - Pediatric).
   c. ALS Protocol 5022A (Narrow Complex Tachycardia – Adult).
   d. ALS Protocol 5022P (Narrow Complex Tachycardia – Pediatric).
   e. ALS Protocol 5023A (Wide Complex Tachycardia – Adult).
   f. ALS Protocol 5023P (Wide Complex Tachycardia – Pediatric).
   ** For pain control or sedation related to pacing or cardioversion, follow the preferred procedure below.
2. Consider treatable causes:
   a. Hypoxemia.
   b. Alkalosis/Acidosis.
   c. Electrolyte imbalance (Hypokalemia, Hypomagnesemia).
   d. Digitalis toxicity.
   If one of these causes is suspected, contact Medical Command.
3. For patients with ventricular ectopy and suspected acute coronary syndrome, refer to Protocol CC501 (Suspected Acute Coronary Syndrome) for administration of Amiodarone.
   If no indication of an acute coronary syndrome, contact Medical Command.
4. For patients requiring synchronized cardioversion based on the above ALS protocols, initial energy setting should be 100J for all rhythms. If unsuccessful, any additional cardioversion should be 200J.
5. For patients with advanced airways undergoing pacing or cardioversion, refer to Protocol CC402 (Sedation for Patients with an Advanced Airway).
6. For patients without advanced airways undergoing pacing or cardioversion, administer Fentanyl 1 microgram/kg IV/IO (maximum 100 micrograms) if SBP >100 mmHg (adult) or SBP > [70 + (2 x age in years)] mmHg (pediatric) prior to initiation of pacing or cardioversion.
   For additional pain control, refer to Protocol CC603 (Pain Management). Contact Medical Command if sedation (e.g. benzodiazepine) or additional pain control is needed, or if patient has hypotension.
7. For patients undergoing transcutaneous or transvenous pacing prior to transport, contact the Medical Director on Call (MDOC) for orders to continue pacing with existing pacer or transfer to transport pacer.

8. For patients with ventricular ectopy, Medical Command may order any of the following:
   a. **Amiodarone 150 mg IV/IO** over 10 minutes. An Amiodarone infusion can then be established at **1mg/min.** Monitor for hypotension.
   b. **Lidocaine 1.5 mg/kg IV/IO** over 2 minutes (heart rate must be ≥ 60 bpm); if < 60 bpm, contact Medical Command. If ectopy is suppressed, initiate Lidocaine infusion at **2 mg/min.**
   c. **Magnesium Sulfate 1-2 gm IV/IO** over 15 minutes. Monitor for hypotension.

9. For patients undergoing transcutaneous pacing prior to transport, the Medical Director on Call (MDOC) may order:
   a. Continuation of pacing with referring unit pacer (e.g. ground transport with EMS rendezvous). Ensure referring staff approves of use of the device during transport and ensure return of the device after the mission. MDOC must be contacted to approve use of an outside device and to ensure you are able to operate the device.
   b. Transfer to STAT MedEvac monitor for continuation of transcutaneous pacing:
      1) Ensure presence of electrical and mechanical capture on the referring pacer.
      2) Place transport monitor electrodes on the patient beside the referring electrodes and the transport monitor pacer pads in an anterior and posterior position on the patient.
      3) Set the transport pacer to fixed mode and set the referring pacer to demand mode.
      4) Set the rate on the referring pacer to 60 bpm.
      5) Set the transport pacer to a rate of 80 bpm and the energy level 10 mA higher than the referring pacer setting.
      6) Initiate pacing on the transport pacer and rapidly increase (over seconds) the mA on the transport pacer until there is electrical and mechanical capture on the transport pacer.
      7) Decrease the mA on the referring pacer while continuing to assess the pulse rate for maintenance of mechanical capture with the transport pacer.
      8) Turn off the referring pacer once you confirm you have maintained electrical and mechanical capture with the transport pacer.

10. For patients undergoing transvenous pacing prior to transport, the Medical Director on Call (MDOC) may order:
    a. Continuation of transvenous pacing with the referring facility transvenous pacer. Ensure referring staff approves of use of the device during transport and ensure return of the device after the mission. MDOC must be contacted to approve use of an outside device and to ensure you are able to operate the device.
    b. Transfer to STAT MedEvac transport pacer for continuation of transvenous pacing:
        1) Ensure presence of electrical and mechanical capture on the referring pacer.
        2) Ensure pacing wires are compatible between devices and procure adaptors as needed.
        3) Set transport pacer to match settings on referring pacer with rate of at least 60 bpm.
        4) Set devices side by side.
        5) Transfer pacing wires between devices as quickly as possible.
6) Ensure electrical and mechanical capture. If needed to achieve electrical and mechanical capture, increase output quickly between 2-20 mA until capture is obtained.

11. For patients undergoing pacing requiring additional pain control or sedation, Medical Command may order additional doses of:
   a. Fentanyl 1 micrograms/kg IV/IO (maximum 100 micrograms) as needed in 10 minute intervals (specify number of doses).
   b. Versed 0.05 mg/kg IV/IO (maximum 2 mg) repeated as needed in 10 minutes up to 2 doses.

Performance Parameters:
   A. Inclusion criteria for protocol.
   B. Following appropriate ALS protocols.
   C. Consideration of underlying causes and their treatment.
   D. Appropriate use of antidyssrhythmic.
   E. Appropriate use of electrical therapies.
   F. Appropriate use of pain control and/or sedation.
   G. Appropriate transfer between pacing devices.
ARTERIAL OR VENOUS THROMBOEMBOLISM – ADULT

Criteria:
Patient meets either of the following criteria:
A. Radiographic evidence of acute pulmonary thromboembolism by CT, MRI, or VQ-scan.
B. Radiographic evidence of extremity venous or arterial thromboembolism by ultrasound, CT, or MRI.

Exclusion Criteria:
A. Patient is receiving oral anticoagulation including:
   1. Warfarin (Coumadin, Jantoven) with INR ≥1.5 (may follow procedure if INR <1.5)
   2. Direct thrombin or Factor Xa inhibitors such as Dabigatran (Pradaxa), Rivaroxaban (Xarelto) or Apixaban (Eliquis)
If either exclusion met, contact Medical Command.
B. Cardiac arrest – Refer to ALS Protocol 3031A.
C. Aortic dissection – Refer to Protocol CC503 (Aortic Emergencies).
D. Active or high risk of bleeding, recent intracranial hemorrhage, or recent trauma – contact Medical Command.
E. History of heparin-induced thrombocytopenia and/or thrombosis – contact Medical Command.

Procedure:
14. If patient has oxygen saturation of <95%, refer to CC202 (Oxygen Administration).
15. If patient has refractory hypoxia of <90%, refer to CC405 (Non-Invasive Positive Pressure Ventilation – Adult) and if patient requires immediate airway management, refer to CC401 (Airway Management).
   ** Note that patients with acute pulmonary thromboembolism may become hypotensive upon RSI medication administration. If SBP is <90 mmHg, follow procedure below.
16. For interfacility transfers of patients already receiving Heparin infusion, continue this infusion based on the following parameters:
   c. Dosing Range: 100-2000 units/hr. Contact Medical Command if patient is receiving a dose outside of this range.
   d. Monitor for any signs of bleeding. If bleeding is identified, stop Heparin infusion and contact Medical Command.
17. If patient is not receiving Heparin infusion, contact Medical Command for consideration of initiating Heparin infusion.
18. If SBP <90 mmHg or other evidence of shock, refer to Protocol CC705A-4 (Obstructive Shock – Adult).

19. If patient is not receiving Heparin infusion, Medical Command may order either:
   a. **Heparin**:
      1) Initial bolus: 80 units/kg IV/IO (maximum dose 10,000 units; round to closest 100 units).
      2) Infusion: 18 units/kg/hr IV/IO (maximum rate 1,600 units/hr; round to closest 100 units/hr).
      3) Monitor for any signs of bleeding. If bleeding is identified, stop Heparin infusion and contact Medical Command.
b. **Enoxaparin (Lovenox) 1 mg/kg SC.** Verify patient has normal serum creatinine. Monitor for any signs of bleeding. If bleeding is identified, contact Medical Command.

20. If patient has persistent SBP <90 mmHg, Medical Command may order Alteplate (Activase) 10 mg IV/IO bolus followed by 90 mg IV/IO over 2 hours. If heparin has been ordered, it should be administered after Alteplate (Activase) infusion.

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**Performance Parameters:**

A. Appropriate application of protocol criteria.
B. Appropriate initiation or continuation of anticoagulation therapy.
C. Identification of hemodynamic instability and appropriate treatment.
D. Appropriate medical command consultation.

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**Note:**

A. For patients on interfacility transfers who are already receiving vasopressors listed above the medical consult line in this protocol, the medication may be continued based on the titration parameters listed above. For patients already receiving vasopressors listed below the medical consult line or absent from the protocol, contact Medical Command for continuation of the infusion or alternate therapy.
EXTRA CORPOREAL MEMBRANE OXYGENATION (ECMO) – ADULT

Criteria:
A. Patient is receiving extra corporeal membrane oxygenation (ECMO).

Exclusion Criteria:
A. None.

Procedure:
1. Ensure the appropriate equipment is available for the transport in collaboration with the perfusionist. This equipment may include:
   a. Bed plate
   b. 2 full oxygen bottles (one for the ventilator and one for the oxygenator)
   c. Hand crank or backup console
   d. 2 clamps
   e. External drive motor
2. A perfusionist will accompany the STAT MedEvac crew on all ECMO cases. Upon arrival to the bedside, the STAT MedEvac crew and perfusionist must review all aspects of patient care.
3. Identify if patient is receiving Veno-Arterial (V-A) or Veno-Venous (V-V) ECMO.
4. Assess, monitor, and document any and all parameters being monitored at the receiving facility, including:
   a. EKG waveform
   b. Vital signs including ETCO$_2$
   c. Hemodynamic monitoring
   d. Blood flow (liters per minute)
   e. Sweep gas and Oxygen used with the oxygenator
5. Obtain pulse oximetry on right hand if possible. Pulse oximetry may not be accurate in V-A ECMO.
6. In case of low blood flow, discuss need for volume or vasopressors with the perfusionist and contact Medical Director on Call (MDOC). Indicators of low blood flow include:
   a. VA ECMO: Blood flow <3.5-4.0 liters/min (>70kg) or <3-3.5 liters/min (<70 kg).
   b. VV ECMO: Blood flow <3.0 liters/min and/or desaturation is noticed.
   Note: Volume replacement is preferred over vasopressor management initially. Also, if the tubing is collapsing (“pulling” or “chattering”) and the central venous pressure (CVP) is low, the intravascular volume is probably low. See below for possible orders.
7. Identify current ventilator settings from the referring facility staff. Contact the Medical Director on Call (MDOC) to obtain orders for ventilator settings. Expect the ETCO$_2$ waveform to not be normal because there may not be significant gas exchange occurring in the lungs.
8. Identify if patient is receiving a Heparin infusion and discuss administration of Heparin with the Medical Director on Call (MDOC).
9. If there is bleeding at any ECMO catheter site, consider using a hemostatic dressing. Caution with using pressure dressings as it may decrease flow through the cannula. For any major or persistent bleeding, stop Heparin infusion and contact the Medical Director on Call (MDOC).
10. Take extreme caution with introduction of any air in venous lines, as the venous system may be under negative pressure and is at risk of drawing air through an unsecured line.

11. After every patient move, ensure that all tubes and hoses are positioned correctly and not kinked.

12. In case of equipment failure, assist perfusionist in emergency procedures and contact the Medical Director on Call (MDOC).

13. If patient has decreased blood flow, Medical Director on Call (MDOC) may order:

   a. Volume (one or more of the following):
      1) **Albumin (5%) 500 ml IV**
      2) **1 unit of type "O" Packed Red Blood Cells IV.** Refer to Protocol CC212 (Administration of Blood Products).
      3) **1 unit fresh frozen plasma (FFP) IV.**

   b. Vasopressor:
      1) **Epinephrine 0.05-0.15 micrograms/kg/min** (preferred agent). Titrate by 0.02 micrograms/kg/min every 5-10 minutes to achieve goal blood flows. If goal is not reached at 0.15 micrograms/kg/min, contact Medical Command.
      2) **Norepinephrine (Levophed) 0.05-0.5 micrograms/kg/min** to achieve goal blood flow. Titrate Norepinephrine (Levophed) by 0.05 micrograms/kg/min every 5-10 minutes to achieve goal blood flow. If goal is not reached at 0.5 micrograms/kg/min, recontact Medical Command.

14. Medical Director on Call (MDOC) may order minimal ventilator settings to prevent oxygen toxicity and barotrauma. These may include:

   a. Mode  **PSIMV+**
   b. Rate  **12 bpm**
   c. TI  **1.65 seconds**
   d. Flowtrigger  **5.0 l/min**
   e. Pinsp  **10 cmH₂O**
   f. PEEP  **5 cmH₂O**
   g. Oxygen  **50%**
Notes:
A. Types of cannulation:

- **Veno-Arterial (VA) Cannulation**
- **Veno-Venous (VV) Cannulation**

Performance Parameters:
1. Appropriate monitoring of patient parameters.
2. Appropriate Medical Director on Call (MDOC) contact.
3. Appropriate treatment for decreased blood flow.
4. Appropriate treatment for bleeding from catheter sites.
TRAMA ASSESSMENT AND INITIAL MANAGEMENT

Criteria:
A. Patient with known or suspected trauma.

Exclusion Criteria:
A. Traumatic Cardiac Arrest – Refer to Protocol CC332 (Cardiac Arrest – Traumatic) and ALS Protocol 3032 (Cardiac Arrest – Traumatic).

Procedure:
A. Refer to applicable BLS/ALS protocols:
1. ALS 6002 – Multisystem Trauma or Traumatic Shock.
2. BLS 601 – Bleeding Control.
3. BLS 602 – Multisystem Trauma or Traumatic Shock.
4. BLS 632 – Impaled Object.
B. Additional/Preferred Procedures:

1. PRIMARY SURVEY – This survey should be performed simultaneously with initial resuscitative measures.
   a. AIRWAY
      1) While stabilizing the cervical spine, ensure airway patency per airway protocols.
      2) If intubation is necessary, open the collar during intubation and maintain manual in-line stabilization.
   b. BREATHING
      1) \( \text{O}_2 \): maintain \( \text{SaO}_2 \geq 95\% \).
      2) Assist ventilation as needed.
      3) Place occlusive dressing on open pneumothorax (sucking chest wound) on three sides; observe for tension pneumothorax (increased dyspnea, hypotension, and cyanosis) and briefly release dressing if these signs occur.
      4) Tension pneumothorax: Perform needle decompression as per Protocol CC613 (Tension Pneumothorax). In a patient with an open airway and tension pneumothorax, needle decompression should be performed before placing an advanced airway. If at a hospital, placement of a chest tube by referring physician is preferred after needle decompression.
   c. CIRCULATION
      1) Assess rate and quality of pulse and blood pressure (Do not rely solely on automated blood pressure monitors; correlate with manual BP at each phase of mission).
      2) Direct pressure to control bleeding (if direct pressure is not sufficient or not feasible, use a hemostatic dressing).
      3) Establish two large bore IVs. Fluid resuscitate as per appropriate shock protocols. NOTE: Do not delay transport to initiate IV lines; IVs can be initiated during transport.
      4) Consider IO access for pediatric and adult patients without IV access.
      5) Initiate and continue cardiac monitoring.
      6) Check a venous lactate level during initial assessment if patient is not in extremis (capillary if no IV access is available). If patient is in extremis, check immediately upon initiating transport.
         a) If patient has lactate level \( \geq 4 \text{ mmol/L} \) and patient is NOT suspected of having active bleeding or sustained penetrating trauma, administer 500 mL NSS (adult) or 20...
ml/kg (pediatric). Administer additional IVF fluids based on Protocol CC705A-1 (Hypovolemic Shock – Adult) or Protocol CC705P (Shock – Pediatric).

b) If lactate level is ≥4 mmol/L in a patient who is suspected of having active bleeding or who has sustained penetrating trauma, contact Medical Command.

c) If patient is in shock, treat based on Protocol CC705A-1 (Hypovolemic Shock – Adult) or Protocol CC705P (Shock – Pediatric) or Medical Command order.

d) Repeat lactate level every 60 minutes up to 4 times. If repeat lactate level is ≥4 mmol/L, contact Medical Command.

7) Rapid transport to trauma center per trauma destination protocol.

8) If patient remains hypotensive after 2L NSS, contact Medical Command for blood administration orders.

2. SECONDARY SURVEY – Complete in-transit if patient is unstable.

a. HEAD

1) Assess for signs of trauma, including scalp lacerations/bleeding and skull deformities.
2) Assess for rhino/otorrhea.
3) Assess pupillary size and reactivity.

Definitive Care:
1) Control bleeding with direct pressure.
2) If direct pressure fails to control bleeding, place a hemostatic dressing and re-apply pressure.

b. MAXILLOFACIAL

1) Reassess adequacy of airway.
2) Assess for instability of facial bones.
3) Assess for nasal, eye, and oral injuries.

Definitive Care:
1) Protect and maintain airway.
2) Treat eye injuries per protocol.

c. NECK

1) Assess for wounds, swelling, deformity, subcutaneous emphysema, tracheal deviation, and venous distention.
2) Assess quality of carotid pulses.

Definitive Care:
1) Refer to Protocol CC261 (Spinal Care) regarding the need for spinal immobilization.
2) Control bleeding by direct pressure.
3) Protect airway.

d. CHEST

1) Assess chest wall for wounds, deformities, and symmetrical excursion.
2) Auscultate breath sounds.
3) Auscultate heart tones with regard to rate and quality.

Definitive Care:
1) Assist ventilation per airway protocol.

e. ABDOMEN

1) Assess abdomen for contusions, wounds or eviscerated organs.
2) Gently palpate abdomen to assess tenderness or rigidity.
   **Definitive Care:**
   1) Cover open wounds with dry sterile dressing.
   2) Cover any eviscerated organs with sterile moist saline dressing.

**f. PERINEUM / PELVIS**
   1) Assess for swelling, discoloration, bleeding or blood at urethral meatus.
   2) Gentle pressure to pelvis to assess stability and to detect crepitus.
   **Definitive Care:**
   1) Control bleeding by direct pressure.
   2) If pelvic fracture is suspected, bind pelvis using a pelvic immobilization device to control potential bleeding.

**g. EXTREMITIES**
   1) Assess for bleeding, contusions, deformities, or swelling in all extremities.
   2) Assess neurovascular status of all extremities by noting presence of pulses, skin color and gross motor and sensory function.
   **Definitive Care:**
   1) Control bleeding by direct pressure and cover all open wounds with dry sterile dressings.
   2) Splint all suspected fractures and deformities. Assess peripheral neurovascular status after splinting.
   3) Place tourniquet if direct pressure and splinting fail to control bleeding.
   4) If a crush injury is suspected, contact medical command for additional NSS and/or NaHCO₃ (3 amps in one liter D₅W) at 200 mL/hr to prevent the effects of rhabdomyolysis.

**h. NEUROLOGIC**
   1) Assess mental status and note Glasgow Coma Scale score.
   2) Assess gross motor and sensory function. (If intubation and paralysis are required, report this assessment to the receiving facility).
   **History:**
   1) Obtain details surrounding incident.
   2) Receive report of patient condition and interventions prior to flight crew arrival.
   3) Obtain information concerning past medical history, allergies, medications and last meal.
   **Definitive Care:**
   1) Treat per Protocol CC611 (Head Injury).
   2) Monitor and treat potentially reversible causes of altered level of consciousness (e.g., hypoxia, hypovolemia, hypoglycemia).

3. **RE-EVALUATION**
   a. Continually reassess patient for changes or new findings.
   b. Assess vital signs at least every 5 minutes.
   c. Monitor and document response to all interventions.
   d. Perform and document serial neurological, cardiac, respiratory and abdominal exams.

4. **ADDITIONAL TREATMENT**
   a. Ensure safety of crew and other scene personnel at all times.
b. The most acute of the possibly applicable protocols takes precedence.
c. Notify the receiving facility of patient’s condition as soon as possible.
d. Do not delay transport.
e. Transport to trauma center as per state trauma destination protocols (if applicable).

Performance Parameters:
A. Appropriate application of Trauma destination policy.
B. IV/IO NSS treatment for hypotension.
C. Appropriate vital signs frequency.
D. IV/IO initiated en route vs. on scene.
E. Trauma notification.
F. Cervical spine immobilization.
G. Assessment of neurological status (GCS) prior to intubation or sedation and paralysis.
PAIN MANAGEMENT

Criteria:
A. Patient is experiencing acute pain from a medical condition or traumatic injury.

Exclusion Criteria:
A. Patient with altered mental status (including GCS <14).
B. Patient is receiving an ongoing sedative or analgesic infusion.
C. Patient has hypotension:
   a. Adult patient with SBP <100 mmHg.
   b. Pediatric patient with SBP < [70 + 2(age in years)] mmHg.
D. Patient is pregnant.
If any of above exclusion criteria, consult Medical Command prior to pain management.

Procedure:
1. Assess a pain scale on all patients with potentially painful conditions.
2. Fentanyl (Sublimaze) 1 microgram/kg (maximum dose 100 micrograms) every 10 minutes until pain is controlled (pain described as less than 5/10). Reassess blood pressure between each dose.
   a) Hold if SBP <100 mmHg.
   b) Maximum is up to 4 doses of Fentanyl.
      Exception: In patients with an acute neurological condition (e.g non-traumatic headache, suspected ischemic stroke or possible intracranial hemorrhage), maximum dose prior to medical consult is 1 dose of Fentanyl. Consult Medical Command if additional pain control is needed.
3. Re-evaluate Pain Scale with each vital sign assessment.
4. If pain continues, contact Medical Command for further orders.
5. Medical Command may order Ketamine 0.2 mg/kg (maximum dose 20 mg) as an adjunct for pain control or in cases of prolonged patient management. To prepare, mix Ketamine 500 mg in 250 ml NSS (concentration 2 mg/ml). Draw the appropriate amount and administer slow IV push.

<table>
<thead>
<tr>
<th>Amount</th>
<th>10 kg</th>
<th>20 kg</th>
<th>30 kg</th>
<th>40 kg</th>
<th>50 kg</th>
<th>60 kg</th>
<th>70 kg</th>
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Notes:
A. Contraindications to Ketamine: Patient with hydrocephalus, VP shunt, or open globe injury.
B. Preferred pain scales are:

[Continued on next page]
**Adult**
Self-reported 0 to 10 scale.

**Pediatric (age 4-12 years)**

![Wong-Baker FACES™ Pain Rating Scale](Image)

* Ask the patient to choose the face that best depicts the pain they are experiencing

**Pediatric (age <4 years)**

<table>
<thead>
<tr>
<th>Categories</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face</td>
<td>No particular expression or smile</td>
</tr>
<tr>
<td></td>
<td>Occasional grimace or frown, withdrawn, disinterested</td>
</tr>
<tr>
<td></td>
<td>Frequent to constant frown, clenched jaw, quivering chin</td>
</tr>
<tr>
<td>Legs</td>
<td>Normal position or relaxed</td>
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<tr>
<td></td>
<td>Uneasy, restless, tense</td>
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<tr>
<td></td>
<td>Kicking, or legs drawn up</td>
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<tr>
<td>Activity</td>
<td>Lying quietly, normal position, moves easily</td>
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<tr>
<td></td>
<td>Squirming, shifting back and forth, tense</td>
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<tr>
<td></td>
<td>Arched, rigid, or jerking</td>
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<tr>
<td>Cry</td>
<td>No cry (awake or asleep)</td>
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<td></td>
<td>Moans or whimpers, occasional complaint</td>
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<td></td>
<td>Crying steadily, screams or sobs, frequent complaints</td>
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<tr>
<td>Consolability</td>
<td>Content, relaxed</td>
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<td></td>
<td>Reassured by occasional touching, hugging, or being talked to, distractible</td>
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<tr>
<td></td>
<td>Difficult to console or comfort</td>
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</tbody>
</table>

Each of the five categories (F) Face; (L) Legs; (A) Activity; (C) Cry; (C) Consolability is scored from 0-2, which results in a total score between 0 and 10.

* Patients who are awake: Observe for at least 1-2 minutes. Observe legs and body uncovered if possible. Reposition patient or observe activity, assess body for tenseness and tone. Initiate consoling interventions if needed.

** Patients who are asleep: Observe for at least 2 minutes or longer. Observe body and legs when possible. Touch the body and assess for tenseness and tone.
Performance Parameters:

A. Appropriate pain management.
B. Appropriate Medical Command consultation.
C. Documentation of Pain Scale with each vital sign assessment.
HEAD INJURY

Criteria:
Patient meets either of the following criteria:
A. Patient with a head injury and altered mental status (GCS <15).
B. Patient with a CT-confirmed traumatic intracranial hemorrhage.

Exclusion Criteria:
A. Head injury, but alert and oriented with GCS = 15 and no known intracranial injury.

Procedure:
A. Refer to BLS Protocol 611 (Head Injury).
B. Additional/Preferred Procedures:
   1. Ensure airway patency. Administer oxygen as needed to maintain O$_2$ Saturation $\geq$95%. If intubated, ventilate to maintain ETCO$_2$ 35-40 mmHg.
      a. Adult – SBP $\geq$90 mmHg.
      b. Pediatric: SBP $\geq [70 + (2 \times \text{age})]$ mmHg.
      NOTE: Document GCS and pupil reactivity prior to any sedative or paralytic administration.
   4. Elevate head of bed 30 degrees (if spine is cleared).
   5. If patient has signs/symptoms of decompensation due to suspected elevated intracranial pressure:
      a. Change in level of consciousness: e.g. GCS <10 or a decrease in GCS $>$2 points.
      b. Unequal pupils.
      c. Pupils become fixed.
      d. Decerebrate/decorticate posturing or unilateral deficit.
      e. Rising blood pressure with decreasing heart rate (Cushing’s reflex).
   Treatment:
      a. Intubate if not already performed.
      b. Adjust ventilator %MinVol between 100-150% to maintain ETCO$_2$ of 35-40 mmHg.
      c. If unable to achieve ETCO$_2$ goal, contact Medical Command for additional orders.
   6. If a Phenytoin (Dilantin) or Fosphenytoin (Cerebyx) infusion has been started by the referring facility for CT-confirmed intracranial hemorrhage, continue this infusion. Contact Medical Command based on the following parameters:
      a. Dosing range: Phenytoin 10-20 mg/kg (maximum dose 2000 mg) or Fosphenytoin 10-20 PE/kg (maximum dose 2000 PE).
      b. Rate of infusion may not exceed 25 mg/min (Phenytoin) or 150 PE/min (Fosphenytoin).
      c. If patient has HR <60, SBP <100 mmHg, or dysrhythmia, hold infusion and contact Medical Command.
   7. If patient has a CT-confirmed intracranial hemorrhage, has had a seizure in the past 24 hours, and an antiepileptic has not already been administered, administer Phenytoin (Dilantin) 20 mg/kg IV/IO (maximum dose 2000 mg); rate of infusion may not exceed 25 mg/min. If patient has HR <60, SBP <100 mmHg, or dysrhythmia, hold infusion and contact Medical Command.
8. If patient has a CT-confirmed intracranial hemorrhage and patient is anticoagulated (e.g. takes Warfarin [Coumadin]) and/or has a coagulopathy with INR ≥1.5, contact Medical Command for possible administration of plasma if available.

9. If signs or symptoms of decompensation, Medical Command may order Mannitol 1 gm/kg IV/IO (Adult) or 0.5 gm/kg (Pediatric) (maximum dose 50 gm for Adult or Pediatric) over 5 minutes. If patient becomes hypotensive or has precipitous drop in blood pressure during infusion of Mannitol, stop Mannitol and re-contact Medical Command.

10. If patient has a CT-confirmed intracranial hemorrhage and patient is anticoagulated with INR ≥1.5, Medical Command may order 2 units of Fresh Frozen Plasma (FFP) (Adult dose). Refer to Protocol CC212 (Administration of Blood Products).

Performance Parameters:
A. Destination selection.
B. EtCO₂ monitoring.
C. Appropriate GCS/Pupils/Neuro exam before and after sedation.
D. Appropriate blood pressure control.
E. Appropriate seizure prophylaxis.
Criteria:
Patient meets both of the following criteria:
A. Pregnancy greater than 20 weeks gestation.
Significant head, trunk, and/or extremity trauma.

Exclusion Criteria:
A. Pregnant patient less than 20 weeks gestation – Consult Medical Command for appropriate destination selection.

Procedure:
A. Refer to applicable BLS/ALS protocols:
   1. ALS 6002 – Multisystem Trauma or Traumatic Shock.
   2. BLS 601 – Bleeding Control.
   3. BLS 602 – Multisystem Trauma or Traumatic Shock.
   4. BLS 632 – Impaled Object.
B. Additional/Preferred Procedures:
   1. Assess and document fetal heart rate (FHR) every 30 minutes. Ask mother about fetal movement and document.
   2. If SBP is ≤90 mmHg, transport patient rolled slightly onto left side. Resuscitate as per Protocol CC705A-1 (Hypovolemic Shock).
   3. Cardiac arrest during transport: Continue resuscitation until arrival at trauma center.
   4. Transport to closest trauma center with emergency obstetrical services.

Note:
A. The preferred destination for pregnant trauma in the Pittsburgh Area is UPMC Mercy; the preferred site in the Maryland area is Maryland Shock Trauma.

Performance Parameters:
A. Proper use of all trauma protocols.
B. Transporting patient with hypotension on left side.
C. Cardiac arrest management.
D. Proper transport destination.
TENSION PNEUMOTHORAX

Criteria:
Patient meets all of the following criteria:
A. Known or suspected chest wall trauma, severe COPD, or airway manipulation.
B. Decreased breath sounds (unilateral or bilateral).
C. One of the following criteria:
   1. Difficulty ventilating (i.e., short of breath or elevated peak inspiratory pressures, increased resistance to bag-valve ventilation).
   2. Hypotension {Adult - SBP <90 mmHg; Pediatric - SBP ≤ [70 + (2 x age)] mmHg}.
   3. Subcutaneous emphysema of chest or neck.
   5. Tracheal deviation.

Exclusion Criteria:
A. None.

Procedure:
1. Assess for alternate reasons for asymmetrical lung sounds (e.g. if patient is intubated, assess the ETT depth [3x internal tube diameter]). If not present and tension pneumothorax is suspected, proceed with procedures below without delay.
2. Needle decompress affected side at the second (2nd) intercostal space at mid-clavicular line (preferred). Alternative: fourth (4th) intercostal space, anterior axillary line. Use a 10-12G 3 inch catheter (Adult) or 16-20G 1¼ inch catheter (Pediatric).
3. Regardless of the result, leave the catheter (without needle) in place.
4. If there are recurrent signs or symptoms of tension Pneumothorax, repeat the procedure.
5. If SBP remains <90 mmHg or other evidence of shock, refer to Protocol CC705A-4 (Obstructive Shock – Adult) or Protocol CC705P (Shock – Pediatric).

NOTE:
A. Once recognized or suspected, a tension pneumothorax should be treated promptly, without delaying to complete other tasks.
B. If advanced airway management is indicated and a tension pneumothorax is suspected, needle decompression should occur without delay, while providing bag-valve-mask ventilation and preparing for advanced airway placement.

Performance Parameters:
A. Recognition of tension pneumothorax and appropriate application of the protocol.
B. Appropriate selection of catheter and needle placement.
C. Repeat procedure when indicated.
AMPUTATION

Criteria:
A. Patient with amputation of a digit or limb.

Exclusion Criteria:
A. None.

Procedure:
A. Refer to BLS Protocol 662 (Amputation), including wrapping the amputated part(s) in sterile saline soaked gauze, seal in plastic and then place on ice.
B. Additional/Preferred Procedures:
   1. Control hemorrhage: direct pressure, and/or proximal placement of BP cuff or tourniquet for amputated or near amputated extremity.
   2. Tourniquet use in partial or total amputation.
      a. If unable to control hemorrhage via direct pressure or hemostatic dressings, apply tourniquet as proximal to the body as possible.
      b. Turn windlass rod on tourniquet until hemorrhage is controlled, and secure with Velcro tabs.
      c. Once secured, do not loosen the tourniquet windlass rod.
      d. Record time of application directly on the tourniquet using a permanent marker or indelible ink.
      e. Report tourniquet use and time of placement to receiving facility trauma staff and confirm acknowledgement of presence of tourniquet application.
   3. Incomplete amputation:
      a. Place injured limbs in a position of function, apply dry sterile dressing, and splint extremity(s).
      b. Elevate injured extremity; monitor neurovascular status.
   5. Transport to a trauma facility per trauma destination policy. Consult for hand injuries, as some trauma centers may not have hand surgery.
   6. Contact Medical Command for additional analgesia as needed.
   7. When a patient is entrapped by a limb and cannot be extricated, and when requested by EMS, STAT MedEvac will attempt to arrange for a qualified physician to be transported to the scene for possible field amputation. Contact the Medical Director On-Call (MDOC) to assist in arranging this.

Performance Parameters:
A. Appropriate care of amputated part documented.
B. Pain management.
C. Destination for isolated amputation.
BURNS

Criteria:
Patient meets any of the following criteria:
A. Thermal injury from exposure to intense heat
B. Injury from electrical shock or lightning strike
C. Skin injury from chemical exposure

Exclusion Criteria:
A. None.

Procedure:
A. Refer to applicable BLS/ALS protocols:
   1. ALS 6071 – Burns.
   2. BLS 671 – Burns.
B. Additional/Preferred Procedures:
   1. Assess for presence of or potential inhalational injury, including evidence of:
      a. Facial Burns.
      b. Singed eyebrow or nasal hairs.
      c. History of impaired mentation and/or confinement in a burning building.
      d. History of an explosion.
      e. * Carbon deposits or acute inflammatory changes in the oropharynx.
      f. * Carbonaceous sputum.
      g. * Presence of erythema and edema in the airway.
      * If present, consider airway management. Refer to Protocol CC401 (Airway Management).
   2. Assess % Total Body Surface Area (TBSA) burned based on partial thickness (2\textsuperscript{nd} degree) and full thickness (3\textsuperscript{rd} degree) burns. Refer to Rule of Nines diagram below.
   3. Obtain a lactate level during initial assessment if patient is not in extremis. If patient is in extremis, check immediately upon initiating transport. If lactate level is ≥4 mmol/L, administer 500 mL NSS (adult) or 20 mL/kg (pediatric) bolus as part of initial fluid resuscitation.
   4. Repeat lactate level every 60 minutes up to 4 times. If repeat lactate level is ≥4 mmol/L, contact Medical Command.
   6. If patient is demonstrating evidence of hypotension, treat per appropriate protocol:
      a. Adult patient with SBP ≥90 mmHg, refer to Protocol CC705A-2 (Distributive Shock – Adult).
      b. Pediatric patient with SBP ≥ [70 + (2 x age)] mmHg, refer to Protocol CC705P (Shock – Pediatric).
   7. If patient has <20% TBSA burns and is not exhibiting signs of shock, administer maintenance fluids as per Protocol CC211 (Vascular Access and Fluid Administration).
8. Fluid resuscitation for patients with ≥20% TBSA burns and without signs of shock:
   a. **Scene transport:**
      1) Pediatric (≤5 years old) 125 ml/hr
      2) Pediatric (6-14 years old) 250 ml/hr
      3) Adult (≥15 years old) 500 ml/hr
   b. **Interfacility transfer** of patients with thermal or chemical burns (first 8 hours post-burn):
      1) Adult \((2 \text{ ml} \times \% \text{ TBSA burned} \times \text{kg}) / 16 = \text{ml/hr LR or NSS}\)
      2) Pediatric \((3 \text{ ml} \times \% \text{ TBSA burned} \times \text{kg}) / 16 = \text{ml/hr LR or NSS}\)
         + **Maintenance fluid** as separate infusion (D5½NS, D5NS, or D5LR)
         Refer to Protocol CC211 (Vascular Access and Fluid Administration)
   c. **Interfacility transfer** of patient with electrical burns (first 8 hours post-burn):
      1) Adult \((4 \text{ ml} \times \% \text{ TBSA burned} \times \text{kg}) / 16 = \text{ml/hr LR or NSS}\)
      2) Pediatric \((4 \text{ ml} \times \% \text{ TBSA burned} \times \text{kg}) / 16 = \text{ml/hr LR or NSS}\)
         + **Maintenance fluid** as separate infusion (D5½NS, D5NS, or D5LR)
         Refer to Protocol CC211 (Vascular Access and Fluid Administration)

9. If patient is >8 hours post-burn, contact Medical Command for fluid resuscitation orders.
10. Transport patient to appropriate Burn Center. If patient has non-burn traumatic injuries, contact Medical Command for appropriate destination.

11. For interfacility patients (especially >8 hours post-burn), Medical Command may order foley catheter placement to monitor urinary output. Fluid resuscitate to maintain adequate urine output:
    a. Adult 0.5 ml/kg/hour (30-50 mL/hr)
    b. Pediatric 1 ml/kg/hour

12. For electrical injuries where urine myoglobin (red or brown urine) has been detected:
    a. Medical Command may order:
       1) Fluid resuscitation to maintain urine output of 1 – 1.5 ml/kg/hr.
       2) **Sodium Bicarbonate 200 mL/hr IV/IO.**
       3) **Mannitol 1 gm/kg IV/IO** (adult) or 0.5 gm/kg IV/IO (pediatric) (maximum dose 50 gm) over 5 minutes. If patient becomes hypotensive or has precipitous drop in blood pressure during infusion of Mannitol, stop Mannitol and re-contact Medical Command.

    b. If ECG changes consistent with hyperkalemia are present (peaked T waves or wide complex rhythm), Medical Command may order **10% Calcium Gluconate 10 mL IV/IO** (adult only).

13. If the patient is intubated and circumferential chest burns limit chest wall excursion and the ability to ventilate, perform chest wall escharotomy.

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**Performance Parameters:**
A. Pain management.
B. Proper fluid management.
C. Appropriate airway control for documentation of suspected inhalation injury.
D. Appropriate monitoring.
E. Appropriate consultation of Medical Command.
F. Destination selection.
Burn Chart – Rule of Nines:

Adult

- 9%
- 18% front
- 18% back

Child

- 18%
- 18% front
- 18% back
- 9%
- 14% 14%
HYPOVOLEMIC SHOCK – ADULT

Criteria:
Patient meets both of the following criteria:
A. Suspected fluid loss related to one of the following causes:
   1. Trauma.
   2. Suspected hemorrhage.
   3. Other volume loss (e.g. vomiting or diarrhea).
B. Decreased tissue perfusion as evidenced by any of the following:
   1. SBP <90 mmHg.
   2. Changes in mental status.
   3. Changes in skin color (pallor, mottling or cyanosis).
   4. Heart rate > 120 beats per minute.
   5. Capillary refill > 2 seconds.
   6. Urine output < 30 ml/hr for 4 hours or more (interfacility transports).
   7. Lactate level ≥ 4 mmol/L.
   8. Shock Index (HR/SBP) > 0.9.

Exclusion Criteria:
A. None.

Procedure:
A. Refer to ALS Protocol 7005 (Shock / Systemic Inflammatory Response Syndrome).
B. Additional/Preferred Procedures:
   1. Control external blood loss.
   2. Consider obtaining secondary vascular access if not already established.
   3. Obtain a venous lactate level during initial assessment if patient is not in extremis. If patient is in extremis, check immediately upon initiating transport. Repeat lactate level every 60 minutes up to 4 times. If repeat lactate level is ≥ 4 mmol/L, contact Medical Command.
   4. Provide volume resuscitation:
      a. If SBP is ≥90 mmHg and lactate level is <4 mmol/L, administer 500 mL NSS IV/IO.
      b. If SBP is <90 mmHg or lactate level is ≥4 mmol/L and not believed to be due to blood loss, administer 1 Liter NSS bolus under pressure. If after 1 Liter of NSS patient's SBP remains <90 mmHg, repeat 1 Liter NSS bolus.
      c. If SBP is <90 mmHg and believed to be due to blood loss, fluid resuscitate with 1 L NSS bolus under pressure. If after 1 Liter of NSS the patient's SBP remains <90 mmHg and blood loss is suspected or hemoglobin is known to be <8 gm/dl, begin transfusion of 2 units of Packed Red Blood Cells IV and contact Medical Command. Refer to Protocol CC212 (Administration of Blood Products).
      d. If patient is having ongoing hemorrhage with shock, PRBCs may be initiated with initial volume resuscitation.
   5. If SBP remains <90 mmHg, initiate Norepinephrine (Levophed) 0.05-0.5 micrograms/kg/min IV/IO. Parameters:
      a. Goal is SBP 90-140 mmHg and improvement in tissue perfusion.
      b. Titrate Norepinephrine (Levophed) by 0.05 micrograms/kg/min every 5-10 minutes to achieve goal SBP. If goal SBP is not reached at 0.1 micrograms/kg/min, contact Medical Command for consideration of additional vasopressor while continuing to titrate Norepinephrine (Levophed).
6. If patient has SBP <70 mmHg or otherwise appears to be in a peri-arrest state, administer **Epinephrine 100 micrograms IV/IO** (1 ml of 1:10,000 Epinephrine administered through a wide open line of normal saline for dilution) while initiating or titrating vasopressor infusion(s). If SBP remains <70 mmHg, repeat every 2 minutes up to 4 doses. If patient requires more than 2 doses of bolus (push-dose) Epinephrine, contact Medical Command to discuss continued management of hypotension.

7. If patient is acidotic with pH <7.1, administer **Sodium Bicarbonate 1 mEq/kg IV/IO** and **Sodium Bicarbonate infusion at 200 ml/hr IV/IO** (150 mEq Sodium Bicarbonate in 1000 ml D5W).

8. If patient remains hypotensive after above interventions or after 30 minutes of treatment, contact Medical Command.

9. If patient has a coagulopathy (elevated PT/INR or PTT), contact Medical Command.

10. If patient remains hypotensive after 2 units of PRBCs, contact Medical Command for additional blood administration orders. If unable to contact Medical Command and patient continues to be hypotensive secondary to hypovolemia, continue to transfuse an additional **2 units Packed Red Blood Cells IV** (obtained from referring facility).

11. If patient has active bleeding and patient is anticoagulated with INR ≥1.5, Medical Command may order **2 units of Fresh Frozen Plasma (FFP) IV**. Refer to Protocol **CC212** (Administration of Blood Products).

**Notes:**

A. Initial fluid resuscitation should account for fluid already administered in preceding 2 hours.

B. For patients on interfacility transfers who are already receiving vasopressors listed above the medical consult line in this protocol, the medication may be continued based on the titration parameters listed above. For patients already receiving vasopressors listed below the medical consult line or absent from the protocol, contact Medical Command for continuation of the infusion or alternate therapy.

**Performance Parameters:**

A. Inclusion criteria for protocol.

B. Appropriate fluid resuscitation with normal saline.

C. Administration of correct type of blood if patient remains hypotensive after two liters of fluid.

D. Appropriate Medical Consultation.
DISTRIBUTIVE SHOCK – ADULT

Criteria:
Patient meets both of the following criteria:
A. Evidence of shock related to one of the following causes:
   1. Sepsis (characterized by suspected infection in setting of shock).
   2. Anaphylaxis.
   3. Toxic drug exposure.
   5. Adrenal crisis.*
B. Decreased tissue perfusion as evidenced by any of the following:
   1. SBP <90 mmHg.
   2. Changes in mental status.
   3. Changes in skin color (pallor, mottling or cyanosis).
   4. Heart rate > 120 beats per minute.
   5. Capillary refill > 2 seconds.
   6. Urine output < 30 ml/hr for 4 hours or more (interfacility transports).
   7. Lactate level ≥4 mmol/L.
   8. Shock Index (HR/SBP) >0.9.
   
   Note: Patients with distributive shock may have warm/pink skin and normal capillary refill.

Exclusion Criteria:
A. None.

Procedure:
A. Refer to ALS Protocol 7005 (Shock / Systemic Inflammatory Response Syndrome).
B. Additional/Preferred Procedures:
   1. Consider obtaining secondary vascular access if not already established.
   2. Obtain a venous lactate level during initial assessment if patient is not in extremis. If patient is in extremis, check immediately upon initiating transport. Repeat lactate level every 60 minutes up to 4 times. If repeat lactate level is ≥4 mmol/L, contact Medical Command.
   3. Provide volume resuscitation:
      a. If SBP is ≥90 mmHg and lactate level is <4 mmol/L, administer 500 mL NSS IV/IO.
      b. If SBP is <90 mmHg or lactate level is ≥4 mmol/L, administer 1 Liter NSS bolus under pressure. If after 1 Liter of NSS patient's SBP remains <90 mmHg, repeat 1 Liter NSS bolus.
   4. If SBP remains <90 mmHg, initiate Norepinephrine (Levophed) 0.05-0.5 micrograms/kg/min IV/IO. Parameters:
      a. Goal is SBP 90-140 mmHg and improvement in tissue perfusion.
      b. Titrate Norepinephrine (Levophed) by 0.05 micrograms/kg/min every 5-10 minutes to achieve goal SBP. If goal SBP is not reached at 0.1 micrograms/kg/min, contact Medical Command for consideration of additional vasopressor while continuing to titrate Norepinephrine (Levophed).
      c. Contact Medical Command if there is development of ventricular dysrhythmia.
   5. If patient has SBP <70 mmHg or otherwise appears to be in a peri-arrest state, administer Epinephrine 100 micrograms IV/IO (1 ml of 1:10,000 Epinephrine administered through a wide open line of normal saline for dilution) while initiating or titrating vasopressor infusion(s). If SBP remains <70 mmHg, repeat every 2 minutes up to 4 doses. If patient...
requires more than 2 doses of bolus (push-dose) Epinephrine, contact Medical Command to discuss continued management of hypotension.

6. If patient is acidic with pH <7.1, administer Sodium Bicarbonate 1 mEq/kg IV/IO and Sodium Bicarbonate infusion at 200 ml/hr IV/IO (150 mEq Sodium Bicarbonate in 1000 ml D5W).

7. If patient remains hypotensive after above interventions or after 30 minutes of treatment, contact Medical Command.

8. If patient is known to have a hemoglobin <8 gm/dl, contact Medical Command for blood administration orders. If unable to contact Medical Command and patient continues to be hypotensive transfuse 2 units Packed Red Blood Cells IV. Refer to Protocol CC212 (Administration of Blood Products).

9. Medical Command may order Vasopressin (Vasostrict) 0.04 units/min IV/IO. Dose is not titrated. This may be particularly useful when patient is acidic (pH <7.1), as other vasopressors are ineffective in an acidic environment.

10. Medical Command may order Epinephrine 0.05-0.15 micrograms/kg/min IV/IO. Titrate by 0.02 micrograms/kg/min every 5-10 minutes to achieve goal SBP 90-140 mmHg. If goal not reached at 0.15 micrograms/kg/min, contact Medical Command.

11. *If adrenal crisis is suspected, contact Medical Command. Medical Command may order Hydrocortisone (Solu-Cortef) 100 mg IV/IO.

Notes:

A. Initial fluid resuscitation should account for fluid already administered in preceding 2 hours.
B. For patients on interfacility transfers who are already receiving vasopressors listed above the medical consult line in this protocol, the medication may be continued based on the titration parameters listed above. For patients already receiving vasopressors listed below the medical consult line or absent from the protocol, contact Medical Command for continuation of the infusion or alternate therapy.

Performance Parameters:

A. Inclusion criteria for protocol.
B. Appropriate fluid resuscitation with normal saline.
C. Appropriate use of vasopressors.
D. Appropriate Medical Consultation.
CARDIOGENIC SHOCK – ADULT

Criteria:

Patient meets both of the following criteria:

A. Decrease in cardiac output related to any of the following:
   1. Acute Myocardial Infarction.
   2. Congestive Heart Failure.
   3. Congenital Heart Defects.

B. Decreased tissue perfusion as evidenced by any of the following:
   1. SBP < 90 mmHg.
   2. Changes in mental status.
   3. Changes in skin color (pallor, mottling or cyanosis).
   4. Heart rate > 120 beats per minute.
   5. Capillary refill > 2 seconds.
   6. Urine output < 30 ml/hr for 4 hours or more (interfacility transports).
   7. Lactate level ≥ 4 mmol/L.
   8. Shock Index (HR/SBP) > 0.9.

Exclusion Criteria:

A. None.

Procedure:

A. Refer to ALS Protocol 7005 (Shock / Systemic Inflammatory Response Syndrome).

B. Additional/Preferred Procedures:

1. Consider obtaining secondary vascular access if not already established.
2. Obtain a venous lactate level during initial assessment if patient is not in extremis. If patient is in extremis, check immediately upon initiating transport. Repeat lactate level every 60 minutes up to 4 times. If repeat lactate level is ≥ 4 mmol/L, contact Medical Command.
3. Provide volume resuscitation:
   a. If SBP ≥ 90 mmHg and lactate level is < 4 mmol/L, administer 250 mL NSS IV/IO.
   b. If SBP < 90 mmHg and lactate level is ≥ 4 mmol/L, administer 500 ml NSS bolus under pressure. If after 500 ml of NSS patient’s SBP remains < 90 mmHg, repeat 500 ml NSS bolus.
4. If SBP remains < 90 mmHg, initiate Norepinephrine (Levophed) 0.05-0.5 micrograms/kg/min IV/IO. Parameters:
   a. Goal is SBP 90-140 mmHg and improvement in tissue perfusion.
   b. Titrate Norepinephrine (Levophed) by 0.05 micrograms/kg/min every 5-10 minutes to achieve goal SBP. If goal SBP is not reached at 0.1 micrograms/kg/min, contact Medical Command for consideration of additional vasopressor while continuing to titrate Norepinephrine (Levophed).
   c. Contact Medical Command if there is development of ventricular dysrhythmia.
5. If patient has SBP < 70 mmHg or otherwise appears to be in a peri-arrest state, administer Epinephrine 100 micrograms IV/IO (1 ml of 1:10,000 Epinephrine administered through a wide open line of normal saline for dilution) while initiating or titrating vasopressor infusion(s). If SBP remains < 70 mmHg, repeat every 2 minutes up to 4 doses. If patient requires more than 2 doses of bolus (push-dose) Epinephrine, contact Medical Command to discuss continued management of hypotension.
6. If patient is acidotic with pH <7.1, administer **Sodium Bicarbonate 1 mEq/kg IV/IO** and **Sodium Bicarbonate infusion at 200 ml/hr IV/IO** (150 mEq Sodium Bicarbonate in 1000 ml D5W).

7. If patient is known to have a hemoglobin <8 gm/dl, contact Medical Command for blood administration orders. If unable to contact Medical Command and patient continues to be hypotensive transfuse **2 units Packed Red Blood Cells IV**. Refer to Protocol CC212 (Administration of Blood Products).

8. Medical Command may order administration of **Dobutamine 5-20 micrograms/kg/min** to achieve goal SBP 100-140 mmHg. Titrate by 5 micrograms/kg/min every 5-10 minutes to obtain goal SBP. If goal not reached at 20 micrograms/kg/min, recontact Medical Command.

9. If no response to Norepinephrine or Dobutamine, Medical Command may order **Epinephrine 0.05-0.15 micrograms/kg/min**. Titrate by 0.02 micrograms/kg/min every 5-10 minutes to achieve goal SBP. If goal not reached at 0.15 micrograms/kg/min, recontact Medical Command.

**Notes:**

A. Initial fluid resuscitation should account for fluid already administered in preceding 2 hours.

B. For patients on interfacility transfers who are already receiving vasopressors listed above the medical consult line in this protocol, the medication may be continued based on the titration parameters listed above. For patients already receiving vasopressors listed below the medical consult line or absent from the protocol, contact Medical Command for continuation of the infusion or alternate therapy.

**Performance Parameters:**

A. Inclusion criteria for protocol.

B. Appropriate use of vasopressors to maintain blood pressure.

C. Documentation of frequent reassessment.
Criteria:
  Patient meets both of the following criteria:
  A. Presence of mechanical factors impeding appropriate cardiac output, including:
     1. Cardiac Tamponade, confirmed by imaging or suspected based on presence of:
        a. Penetrating or blunt chest trauma.
        b. Bilateral breath sounds present.
        c. Distant heart tones.
        d. Distended neck veins (not always present due to hypovolemia).
     2. Pulmonary embolism
     3. Tension Pneumothorax
  B. Decreased tissue perfusion as evidenced by any of the following:
     1. SBP <90 mmHg.
     2. Changes in mental status.
     3. Changes in skin color (pallor, mottling or cyanosis).
     4. Heart rate > 120 beats per minute.
     5. Capillary refill > 2 seconds.
     6. Urine output < 30 ml/hr for 4 hours or more (interfacility transports).
     7. Lactate level ≥4 mmol/L.
     8. Shock Index (HR/SBP) >0.9.

Exclusion Criteria:
  A. None.

Procedure:
  A. Refer to ALS Protocol 7005 (Shock / Systemic Inflammatory Response Syndrome).
  B. Additional/Preferred Procedures:
     1. Address obstructive process requiring immediate intervention:
        a. Cardiac Tamponade
           1) If at a referring facility and ultrasound is available, consult Medical Command regarding the possibility of performing ultrasound to confirm presence of cardiac tamponade and having a pericardiocentesis performed at the referring facility prior to transport.
           2) At time of transport, notify receiving facility of patient condition and possible need for immediate intervention upon arrival.
        b. Pulmonary Embolism – Refer to Protocol CC530 (Arterial or Venous Thromboembolism – Adult).
        c. Tension Pneumothorax – Refer to Protocol CC613 (Tension Pneumothorax).
     2. Consider obtaining secondary vascular access if not already established.
     3. Obtain a venous lactate level during initial assessment if patient is not in extremis. If patient is in extremis, check immediately upon initiating transport. Repeat lactate level every 60 minutes up to 4 times. If repeat lactate level is ≥4 mmol/L, contact Medical Command.
     4. Provide volume resuscitation:
        a. If SBP ≥90 mmHg and lactate level is <4 mmol/L, administer 500 mL NSS IV/IO.
        b. If SBP <90 mmHg and lactate level is ≥4 mmol/L, administer 500 ml NSS bolus under pressure. If after 500 ml of NSS patient’s SBP remains <90 mmHg, repeat 500 ml NSS bolus.
5. If SBP remains < 90 mmHg, initiate **Norepinephrine (Levophed) 0.05-0.5 micrograms/kg/min IV/IO**. Parameters:
   a. Goal is SBP 90-140 mmHg and improvement in tissue perfusion.
   b. Titrate Norepinephrine (Levophed) by 0.05 micrograms/kg/min every 5-10 minutes to achieve goal SBP. If goal SBP is not reached at 0.1 micrograms/kg/min, contact Medical Command for consideration of additional vasopressor while continuing to titrate Norepinephrine (Levophed).
   c. Contact Medical Command if there is development of ventricular dysrhythmia.

6. If patient has SBP < 70 mmHg or otherwise appears to be in a peri-arrest state, administer **Epinephrine 100 micrograms IV/IO** (1 ml of 1:10,000 Epinephrine administered through a wide open line of normal saline for dilution) while initiating or titrating vasopressor infusion(s). If SBP remains <70 mmHg, repeat every 2 minutes up to 4 doses. If patient requires more than 2 doses of bolus (push-dose) Epinephrine, contact Medical Command to discuss continued management of hypotension.

7. If patient is acidotic with pH < 7.1, administer **Sodium Bicarbonate 1 mEq/kg IV/IO** and **Sodium Bicarbonate infusion at 200 ml/hr IV/IO** (150 mEq Sodium Bicarbonate in 1000 ml D5W).

8. If patient is known to have a hemoglobin < 8 gm/dl, contact Medical Command for blood administration orders. If unable to contact Medical Command and patient continues to be hypotensive transfuse **2 units Packed Red Blood Cells IV**. Refer to Protocol **CC212** (Administration of Blood Products).

9. Medical Command may order **Epinephrine 0.05-0.15 micrograms/kg/min**. Titrate by 0.02 micrograms/kg/min every 5-10 minutes to achieve goal SBP. If goal not reached at 0.15 micrograms/kg/min, recontact Medical Command.

**Notes:**

A. Initial fluid resuscitation should account for fluid already administered in preceding 2 hours.

B. For patients on interfacility transfers who are already receiving vasopressors listed above the medical consult line in this protocol, the medication may be continued based on the titration parameters listed above. For patients already receiving vasopressors listed below the medical consult line or absent from the protocol, contact Medical Command for continuation of the infusion or alternate therapy.

**Performance Parameters:**

A. Inclusion criteria for protocol.

B. Appropriately addressing obstructive process based on relevant procedure or protocol.

C. Appropriate use of vasopressors to maintain blood pressure.

D. Documentation of frequent reassessment.
### SUMMARY OF SHOCK PROTOCOLS – ADULT

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Hypovolemic Shock</th>
<th>Distributive Shock</th>
<th>Cardiogenic Shock</th>
<th>Obstructive Shock</th>
</tr>
</thead>
<tbody>
<tr>
<td>If SBP ≥90 &amp; lactate &lt;4</td>
<td>CC705A-1 500 ml NSS</td>
<td>CC705A-2 500 ml NSS</td>
<td>CC705A-3 250 ml NSS</td>
<td>Address obstructive process 500 ml NSS</td>
</tr>
<tr>
<td>If SBP &lt;90 or lactate ≥4</td>
<td>1 L NSS</td>
<td>1 Liter NSS</td>
<td>500 ml NSS</td>
<td>500 ml NSS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2</th>
<th>If SBP remains &lt;90</th>
<th>1 L NSS or 2 u PRBC (if bleeding / Hgb &lt;8)**</th>
<th>1 L NSS</th>
<th>500 ml NSS</th>
<th>500 ml NSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>If SBP remains &lt;90 (refer to specific criteria)</td>
<td>Norepinephrine</td>
<td>Norepinephrine</td>
<td>Norepinephrine</td>
<td>Norepinephrine</td>
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<td></td>
<td>Push-Dose Epinephrine</td>
<td>Push-Dose Epinephrine</td>
<td>Push-Dose Epinephrine</td>
<td>Push-Dose Epinephrine</td>
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<tr>
<td></td>
<td>Sodium Bicarbonate</td>
<td>Sodium Bicarbonate</td>
<td>Sodium Bicarbonate</td>
<td>Sodium Bicarbonate</td>
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<tr>
<td></td>
<td>PRBCs</td>
<td>Vasopressin</td>
<td>Dobutamine</td>
<td>Epinephrine</td>
<td></td>
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<tr>
<td></td>
<td>FFP</td>
<td>Epinephrine</td>
<td>Epinephrine</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Hydrocortisone</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Hgb = Hemoglobin
* Initial fluid resuscitation should account for fluid already administered in preceding 2 hours.
** Initiate PRBC infusion and contact Medical Command.
SHOCK – PEDIATRIC

Criteria:
A. Decreased tissue perfusion as evidenced by any of the following:
   1. Hypotension:
      a. <1 month  SBP <60 mmHg
      b. 1 month - 1 year  SBP <70 mmHg
      c. >1 year  SBP < [70 + (2 x age in years)] mmHg
   2. Changes in mental status.
   3. Changes in skin color (pallor, mottling or cyanosis).
   4. Tachycardia/Bradycardia.
   5. Diminished peripheral pulses or capillary refill >2 seconds.

Exclusion Criteria:
B. None.

Procedure:
A. Refer to ALS Protocol 7005 (Shock / Systemic Inflammatory Response Syndrome).
B. Additional/Preferred Procedures:
   1. Check glucose.
   2. Check lactate level during initial assessment if patient is not in extremis. If patient is in extremis, check immediately upon initiating transport.
   3. Repeat lactate level every 60 minutes up to 4 times. If repeat lactate level is ≥4 mmol/L, contact Medical Command.
   4. HYPOVOLEMIC SHOCK (History of diarrhea, vomiting or blood loss).
      a. If patient has hypotension based on the parameters above:
         1) If liver is not palpable, administer NSS 20 ml/kg IV/IO boluses up to 60 ml/kg to raise SBP based on parameters above and improve tissue perfusion.
         2) If liver is palpable, contact Medical Command.
      b. If patient does not have hypotension and lactate level is ≥4 mmol/L, administer 20 ml/kg NSS.
      c. If patient has evidence of decreased tissue perfusion based on above criteria but lactate level is ≤4 mmol/L and patient is not hypotensive, contact Medical Command.
      d. If there is persistent shock after the administration of 20 ml/kg of crystalloid and acute blood loss is suspected, contact Medical Command for consideration of early blood product administration.
      e. If there is persistent shock after the administration of 20 ml/kg of crystalloid in the setting of acute blood loss or 60 ml/kg of crystalloid in other cases of hypovolemic shock, Medical Command may order 10 ml/kg of PRBCs and to repeat X 2 or until signs of decreased tissue perfusion resolve. Refer to Protocol CC212 (Administration of Blood Products).
      f. If the liver is palpable, Medical Command may order Epinephrine 0.05-0.15 micrograms/kg/min. Titrate by 0.02 micrograms/kg/min every 5-10 minutes to achieve goal SBP. If goal not reached at 0.15 micrograms/kg/min, contact Medical Command.
5. **DISTRIBUTIVE SHOCK** (sepsis [history of fever and/or petechiae and no fluid loss], anaphylaxis, toxic drug exposure, spinal cord injury, or adrenal crisis).
   a. If patient has hypotension based on the parameters above:
      1) If liver is not palpable, administer **NSS 20 ml/kg IV/IO** boluses up to 60 ml/kg to raise SBP based on parameters above and improve tissue perfusion.
      2) If liver is palpable, contact Medical Command.
   b. If patient does not have hypotension and lactate level is ≥4 mmol/L, administer **20 ml/kg NSS**.
   c. If patient has evidence of decreased tissue perfusion based on above criteria but lactate level is ≤4 mmol/L and patient is not hypotensive, contact Medical Command.
   d. If there is persistent shock after the administration of 60 ml/kg of crystalloid and/or liver is palpable, Medical Command may order **Epinephrine 0.05-0.15 micrograms/kg/min**. Titrate by 0.02 micrograms/kg/min every 5-10 minutes to achieve goal SBP. If goal not reached at 0.15 micrograms/kg/min, contact Medical Command.
   e. If adrenal crisis is suspected, contact Medical Command. Medical Command may order **Hydrocortisone (Solu-Cortef) 2 mg/kg IV/IO** (maximum dose 100 mg).

6. **CARDIOGENIC SHOCK** (Bilateral rales, hepatomegaly, +/- heart murmur or history of heart disease).
   a. Contact Medical Command. Medical Command may order **Epinephrine 0.05-0.15 micrograms/kg/min** to raise SBP based on parameters above. Titrate by 0.02 micrograms/kg/min every 5-10 minutes to achieve goal SBP. If goal not reached at 0.15 micrograms/kg/min, contact Medical Command.
   b. (Interfacility) Medical Command may order **Lasix 1 mg/kg IV/IO**.
   c. (Interfacility) Medical Command may order **Alprostadil (Prostaglandin E-1) 0.05 micrograms/kg/min IV/IO** for infants < 4 weeks of age with liver palpable.

7. **OBSTRUCTIVE SHOCK** (Cardiac tamponade, pulmonary embolism, pneumothorax).
   a. Address obstructive process requiring immediate intervention:
      1) **Cardiac Tamponade**
         a) If at a referring facility and ultrasound is available, consult Medical Command regarding the possibility of performing ultrasound to confirm presence of cardiac tamponade and having a pericardiocentesis performed at the referring facility prior to transport.
         b) At time of transport, notify receiving facility of patient condition and possible need for immediate intervention upon arrival.
      2) **Pulmonary Embolism** – Refer to Protocol **CC530** (Arterial or Venous Thromboembolism – Adult).
      3) **Tension Pneumothorax** – Refer to Protocol **CC713** (Tension Pneumothorax).
   b. If patient has hypotension based on the parameters above:
      1) If liver is not palpable, administer **NSS 20 ml/kg IV/IO** boluses up to 60 ml/kg to raise SBP based on parameters above and improve tissue perfusion.
      2) If liver is palpable, contact Medical Command.
   c. If patient does not have hypotension and lactate level is ≥4 mmol/L, administer **20 ml/kg NSS**.
d. If patient has evidence of decreased tissue perfusion based on above criteria but lactate level is ≤4 mmol/L and patient is not hypotensive, contact Medical Command.

e. Contact Medical Command. Medical Command may order **Epinephrine 0.05-0.15 micrograms/kg/min** to raise SBP based on parameters above. Titrate by 0.02 micrograms/kg/min every 5-10 minutes to achieve goal SBP. If goal not reached at 0.15 micrograms/kg/min, contact Medical Command.

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**Note:**

A. Consult Medical Command regarding possible prophylactic intubation of patients receiving PGE-1 as it may precipitate apnea.
B. Bolus fluids for pediatric patients should be administered using a three-way stopcock and syringe.

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**Performance Parameters:**

A. Inclusion criteria followed and documented.
B. Appropriate arm of protocol used based on patient condition.
C. Proper fluid boluses for weight.
D. Appropriate use of Epinephrine infusion and dosing.
E. Appropriate Medical Command contact.
SUSPECTED ISCHEMIC STROKE – ADULT

Criteria:
Patient meets either of the following criteria:
A. Scene transport of patient with suspected stroke. Patient may have the following clinical symptom(s):
   1. Impaired expression or understanding of speech.
   2. Unilateral weakness/hemiparesis
   3. Facial asymmetry/droop.
   5. Poor coordination or balance.
   6. Partial loss of peripheral vision.
   7. Vertigo.
B. Interfacility transfer of patient diagnosed with acute ischemic stroke at the referring hospital.

Exclusion Criteria:
A. Radiographic evidence of intracranial hemorrhage.
B. Clinical or radiographic evidence of trauma.

Procedure:
A. For all patients with a suspected ischemic stroke:
   1. Refer to ALS Protocol 7006 (Stroke).
   2. Assess neurologic findings, NIHSS (Refer to Appendix C), and onset of symptoms (GCS, Ability to follow commands, Pupillary, Motor, and Sensory response). NIHSS must be assessed and documented at the beginning and end of the transport. Preferably, NIHSS should be assessed together with the receiving nurse or physician upon arrival at the receiving facility.
   3. Obtain the following information and communicate this in the receiving hospital notification:
      a) Time last known well
      b) NIHSS
      c) Request for stroke alert activation
   4. In addition to the above information, obtain the following information and communicate this to receiving facility staff at transfer of care:
      a) Name and phone number of next of kin
   5. If patient is intubated, place an esophageal (preferred) or rectal temperature probe. Assess and document core body temperature every 15 minutes.
B. Goal Blood Pressure:

<table>
<thead>
<tr>
<th>Type</th>
<th>Condition</th>
<th>Thrombolytics</th>
<th>Goal Blood Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scene</td>
<td>Suspected acute ischemic stroke or non-traumatic intracranial hemorrhage</td>
<td>N/A</td>
<td>&lt; 220/120 mmHg</td>
</tr>
<tr>
<td>Interfacility</td>
<td>Acute ischemic stroke</td>
<td>HAVE NOT received or expected to receive</td>
<td>&lt; 220/120 mmHg</td>
</tr>
<tr>
<td>Interfacility</td>
<td>Acute ischemic stroke</td>
<td>HAVE received or are expected to receive</td>
<td>&lt; 180/105 mmHg</td>
</tr>
</tbody>
</table>

C. Blood pressure management for target goals as above: Initiate or continue Nicardipine (Cardene) 5 mg/hr. Titrated by 2.5 mg/hr every 10 minutes to achieve target blood pressure
goal (maximum rate 15mg/hr). If blood pressure drops precipitously, stop infusions, administer 250 ml NSS IV/IO bolus, and contact Medical Command.

D. For patients undergoing interfacility transfer after diagnosis of acute ischemic stroke and are receiving thrombolytics (e.g. Tissue Plasminogen Activator – tPA) by infusion or have been ordered to receive thrombolytics:

1. Ensure patient meets criteria in Appendix D (Thrombolysis Checklist for Acute Ischemic Stroke) and then contact Medical Command for order to administer or continue thrombolytics. Verify appropriate dosing as below.

2. Medical Command may order administration or continuation of thrombolytics. Standard dose of Alteplase (Activase) is:
   a. **Total Dose of 0.9 mg/kg IV/IO** (max total dose 90 mg), divided into:
   b. **Bolus Dose of 10%** of Total Dose over 1 minute.
   c. **Infusion of 90%** of Total Dose over 1 hour.

**If a thrombolytic other than Alteplase (Activase) has been ordered at the referring facility, verify appropriate dosing with Medical Command.**

3. Contact Medical Command for signs of decompensation (change in mental status, unequal pupils, Cushing’s reflex defined as bradycardia and hypertension), or if patient’s stroke symptoms worsen.

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**Notes:**

A. Alteplase (Activase) should be reconstituted with sterile water to 1 mg/mL prior to administration. Remove excess medication from bottle prior to initiating administration.

B. Dosing of thrombolytics should avoid rounding whenever possible.

C. If a thrombolytic is already being administered, transport IV tubing should preferably be connected to the referring facility tubing to minimize waste of medication intended for the patient.

D. When the bottle of thrombolytic is empty, replace with a 250 ml bag of NSS and run at the same infusion rate until all thrombolytic in the tubing has been infused.

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**Performance Parameters:**

A. Appropriate application of inclusion/exclusion criteria.

B. Use of appropriate blood pressure goal.

C. Appropriate blood pressure management with Nicardipine.

D. Documentation of NIHSS at the beginning and end of transport.

E. Consultation for administration/continuation of thrombolytics.
SEIZURE

Criteria:
Patient meets either of the following criteria:
A. Patient is actively seizing with generalized clonic-tonic seizure. Indicators of seizures requiring treatment include:
   1. Two or more consecutive seizures without return of consciousness between episodes.
   2. Ongoing seizure for more than 4 minutes.
   3. Seizures associated with hypoxia.
B. Patients who have had tonic-clonic seizure activity prior to EMS arrival.

Exclusion Criteria:
A. Patient is postictal following a single seizure and have history or evidence of trauma - Follow Protocol 6002 (Multi-system Trauma or Traumatic Shock) or Protocol 611 (Head Injury), as indicated.

Procedure:
A. Refer to ALS Protocol 7007 (Seizure).
B. Additional/Preferred Procedures:
   1. If seizure activity is persistent, administer Lorazepam (Ativan) 2 mg IV/IO (adult) or 0.1 mg/kg IV/IO (Pediatric, max 2mg per dose) every 5 minutes up to maximum dose of 6 mg (adult) or 3 doses (Pediatric).
   2. If seizure activity is persistent, consider intubation.
      Note: Paralytic agents (e.g. Rocuronium), if necessary, may be used to facilitate intubation. However, they do not treat/stop seizures. Continue to administer anticonvulsant medications! Medical Command must be contacted prior to the administration of Vecuronium.
   3. If serum Na⁺ is < 125 mEq/L: Contact Medical Command for possible administration of 3% Sodium Chloride solution from referring facility.
   4. If seizure activity is persistent, or situation warrants, contact Medical Command. Medical Command may order Phenytoin (Dilantin) 20 mg/kg (maximum dose 2000 mg) IV; rate may not exceed 25 mg/min.
      NOTE: Hypotension may occur with intravenous Phenytoin administration; blood pressure and cardiac rhythm must be monitored closely. This risk may be diminished by administration at a lower rate. Discontinue Phenytoin if hypotension, bradycardia, or QRS widening occurs and contact Medical Command.
   5. If seizure activity is persistent, or situation warrants, Medical Command may order Phenobarbital 20 mg/kg IV/IO (maximum dose 1000 mg) over 10 minutes.
      NOTE: Monitor closely for hypotension and respiratory depression.

Note:
A. For Pediatric patients, the preferred antiepileptic is:
   1. Age < 6 months: Phenobarbital 20 mg/kg IV/IO (maximum dose 1000 mg).
2. Age >6 months: **Phenytoin (Dilantin) 20 mg/kg IV/IO** (maximum dose 2000 mg); rate may not exceed 25 mg/min.

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**Performance Parameters:**

- A. Checking serum glucose and treating hypoglycemia.
- B. Appropriate administration of Ativan.
- C. Vecuronium administration only with Medical Command consultation.
- D. Appropriate dose and rate for Dilantin infusion.
- E. Appropriate Medical Command Contact.
NON-TRAUMATIC INTRACRANIAL HEMORRHAGE – ADULT

Criteria:
A. Patient with known intracranial hemorrhage related to hypertension and no history of recent trauma.

Exclusion Criteria:
A. Patient with history of trauma related to this event.

Procedure:
A. Refer to ALS Protocol 7006 (Stroke).
B. Additional/Preferred Procedures:
   1. Ensure airway patency. Administer oxygen as needed to maintain O₂ Saturation ≥95%. If intubated, ventilate to maintain ETCO₂ 35-40 mmHg.
   2. Document neurologic findings (GCS, Ability to follow commands, Pupilary, Motor, and Sensory response).
   3. Goal SBP is <140 mmHg.
   4. Blood pressure management for target goal as above: Initiate Nicardipine (Cardene) 5 mg/hr. Titrate by 2.5 mg/hr every 10 min to a goal SBP 100-140 mmHg (maximum rate 15 mg/hr). Monitor closely; if blood pressure drops precipitously, discontinue infusion, administer 250 ml Normal Saline bolus and contact Medical Command.
   5. If a Phenytoin (Dilantin) or Fosphenytoin (Cerebyx) infusion has been started by the referring facility for CT-confirmed intracerebral hemorrhage and SBP ≥100 mmHg, continue this infusion. Contact Medical Command if infusion is outside of the following parameters or SBP <100 mmHg:
      a. Dosing range: Phenytoin 10-20 mg/kg (maximum dose 2000 mg) or Fosphenytoin 10-20 PE/kg (maximum dose 2000 PE).
      b. Rate of infusion may not exceed 25 mg/min (Phenytoin) or 150 PE/min (Fosphenytoin).
      c. If patient has HR <60, SBP <100 mmHg, or dysrhythmia, hold infusion and contact Medical Command.
   6. If patient has a CT-confirmed intracranial hemorrhage, has had a seizure within the past 24 hours, and an antiepileptic has not already been administered, administer Phenytoin (Dilantin) 20 mg/kg IV/IO (maximum dose 2000 mg); rate of infusion may not exceed 25 mg/min. If patient has HR <60, SBP <100 mmHg, or dysrhythmia, hold infusion and contact Medical Command.
   7. If patient has a CT-confirmed intracranial hemorrhage and patient is anticoagulated (e.g. takes Warfarin [Coumadin]) and/or has a coagulopathy with INR ≥1.5, contact Medical Command for possible administration of plasma if available.
   8. Contact Medical Command if signs of decompensation develop (change in level of consciousness, Glasgow Coma Scale <10, unequal pupils, pupils fixed, posturing, or Cushing’s reflex defined as bradycardia and hypertension). Medical Command may order Mannitol 1 gm/kg IV/IO (maximum dose 50 gm) over 5 minutes. If patient becomes hypotensive or has precipitous drop in blood pressure during infusion of Mannitol, stop Mannitol and re-contact Medical Command.
9. If patient has a CT-confirmed intracranial hemorrhage and patient is anticoagulated with INR ≥1.5, Medical Command may order **2 units of Type AB+ Fresh Frozen Plasma (FFP)**. Refer to Protocol CC212 (Administration of Blood Products).

**Performance Parameters:**

A. Intracranial hemorrhage and hypertension are not trauma-related.
B. Appropriate mean arterial pressure calculation.
C. Appropriate blood pressure management.
D. Initiation of Nicardipine infusion and appropriate dosage if required.
INTRACRANIAL CATHETER

Criteria:
A. Patient has an existing intraventricular catheter (IVC) or extraventricular drain device (EVD).

Exclusion Criteria:
A. None.

Procedure:
1. Complete and document a neurological exam to include (at a minimum):
   a. Level of consciousness.
   b. Bilateral pupil size and reactivity.
   c. Motor and sensory responses.
2. Assess the intraventricular catheter:
   a. For patients with an IVC:
      1) Obtain intracranial pressure trends from referring staff.
      2) Obtain the order for head of bed elevation and keep the head of bed at this elevation as much as possible during transfer.
   b. For patients with an EVD:
      1) Note color, clarity, and amount of CSF in the drip chamber.
      2) Obtain and follow the order for specific placement of the drip chamber.
      3) Obtain intracranial pressure trends from referring staff.
      4) Obtain the order for head of bed elevation and keep the head of bed at this elevation as much as possible during transfer.
3. Transfer monitoring to transport monitor:
   a. Zero the transducer by placing the stopcock off to the patient and opening the system to air.
   b. Level the transducer any time the patient, the level of the stretcher, or the head of the stretcher is moved.
4. Minimize the risks of elevating intracranial pressure by:
   a. Positioning the patient’s head midline with limited flexion or extension of the neck.
   b. Maintaining the head of bed elevation as ordered.
5. Minimize physical stimulation – apply hearing protection prior to departure from bedside if available or prior to helicopter start up.
6. If patient experiences nausea or vomiting, refer to Protocol CC710 (Nausea and Vomiting).
7. If patient experiences intracranial pressure >20 mmHg, contact the Medical Director on Call (MDOC).

Performance Parameters:
A. Appropriate assessment and documentation of clinical parameters.
B. Appropriate Medical Command consultation.
C. Appropriate treatment for nausea and vomiting.
NAUSEA AND VOMITING

Criteria:
A. Patient complaining of nausea and/or vomiting.

Exclusion Criteria:
A. None.

Procedure:
A. Refer to ALS Protocol 7010 (Nausea/Vomiting).
B. Additional/Preferred Procedures:
   1. Treat underlying and potentially contributing factors.
   2. Adult:
      a. Ondansetron (Zofran) 4 mg IV/IO/IM.
      b. If continued nausea/vomiting, repeat Ondansetron (Zofran) 4 mg IV/IO/IM.
      c. If continued nausea/vomiting or allergy to Ondansetron, administer Prochlorperazine (Compazine) 10 mg IV/IO over 2 minutes. If patient experiences akathesia (restlessness and/or agitation) after receiving Prochlorperazine (Compazine), administer Diphenhydramine (Benadryl) 25 mg IV/IO and consult Medical Command.
3. Pediatric (>2 years old):
   a. Ondansetron (Zofran) 4 mg IV/IO/IM.
   b. If continued nausea/vomiting, repeat Ondansetron (Zofran) 4 mg IV/IO/IM.
4. Pediatric (6 months - 2 years old):
   a. Ondansetron (Zofran) 2 mg IV/IO/IM.
   b. If continued nausea/vomiting, repeat Ondansetron (Zofran) 2 mg IV/IO/IM.
5. Pediatric (<6 months old): Consult Medical Command.
6. Document any adverse reaction including continued nausea, sedation, or agitation.
7. If continued nausea or vomiting, contact medical command.

Performance Parameters:
A. Appropriate use of Zofran.
B. Appropriate use of Prochlorperazine.
C. Appropriate Medical Command consultation.
DIABETIC KETOACIDOSIS

Criteria:
A. Patient with diagnosis of diabetic ketoacidosis at referring facility and serum glucose >250 mg/dl.

Exclusion Criteria:
A. Patient with diagnosis of diabetic ketoacidosis and serum glucose < 250 mg/dl – Contact Medical Command.

Procedure:
1. Administer 1000 ml NSS IV/IO (adult) or 10 ml/kg NSS IV/IO (pediatric) over 1 hour if not already administered; continue fluid resuscitation at 250 ml/hr IV/IO (adult) or maintenance fluids (pediatric).
2. Contact Medical Command for guidance on further fluid resuscitation.
3. Medical Command may order an additional 1000 ml NSS IV/IO (adult) or 10 ml/kg NSS IV/IO (pediatric).
4. Medical Command may order to initiate or continue Insulin therapy (obtain from referring facility). Usual dose: Insulin 0.1 units/kg/hr IV/IO.
5. Insert NG tube as needed for nausea/vomiting/gastric decompression.
6. If patient is on a ventilator or requires intubation consult Medical Command and do not paralyze the patient.
7. Consider administration of Sodium Bicarbonate 1 mEq/kg IV/IO if serum pH is <7.1.

Note:
A. Caution with administration of rapid IV/IO fluids in pediatric patients with diabetic ketoacidosis (greater than 20 ml/kg), as this may cause cerebral edema.

Performance Parameters:
A. Appropriate administration of IV/IO fluids per protocol.
B. Initiation of appropriate Insulin therapy.
ANTIBIOTIC ADMINISTRATION – ADULT

Criteria:
A. Patient at a referring facility receiving antibiotics for either:
   1. Known or suspected infection (e.g. cellulitis, meningitis, pneumonia, and urinary tract infection).
   2. Infection prophylaxis (e.g. traumatic injuries).

Exclusion Criteria:
A. None

Procedure:
1. For patients with suspected sepsis and/or shock, refer to CC705A-2 (Distributive Shock – Adult).
2. If patient is receiving or has been ordered to immediately receive an antibiotic listed below at the referring facility:
   a. Verify and document that the medication has been ordered by a physician at the referring facility.
   b. Verify and document the ordered dose and rate of the medication. Refer to Appendix B (Antibiotic Reference List). If the dose or rate is outside the parameters outlined in Appendix B (Antibiotic Reference List), contact Medical Command prior to the initiation or continuation of this medication.
   c. Verify that the patient does not have a known allergy to that medication or class of medications. If patient has an allergy to that medication or class of medications, contact Medical Command.
   d. If the above parameters are met, continue administration of the medication at the same dose and rate as ordered at the referring facility.
3. Monitor the patient for any signs of allergic reaction. These may include rash/hives, itching, difficulty breathing, wheezing, tongue/lip swelling, or hypotension. If signs of an allergic reaction occur, stop the medication and contact Medical Command. Follow the following protocols as needed:
   a. ALS Protocol 4011 (Allergic Reaction).
   b. BLS Protocol 411 (Allergic Reaction/Anaphylaxis).
4. Contact Medical Command if:
   a. Antibiotic administration at the referring facility is outside of the dosing parameters listed below.
   b. There is any concern about the medication order or administration.

Notes:
A. Refer to Appendix B (Antibiotic Reference List) for a list of antibiotics that may be administered without Medical Command contact based on above parameters.
B. If an antibiotic infusion is already running at a receiving facility, the rate of administration should be adjusted so that the total dose would be administered over the specified time of infusion in this protocol, unless ordered differently by Medical Command. For example, if
patient is receiving Azithromycin (Zithromax) 500 mg IV/IO and half of the dose has already been administered, the remaining 250 mg should be administered over 30 min.

C. IV Ceftriaxone (Rocephin) should not be mixed with IV calcium-containing solutions and/or administered via the same IV line as IV calcium-containing products.

Performance Parameters:
A. Appropriate Medical Command contact.
B. Assessment for allergic reaction from medication.
GASTROINTESTINAL BLEEDING – ADULT

Criteria:
A. Patient is suspected of having has been diagnosed with gastrointestinal bleeding at a referring institution.

Exclusion Criteria:
A. None.

Procedure:
1. Establish two intravenous access sites if not already performed.
2. Assess for shock and refer to:
   a. CC705A-1 (Hypovolemic Shock – Adult)
   b. ALS Protocol 7005 (Shock / Systemic Inflammatory Response Syndrome)
3. For patients that have been diagnosed with gastrointestinal bleeding at a referring facility:
   a. If patient has been ordered to receive Pantoprazole (Protonix) 40-80 mg IV/IO bolus and/or Pantoprazole (Protonix) 8 mg/hr IV/IO, administer this bolus and/or infusion as ordered by the referring physician. If a different bolus/rate has been ordered, contact Medical Command.
   b. If patient has been ordered to receive Octreotide 50 micrograms/hr IV/IO, administer this infusion as ordered by the referring physician. If a different rate has been ordered, contact Medical Command.
   c. If blood products have been ordered to be infused, contact Medical Command. Refer to CC212 (Administration of Blood Products).
4. Refer to Protocol CC705A-1 (Hypovolemic Shock – Adult) regarding the initiation of blood products if indicated.
5. Refer to Protocol CC212 (Administration of Blood Products) regarding the administration of any blood products.
6. If a balloon tamponade system (e.g. Sengstaken-Blakemore tube, Minnesota tube, or Linton-Nachlas tube) has been placed for management of esophageal bleeding:
   a. Maintain the tube in place for transport.
   b. Place the gastric suction port (if present) to low continuous suction.
   c. Keep a pair of scissors near the patient at all times in case the balloon migrates superiorly and obstructs the airway (in non-intubated patients). If this occurs, cut the inflation port(s) to deflate and remove the tube. Ensure control of the distal tube during removal.
7. Refer to Protocol CC603 (Pain Management) for assessment and management of pain.
8. If patient has a coagulopathy (elevated PT/INR or PTT), contact Medical Command.

9. If patient has active bleeding and patient is anticoagulated with INR ≥1.5, Medical Command may order 2 units of Type AB+ Fresh Frozen Plasma (FFP). Refer to Protocol CC212 (Administration of Blood Products).
Performance Parameters:
A. Administration of infusions according to protocol.
B. Appropriate management of shock.
C. Appropriate management of a balloon tamponade system.
EMERGENCY CHILDBIRTH

Criteria:
A. Pregnancy with signs of imminent delivery including crowning, mother with urge for bowel movement, frequent contractions < every 2 minutes, or worsening of perineal discomfort.

Exclusion Criteria:
A. None.

Procedure:
1. Refer to BLS Protocol 781 (Emergency Childbirth).
2. Additional/Preferred Procedures:
3. Assess and document fetal heart rate (FHR) every 30 minutes. Ask mother about fetal movement and document.
4. Assist normal delivery as per BLS Protocol 781 (Emergency Childbirth). Additionally:
   a. Instruct mother to push only during contractions.
   b. Upon delivery of the infant’s head, turn the head gently. Deliver the anterior shoulder with gentle downward traction. Lift up and deliver the posterior shoulder.
   c. Once the placenta is delivered, massage the fundus to control bleeding.
5. Volume resuscitate to maintain maternal SBP ≥90 mmHg.
6. If there is post-partum hemorrhage, Medical Command may order Oxytocin 60 milliunits/min IV/IO after placenta delivers. If bleeding is uncontrolled, increase Oxytocin by 20 milliunits/min every 15 minutes (maximum rate 200 milliunits/min).
7. If there is an abnormal presentation (e.g. breech, prolapsed cord): Contact Medical Command.
8. BREECH PRESENTATION
   a. If possible, mother’s hips should be at edge of stretcher – baby’s body will “hang” below her perineum.
   b. Allow the buttocks and trunk to deliver with gentle support and guidance, turning its back “up” to the ceiling (i.e. face down).
   c. Once the baby’s “belly button” (cord insertion) is out, for frank breech gently flex the legs across the baby’s belly to bring them down. You may want to turn the baby slightly for each leg while doing this.
   d. Once the axillae (arm pits) are out, flex each arm across the baby’s chest to bring them out. Again, you may gently rotate the baby’s body while sweeping out each arm.
   e. Support the baby’s body while waiting for the head to deliver.
   f. The head delivers in a flexed position (“chin to chest”) whether spontaneously or with our assistance. If head does not deliver within 3 minutes: insert your middle and index finger into the vagina; move along the baby’s face up to the baby’s nose; push the vaginal wall away from the baby’s nose and mouth to create an airway until the baby delivers. DO NOT TRY TO PULL BABY OUT WITH EXCESSIVE FORCE.
   g. After delivery, refer to BLS Protocol 781 (Emergency Childbirth) and protocol above, continuing with postpartum care.
9. PROLAPSED CORD  
   a. Immediately place mother in a knee-chest position; if this is not possible, position mother so her hips and buttocks are elevated, in Trendelenberg, if possible.
   b. Immediately insert a gloved hand into the vagina; gently push the baby’s head off the cord; maintain this position at all times during transport and until relieved at the receiving institution.

10. LIMB PRESENTATION  
   a. Fetus presents with a leg or arm first: contact Medical Command and land at the closest hospital with emergency obstetrical facilities.

11. NEONATAL DISTRESS  
   a. Warm, dry and stimulate neonate.
   b. Call command for additional resources.
      1) Neonatal Team.
      2) An additional aircraft with an isolette.
   a. Provide blow-by oxygen.
   b. If neonate remains cyanotic or HR is < 100 bpm, administer bag and mask ventilation and consider intubation.
   c. If HR is persistently < 60 bpm begin chest compressions.

Performance Parameters:
   A. Assessment and documentation of fetal heart rate and fetal movements.
   B. Documentation and management of Breech Presentation.
   C. Documentation and management of Prolapsed Cord Presentation.
   D. Documentation and management of Limb Presentation.
   E. Documentation of APGAR Scores (APGAR Checklist is located in the OB kit).
   F. Calling medical command for additional resources.
ABRUPTIO PLACENTA / PLACENTA PREVIA

Criteria:
A. Pregnancy greater than 20 weeks gestation and either of the following:
   1. Hemorrhaging with little or no pain (Placenta Previa).
   2. Continuous painful contraction(s) with or without bleeding (Abruptio Placenta).

Exclusion Criteria:
A. None.

Procedure:
1. Assess and document fetal heart rate (FHR) every 30 minutes. Ask mother about fetal movement and document.
2. Two Large Bore IVs with NSS. If no IV access, consider IO.
3. Resuscitate: maintain SBP >90 mmHg.
4. Do not pack vagina or perform vaginal or rectal exams.
5. Be prepared for precipitous delivery (keep OB/Delivery Kit with patient at all times).
6. Medical Command may order **Oxytocin 60 milliunits/min IV/IO** after placenta delivers if bleeding is not controlled. Increase Oxytocin by 20 milliunits/min every 15 minutes (maximum rate 200 milliunits/min) if bleeding is substantial. Use Oxytocin 40 units/1000 ml NSS (must obtain from referring facility).
7. If no IV access, give **Oxytocin 10 units IM**.
8. After placenta delivers, use abdominal uterine fundal massage to help uterus contract down and slow bleeding.
9. If bleeding is not controlled with these measures, contact Medical Command.
10. If SBP is ≤90 mmHg, transport patient rolled slightly onto left side. Resuscitate as per Protocol **CC705A-1** (Hypovolemic Shock).

Note:
A. Use of tocolysis for severe abruption placenta is absolutely contraindicated as delivery is the treatment of choice. For mild abruption, tocolysis may be appropriate and should be considered in consultation with the referring/receiving OB/GYN physician and medical command. Use of tocolysis for placenta previa is generally considered appropriate in the setting of prematurity.

Performance Parameters:
A. Assessment and documentation of fetal heart rate and fetal movements.
B. Documentation of Abruption or Placenta Previa.
C. Establishment of two large bore IVs.
D. Appropriate use of Oxytocin.
E. Medical Command consultation.
F. Appropriate use of tocolysis.
PREECLAMPSIA / ECLAMPSIA

Criteria:
Patient meets either of the following criteria:
A. **Preeclampsia** – Pregnancy greater than 20 weeks gestation and any of the following:
   1. SBP > 160 mmHg or diastolic blood pressure > 110 mmHg.
   2. Proteinuria.
B. **Eclampsia** -- Preeclampsia with seizure activity.

Exclusion Criteria:
A. Patient has existing known hypertension prior to pregnancy. Contact Medical Command for management of hypertension.

Procedure:
1. Assess and document fetal heart rate (FHR) every 30 minutes. Ask mother about fetal movement and document.
2. If possible, place patient in left lateral position.
3. If blood pressure elevated to SBP >160 mmHg or DBP >110 mmHg on at least 2 recordings greater than 10 minutes in duration:
   a. If HR >60 beats per minute, administer **Labetalol 10 mg IV/IO**. If after 10 minutes blood pressure remains higher than parameters and HR >60, administer **Labetalol 20 mg IV/IO**. Do not decrease diastolic blood pressure below 85.
   b. If patient remains with SBP >160 mmHg or DBP >110 mmHg, or HR <60, give **Hydralazine 5 mg IV/IO**.
   c. If blood pressure remains above SBP >160 mmHg or DBP >110 mmHg, contact Medical Command.
4. Seizure Treatment and/or Prevention:
   a. Ensure airway patency. Administer high flow oxygen to any seizing or post-ictal patient.
   b. If Magnesium Sulfate 2-4 gm/hr has been initiated by the receiving facility, continue at that rate. If outside of this dosing range, contact Medical Command.
   c. If patient has a seizure or has had a seizure within past 24 hours and has not received treatment with Magnesium Sulfate:
      1) Administer **Magnesium Sulfate 4 gm IV/IO** over 20 minutes.
      2) Initiate **Magnesium Sulfate 2 gm/hr IV/IO**.
   d. Administer **Lorazepam (Ativan) 2 mg IV/IO** and repeat every 5 minutes up to total of 6 mg as needed for seizure activity. **Lorazepam may be administered simultaneously with Magnesium Sulfate for active seizure in Eclampsia**
   e. If patient has continued seizure activity, contact Medical Command.
5. If blood pressure remains above SBP >160 mmHg or DBP >110 mmHg, Medical Command may order additional doses of Hydralazine 5-10 mg IV/IO.
6. If patient has continued seizure activity, Medical Command may order additional doses of Ativan 2 mg IV/IO.
Note:
A. If Magnesium Sulfate has been initiated, closely monitor the patient for:
   1. Decrease in respiratory rate.
   2. Decrease in deep tendon reflexes (DTR) – Assess and document DTRs every 30 minutes including before and after transport.
   3. Hypotension.
      If present, decrease Magnesium Sulfate by 1 gm/hr and contact Medical Command.

Performance Parameters:
A. Assessment and documentation of fetal heart rate and fetal movements.
B. Documentation of eclampsia or preeclampsia.
C. Appropriate use of Labetalol.
D. Use of Hydralazine as second agent.
E. Continuation or initiation of Magnesium.
F. Documentation of DTRs on all patients on Magnesium Sulfate.
G. Documentation and management of seizure activity.
ACTIVE LABOR

Criteria:
A. Patient in active labor at any gestational age.

Exclusion Criteria:
A. None.

Procedure:
1. If there is an imminent delivery, refer to:
   a. Protocol CC781 (Emergency Childbirth)
   b. BLS Protocol 781 (Emergency Childbirth).
3. Monitor frequency and duration of contractions.
4. If possible, place patient in slight left lateral tilt position.
5. If Magnesium Sulfate 2-4 gm/hr has been initiated by the referring facility:
   a. Continue Magnesium Sulfate at the existing rate. If outside of this dosing range, contact Medical Command.
   b. Assess and document DTRs every 30 minutes including before and after transport.
6. For active labor with contractions less than or equal to 5 minutes apart and/or cervix dilation greater than or equal to 5 cm at any gestational age, consult Medical Director on Call (MDOC) for appropriateness of transport and consideration of tocolysis.
7. If patient does not meet criteria above for MDOC consult but has increasing frequency or intensity of contractions, contact Medical Command for possible administration of a tocolytic agent.
8. If patient develops hypotension (SBP <90 mmHg), administer NS 500 ml and consult Medical Command.

9. If tocolytic therapy needs to be initiated (patient not already receiving such therapy or has continued progression of labor) and patient’s SBP ≥100 mmHg and HR ≥60, Medical Command may order Nifedipine 20 mg PO (may be administered every 30 minutes up to 3 doses). Monitor blood pressure, as Nifedipine (alone and especially in combination with Magnesium) can precipitate hypotension.

Note:
A. Magnesium Sulfate and Terbutaline have traditionally been used as tocolytics to slow the progression of premature labor. However, these may not be effective for this indication. Magnesium may be administered for potential neuroprotective effects for the prematurely born fetus.
B. Nifedipine has been demonstrated to be more effective for premature labor than Magnesium or Terbutaline. If a patient is in premature labor and has continued progression of labor (with or without administration of Magnesium Sulfate), consult Medical Command to discuss use of Nifedipine.
C. If Magnesium Sulfate has been initiated, closely monitor the patient for:
   1. Decrease in respiratory rate.
   2. Decrease in deep tendon reflexes (DTR)
   3. Hypotension (SBP <90 mmHg).

   If present, hold Magnesium Sulfate and contact Medical Command.

Performance Parameters:

A. Assessment and documentation of fetal heart rate and fetal movements.
B. Documentation of frequency and duration of contractions.
C. Appropriate Medical Command consultation.
D. Appropriate use of Nifedipine.
E. Documentation of DTRs any time Magnesium Sulfate is infused.
COMBATIVENESS – ADULT

Criteria:

Patient meets both of the following criteria:
A. Signs of agitation or combativeness that potentially pose a threat to patient and/or crew safety.
B. Potential causes (e.g., hypotension, hypoxia, closed head injury, hypoglycemia) have been considered and appropriately treated.

Exclusion Criteria:
A. None.

Procedure:

A. Refer to applicable BLS/ALS protocols:
   1. ALS Protocol 8001 (Agitated Behavior/Psychiatric Disorders).
   2. BLS Protocol 801 (Agitated Behavior/Psychiatric Disorders).
B. Additional/Preferred Procedures:
   1. Ensure airway patency and administer high flow O2.
   3. Attempt verbal redirection.
   4. Establish IV access. If unable to establish IV access, establish IO access only after patient has been chemically restrained.
   5. Administer Ketamine (Ketalar) 2mg/kg IV/IO (maximum 200 mg) or 4 mg/kg IM (maximum 400 mg) unless contraindicated (see below; if present contact Medical Command).
   6. Closely monitor cardiac monitor, respiratory rate and oxygen saturation. Monitor continuous end-tidal CO2 using nasal capnography on any patient requiring chemical restraint. For values above 50 mmHg, assist ventilations and contact Medical Command. **BE PREPARED TO INTUBATE.**
   7. For patients requiring chemical restraint, apply wrist restraints. Monitor and document neurovascular status of upper extremities every 15 minutes.
   8. If needed for continued chemical restraint, may repeat Ketamine (Ketalar) 2mg/kg IV/IO (maximum 200 mg) every 10-20 minutes up to 3 total doses.
   9. If response is inadequate after initial or second dose of medication, either:
      a. Contact Medical Command for additional medication administration, or
      b. If patient is a threat to his/her own safety or the crew’s safety, proceed with intubation per Protocol CC401 (Airway Management).

Note:

A. **Contraindications to Ketamine:** Patient with hydrocephalus, VP shunt, or open globe injury.
Performance Parameters:
   A. Proper treatment of causes for combativeness addressed.
   B. Appropriate dosage of medications utilized.
   C. Repeat dose of initial medications necessary.
   D. Need for airway protocol.
   E. Appropriate patient monitoring.
POISONING / TOXIC EXPOSURE

Criteria:
A. Patient with known or suspected potentially toxic ingestion, inhalation or injection.

Exclusion Criteria:
A. None.

Procedure:
A. Refer to applicable BLS/ALS Protocols:
1. ALS Protocol 8031 (Poisoning / Toxic Exposure).
2. ALS Protocol 8081 (Cyanide Compound Exposure).
3. ALS Protocol 8083 (Nerve Agent / Pesticide Exposure).
4. BLS Protocol 831 (Poisoning/Toxic Exposure).
B. Additional/Preferred Procedures:
1. Ensure airway patency; administer high flow oxygen.
2. Fluid resuscitate to maintain SBP >90 mmHg.
3. Monitor closely for dysrhythmias. Review 12-lead EKG findings if available. Call Medical Command if QRS is greater than 0.12 seconds for possible administration of Sodium Bicarbonate 1mEq/kg IV/IO.
4. If suspected opiate overdose, administer Naloxone (Narcan) 0.8-2 mg IV/IO/IM. Repeat in 5-10 minutes if partial response noted.
5. If SBP is <90 mmHg and unresponsive to fluid resuscitation (1000 ml), initiate Levophed (Norepinephrine) 0.05-0.5 micrograms/kg/min IV/IO and titrate to achieve goal SBP >100 mmHg (adult) or SBP > [70 + (2 x age in years)] mmHg (pediatric). Increase Norepinephrine (Levophed) by 0.05 micrograms/kg/min every 5-10 minutes to achieve goal SBP. If goal not reached at 0.5 micrograms/kg/min, contact Medical Command.
6. Check serum glucose level; if <60 mg/dl. Administer 50% Dextrose 25 gm/50ml IV/IO (Adult), 25% Dextrose 2ml/kg IV/IO (Pediatric), or 12.5% Dextrose 4ml/kg IV/IO (Neonates).
7. Consult Medical Command for specific therapy and for possible toxicologist consultation.
8. If intubation is required and patient has a known acidosis, consult Medical Command prior to administration of sedation and paralysis.
9. Medical Command may order specific antidotes (may need to obtain from referring facility):
   a. Acetaminophen – N-Acetylcysteine.
   b. Salicylates (Aspirin) – Sodium Bicarbonate and saline.
   c. Tricyclic antidepressants – Sodium Bicarbonate.
   d. Toxic Alcohols – Fomepizole.
   e. Opioids – Narcan.
   g. Calcium channel blockers – Calcium Chloride or Calcium Gluconate.
   h. Carbon monoxide – High-flow oxygen.
   i. Cyanide – Cyanocobalamin.
Performance Parameters:
   A. Appropriate administration of Narcan.
   B. Initiation of Norepinephrine infusion for hypotension.
   C. Measurement of serum glucose.
HAZARDOUS MATERIALS EXPOSURE

Criteria:
A. Patient with presence or exposure to known or suspected hazardous material.

Exclusion Criteria:
A. None.

Procedure:
A. Refer to applicable BLS/ALS protocols:
   1. ALS Protocol 8031 (Poisoning / Toxic Exposure).
   2. ALS Protocol 8081 (Cyanide Compound Exposure).
   3. ALS Protocol 8083 (Nerve Agent / Pesticide Exposure).
   4. BLS Protocol 831 (Poisoning/Toxic Exposure).
B. Additional/Preferred Procedures:
   1. If a hazardous material is suspected to be involved at a scene, verify that the nearest HAZMAT response team has been notified.
   2. The on-scene HAZMAT response team will be responsible for LZ safety. No landing is to be made until clearance is given. The pilot should then verify that the LZ is safe and that it is upwind, uphill and as far from the material as feasible.
   3. Follow the direction of the HAZMAT scene commander concerning staging area, personal protection and safety and patient decontamination.
   4. Advise the HAZMAT team regarding patient care issues.
   5. Follow HAZMAT scene commander instructions regarding when it is safe to approach the patient.
   6. The flight crew may defer care until after primary decontamination has occurred. The patient(s) must receive primary decontamination prior to transport. If any crew member feels that the gross decontamination of the patient is insufficient, request the HAZMAT team to perform a technical decontamination or consider ground transport to a facility capable of decontamination.
   7. Contact command prior to transporting any potentially contaminated patient.
   8. Ensure airway patency and administer high flow O₂.
   9. Establish IV/IO access. Site must be decontaminated prior to access.
10. Assess for the localized effects of the hazardous material exposure:
   a. Dermal irritation and/or lesions.
   b. Mucosal membrane irritation.
11. If eye injury is present related to caustic agent or chemical: Irrigate eyes with NSS for duration of transport, beginning as soon as possible after exposure.
   Note: If caustic agent is particulate or reactive with water, do not irrigate; attempt to gently remove substance using gauze.
12. Assess for the systemic effects of the hazardous material exposure:
   a. Respiratory – Shortness of breath, wheezing, stridor.
   b. CNS - alteration in level of consciousness, anxiety, combative ness, seizures.
   c. Cardiac - tachycardia, dysrhythmia, hypotension, cardiopulmonary arrest.
13. Institute appropriate trauma and/or medical treatment protocol.
14. Obtain treatment guidelines for hazardous material exposures from the referring agency or Medical Command. Poison Control (412) 681-6669 may also be valuable resources.
15. Provide receiving facility with patient update and indicate any special needs as soon as possible.
16. Ventilate aircraft.
17. Monitor crew members, including pilots, closely for evidence of exposure. If the pilot exhibits signs or symptoms of exposure, the aircraft must land.
18. Treat crew exposure symptoms immediately.
19. Crew members are to be appropriately decontaminated and must be cleared to return to duty by ED attending physician.
20. Follow receiving facility's decontamination procedure, which should include, but is not limited to:
   a. Flush body with copious amounts of water for at least 15 minutes in decontamination shower.
   b. If radiation exposure has occurred or is suspected, Geiger counter readings should be obtained prior to leaving the treatment area.

**Performance Parameters:**
A. Hazardous Material Incident recognized.
B. Proper notifications for scene response.
C. Decontamination of crew and patient.
MEDICAL COMMAND CONTACT

Procedure:
A. Refer to applicable BLS/ALS protocols:
   1. ALS Protocol 9001 (Medical Command Contact).
   2. BLS Protocol 901 (Medical Command Contact).
B. Additional/Preferred Procedures:
   1. Medical Consultations should adhere to the structure outlined below (Medical Command Consultation Template).
   2. Consultation with a Medical Command physician should occur as outlined in the relevant protocols. Additionally, contact a Medical Command physician if:
      a. The patient has persistent abnormal vital signs after initial interventions.
      b. There is any concern regarding the appropriateness of any specific protocolized intervention.
      c. Medical Command consultation is requested by the referring physician or hospital.
      d. Patient is complex or requiring resources beyond those that are routinely employed.
      e. There are questions about the patient condition or if it is anticipated that immediate care requirements will exceed the scope of STAT MedEvac clinical protocols.
      f. There is a desire to change the planned mode of transport.
      g. The patient is determined to be dead or resuscitative efforts will be discontinued.
      h. A patient is being diverted to a facility other than that which was initially anticipated due to clinical condition.
      i. There is a question regarding the destination of a patient.
   3. Consultation with the Medical Director on Call (MDOC) should occur as outlined in the relevant protocols. Additionally, contact the Medical Director on Call (MDOC) if a medical question is tied to an operational question or the appropriate function of a piece of medical equipment.
   4. Consult Medical Command prior to the initiation of any care that exceeds the scope of STAT MedEvac clinical protocols.
   5. A 3-way Medical Command consultation must be performed on all interfacility medical pediatric patients involving the UPMC Medical Command physician and the receiving Pediatric Critical Care physician.
   6. If the medical provider(s) has(ve) a concern regarding a medical consultation provided by a Medical Command physician:
      a. Explain the concern to the medical command physician and request clarification regarding any orders being sought or provided.
      b. If there continues to be a concern by the medical crew provider(s), contact the Medical Director on Call (MDOC).
### Medical Command Consultation Template

- Provider name, Base
- Referring and Receiving facilities (state if ground mission)
- Clinical Questions (purpose of the consult)
- Age, sex, chief complaint/diagnosis
- Pertinent HPI, PMH
- Pertinent treatment already received
- Vital signs (including Weight, Glucose, and Pain Scale if applicable)
- Pertinent physical exam findings
- Pertinent labs and imaging results (if applicable)
- Restate Clinical Questions above
- Receive orders (Command Physician)
- Restate/verify orders
- Ask the Communication Specialist if any other information is needed

### Conditions requiring Consultation with the Medical Director on Call (MDOC)

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Order (abbreviated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Medical question tied to an operational question or the appropriate function of a piece of medical equipment</td>
</tr>
<tr>
<td>CC201</td>
<td>Alteration in frequency of vital signs documentation (post-mission).</td>
</tr>
<tr>
<td></td>
<td>Patient weighing &lt;4.5 kg (3-way consult with MDOC and Clinical Director on Call).</td>
</tr>
<tr>
<td></td>
<td>Patient is on a continuous home infusion device or other home medical equipment</td>
</tr>
<tr>
<td></td>
<td>Delay in departing bedside &gt;30 minutes due to lack of acceptance or bed availability at the receiving facility.</td>
</tr>
<tr>
<td></td>
<td>If obtaining a copy of imaging (CT or MRI) will delay transport by &gt;15 minutes.</td>
</tr>
<tr>
<td>CC404</td>
<td>Patient is on APRV or Bi-Level ventilation.</td>
</tr>
<tr>
<td></td>
<td>Patient is being ventilated in the prone position.</td>
</tr>
<tr>
<td></td>
<td>PEEP &gt;10 cmH2O.</td>
</tr>
<tr>
<td>CC405</td>
<td>Patient does not tolerate NIPPV using initial settings or SaO2 &lt;95% after initiation of NIPPV.</td>
</tr>
<tr>
<td>CC501</td>
<td>For STEMI patient, if transport is anticipated to be &gt;1 hour and patient is being transported for primary PCI, for consideration of thrombolitics at referring facility.</td>
</tr>
<tr>
<td>CC503</td>
<td>Aortic emergency with SBP &lt;90 mmHg.</td>
</tr>
<tr>
<td>CC506</td>
<td>Any intra-aortic balloon pump (IABP)-related orders or complications.</td>
</tr>
<tr>
<td>CC508</td>
<td>For STEMI patient, if interfacility transport is anticipated to be &gt;1 hour and patient is being transported for primary PCI, for consideration of whether or when to perform remote ischemic conditioning.</td>
</tr>
<tr>
<td>CC540</td>
<td>Any extra corporeal membrane oxygenation (ECMO)-related orders or complications.</td>
</tr>
<tr>
<td>CC662</td>
<td>Patient is entrapped by a limb and cannot be extricated, if needing to arrange a physician to be transported to the scene for possible field amputation.</td>
</tr>
<tr>
<td>CC709</td>
<td>Patient with intracranial catheter and intracranial pressure &gt;20 mmHg.</td>
</tr>
<tr>
<td>CC784</td>
<td>Patient in active labor with contractions ≤5 minutes apart and/or cervix dilation ≥5 cm at any gestational age.</td>
</tr>
<tr>
<td>CC901</td>
<td>Concern regarding a medical command physician order.</td>
</tr>
</tbody>
</table>
Performance Parameters:
   A. Appropriate Medical Command contact.
   B. Medical Command report adheres to the Medical Command Consultation Template.
   C. Appropriate use of a 3-way Medical Command consultation.
PHYSICIANS AS CREW MEMBERS OR OBSERVERS

Procedure:
A. Physicians participate in patient care as part of a medical crew or may act as observers with STAT MedEvac. The procedure below outlines the capabilities of physicians based on level of training and role on the mission.
B. If a physician is encountered on a scene that is not a STAT MedEvac medical crew member or observer, refer to BLS Protocol 401 (On-Scene Physician/RN). If this on-scene physician desires to participate in the medical care of the patient, contact the Medical Director on Call.
C. Roles of physicians:
   1. **UPMC Emergency Medicine Resident Flight Physicians**
      a. Description: Second or third year Emergency Medicine residents.
      b. Role: Medical crew member.
      c. Participate in all aspects of patient care including medication administration, medical equipment use, and performing procedures.
      d. May provide medical command orders not included in the protocols and deviate from protocols based on the following requirements:
         1) STAT MedEvac protocols should be followed unless there is a clear reason why deviation from the protocol would be in the best interest of the patient.
         2) All medical crew members must be in agreement with the order. If there is disagreement, then a faculty Medical Command Physician must be contacted.
         3) Any deviation from the protocols must be documented using an Incident Report. If the deviation occurred due to a physician decision, the Incident Report must be created by the physician and document the reason for protocol deviation.
         4) A faculty Medical Command Physician must be contacted for the following orders:
            a) Change in destination or mode of transport.
            b) Spinal immobilization clearance.
            c) Orders for pediatric patients that necessitate a 3-way medical consultation with the receiving facility.
            d) Pronouncement of patient death and termination of resuscitation efforts.
            e) If bedside time is >45 minutes, to discuss patient care plan.
   2. **UPMC Emergency Medical Services Fellows**
      a. Role: Medical crew member.
      b. Participate in all aspects of patient care including medication administration, medical equipment use, and performing procedures.
      c. May provide medical command orders not included in the protocols and deviate from protocols based on the following requirements:
         1) STAT MedEvac protocols should be followed unless there is a clear reason why deviation from the protocol would be in the best interest of the patient.
         2) All medical crew members must be in agreement with the order. If there is disagreement, then the Medical Director on Call must be contacted.
      d. EMS Fellows may provide orders at the level of a faculty Medical Command Physician.
   3. **STAT MedEvac Medical Director or Associate Medical Director**
      a. Role: Medical crew member.
      b. Participate in all aspects of patient care including medication administration, medical equipment use, and performing procedures.
      c. May provide orders on behalf of the Medical Director on Call.
4. **Physician Members of Specialty Teams**
   a. Role: Medical crew member.
   b. Upon initial assessment, contact Medical Command to discuss overall patient care plan and physician’s role in the medical team. Under Medical Command order, physician may provide orders during transport. If there is a disagreement with a specific order that deviates from STAT MedEvac protocols, contact the Medical Director on Call.

5. **Other Physician Observers**
   a. Role: Observer only.
   b. Cannot provide medical command orders.
   c. May prepare medication or equipment for the medical crew, but cannot administer medications or perform procedures on patients.
   d. If the physician and/or medical crew determine the need for the physician’s intervention in patient care, contact the Medical Director on Call.

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**Performance Parameters:**

A. Adherence to appropriate procedures according to physician role and level of training.
B. Appropriate completion of Incident Reports for protocol deviations involving a physician.
C. Appropriate contact of faculty Medical Command Physician or Medical Director on Call as required.
<table>
<thead>
<tr>
<th>MEDICATION</th>
<th>MIXTURE</th>
<th>FLUID</th>
<th>CONCENTRATION</th>
<th>USUAL DOSING RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amiodarone</td>
<td>150 mg / 250 ml (self mix)</td>
<td>D5W</td>
<td>0.6 mg/ml</td>
<td>0.5-1 mg/min</td>
</tr>
<tr>
<td></td>
<td>450 mg / 250 ml (interfacility)</td>
<td></td>
<td>1.8 mg/ml</td>
<td></td>
</tr>
<tr>
<td>Dexmedetomidine (Precedex)</td>
<td>400 mcg / 100 ml</td>
<td>NSS, D5W</td>
<td>4 mcg/ml</td>
<td>0.2-1.5 mcg/kg/hr</td>
</tr>
<tr>
<td>Diltiazem (Cardizem)</td>
<td>125 mg / 125 ml</td>
<td>NSS, D5W</td>
<td>1 mg/ml</td>
<td>5-15 mg/hr</td>
</tr>
<tr>
<td>Dobutamine</td>
<td>500 mg / 250 ml</td>
<td>D5W, NSS</td>
<td>2 mg/ml</td>
<td>5-20 micrograms/kg/min</td>
</tr>
<tr>
<td>Dopamine</td>
<td>400 mg / 250 ml</td>
<td>D5W, NSS</td>
<td>1.6 mg/ml</td>
<td>5-20 micrograms/kg/min</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>8 mg / 250 ml</td>
<td>NSS, D5W</td>
<td>32 micrograms/ml (0.032 mg/ml)</td>
<td>0.05-0.15 micrograms/kg/min</td>
</tr>
<tr>
<td>Eptifibatide (Integrilin)</td>
<td>75 mg / 100 ml</td>
<td>NSS, D5W</td>
<td>0.75 mg/ml</td>
<td>1-2 micrograms/kg/min</td>
</tr>
<tr>
<td>Esmolol (Brevibloc)</td>
<td>2,500 mg / 250 ml</td>
<td>NSS, D5W</td>
<td>10 mg/ml</td>
<td>25-200 micrograms/kg/min</td>
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<tr>
<td>Fentanyl</td>
<td>2,500 micrograms / 100 ml</td>
<td>NSS, D5W</td>
<td>25 micrograms/ml</td>
<td>25-200 micrograms/hr</td>
</tr>
<tr>
<td>Heparin</td>
<td>25,000 units / 250 ml</td>
<td>D5W, NSS</td>
<td>100 units/ml</td>
<td>100-2000 units/hr</td>
</tr>
<tr>
<td>Insulin (Regular)</td>
<td>250 units / 250 ml</td>
<td>NSS</td>
<td>1 unit/ml</td>
<td>0.1 units/kg/hr</td>
</tr>
<tr>
<td>Ketamine (Ketalar)</td>
<td>500 mg / 250 ml</td>
<td>NSS</td>
<td>2 mg/ml</td>
<td>1-4 mg/kg/hr</td>
</tr>
<tr>
<td>Labetalol (Trandate)</td>
<td>300 mg / 80 ml</td>
<td>NSS, D5W</td>
<td>3.75 mg/ml</td>
<td>1-8 mg/min</td>
</tr>
<tr>
<td>Lidocaine (Xylocaine)</td>
<td>2000 mg / 250 ml</td>
<td>D5W, NSS</td>
<td>8 mg/ml</td>
<td>1-4 mg/min</td>
</tr>
<tr>
<td>Lorazepam (Ativan)</td>
<td>60 mg / 60 ml</td>
<td>D5W, NSS</td>
<td>1 mg / 1 ml</td>
<td>0.5-10 mg/hr</td>
</tr>
<tr>
<td>Magnesium Sulfate</td>
<td>Bolus: 4 gm / 250 mL</td>
<td>D5W, NSS</td>
<td>16 mg/ml</td>
<td>4 gm over 20 min</td>
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<tr>
<td></td>
<td>Infusion: 40 gm / 1000mL</td>
<td></td>
<td>40 mg/ml</td>
<td>2-4 gm/hr</td>
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<tr>
<td>Mannitol (Osmotrol)</td>
<td>12.5 gm / 50 ml (undiluted)</td>
<td>N/A</td>
<td>12.5 gm / 50 ml</td>
<td>1 gm/kg (max 50 gm) over 5 min</td>
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<tr>
<td>Midazolam (Versed)</td>
<td>100 mg / 100 ml</td>
<td>NSS, D5W</td>
<td>1 mg/ml</td>
<td>1-20 mg/hr</td>
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<tr>
<td>Milrinone (Primacor)</td>
<td>20 mg / 100 ml</td>
<td>D5W</td>
<td>200 micrograms/ml (0.2 mg/ml)</td>
<td>0.2-0.75 micrograms/kg/min</td>
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<tr>
<td>Morphine</td>
<td>150 mg / 30 ml</td>
<td>NSS</td>
<td>5 mg/ml</td>
<td>0.8 – 80 mg/hr</td>
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<tr>
<td>Naloxone (Narcan)</td>
<td>5 mg / 500 ml</td>
<td>NSS</td>
<td>10 mcg/ml (0.01 mg/ml)</td>
<td>0.25-6.25 mg/hr</td>
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<tr>
<td>Nicardipine</td>
<td>20 mg / 200 ml</td>
<td>NSS, D5W</td>
<td>0.1 mg/ml</td>
<td>5-15 mg/hr</td>
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<tr>
<td>MEDICATION</td>
<td>MIXTURE</td>
<td>FLUID($)</td>
<td>CONCENTRATION</td>
<td>USUAL DOSING RANGE($)</td>
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<tr>
<td>-------------------------</td>
<td>------------------</td>
<td>----------</td>
<td>---------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Nitroglycerin</td>
<td>50 mg / 250 ml</td>
<td>D5W</td>
<td>0.2 mg/ml</td>
<td>10-200 micrograms/min</td>
</tr>
<tr>
<td>Nitroprusside (Nipride)</td>
<td>50 mg / 250 ml</td>
<td>D5W</td>
<td>0.2 mg/ml</td>
<td>0.1-10 micrograms/kg/min</td>
</tr>
<tr>
<td>Norepinephrine (Levophed)</td>
<td>8 mg / 250 ml</td>
<td>NSS, D5W</td>
<td>32 micrograms/ml (0.032 mg/ml)</td>
<td>0.05-0.5 micrograms/kg/min</td>
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<tr>
<td>Octreotide (Sandostatin)</td>
<td>500 micrograms / 100 ml</td>
<td>NSS</td>
<td>5 micrograms/ml</td>
<td>25-50 micrograms/hr</td>
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<td>Pantoprazole (Protonix)</td>
<td>80 mg / 80 ml</td>
<td>NSS, D5W</td>
<td>1 mg/ml</td>
<td>8 mg/hr</td>
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<tr>
<td>Phenylephrine</td>
<td>10 mg / 250 ml</td>
<td>NSS, D5W</td>
<td>40 micrograms/ml (0.04 mg/ml)</td>
<td>0.1-1.5 micrograms/kg/min</td>
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<tr>
<td>Phenylephrine (Neosynephrine)</td>
<td>1000 mg / 250 ml</td>
<td>NSS</td>
<td>4 mg/ml</td>
<td>10-20 mg/kg</td>
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<td></td>
<td>2000 mg / 250 ml</td>
<td>NSS</td>
<td>8 mg/ml</td>
<td></td>
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<tr>
<td>Potassium Chloride</td>
<td>10 mEq / 50 ml</td>
<td>NSS, D5W</td>
<td>0.2 mEq/ml</td>
<td>Dose: 10-30 mEq</td>
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<tr>
<td></td>
<td>10 mEq / 100 ml</td>
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<td>0.1 mEq/ml</td>
<td>Rate: 10 mEq/hr (peripheral IV)</td>
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<tr>
<td></td>
<td>20 mEq / 50 ml</td>
<td></td>
<td>0.4 mEq/ml</td>
<td>20 mEq/hr (central line / IO)</td>
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<tr>
<td>Procaainamide</td>
<td>2000 mg / 250 ml</td>
<td>NSS, D5W</td>
<td>8 mg/ml</td>
<td>1-4 mg/min</td>
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<tr>
<td>Propofol (Diprivan)</td>
<td>1000 mg / 100 ml</td>
<td>Premix</td>
<td>10 mg/ml</td>
<td>10-100 micrograms/kg/min</td>
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<tr>
<td>Sodium Bicarbonate</td>
<td>150 mEq / 1000 ml</td>
<td>D5W</td>
<td>150 mEq/L</td>
<td>75-300 ml/hour</td>
</tr>
<tr>
<td>Vasopressin</td>
<td>40 units / 250 ml</td>
<td>NSS, D5W</td>
<td>0.16 units/ml</td>
<td>0.04 units/min($)</td>
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<tr>
<td>Vecuronium</td>
<td>100 mg / 100ml</td>
<td>NSS, D5W</td>
<td>1 mg/ml</td>
<td>1-5 mg/hr</td>
</tr>
</tbody>
</table>

**Notes:**

A. **This Standard Infusion List is only a reference of usual dosing ranges for verification of orders. Administration of any medication requires a standing order within a separate protocol or a Medical Command order.** Refer to the applicable protocol or online Medical Command order for dosing to be administered to the patient. Concentrations of medications may differ when obtained from a referring hospital. Contact Medical Command if there is any concern about the concentration or dosing of an infusion.

B. Fluid diluents that are compatible with each medication are provided. The first diluent listed is preferred.

C. These medications must be obtained from the referring facility for infusion. Concentrations may differ based on referring pharmacy – **Always check medications/concentrations provided.**

D. Epinephrine or Norepinephrine (Levophed) dose may exceed the above dosing range if under order from Medical Command. However, if a high dose is ineffective, consider possibility of metabolic acidosis, which makes catecholamines such as Epinephrine and Norepinephrine ineffective. Consult Medical Command for treatment of the metabolic acidosis and/or use of Vasopressin (Vasostrict) (which is not pH-dependent) in these cases.
E. When mixing an infusion, remove an equal volume of diluent from the bag as the volume of medication being mixed in.

F. Example infusion calculation (use pump’s drug calculator whenever possible):
   1. Order: Dopamine 5 micrograms/kg/min for a 70 kg patient and 400 mg / 250 ml NSS.
   2. Dose Calculation: Dopamine (5 micrograms/kg/min) x (70 kg) = 350 micrograms/min.
   3. Volume Calculation: (350 micrograms/min) x (250 ml / 400,000 micrograms) = 0.22 ml/min.

G. A filter must be used with medications marked:

H. Compatibility of standard infusions listed on next page:

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>Y-site compatibility</td>
<td>• Able to co-administer at Y-site</td>
</tr>
<tr>
<td>!</td>
<td>Caution, variable results</td>
<td>• Use alternate access if available</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• May co-administer at Y-site if no other access available</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Monitor site and drug effect</td>
</tr>
<tr>
<td>N</td>
<td>Not compatible</td>
<td>• Administer through separate lines</td>
</tr>
<tr>
<td>U</td>
<td>Unknown</td>
<td>• Administer through separate lines</td>
</tr>
<tr>
<td>STAT MedEvac</td>
<td>Appendix A</td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>------------</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Amiodarone         | U Y Y ! Y Y Y Y N ! Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y
# ANTIBIOTIC REFERENCE LIST

<table>
<thead>
<tr>
<th>Medication</th>
<th>Class</th>
<th>Dosing Range</th>
<th>Time of Infusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ampicillin (Omnipen)</td>
<td>Penicillins</td>
<td>1 – 2 gm</td>
<td>30 min</td>
</tr>
<tr>
<td>Ampicillin/Sulbactam (Unasyn)</td>
<td>Penicillins</td>
<td>1.5 – 3 gm</td>
<td>30 min</td>
</tr>
<tr>
<td>Azithromycin (Zithromax)</td>
<td>Macrolides</td>
<td>500 mg</td>
<td>60 min</td>
</tr>
<tr>
<td>Aztreonam (Azactam)</td>
<td>Other</td>
<td>0.5 – 2 gm</td>
<td>30 min</td>
</tr>
<tr>
<td>Cefazolin (Ancef)</td>
<td>Cephalosporins</td>
<td>0.25 – 2 gm</td>
<td>30 min</td>
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<tr>
<td>Cefepime (Maxipime)</td>
<td>Cephalosporins</td>
<td>0.5 – 2 gm</td>
<td>30 min</td>
</tr>
<tr>
<td>Cefotaxime (Claforan)</td>
<td>Cephalosporins</td>
<td>0.5 – 2 gm</td>
<td>30 min</td>
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<tr>
<td>Cefotetan (Cefotan)</td>
<td>Cephalosporins</td>
<td>0.5 – 3 gm</td>
<td>30 min</td>
</tr>
<tr>
<td>Cefoxitin (Mefoxin)</td>
<td>Cephalosporins</td>
<td>1 – 2 gm</td>
<td>30 min</td>
</tr>
<tr>
<td>Ceftazidime (Fortaz, Tazicef)</td>
<td>Cephalosporins</td>
<td>0.5 – 2 gm</td>
<td>30 min</td>
</tr>
<tr>
<td>Ceftaxone (Rocephin)(^c)</td>
<td>Cephalosporins</td>
<td>1 – 2 gm</td>
<td>30 min</td>
</tr>
<tr>
<td>Cefuroxime (Zinacef)</td>
<td>Cephalosporins</td>
<td>0.75 – 1.5 gm</td>
<td>30 min</td>
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<td>Ciprofloxacin (Cipro)</td>
<td>Fluroquinolones</td>
<td>200 – 400 mg</td>
<td>60 min</td>
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<tr>
<td>Clindamycin (Cleocin)</td>
<td>Other</td>
<td>300 – 900 mg</td>
<td>30 min</td>
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<td>Doxycycline (Vibramycin)</td>
<td>Tetracyclines</td>
<td>100 mg</td>
<td>60 min</td>
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<tr>
<td>Ertapenem (Invanz)</td>
<td>Carbapenems</td>
<td>1000 mg</td>
<td>30 min</td>
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<td>Gentamicin (Garamycin)</td>
<td>Aminoglycosides</td>
<td>1 – 7 mg/kg</td>
<td>30 min</td>
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<tr>
<td>Levofloxacin (Levaquin)</td>
<td>Quinolones</td>
<td>250 – 500 mg</td>
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<td>750 mg</td>
<td>90 min</td>
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<td>Linezolid (Zyvox)</td>
<td>Other</td>
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<td>60 min</td>
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<td>Meropenem (Merrem)</td>
<td>Carbapenems</td>
<td>500 – 1000 mg</td>
<td>30 min</td>
</tr>
<tr>
<td>Metronidazole (Flagyl)</td>
<td>Other</td>
<td>250 – 750 mg</td>
<td>60 min</td>
</tr>
<tr>
<td>Moxifloxacin (Avelox)</td>
<td>Quinolones</td>
<td>400 mg</td>
<td>60 min</td>
</tr>
<tr>
<td>Nafcillin (Nafcil, Unipen)</td>
<td>Penicillins</td>
<td>0.5 – 2 gm</td>
<td>30 min</td>
</tr>
<tr>
<td>Oxacillin (Bactocill, Prostaphilin)</td>
<td>Penicillins</td>
<td>0.25 – 2 gm</td>
<td>30 min</td>
</tr>
<tr>
<td>Penicillin G Potassium/Sodium</td>
<td>Penicillins</td>
<td>2 – 4 million units</td>
<td>60 min</td>
</tr>
<tr>
<td>Piperacillin/Tazobactam (Zosyn)</td>
<td>Penicillins</td>
<td>3.375 – 4.5 gm</td>
<td>30 min</td>
</tr>
<tr>
<td>Ticarcillin/Clavulanate (Timentin)</td>
<td>Penicillins</td>
<td>3.375 – 4.5 gm</td>
<td>30 min</td>
</tr>
<tr>
<td>Tigecycline (Tygacil)</td>
<td>Other</td>
<td>50 – 100 mg</td>
<td>60 min</td>
</tr>
<tr>
<td>Tobramycin</td>
<td>Aminoglycosides</td>
<td>1 – 7 mg/kg</td>
<td>30 min</td>
</tr>
<tr>
<td>Trimethoprim/Sulfamethoxasole (Bactrim, Septra)</td>
<td>Sulfonamides</td>
<td>10 – 20 mg/kg</td>
<td>60 min</td>
</tr>
<tr>
<td>Vancomycin Hydrochloride</td>
<td>Other</td>
<td>0.5 – 1 gm</td>
<td>60 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.5 – 2 gm</td>
<td>120 min</td>
</tr>
</tbody>
</table>
Notes:
A. Refer to Protocol CC712 (Suspected Infection). This appendix is a list of antibiotics that may be administered without Medical Command contact based on the parameters listed in Protocol CC712 (Suspected Infection).

B. If an antibiotic infusion is already running at a receiving facility, the rate of administration should be adjusted so that the total dose would be administered over the specified time of infusion in this protocol, unless ordered differently by Medical Command. For example, if patient is receiving Azithromycin (Zithromax) 500 mg IV and half of the dose has already been administered, the remaining 250 mg should be administered over 30 min.

C. Compatibility:
   1. Administer antibiotics through a dedicated infusion line unless compatibility with other infusion is confirmed by a hospital-based pharmacist.
   2. IV Ceftriaxone (Rocephin) should not be mixed with IV calcium-containing solutions and/or administered via the same IV line as IV calcium-containing products.
**NIH STROKE SCALE**

<table>
<thead>
<tr>
<th>INSTRUCTIONS</th>
<th>SCALE DEFINITION</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. A) Level of Consciousness</strong></td>
<td><strong>0 =</strong> Alert: keenly responsive. <strong>1 =</strong> Not alert; but arousable by minor stimulation <strong>2 =</strong> Not alert; requires repeated stimulation to attend, or requires strong or painful stimulation to make movements. <strong>3 =</strong> Responds only with reflex motor or autonomic effects or totally unresponsive, flaccid, and areflexic</td>
<td></td>
</tr>
<tr>
<td><strong>B) LOC Questions (Age &amp; Month)</strong></td>
<td><strong>0 =</strong> Answers both questions correctly. <strong>1 =</strong> Answers one question correctly. <strong>2 =</strong> Answers neither question correctly.</td>
<td></td>
</tr>
<tr>
<td><strong>C) LOC Commands</strong></td>
<td><strong>0 =</strong> Performs both tasks correctly. <strong>1 =</strong> Performs one task correctly. <strong>2 =</strong> Performs neither task correctly.</td>
<td></td>
</tr>
<tr>
<td><strong>2. Best Gaze</strong></td>
<td><strong>0 =</strong> Normal. <strong>1 =</strong> Partial gaze palsy. <strong>2 =</strong> Forced deviation</td>
<td></td>
</tr>
<tr>
<td><strong>3. Visual</strong></td>
<td><strong>0 =</strong> No visual loss. <strong>1 =</strong> Partial hemianopia. <strong>2 =</strong> Complete hemianopia. <strong>3 =</strong> Bilateral hemianopia (blind)</td>
<td></td>
</tr>
<tr>
<td><strong>4. Facial Palsy</strong></td>
<td><strong>0 =</strong> Normal symmetrical movements. <strong>1 =</strong> Minor paralysis. <strong>2 =</strong> Partial paralysis. <strong>3 =</strong> Complete paralysis of one or both sides.</td>
<td></td>
</tr>
<tr>
<td><strong>5. A) Motor Arm - Left</strong></td>
<td><strong>0 =</strong> No drift for full 10 seconds <strong>1 =</strong> Drift <strong>2 =</strong> Some effort against gravity</td>
<td></td>
</tr>
<tr>
<td><strong>B) Motor Arm - Right</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>6. A) Motor Leg - Left</strong></td>
<td><strong>3 =</strong> No effort against gravity; limb falls <strong>4 =</strong> No movement <strong>UN =</strong> Amputation or joint fusion</td>
<td></td>
</tr>
<tr>
<td><strong>B) Motor Leg - Right</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>7. Limb Ataxia</strong></td>
<td><strong>0 =</strong> Absent. <strong>1 =</strong> Present in one limb. <strong>2 =</strong> Present in two limbs. <strong>UN =</strong> Amputation or joint fusion</td>
<td></td>
</tr>
<tr>
<td><strong>8. Sensory</strong></td>
<td><strong>0 =</strong> Normal; no sensory loss. <strong>1 =</strong> Mild-to-moderate sensory loss. <strong>2 =</strong> Severe to total sensory loss.</td>
<td></td>
</tr>
<tr>
<td><strong>9. Best Language</strong></td>
<td><strong>0 =</strong> No aphasia; normal. <strong>1 =</strong> Mild-to-moderate aphasia. <strong>2 =</strong> Severe aphasia. <strong>3 =</strong> Mute, global aphasia.</td>
<td></td>
</tr>
<tr>
<td><strong>10. Dysarthria</strong></td>
<td><strong>0 =</strong> Normal. <strong>1 =</strong> Mild-to-moderate dysarthria. <strong>2 =</strong> Severe dysarthria. <strong>UN =</strong> Intubated or other physical barrier</td>
<td></td>
</tr>
<tr>
<td><strong>11. Extinction and Inattention</strong></td>
<td><strong>0 =</strong> No abnormality. <strong>1 =</strong> Inattention or extinction to bilateral simultaneous stimulation in one sensory modality (visual, tactile, auditory, etc). <strong>2 =</strong> Profound hemi-inattention or extinction (&gt;1 modality).</td>
<td></td>
</tr>
</tbody>
</table>
THROMBOLYSIS CHECKLIST FOR ACUTE ISCHEMIC STROKE

Inclusion Criteria

- Acute ischemic Stroke causing measurable neurological deficit (NIHSS >3)
- Onset of symptoms <3 hours before beginning treatment OR
- Onset of symptoms 3 to 4.5 hours before beginning treatment (see additional relative exclusion criteria below)
- Age ≥18 years

Exclusion Criteria

- Significant head trauma or prior stroke in previous 3 months
- Symptoms suggest subarachnoid hemorrhage
- Arterial puncture at noncompressible site in previous 7 days
- History of previous intracranial hemorrhage (any)
- Intracranial neoplasm, arteriovenous malformation, or aneurysm
- Recent intracranial or intraspinal surgery
- Elevated blood pressure (systolic >185 mmHg or diastolic >110 mmHg)
- Active internal bleeding
- Acute bleeding diathesis, including but not limited to:
  - Platelet count <100,000/mm³
  - Heparin received within 48 hours, resulting in abnormally elevated aPTT greater than the upper limit of normal
  - Current use of anticoagulant with INR >1.7 or PT >15 seconds
  - Current use of direct thrombin inhibitors or direct factor Xa inhibitors with elevated sensitive laboratory tests (e.g. aPTT or INR)
- Blood glucose concentration <50 mg/dL
- CT demonstrates multilobar infarction (hypodensity >1/3 cerebral hemisphere)

Relative Exclusion Criteria

- Only minor or rapidly improving stroke symptoms (clearing spontaneously)
- Pregnancy
- Seizure at onset with postictal residual neurological impairments
- Major surgery or serious trauma within previous 14 days
- Recent gastrointestinal or urinary tract hemorrhage within previous 21 days
- Recent acute myocardial infarction within previous 3 months

Relative Exclusion Criteria for Patients Treated within 3 to 4.5 Hours of Symptom Onset

- Age >80 years
- Severe stroke (NIHSS >25)
- Taking an oral anticoagulant regardless of INR
- History of both diabetes and prior ischemic stroke
Notes:

A. Medical Command must be contacted for an order to administer any thrombolytic [e.g. Alteplase (Activase)] for all patients.
B. Prior to contacting Medical Command, obtain information on the checklist above from the referring facility staff.
C. If any criteria are not met as specified above, this needs to be discussed specifically with the Medical Command physician.
HYPOXIA CHECKLIST

Procedure

1. Increase oxygen to 100%.
2. Check ventilator set-up:
   a. O₂ source → Ensure adequate oxygen pressure.
   b. Circuit leaks or disconnections → Address leaks or disconnections from O₂ source of ventilator circuit.
   c. Circuit obstruction → Ensure no kinks or other obstruction.
   d. Endotracheal tube obstruction → Address patient biting tube or tube kinking.
   e. Secretions → Suction patient.
   f. Filter obstruction → If sputum or debris in HME filter, replace filter.
   g. Endotracheal tube cuff leak → Inflate ETT cuff as needed.
   h. Ventilator alarms → Address alarms.
   i. Assess alternate SpO₂ probe/site.
   j. Ensure proper ETCO₂ waveform.
3. Assess patient for signs of hemodynamic compromise (pulse oximetry may be inaccurate in low perfusion states, such as hypotensive patient or patient on vasopressors). If evidence of shock, refer to the appropriate shock protocol:
   a. CC705A-1 (Hypovolemic Shock – Adult)
   b. CC705A-2 (Distributive Shock – Adult)
   c. CC705A-3 (Cardiogenic Shock – Adult)
   d. CC705A-4 (Obstructive Shock – Adult)
   e. CC705P (Shock – Pediatric)
4. Assess for and address signs of poor ventilation dynamics, abnormal oxygen diffusion, or inadequate ventilator support. Refer to chart below.
5. If hypoxia remains unresolved or patient is rapidly decompensating, Contact Medical Command for additional orders.
<table>
<thead>
<tr>
<th>Patient Characteristics may include</th>
<th>Abnormal Oxygen Diffusion</th>
<th>Inadequate Ventilator Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>• PIP &gt; 40 cmH₂O</td>
<td>• PIP &gt; 40 cmH₂O</td>
<td>• PIP &lt; 40 cmH₂O</td>
</tr>
<tr>
<td>• ETCO₂ &gt; 45 cmH₂O</td>
<td>• ETCO₂ &lt; 45 cmH₂O</td>
<td>• ETCO₂ &lt; 45 cmH₂O</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Spontaneous ventilations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Increased work of breathing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>→ negative deflection of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ventilation curve</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Common Conditions</th>
<th></th>
<th>Acidosis, Sepsis, Pneumonia, Neurological Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Asthma, COPD, Pneumonia, Trauma</td>
<td>• Pneumonia, CHF, ARDS</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interventions</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Assess tube depth for mainstem intubation → Adjust tube positioning</td>
<td>• Titrate PEEP up to 10 cmH₂O. Refer to Protocol CC404 (Mechanical Ventilation).</td>
<td>• Contact Medical Command for orders to increase ventilator support</td>
</tr>
<tr>
<td>• Assess for tension pneumothorax → Refer to Protocol CC613 (Tension Pneumothorax).</td>
<td>• Perform an inspiratory hold maneuver</td>
<td></td>
</tr>
<tr>
<td>• Assess for bronchospasm → Refer to Protocol CC422 (Asthma/COPD/Bronchospasm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Assess for auto-PEEP → Disconnect from ventilator for 5 seconds to allow a full exhale and reconnect the ventilator (place ventilator on standby immediately before disconnecting from patient); if peak pressure improves transiently:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o Consider increasing PEEP up to 10 cmH₂O to prevent air trapping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o If not in ASV, consider decreasing RR or decreasing inspiratory time (TI) to improve exhalation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PREPARATION

1. Connect ventilation circuit to the ventilator:
   a. Utilize adult tubing for patients weighing >30 kg IBW.
   b. Utilize pediatric tubing for patients weighing 3-30 kg IBW.
2. Perform a Preop Check prior to connecting to the patient:
   a. Perform Tightness Test.
   b. Perform Flow Sensor Test (turn flow sensor around and connect with adapter, then turn back around when indicated by ventilator).

Ventilator Circuit Configuration (Standard):

Ventilator → Tubing → ETCO₂ → Flow Sensor → Filter → Elbow → ET tube → Patient

*For pediatric patients, minimize dead space between ventilator tubing and patient by:
   ▪ Using a pediatric filter when available
   ▪ Eliminating or limiting the extension of the elbow

Ventilator Circuit Configuration (with Nebulizer):

Ventilator → Tubing → Nebulizer → ETCO₂ → Flow Sensor → Elbow → ET tube → Patient

NOTE: When using a nebulizer during transport with any patient that has a suspected respiratory/airborne infection, an appropriate mask should be worn by the crew.
ADAPTIVE SUPPORT VENTILATION (ASV)

1. Select Adult/Ped.
2. Set Mode to ASV.
3. Set ventilation parameters based on patient values and relevant protocol or Medical Command order and confirm:
   a. Gender
   b. Patient Height
   c. %MinVol (Percent Minute Volume) \(\rightarrow\) per protocol or order
   d. PEEP (Peak End-Expiratory Pressure) \(\rightarrow\) per protocol or order
   e. Oxygen \(\rightarrow\) per protocol or order; adjust between 40-100% to the lowest oxygen concentration to achieve SpO\(_2\) \(\geq 95\%

4. Start ventilation and connect to patient.
5. Alarms:
   a. Observe ventilator auto-titrations as volume and rate are adjusted to meet %MinVol.
   b. Within 1-2 minutes of initiating ventilation or when patient is stable on the ventilator, adjust alarms by pressing the “Auto” adjust button under Alarms.

PRESSURE-REGULATED SYNCHRONIZED INTERMITTENT MANDATORY VENTILATION (PSIMV+)

1. Select Adult/Ped.
2. Set Mode to PSIMV+.
3. Set ventilation parameters based on Medical Command order and confirm:
   a. Gender
   b. Patient Height
   c. Rate \(\rightarrow\) Per default
   d. TI (Time-Inspiration) \(\rightarrow\) 1.65 seconds
   e. Flowtrigger \(\rightarrow\) 5.0 l/min
   f. Pinsp (Inspiratory Pressure) \(\rightarrow\) Per order
      Note: Inspiratory Positive Airway Pressure (IPAP) = Pinsp + PEEP
   g. PEEP (Peak End-Expiratory Pressure) \(\rightarrow\) per order
   h. Oxygen \(\rightarrow\) per order
4. Start ventilation and connect to patient
5. Alarms:
   a. Observe ventilator alarms while adjusting Pinsp and PEEP as per order and address any persistent alarms with the Medical Director on Call (MDOC).
   b. Within 1-2 minutes of initiating ventilation or when patient is stable on the ventilator, adjust alarms by pressing the “Auto” adjust button under Alarms.
BILEVEL POSITIVE AIRWAY PRESSURE (BiPAP)
1. Select Adult/Ped.
2. Set Mode to NIV-ST.
3. Set ventilation parameters based on patient values and relevant protocol or Medical Command order and confirm:
   a. **Rate** → Per default (this is a backup rate in case of apnea)
   b. **Pinsp** (Inspiratory Pressure) → Per order
      Note: Inspiratory Positive Airway Pressure (IPAP) = Pinsp + PEEP
   c. **PEEP** (Peak End-Expiratory Pressure) → Per protocol or order
   d. **Oxygen** → per protocol or order; adjust between 40-100% to the lowest oxygen concentration to achieve SpO₂ ≥95%
4. Start ventilation and connect to patient
5. Alarms:
   a. Observe ventilator alarms while adjusting Pinsp and PEEP as per order and address any persistent alarms with Medical Command.
   b. Within 1-2 minutes of initiating ventilation or when patient is stable on the ventilator, adjust alarms by pressing the “Auto” adjust button under Alarms.

CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP)
1. Select Adult/Ped.
2. Set Mode to NIV.
3. Set ventilation parameters based on patient values and relevant protocol or Medical Command order and confirm:
   a. **Rate** → Per default (this is a backup rate in case of apnea)
   b. **Pinsp** (Inspiratory Pressure) → Set to 0 (zero)
   c. **PEEP** (Peak End-Expiratory Pressure) → Set the continuous pressure level, per protocol or order (typical range 5-20 cmH₂O)
   d. **Oxygen** → per protocol or order; adjust between 40-100% to the lowest oxygen concentration to achieve SpO₂ ≥95%
4. Start ventilation and connect to patient
5. Alarms:
   a. Observe ventilator alarms while adjusting PEEP as per order and address any persistent alarms with Medical Command.
   b. Within 1-2 minutes of initiating ventilation or when patient is stable on the ventilator, adjust alarms by pressing the “Auto” adjust button under Alarms.
AIRWAY PRESSURE RELEASE VENTILATION

1. Select Adult/Ped.
2. Set Mode to APRV.
3. Set ventilation parameters based on Medical Command order and confirm:
   a. Gender
   b. Patient Height
   c. T High (Time cycle for high pressure) → Per order (default is per table below)
   d. T Low (Time cycle for low pressure) → Per order (default is per table below)
   e. Flowtrigger → 5.0 l/min
   f. P High (Inspiratory Pressure) → Per order (default is per table below)
   g. P Low (Expiratory Pressure) → Per order (default is per table below)
   h. Oxygen → Per order
4. Start ventilation and connect to patient
5. Alarms:
   a. Observe ventilator alarms and address any persistent alarms with the Medical Director on Call (MDOC).
   b. Within 1-2 minutes of initiating ventilation or when patient is stable on the ventilator, adjust alarms by pressing the “Auto” adjust button under Alarms.

<table>
<thead>
<tr>
<th>IBW (kg)</th>
<th>Phigh / Plow (cmH20)</th>
<th>Thigh (s)</th>
<th>Tlow (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 to 5</td>
<td>20 / 5</td>
<td>1.7</td>
<td>0.3</td>
</tr>
<tr>
<td>6 to 8</td>
<td>20 / 5</td>
<td>2.1</td>
<td>0.3</td>
</tr>
<tr>
<td>9 to 20</td>
<td>20 / 5</td>
<td>2.6</td>
<td>0.4</td>
</tr>
<tr>
<td>21 to 39</td>
<td>20 / 5</td>
<td>3.5</td>
<td>0.5</td>
</tr>
<tr>
<td>40 to 59</td>
<td>20 / 5</td>
<td>4.4</td>
<td>0.6</td>
</tr>
<tr>
<td>60 to 89</td>
<td>20 / 5</td>
<td>5.4</td>
<td>0.6</td>
</tr>
<tr>
<td>90 to 99</td>
<td>23 / 5</td>
<td>5.4</td>
<td>0.6</td>
</tr>
<tr>
<td>≥ 100</td>
<td>25 / 5</td>
<td>5.4</td>
<td>0.6</td>
</tr>
</tbody>
</table>
Hamilton-T1 Ventilator Schematic

**FRONT VIEW**
1. Alarm Lamp
2. Touch Screen
3. Power/Standby
4. Battery Charge Indicator
5. Day/Night Key
   - Screen Lock/Unlock
   - O₂ Enrichment
7. Print Screen
   - Nebulizer On/Off
8. Alarm Silence
9. Press-and-Turn Knob
10. Front Cover and Battery
11. Expiratory Valve Bleed Port

**SIDE VIEW 1**
1. N/A
2. Pneumatic Nebulizer Output Connector
3. Flow Sensor Ports
4. Loudspeaker
5. Cooling Air Vent
6. To Patient Port
7. From Patient Port with Expiratory Valve
   - Cover and Membrane

**SIDE VIEW 2**
1. USB Connector
2. High-Pressure Oxygen Inlet Fitting
3. Low-Pressure Oxygen Connector
4. AC Power Receptacle
5. Cooling Air Intake and Dust Filter
6. AC Power Cord with Retaining Dip
7. Serial Number Label
8. DC Power Jack
Low-Pressure Oxygen Source Configuration

If an ambulance or aircraft cannot maintain at least 41 PSI, configure the oxygen source for low-pressure oxygen source as below:

- Attach the low-pressure inlet fitting to the low-pressure oxygen connector.
- Connect oxygen tubing from the oxygen source to the ventilator and set oxygen flow at 15 liters per minute.
- Select the source type on the ventilator:
  - In **Standby** mode, touch the **Utilities** button.
  - Select **LPO** for low-pressure oxygen
  - Close the Utilities window

**Calculation for \( O_2 \) Liters Remaining:**

\[
Total \text{ Liters } O_2 \text{ Remaining} = (\text{Tank Pressure in psi}) \times (\text{Tank Constant})
\]

<table>
<thead>
<tr>
<th>Size</th>
<th>Type</th>
<th>Tank Constant</th>
<th>(2000) psi</th>
<th>(1800) psi</th>
<th>(1500) psi</th>
<th>(1000) psi</th>
<th>(800) psi</th>
<th>(500) psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;H&quot;</td>
<td>Some ground ambulances</td>
<td>3.14</td>
<td>6280 L</td>
<td>5650 L</td>
<td>4710 L</td>
<td>3140 L</td>
<td>2510 L</td>
<td>1570 L</td>
</tr>
<tr>
<td>&quot;M&quot;</td>
<td>Helicopter; some ground ambulances</td>
<td>1.56</td>
<td>3120 L</td>
<td>2800 L</td>
<td>2340 L</td>
<td>1560 L</td>
<td>1240 L</td>
<td>780 L</td>
</tr>
<tr>
<td>&quot;E&quot;</td>
<td>Large portable</td>
<td>0.28</td>
<td>560 L</td>
<td>500 L</td>
<td>420 L</td>
<td>280 L</td>
<td>220 L</td>
<td>140 L</td>
</tr>
<tr>
<td>&quot;D&quot;</td>
<td>Small portable</td>
<td>0.16</td>
<td>320 L</td>
<td>280 L</td>
<td>240 L</td>
<td>160 L</td>
<td>120 L</td>
<td>80 L</td>
</tr>
</tbody>
</table>

* Values rounded down

**Calculation for \( O_2 \) Time Remaining:**

\[
Minutes \text{ of } O_2 \text{ remaining} = \frac{(\text{Liters of } O_2 \text{ in Tank})}{(\text{Liters per min being consumed by patient})}
\]
### IDEAL BODY WEIGHT

**IBW and Tidal Volumes for FEMALES**

<table>
<thead>
<tr>
<th>Height</th>
<th>IBW (kg)</th>
<th>6 ml/kg*</th>
<th>8 ml/kg*</th>
</tr>
</thead>
<tbody>
<tr>
<td>4' 0&quot; (48)</td>
<td>18</td>
<td>110</td>
<td>140</td>
</tr>
<tr>
<td>4' 1&quot; (49)</td>
<td>20</td>
<td>120</td>
<td>160</td>
</tr>
<tr>
<td>4' 2&quot; (50)</td>
<td>23</td>
<td>140</td>
<td>180</td>
</tr>
<tr>
<td>4' 3&quot; (51)</td>
<td>25</td>
<td>150</td>
<td>200</td>
</tr>
<tr>
<td>4' 4&quot; (52)</td>
<td>27</td>
<td>160</td>
<td>220</td>
</tr>
<tr>
<td>4' 5&quot; (53)</td>
<td>29</td>
<td>170</td>
<td>230</td>
</tr>
<tr>
<td>4' 6&quot; (54)</td>
<td>32</td>
<td>190</td>
<td>260</td>
</tr>
<tr>
<td>4' 7&quot; (55)</td>
<td>34</td>
<td>200</td>
<td>270</td>
</tr>
<tr>
<td>4' 8&quot; (56)</td>
<td>36</td>
<td>220</td>
<td>290</td>
</tr>
<tr>
<td>4' 9&quot; (57)</td>
<td>39</td>
<td>230</td>
<td>310</td>
</tr>
<tr>
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*Tidal volumes rounded to the closest 10 ml

**IBW and Tidal Volumes for MALES**

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<th>Height</th>
<th>IBW (kg)</th>
<th>6 ml/kg*</th>
<th>8 ml/kg*</th>
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<td>7' 0&quot; (84)</td>
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<td>840</td>
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</table>

*Tidal volumes rounded to the closest 10 ml
INTRA-AORTIC BALLOON PUMP (IABP) REFERENCE

**Transfer of IABP**

**Do not remove or turn off referral IABP until IABP transfer is complete.**

1. **Assess the Patient** for:
   a. IABP insertion site, catheter size and type.
   b. Assess IABP settings.
   c. Assess platelet count, PTT, and INR.
   d. Assess IABP augmentation prior to arrival.
   e. Verify left radial and/or brachial pulses, urine output, and pedal pulses.
   f. Confirm IABP settings with referring staff.


3. **Apply Electrodes** (do not remove/disconnect existing electrodes).

4. **Connect A-Line & Cables** (level & secure to mid-axillary line).

5. If available, connect Fiber Optic Sensor and Key Card (upper left corner of display, light bulb icon color).
   b. Blue: Not zeroed (must be calibrated). Refer to “Calibrating Fiber Optic Catheter” below.

6. **Connect Helium Drive Line**.

7. **Verify Balloon Volume** (select “Apply” after change is made)

8. **Datascope IABP Adapter**: If needed, connect appropriate size Arrow pump adapter.

9. **Confirm Helium Filling Volume** is correct.

10. **Verify Trigger** recognition (ECG or A-line).

11. **Select Desired Assist Ratio** (1:1 to 1:4).

12. **Mode Selection** (Autopilot Mode)

13. **Pump Status to “ON”**.

14. **Ensure Proper Trigger** (ECG or A-line). Select Operator Mode to change.

15. **Ensure Proper Timing**.

16. **Secure Affected Lower Extremity**.

17. **Remove Referring ECG electrodes** (once all transfer to transport IABP is complete).

18. **Continued Assessment** (site/catheter, pressures, pulses, urine output) and **Documentation**.

19. Do not elevate head of bed >30 degrees. Only log roll for positioning.

20. Ensure IABP is plugged into the aircraft on every transport.

**Calibrating Fiberoptic Catheter**

1. Place IABP in 1:2.

2. View Assisted and Unassisted MAP.

3. Select AP Key.

4. Press FOS Cal Key.

5. Move < & > keys until FOS MAP is equal to Unassisted MAP.
IABP Special Considerations & Troubleshooting

Required Assessment & Documentation:

- IAB insertion site/type/size of catheter
- IABP settings
- Platelet count/PTT/INR
- Augmentation pressure prior to arrival
- Left radial/brachial pulse
- Pedal Pulses
- Urine output

Timing References:

IF DBP< Assisted Diastolic
Timing Error- Early Deflation

IF SBP< Assisted Systolic
Timing Error- Late Deflation
Other Causes:
- IAB small for aorta
- IAB volume too low
- Improper positioning of IAB

IF Augmentation < Systolic
Timing Error- Early or Late Inflation
Other Causes:
- Severe hypovolemia
- Low SVR
- IAB small for aorta
- Improper positioning of IAB
- MAP<40 mmHg

Special Considerations:

1. Datascope:
   a. Utilize the Datascope adapter from your IABP backpack to connect the Datascope catheter to the Arrow IABP.
   b. Ensure the appropriate balloon catheter size.
   c. Adjust fill volume on the IABP console to the correct balloon volume by pressing balloon volume on.

2. Alarms – If IABP is alarming, assess reason for alarm, then press reset and then “Pump Status On”.

3. CPR – The arterial pressure trigger needs to be selected during CPR in a 1:1 assist frequency. Go to Operator Mode → Select Trigger → Select AP. If there is ROSC, return to previous trigger mode.

4. Atrial Fibrillation – Autopilot’s choice when the rhythm is irregular. Ensure Arrhythmia Timing is ON.

5. Pacing
   a. Atrial Pacing – The computer uses the atrial pacing spike as the trigger signal. This mode can be used with 100% atrially paced rhythms only.
   b. Ventricular Pacing – The computer uses the ventricular spike as the trigger signal. This mode can be used with ventricular or AV 100% paced rhythms. To set, go to Operator Mode → Select Trigger → Select appropriate type of pacing. **Remember that patient must be 100% paced and then IABP must stay in operator mode**

6. Trigger Failure – If trigger failure occurs, check connections and ECG leads. If no improvement, change to Operator Mode and select the best available trigger.

7. Loss of left radial pulse, loss of pedal pulse on side of catheter insertion, or urine output <30 ml/hr – This indicates the catheter has migrated. Notify MDOC immediately.

8. IABP Device Failure – Attach a 60 ml slip-tip syringe to the balloon catheter and cycle the balloon manually once every 10 minutes. Notify MDOC immediately for further instructions.


10. Contact MDOC – For any changes required to augmentation rates or changes in patient condition after transfer from bedside to transport IABP.

***Contact MDOC with any questions or concerns***
### HeartMate II Troubleshooting Guide

<table>
<thead>
<tr>
<th>Warning Lights</th>
<th>Audio Tone</th>
<th>Alarm Message</th>
<th>Meaning</th>
<th>Action</th>
</tr>
</thead>
</table>
| Red Heart      | Steady Audio Tone         | LOW FLOW HAZARD (on Display Module)                                           | Pump flow < 2.5 lpm, pump has stopped, perc lead is disconnected, or pump is not working properly. | 1. Make sure System Controller is connected to the pump.  
2. Make sure System Controller is connected to a power source (batteries, PBU/Power Module, or Emergency Power Pack [EPP]).  
3. If alarm continues, immediately seek additional help. |
| NONE: No Warning Lights and No Green Power Symbol | Steady Audio Tone         | NONE                                                                          | System Controller is not receiving power.                               | 1. Make sure System Controller is connected to a power source (batteries, PBU/Power Module, or EPP).  
2. If connected and alarm continues, switch to alternate power source.  
3. If alarm continues after switching power source, replace Controller (see otherside for instructions.) |
| Red Battery    | Steady Audio Tone         | LOW VOLTAGE                                                                   | Less than 5 minutes of battery power remain, voltage is too low, or the System Controller is not getting enough power from the PBU/Power Module. | Immediately replace depleted batteries with new, fully-charged set. Change batteries **one at a time**. If fully-charged batteries are not available, switch to PBU/PowerModule or EPP.  
**WARNING! Do NOT remove power from both power leads at the same time, or the pump will stop.**  
**Note:** Pump speed will gradually decrease to save power (i.e., “Power Saver Mode”) until the condition is resolved and the alarm clears. |
| Yellow Battery | 1 Beep Every 4 Seconds    | Low Voltage Advisory                                                         | Less than 15 minutes of battery power remain, voltage is too low, or the System Controller is not getting enough power from the PBU/Power Module. | Immediately replace depleted batteries with new, fully-charged set. Change batteries **one at a time**. If fully-charged batteries are not available, switch to PBU/PowerModule or EPP.  
**WARNING! Do NOT remove power from both power leads at the same time, or the pump will stop.** |
| NONE: No Warning Light | Broken Audio Tone (repeating cycle: 1 beep per second for 2 seconds, followed by 2 seconds of silence) | REPLACE SYSTEM CONTROLLER (on System Monitor)  
REPLACE SYSTEM DRIVER (on Display Module) | System Controller is operating in back-up mode. | 1. Replace the System Controller (see other side for instructions).  
2. Notify the patient's physician.  
3. Obtain a new backup System Controller.  
4. Program the new backup Controller with settings prescribed for this patient. |
<table>
<thead>
<tr>
<th>Yellow Controller Cell</th>
<th>1 Beep Every 4 Seconds</th>
<th>SC CELL MODULE LOW (on System Monitor) Driver Cell Low (on Display Module)</th>
<th>The battery module that powers the System Controller audible alarm is depleted.</th>
<th>Replace the System Controller Battery Module.</th>
</tr>
</thead>
</table>
| Rapidly Flashing Green Power Symbol | 1 Beep Every Second | POWER CABLE DISCONNECTED | One of the power leads is damaged or disconnected. | 4. Reconnect or tighten disconnected/loose power lead.  
5. If alarm continues, check System Controller power lead and PBU/Power Module patient cable for damage.  
6. If System Controller power lead is damaged, replace the Controller (see other side for instructions). If PBU/Power Module patient cable is damaged, replace PBU/Power Module patient cable.  
7. Obtain a new, backup System Controller for this patient, if necessary. |
| NONE: No Warning Light | NONE on PBU w/ System Monitor 1 Beep Every 4 Seconds when on Batteries or PBU (w/Display Module) | WARNING: Low Speed Operation | Pump is operating below low speed limit. | Connect System Controller to System Monitor (audio alarm will stop) and increase fixed speed setting or reduce low speed limit. |
## PEDIATRIC REFERENCE

### Normal Vital Sign Ranges

<table>
<thead>
<tr>
<th>Age (kg)</th>
<th>Respiration Range</th>
<th>Heart Rate Range</th>
<th>SBP Range</th>
<th>Distance (CM) Mid-Trachea to Lip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preemie (1-2)</td>
<td>40-60</td>
<td>90-180</td>
<td>60-70</td>
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<tr>
<td>Newborn (3.5)</td>
<td>40-60</td>
<td>90-180</td>
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<td>8.5-9.5</td>
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<tr>
<td>6 MO (7)</td>
<td>24-40</td>
<td>85-170</td>
<td>70-106</td>
<td>9.5-11</td>
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<td>1 YR (10)</td>
<td>20-40</td>
<td>80-140</td>
<td>72-110</td>
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<td>80-130</td>
<td>76-114</td>
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<td>10 YR (30)</td>
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### APGAR Score

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<td>A – Appearance</td>
<td>Blue, pale</td>
<td>Body pink</td>
<td>Completely pink</td>
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<tr>
<td>P – Pulse</td>
<td>Absent</td>
<td>&lt; 100</td>
<td>&gt; 100</td>
</tr>
<tr>
<td>G – Grimace</td>
<td>No response</td>
<td>Grimace</td>
<td>Cough or sneeze</td>
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<tr>
<td>A – Activity</td>
<td>Limp</td>
<td>Some flexion</td>
<td>Well flexed</td>
</tr>
<tr>
<td>R – Respiration</td>
<td>Absent</td>
<td>Weak, irregular</td>
<td>Strong Cry</td>
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### Neonatal O₂ Sat

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<td>3</td>
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<td>5</td>
<td>80-85%</td>
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<td>85-90%</td>
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### Broselow Height

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<td>5 kg</td>
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<td>Pink</td>
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<table>
<thead>
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<tr>
<td>17 kg</td>
<td>41 inches</td>
<td></td>
</tr>
<tr>
<td>18 kg</td>
<td>42 inches</td>
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</tr>
<tr>
<td>Blue</td>
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<tr>
<td>22 kg</td>
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<tr>
<td>Orange</td>
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</tr>
<tr>
<td>26 kg</td>
<td>50 inches</td>
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</tr>
<tr>
<td>28 kg</td>
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<tr>
<td>Green</td>
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</tr>
<tr>
<td>32 kg</td>
<td>53 inches</td>
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</tr>
<tr>
<td>33 kg</td>
<td>55 inches</td>
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<tr>
<td>36 kg</td>
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</table>

Effective 07/01/2016
## GROUND AMBULANCE TRANSPORT CHECKLIST

<table>
<thead>
<tr>
<th>EMS Provider Challenge</th>
<th>Flight Crew Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drugs, blood, radio, cell phone, chargers</td>
<td>Present</td>
</tr>
<tr>
<td>Equipment on-board, hard equipment secured with strap</td>
<td>Secured</td>
</tr>
<tr>
<td>Oxygen bottles secured</td>
<td>Secured</td>
</tr>
<tr>
<td>Lap belt for each flight crew member and passenger</td>
<td>Present</td>
</tr>
<tr>
<td>Adequate on-board oxygen w/ 50 p.s.i. source</td>
<td>Adequate &gt;1000 if vent</td>
</tr>
<tr>
<td>Working inverter</td>
<td>Present</td>
</tr>
<tr>
<td>Working on-board suction</td>
<td>Present</td>
</tr>
<tr>
<td>STATCOM notified of ambulance/flight crew contact information &amp; <em>planned travel route</em></td>
<td>Notified</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flight Crew Challenge</th>
<th>EMS Provider Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient condition/information is not presented to ambulance operator.</td>
<td>Check</td>
</tr>
<tr>
<td>STAT personnel will advise the operator when out of lap belts</td>
<td>Done</td>
</tr>
<tr>
<td>One crew member will remain awake and in front with driver between 21:00-07:00</td>
<td>Check</td>
</tr>
<tr>
<td>Expected passengers, i.e. family members, additional medical help, etc.</td>
<td>Done</td>
</tr>
<tr>
<td>Mode of transport briefing</td>
<td>Done</td>
</tr>
<tr>
<td><em>No emergency lights/siren unless directed by flight crew</em></td>
<td>Done</td>
</tr>
<tr>
<td><em>If emergency response is indicated, vehicle will stop at all traffic lights/stop signs</em></td>
<td>Done</td>
</tr>
<tr>
<td><em>Concerns regarding ride quality, road conditions discussed as needed</em></td>
<td>Done</td>
</tr>
</tbody>
</table>
### SECTION 3000: Resuscitation

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3031A</td>
<td>General Cardiac Arrest – Adult</td>
<td>133</td>
</tr>
<tr>
<td>3031P</td>
<td>General Cardiac Arrest – Pediatric</td>
<td>137</td>
</tr>
<tr>
<td>3032</td>
<td>Cardiac Arrest – Traumatic</td>
<td>140</td>
</tr>
</tbody>
</table>

### SECTION 5000: Cardiac

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5021A</td>
<td>Bradycardia – Adult</td>
<td>143</td>
</tr>
<tr>
<td>5021P</td>
<td>Bradycardia – Pediatric</td>
<td>146</td>
</tr>
<tr>
<td>5022A</td>
<td>Narrow Complex Tachycardia – Adult</td>
<td>149</td>
</tr>
<tr>
<td>5022P</td>
<td>Narrow Complex Tachycardia – Pediatric</td>
<td>152</td>
</tr>
<tr>
<td>5023A</td>
<td>Wide Complex Tachycardia – Adult</td>
<td>154</td>
</tr>
<tr>
<td>5023P</td>
<td>Wide Complex Tachycardia – Pediatric</td>
<td>157</td>
</tr>
</tbody>
</table>
DURING UNINTERRUPTED COMPRESSIONS:

- IO/IV Access ASAP
- EPINEPHrine 1 mg IO/IV every 3 - 5 minutes
- Airway Options:
  - Naso/oropharyngeal Airway
  - Alternative Airway

AVOID endotracheal intubation and patient packaging during initial 10 minutes

- Ventilation Options:
  - No Ventilation
  - 1 ventilation every 10-15 compressions (Monitor Perfusion with Capnography)

- Supplemental Oxygen
- Antidysrhythmic if Recurrent VF/VT and Other Medications if appropriate (See Box on Next Page)

Procedural Steps:

1. NO
   - 200 Uninterrupted Chest Compressions
   - If VF/VT, Defibrillate 360 joules

2. YES
   - 200 Uninterrupted Chest Compressions
   - If VF/VT, Defibrillate 360 joules

3. Proceed to Post-resuscitation Protocol #3080

Return of Spontaneous Circulation (ROSC)

General Cardiac Arrest – Adult:

Initial Patient Contact - See Protocol # 201
Pulseless, may have gasping/agonal respirations

Cardiac arrest witnessed by ALS personnel OR Quality CPR in progress on ALS arrival
GENERAL CARDIAC ARREST – ADULT

FROM LAST PAGE

2 Minutes

Check Rhythm

IF VF/VT Shock 360 joules

ROSC

EPINEPHrine 1:10,000; 1 mg IO/IV every 3-5 minutes

Manage Airway

Apply ITD, optional

Ventilate 8-10 breaths / min

Treat Reversible Causes

(See Box)

CONTINUOUS CPR

OTHER MEDICATIONS/ TREATMENTS

For recurrent VF/VT:

- Amiodone 300 mg IV/IO OR 1.5 mg/kg IV/IO
  (if available)

- OR

- Lidocaine

- If torsades de pointes:
  - Administer Magnesium sulfate
  - 2 g IV/IO (if available)

- Sodium bicarbonate not indicated unless hyperkalemia or tricyclic antidepressant overdose

If hyperkalemia suspected in dialysis patient administer:

- Calcium Cl (10%) 10 mL IV/IO
  (if available)

- Sodium bicarbonate 1 mEq/kg IV/IO

If hypovolemia suspected:

- Give NSS 2 liters w/d open.

Naloxone and Glucose are not indicated in cardiac arrest

IF intubated, assess for tension pneumothorax or misplaced ETT:

- If tension pneumothorax suspected, perform needle decompression

CONSIDER FIELD TERMINATION OF RESUSCITATION OR CONTINUE RESUSCITATION AND BEGIN TRANSPORT

Contact Medical Command
GENERAL CARDIAC ARREST – ADULT

Criteria:
A. Adult patient with cardiac arrest (may have gasping or agonal breathing).

Exclusion Criteria:
A. Cardiac arrest due to acute traumatic injury – Follow Cardiac Arrest – Traumatic Protocol #3032.
B. Cardiac arrest due to severe hypothermia – Follow Hypothermia Protocol #3032.
C. Patient displaying an Out-of-Hospital Do Not Resuscitation (OOH-DNR) original order, bracelet, or necklace – see OOH-DNR Protocol #324.

System Requirements:
A. Ideally, providers in each EMS agency will use a “pit crew” approach when using this protocol to ensure the most effective and efficient cardiac arrest care. Training should include teamwork simulations integrating QRS, BLS, and ALS crew members who regularly work together. High-performance systems should practice teamwork using “pit crew” techniques with predefined roles and crew resource management principles. For example:
   1. Rescuer 1 and 2 set up on opposite sides of patient’s chest and perform continuous chest compressions, alternating after every 100 compressions to avoid fatigue.
   2. Use metronome or CPR feedback device to ensure that compression rate is 100-120/minute.
   3. Chest compressions are only interrupted during rhythm check (AED analysis or manual) and defibrillation shocks. Continue compressions when AED/defibrillator is charging.
   4. Additional rescuer obtains IO (or IV) access and gives EPINEPHrine. Consider tibial IO as first attempt at vascular access.
   5. During the first four cycles of compressions/defibrillation (approximately 10 minutes) avoid any attempt at intubation, and consider delaying use of mechanical CPR device.
   6. Use of a CPR checklist to ensure that all best practices are followed during CPR.
B. For efficient “pit crew” style care, the EMS agency medical director should establish the options that will be used by providers functioning within the EMS agency. Options include establishing:
   1. The airway/ventilation management, if any, that will be used during compression-only CPR.
   2. The initial route of vascular access.
   3. Whether an ITD will be used.
C. The EMS agency, overseen by the agency medical director, must perform a QI review of care and outcome for every patient that receives CPR.
   1. The QI should be coordinated with local receiving hospitals to include hospital admission, discharge, and condition information. This EMS agency QI can be accomplished by participation in the Cardiac Arrest Registry for Enhanced Survival (CARES) program.
   2. The QI should be coordinated with local PSAP/dispatch centers to review opportunities to assure optimal recognition of possible cardiac arrest cases and provision of dispatch-assisted CPR (including hands-only CPR when appropriate).

Notes:
1. If AED has been applied by BLS provider, skip to appropriate place in protocol that incorporates previous care. ALS providers should switch to manual defibrillator as soon as possible.
2. Precordial thump may be used when ALS providers witness VF arrest in a monitored patient. Begin chest compressions if any delay to defibrillation.
3. Shock at maximum output of defibrillator, up to maximum of 360 joules, for initial and subsequent defibrillation attempts.

4. Excellent CPR is a priority:
   a. Push hard and fast (100-120/min) and allow full recoil of chest during compressions.
   b. Change rescuer doing compressions every 1-2 minutes (100-200 compressions) to avoid fatigue.
   c. When ventilation indicated and advanced airway in place, deliver 8-10 breaths/minute by giving one ventilation for every 10-15 compressions or using respiratory rate on capnograph or timer on ITD/CPR feedback device. Avoid hyperventilation.
   d. Restart CPR immediately after any defibrillation attempts.
   e. Keep pauses in CPR to a minimum by charging defibrillator during CPR, restarting compressions immediately after defibrillation without checking pulse or rhythm, and avoiding pauses in CPR during airway management.

5. Do not move or package patient for transport at this time. Chest compressions are much less effective during patient transportation/movement, and any possible interventions by medical command will be less effective without optimal CPR.

6. The optimal airway management during compression-only CPR has not been established. Agency medical directors can set agency policy using the following approaches:
   a. Open airway with manual technique or naso/oropharyngeal airway or Alternative Airway – with or without passive oxygenation.
   b. Provide either no active ventilation (passive ventilation from compressions) or bag ventilate at 8-10 breaths per minute (one ventilation every 10-15 compressions) without interrupting compressions (monitor perfusion with capnography if providing active ventilation).
   c. If BVM ventilation, consider 2-thumbs-up 2-person BVM technique.

7. Confirm and document tube placement with absence of gastric sounds and presence of bilateral breath sounds AND continuous waveform ETCO$_2$ detector. Follow Confirmation of Airway Placement Protocol #2032 May insert gastric tube, if available, to decompress stomach.

8. If available, an inspiratory impedance threshold device (ITD) may be placed on the end of an advanced airway or two-person BVM during CPR.

9. Endotracheal intubation optional at this point, but if unable to intubate in up to 3 attempts, consider an alternative/ rescue airway device.

10. Repeat lidocaine, 0.75 mg/kg IV/IO, every 5 -10 minutes to a total dose of 3 mg/kg.

11. May repeat one additional dose of amiodarone, 150 mg IV/IO, after 10 minutes.

12. If possible, contact medical command prior to moving or transporting patient. CPR is much less effective during patient transportation, and any possible interventions by medical command will be less effective without optimal CPR.

13. Field termination of resuscitation must be ordered by Medical Command Physician, otherwise continue resuscitation attempts and initiate transport.

Performance Parameters:
   A. Documentation of code summary from monitor /ECG rhythm strips.
   B. Documentation of confirmation of advanced airway placement including documentation of gastric sounds, breath sounds and use of confirmatory device (include print out of ETCO$_2$ monitor if possible).
   C. EMS agency should document patient outcome and QI indicators for cardiac arrest, including ROSC during EMS care, ROSC on arrival to ED, admitted to hospital, discharged from hospital alive, and neurologic function on discharge. Participating in and registering each cardiac arrest patient in CARES can be used to benchmark agency performance.
GENERAL CARDIAC ARREST – PEDIATRIC

Initial Patient Contact - See Protocol # 201
Assess for pulse and monitor ECG

NO
Perform CPR (15:2) for 2 minutes or until defibrillator charged

YES
Cardiac arrest witnessed by ALS personnel
OR
Quality CPR in progress on ALS arrival

2,3

2 Minutes

Check Rhythm
If VF/VT Shock 4 joules/kg

ROSC
Proceed to Post-Resuscitation Protocol #3080

Continuous Cpr
Monitor Cpr, Quality / Capnography

Epinephrine 1:10,000; 0.01 mg/kg IV/IO ³ every 3-5 mins (0.1 mL/kg of 1:10,000)

If recurrent VF/VT
Amiodarone or Lidocaine (See Box)

Manage Airway BVM ⁴,⁶
Ventilate 8-10 breaths / min

Treat Reversible Causes
(See Box)

CONTINUE RESUSCITATION AND BEGIN TRANSPORT
OR
CONSIDER FIELD TERMINATION OF RESUSCITATION ⁹

Contact Medical Command ⁷

<table>
<thead>
<tr>
<th>OTHER MEDICATIONS/ TREATMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>For recurrent VF/VT:</td>
</tr>
<tr>
<td>Amiodarone 5 mg/kg IV/IO ³ 300 mg max (if available)</td>
</tr>
<tr>
<td>Lidocaine 1 mg/kg IV/IO</td>
</tr>
</tbody>
</table>

If torsade de points: Administer Magnesium sulfate 25-50 mg/kg Max 2 g IV/IO (if available)

If intubated, assess for tension pneumothorax or misplaced ETT: If tension pneumothorax suspected, perform needle decompression

Sodium bicarbonate not indicated unless hyperkalemia or tricyclic antidepressant overdose

If hyperkalemia suspected, administer:
Calcium Cl (10%) 0.2 mL/kg IV/IO (if available)
Sodium bicarbonate 1 mEq/kg IV/IO

If hypovolemia suspected: Give NSS 20 mL/kg wide open
Naloxone not indicated in cardiac arrest

Effective 07/01/2016
GENERAL CARDIAC ARREST – PEDIATRIC

Criteria:
A. Pediatric patient (preadolescent ≤ 14 y/o) with cardiac arrest (may have gasping or agonal breathing).

Exclusion Criteria:
A. Cardiac Arrest in newborns - Follow Neonatal Resuscitation Protocol #3033.
B. Cardiac arrest due to acute traumatic injury - Follow Cardiac Arrest - Traumatic Protocol #3032.
C. Cardiac arrest due to severe hypothermia - Follow Cardiac Arrest - Hypothermia Protocol #3035.
D. Patient displaying an Out-of-Hospital Do Not Resuscitate (OOH-DNR) original order, bracelet, or necklace - see OOH-DNR Protocol #324.

Possible MC Orders:
A. Defibrillation attempts at doses up to 10 joules/kg.
B. Additional antidysrhythmic therapy.
C. If tricyclic antidepressant overdose is suspected, administer sodium bicarbonate 1-2 mEq/kg IV/IO.
D. Field termination of resuscitation.

Notes:
1. Excellent CPR is a priority:
   a. 15 compressions: 2 ventilations in groups of 10 cycles over 2 minutes (30:2 if only one rescuer).
   b. Push hard and fast (≥100/min) and allow full recoil of chest during compressions.
   c. Change rescuer doing compressions every 2 minutes to avoid fatigue.
   d. After advanced airway, ventilation rate should be 8-10 / minute without pausing compressions to deliver ventilation. Respiratory rate on ETCO$_2$ monitor may help to avoid harmful hyperventilation.
   e. Restart CPR immediately after any defibrillation attempts.
   f. Keep pauses in CPR to a minimum by charging defibrillator during CPR, restarting compressions immediately after defibrillation without checking pulse or rhythm, and avoiding pauses in CPR during airway management.
   g. Monitor CPR quality with waveform capnography – in cardiac arrest, level of ETCO$_2$ correlates with perfusion/cardiac output from CPR. A SUDDEN increase in ETCO$_2$ by >10 mmHg may indicate return of spontaneous circulation (ROSC).
2. If AED has been applied by BLS provider, skip to appropriate place in protocol that incorporates previous care. ALS providers should switch to manual defibrillator after initial AED shock.
3. Endotracheal medications are not very effective, but if IV/IO is unsuccessful, EPINEPHrine and lidocaine may be administered via endotracheal tube. EPINEPHrine 0.1 mg/kg (0.1 mL/kg of 1:1,000).
4. Ventilation with BVM is as effective as endotracheal intubation in children when transport times are short. If available, attempt ETT intubation or alternative airway if unable to ventilate adequately with BVM.
5. Confirm and document tube placement with absence of gastric sounds and presence of bilateral breath sounds AND continuous waveform ETCO$_2$ detector. Follow Confirmation of
Airway Placement Protocol #2032. May insert gastric tube, if available, to decompress stomach.

6. Repeat lidocaine, 1 mg/kg IV, in 15 minutes (maximum total dose of 3 mg/kg).

7. If possible, contact medical command prior to moving or transporting patient. CPR is much less effective during patient transportation, and any possible interventions by medical command will be less effective without optimal CPR.

8. Field termination of resuscitation must be ordered by Medical Command Physician, otherwise continue resuscitation attempts and initiate transport.

Performance Parameters:
A. Documentation of code summary from monitor /ECG rhythm strips.
B. Documentation of confirmation of advanced airway placement including documentation of gastric sounds, breath sounds and use of confirmatory device (include print out of ETCO\textsubscript{2} monitor if possible).
CARDIAC ARREST – TRAUMATIC

Initial Patient Contact – See Protocol # 201
Cervical spine stabilization, when indicated
Rapid extrication

Assess for evidence of DOA and apparent cause of cardiac arrest?  

DOA OR Medical / Non-traumatic cause

Proceed to appropriate cardiac arrest protocol OR DOA Protocol #322

OTHER MEDICATIONS/ TREATMENTS
Consider these treatments enroute if patient can arrive at a Trauma Center in < 15 minutes

Initiate IV/Io NSS
Adults: administer NSS wide open up to 2000 mL
Peds: administer NSS wide open up to 60 mL/kg

Monitor ECG / Pulse oximetry

If VF or pulseless VT, attempt defibrillation every 2 minutes (follow doses listed in VF protocols)

EPINEPHrine 1:10,000;
Adults: 1 mg IV/Io every 3-5 mins
Peds: 0.01 mg/kg IV/Io every 3-5 mins

Monitor ETCO₂

Consider other etiologies of cardiac arrest and follow appropriate protocol

Return of spontaneous circulation (ROSC)?

YES

NO

Follow Major Multisystem Trauma Protocol #6002

CONSIDER FIELD TERMINATION OF RESUSCITATION OR
CONTINUE RESUSCITATION AND BEGIN TRANSPORT

Contact Medical Command

Repeat NSS bolus
Adult: up to 2000 mL wide open
Peds: up to 60 mL/kg wide open

- Effective CPR⁴ is important
- Manage Airway⁵,⁶,⁷
  - ETT or Alternative Airway, appropriate for initial airway
  - Ventilate 8-10 breaths/min, after advanced airway
- Assess for tension pneumothorax:
  - Perform Chest Needle Decompression, if indicated
- Control severe external bleeding
- Rapid Transport is a priority⁸,⁹
  - Restrict spinal motion if indicated¹⁰
- Consider Other Medications/Treatments (See Box at Right)
CARDIAC ARREST -- TRAUMATIC

Criteria:
A. Patient in cardiac arrest from suspected traumatic cause.

Exclusion Criteria:
A. Patient that meets DOA criteria (including unwatched cardiac arrest of traumatic cause, decapitation, rigor mortis, etc….) – See DOA Protocol #322.
B. Patient in cardiac arrest due to medical or non-traumatic causes.¹

Possible MC Orders:
A. Terminate resuscitation in the field.

Notes:
1. If the trauma appears to be minor and a medical condition appears to be the cause of the cardiac arrest, follow the appropriate cardiac arrest protocol.
2. If cardiac arrest is witnessed by EMS provider, or there is evidence that the patient had any signs of life within a few minutes before the arrival of EMS personnel, proceed with this protocol. Otherwise, follow DOA Protocol # 322.
3. Unless there is an immediately correctable cause victims of traumatic cardiac arrest must arrive at a hospital within a few minutes to have any chance of survival. Placement of an advanced airway (ETT or Alternative Airway Device) or decompression of a tension pneumothorax may increase this very short time window for survival.
4. Excellent CPR is a priority:
   a. 30 compressions: 2 ventilations (15:2 for children and infants) in groups of 5 cycles over 2 minutes.
   b. Push hard and fast (≥100/min) and allow full recoil of chest during compressions.
   c. Change rescuer doing compressions every 2 minutes to avoid fatigue.
   d. After advanced airway, ventilation rate should be 8-10/minute without pausing compressions to deliver ventilation.
   e. Keep pauses in CPR to a minimum by checking rhythm when rotating rescuer doing compressions and by avoiding pauses in CPR during airway management and other interventions.
   f. Monitor CPR Quality with waveform capnography — in cardiac arrest level of ETCO₂ correlates with perfusion/cardiac output from CPR. A SUDDEN increase in ETCO₂ by >10 mmHg may indicate return of spontaneous circulation (ROSC).
5. Ventilate with BVM is as effective as endotracheal intubation in children when transport times are short. If available, attempt ETT intubation or alternative airway if unable to ventilate adequately with BVM.
7. If unable to intubate on up to 3 attempts, consider alternative/ rescue airway device.
8. Transport immediately if patient can arrive at a trauma center (preferred destination) or the closest hospital in ≤ 15 minutes.
   a. If the patient can arrive at the closest trauma center within 15 minutes, the patient should be taken to the trauma center even if another hospital is closer.
b. Notify the receiving facility ASAP to allow maximum time for preparation to receive the patient.
c. Air medical transport of patients in traumatic cardiac arrest is generally not indicated.
9. Contact medical command for possible field termination of resuscitation if the patient remains in cardiac arrest after initial resuscitation attempt and cannot arrive at the closest receiving facility within 15 minutes.
11. Endotracheal medications are not very effective, but if IV/IO is unsuccessful, EPINEPHrine, atropine, and lidocaine may be administered via endotracheal tube at twice the IV dose.
12. Field termination of resuscitation must be ordered by Medical Command Physician, otherwise continue resuscitation attempts and initiate transport.

Performance Parameters:
A. Review all care given on scene for benefit of intervention versus potential delay to transport time. Especially procedures other than airway management and chest needle decompression in non-entrapped victims with short transport times.
B. Review for transport to appropriate destination based upon protocol.
C. Consider possible benchmark of on-scene time < 10 minutes for non-entrapped patients, although agencies may want to set goal of even less time on-scene.
BRADYCARDIA – ADULT

Initial Patient Contact - see Protocol # 201

If patient has severe hypotension or impending cardiac arrest, begin Pacing IMMEDIATELY.\(^1,2,3\)

Maintain Airway/Ventilate, if needed.
Administer Oxygen
Monitor ECG & Pulse Oximetry
Initiate IV/IO NSS
Consider 12-Lead ECG, if available

Signs or symptoms of poor perfusion? (e.g. acute altered mental status, ongoing chest pain, hypotension, or signs of shock) \(^4\)

\[\text{NO} \quad \text{YES}^5\]

\begin{itemize}
  \item \text{Second-degree AV block (Type II)}
  \item \text{Third-degree AV block}
\end{itemize}

\[\text{NO} \quad \text{YES}\]

Consider applying Pacer pads \(^4\)

Observe/Monitor

Contact Medical Command

Atropine 0.5 mg IV/IO \(^6,7\)
while preparing Pacer
(May repeat if needed to maximum of 3 mg)

\[\text{Begin Pacing}^3,5,6,8\]
\[\text{Sedation}^3\]
Initial dose, if needed (see box below)

Pacing effective AND SBP $> 100$ mmHg

\[\text{YES} \quad \text{NO}\]

Contact Medical Command

Repeat additional sedation (see box below)

\[\text{Sedation Options}^2: \quad \text{(Choose one)}
\]
\[\text{(Titrate to minimum amount necessary)}\]

- \text{Midazolam} 1-5 mg IV/ IO (0.05 mg/kg) titrated slowly may repeat every 5 minutes until maximum of 0.1 mg/kg
  \[\text{OR}\]
- \text{Diazepam} 5-10 mg IV/ IO (0.1 mg/kg) titrated slowly may repeat every 5 minutes until maximum of 0.3 mg/kg
  \[\text{OR}\]
- \text{Lorazepam} 1-2 mg IV/ IO (0.1 mg/kg, max 2 mg/dose) titrated may repeat every 5 minutes until maximum of 4 mg

\[\text{EPINEPHrine}^8 \text{ push dose (diluted) 10-20 mcg boluses or infusion}
\]
\[\text{OR}
\]
\[\text{DOPAmine OR DOBUTamine (if available) infusion}^{10}\]

Repeat additional sedation (see box below)
BRADYCARDIA – ADULT

Criteria:
A. Adult patient with heart rate less than 60 bpm with associated symptoms.

Exclusion Criteria:
A. Patient without pulse - Follow appropriate cardiac arrest protocol.
B. History or evidence of trauma - Follow appropriate trauma protocol.

Possible MC Orders:
A. Additional doses of sedation or analgesia.
B. DOPAmine infusion.
C. Glucagon 3-5 mg IV (0.05mg/kg) (if available) if beta-blocker or calcium channel blocker overdose is suspected. May be repeated in 10-15 minutes.
D. Calcium Cl 10 mL of 10% solution IV (if available) if calcium channel-blocker overdose or hyperkalemia is suspected.

Notes:
1. When applying transcutaneous pacer for serious bradycardia or impending cardiac arrest, begin rapidly increasing the energy to obtain electrical capture.
2. Application and initiation of transcutaneous pacer should not be delayed while awaiting IV access if patient has severe symptoms.
3. Some patients may not tolerate the pacing stimulus to the skin and chest wall that occurs with transcutaneous pacing. In these cases, consider sedation if SBP > 100. (See box)
4. Consider possible etiologies:
   a. Hyper/hypokalemia, other metabolic disorders
   b. Hypothermia
   c. Hypovolemia (including vomiting/diarrhea)
   d. Hypoxia
   e. Toxins/ overdose (e.g. beta-blocker or calcium channel-blocker)
   f. Tamponade
   g. Tension pneumothorax
5. Transcutaneous pacemaker electrode pads may be applied to these patients without initiating pacing so that the pacemaker is ready if patient condition deteriorates.
6. For symptomatic high-degree (second-degree or third-degree) AV block, begin pacing without delay.
7. Atropine should be administered by rapid IV push and may be repeated every 3-5 minutes, to a maximum dose of 3 mg. Atropine is ineffective and should be avoided in heart transplant patients.
8. Start pacing at heart rate of 80 and 80 mAmps. When initiating transtcutaneous pacing on a patient that is conscious with a perfusing rhythm, the pacing energy level should be increased gradually to a level slightly above the minimum energy required to obtain electrical capture.
9. EPINEPHrine by push dose (dilute boluses) or infusion. Push dose boluses = prepare 1:100,000 (10 mcg/mL) by adding 1 mL 1:10,000 EPINEPHrine in 9 mL NSS, then administer 1-2 mL every 2 minutes and titrate to SBP target. Infusion = must administer by electronic pump at 0.1-0.5 mcg/kg/min titrated to SBP target.
10. Mix DOPAmine (if available) infusion using regional or agency prescribed concentration, and administer 5-20 mcg/kg/min. Generally start at 5 mcg/kg/min, and increase every 10 minutes
by an additional 5 mcg/kg/min until SBP >90 mmHg (or [70 + (age x 2)] in children). **DO NOT exceed 20 mcg/kg/min unless ordered by medical command physician.**

**Performance Parameters:**
A. Document presence or absence of signs of poor perfusion/shock before and after interventions.
B. Review for appropriate use of immediate pacing before IV or atropine for patients with serious hypoperfusion or impending cardiac arrest.
C. Documentation of correct ECG rhythm interpretation and inclusion of rhythm strips and ECGs on PCR.
BRADYCARDIA – PEDIATRIC

Initial Patient Contact¹ – see Protocol #201

Maintain Airway/ Ventilate, if needed²,³
Administer Oxygen
Monitor ECG & Pulse Oximetry

Continued Bradycardia
AND
Signs of Cardiorespiratory Compromise?

NO

Consider contributing factors
Continue ventilation, if needed
Initiate IV/IO NSS, if needed
Consider blood glucose check

CONTACT MEDICAL COMMAND

YES

Perform chest compressions/CPR
if HR < 80
despite oxygenation and ventilation

Initiate IV/IO NSS
Check blood glucose

EPINEPHrine 0.01 mg/kg IV/IO⁶
(1:10,000; 0.1 mL/kg)

Suspected increased vagal tone or primary AV block

NO

EPINEPHrine 0.01 mg/kg
IV/IO
(1:10,000; 0.1 mL/kg)
Repeat every 3-5 minutes

CONTACT MEDICAL COMMAND

YES

Atropine 0.02 mg/kg IV/IO⁷
(minimum dose 0.1 mg)
May repeat once
AND/OR
Begin Pacing
(at rate up to 100 bpm)

CONTACT MEDICAL COMMAND
BRADYCARDIA – PEDIATRIC

Criteria:
A. Pediatric patient with heart rate < 60. Bradycardia in children is usually caused by hypoxia and often responds to oxygen and ventilatory support.

Exclusion Criteria:
A. Patient without pulse - Follow appropriate cardiac arrest protocol.
B. Newborn patient – Follow Neonatal Resuscitation Protocol #7090.
C. History or evidence of trauma - Follow appropriate trauma protocol.
D. Severe hypothermia – Follow Hypothermia Protocol #6081.

Possible MC Orders:
A. DOPAmine or EPINEPHrine infusion.
B. Glucagon 0.05mg/kg IV/IO (if available) if beta-blocker or calcium channel blocker overdose is suspected. May be repeated in 10-15 minutes.
C. Calcium Cl 0.2 mL/kg of 10% solution IV/IO (if available) if calcium channel-blocker overdose or hyperkalemia is suspected.

Notes:
1. Consider possible etiologies:
   a. Hypovolemic (including vomiting/diarrhea)
   b. Hypoxia
   c. Hypothermia
   d. Hyper/hypokalemia, other metabolic disorders
   e. Hypoglycemia
   f. Toxins/overdose (e.g. beta-blocker or calcium channel-blocker)
   g. Trauma/Tension Pneumothorax - follow appropriate trauma protocol

2. Ventilation with BVM may be as effective as endotracheal intubation in children when transport times are short. If unable to intubate on up to 3 attempts, ventilate with BVM.

3. Confirm and document tube placement with absence of gastric sounds and presence of bilateral breath sounds AND confirmatory device (like wave-form ETCO\textsubscript{2} detector). Follow Confirmation of Airway Placement Protocol #2032.

4. Serious signs or symptoms include:
   a. Poor perfusion - indicated by absent or weak peripheral pulses, increased capillary refill time, skin cool/mottled.
   b. Hypotension is SBP < 70 + (age x 2).
   c. Respiratory difficulty (respiratory rate >60/minute) indicated by increased work of breathing (retractions, nasal flaring, grunting), cyanosis, altered level of consciousness (unusual irritability, lethargy, failure to respond to parents), stridor, wheezing.

5. When CPR is required, a precise diagnosis of the specific bradyarrhythmia is not important. Perform chest compressions if, despite oxygenation and ventilation, the heart rate is <60/minute and associated with poor systemic perfusion in infant or child. If severe hypothermia, do not perform chest compressions and follow Hypothermia Protocol #6081.

6. When given IV/IO, EPINEPHrine may be repeated every 3-5 minutes. EPINEPHrine 0.1 mg/kg (1:1,000, 0.1 mL/kg) flushed with 5 mL NSS may be administered via endotracheal tube, but IV/IO route is preferred.
7. Atropine administration may be repeated once in five minutes. Maximum dose is 1 mg per dose. Atropine 0.03 mg/kg flushed with 5 mL NSS may be administered via endotracheal tube, but IV/IO route is preferred.
NARROW COMPLEX TACHYCARDIA – ADULT

Initial Patient Contact – see protocol #201

Manage Airway/Ventilate, if needed
Apply Oxygen
Monitor ECG & Pulse Oximetry

Unstable with serious signs or symptoms
Related symptoms uncommon if HR <150

STABLE

IV/IO Access
12-Lead ECG, if available

Regular Narrow QRS Rhythm?

UNSTABLE

IV/IO Access
Sedation if conscious (see box below)
DO NOT delay cardioversion
Synchronized Cardioversion
50 - 100 joules
If no conversion, repeat at
100, 200, 300, 360 joules until conversion

IRREGULAR

Consider Valsalva Maneuver

Adenosine 6 mg IV/IO
(if available)
May repeat 12 mg IV

Diltiazem 15-20 mg IV/IO slowly
(if available)
(After 15 min., may repeat 20-25 mg
(0.35 mg/kg) IV/IO)

Contact Medical Command

Regular

Contact Medical Command

Adenosine 12 mg IV
(if available)

Contact Medical Command

Sedation Options:
(Choose one)
(Titrate to minimum amount necessary)
Midazolam 1-5 mg IV/IO
(0.05 mg/kg) titrated
OR
Diazepam 5-10 mg IV/IO
(0.1 mg/kg) titrated to effect
OR
Lorazepam 1-2 mg IV/IO
0.1 mg/kg, max 2 mg/dose) titrated

Effective 07/01/2016

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NARROW COMPLEX TACHYCARDIA – ADULT

Criteria:
A. Symptomatic adult patients with heart rates >100 bpm and narrow QRS complex (< 0.12 sec).
   It is uncommon for serious symptoms to be related to tachycardia if heart rate is <150 bpm.

Exclusion Criteria:
A. Sinus tachycardia - treat underlying cause rather than rhythm. Causes may include:
   1. Trauma - Follow appropriate trauma protocol
   2. Fever
   3. Hypovolemia/ Shock
B. Wide-complex tachycardias should not be treated with this protocol (SVT with wide QRS complex may be due to Wolf-Parkinson-White, and the use of calcium channel-blockers in these patients can lead to cardiac arrest.)

Possible MC Orders:
A. Synchronized cardioversion
B. Amiodarone (if available) for narrow complex irregular rhythm or for unstable patient.

Notes:
1. Many patients who present with SVT have evidence of cardiovascular dysfunction (low blood pressure, chest pain, congestive heart failure, altered level of consciousness). Some of these patients are unstable (such as shock, pulmonary edema, decreased level of consciousness) and require immediate synchronized cardioversion. The rest who have mild hypotension, mild shortness of breath/scattered rales, chest discomfort and a GCS > 13 may be treated with medications. If the patient develops signs/ symptoms of unstable SVT at any time during treatment, proceed immediately to the cardioversion column. The following chart illustrates the continuum from borderline to critically unstable.

<table>
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</tr>
<tr>
<td>GCS 14-15</td>
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</table>

2. Regular narrow complex supraventricular tachycardias (SVTs) include reentry AV nodal tachycardia and atrial tachycardia. Atrial flutter with 2:1 conduction may be difficult to distinguish from other forms of SVT. Adenosine is not indicated if the ECG is determined to be atrial flutter or fibrillation. If atrial flutter is identified, proceed to treatment of irregular narrow complex tachycardia. If sinus tachycardia is noted, treat the underlying cause with other appropriate protocol. Fast irregular rhythms can appear regular- measure R-R intervals to be sure.

3. Avoid carotid massage if patient is older than 50 y/o or has history of hypertension.
4. Adenosine must be given by rapid IV/IO push (over 1-3 seconds) by immediate bolus of 20 ml NSS. Adenosine success may be enhanced by administration through an antecubital IV with the arm elevated above the level of the heart during injection.
5. **Do NOT give diltiazem or verapamil if wide complex QRS or if SBP < 100.** Calcium channel blocker medications may not be the best treatment for patients with impaired ventricular function and medical command should assist with this decision.

6. May substitute verapamil 5 mg IV/IO slowly over 3-5 minutes. May repeat once at 5-10 mg dose after 15 minutes.

7. Irregular narrow complex tachycardias include atrial fibrillation, atrial flutter, or multifocal atrial tachycardia (MAT). **DO NOT** treat MAT with medications.

8. Begin with 100 joules if using a monophasic defibrillator or if ECG rhythm is atrial fibrillation.

9. If using a biphasic defibrillator, initial and subsequent countershock energy doses should be determined by agency medical director.

10. Unstable patients with known chronic atrial fibrillation may be refractory to cardioversion. Consider early Medical Command contact and rapid transport.

---

**Performance Parameters:**

A. Review for correct documentation of rhythm and for inclusion of rhythm strip in PCR.

B. Review for documentation of vital signs and rhythm after each medication or cardioversion.
NARROW COMPLEX TACHYCARDIA – PEDIATRIC

Initial Patient Contact – see protocol #201

Manage Airway/ Ventilate, if needed
Apply Oxygen
Monitor ECG & Pulse Oximetry
Consider 12-Lead ECG, if available and patient stable

Probable SVT
• History of abrupt rate changes
• P waves absent/abnormal
• HR not variable
• Infants: rate usually ≥ 220 bpm
• Children: rate usually ≥ 180 bpm

Probable Sinus Tachycardia
• Known cause
• P waves present/normal
• Constant P-R; variable R-R
• Infants: rate usually < 220 bpm
• Children: rate usually < 180 bpm

Probable SVT
Unstable with signs of Poor Perfusion

STABLE
Consider vagal maneuvers
Initiate IV/IO NSS

Adenosine 0.1 mg/kg IV/IO
Maximum 6 mg (if available)
May repeat with 0.2 mg/kg IV/IO
Maximum 12 mg

UNSTABLE
 Initiate IV/IO NSS
Sedation before cardioversion
if conscious (see box at right)

DO NOT delay cardioversion
If IV/IO readily available,
Adenosine 0.1 mg/kg IV/IO
Maximum 6 mg (if available)
May repeat with 0.2 mg/kg IV/IO
Maximum 12 mg

If HR >180, consider
Synchronized Cardioversion
0.5 - 1 joules/kg
If no conversion, repeat at 2 joules/kg.

Contact Medical Command

Probable Sinus Tachycardia

Assess for cause of sinus tachycardia

Follow other appropriate protocol

Sedation Options:
(Choose one)
(Titrate to minimum amount necessary)
Midazolam 0.05 mg/kg IV/IO titrated
OR
Diazepam 0.1 mg/kg IV/IO titrated
OR
Lorazepam 0.1 mg/kg IV/IO (max 2 mg/dose) titrated
NARROW COMPLEX TACHYCARDIA – PEDIATRIC

Criteria:
A. Pediatric (preadolescent < 14 years of age) patient presenting with narrow QRS complex (≤0.08 sec) and symptomatic heart rates greater than normal for age.

Exclusion Criteria:
A. Tachycardia in trauma patients (see appropriate trauma protocol).

Possible MC Orders:
A. Amiodarone (if available) 5 mg/kg IV/IO infused over 20-60 minutes.
B. Procainamide (if available) 15 mg/kg IV/IO infused over 30-60 minutes. Avoid administering both amiodarone and procainamide.
C. Additional synchronized cardioversions.

Notes:
1. Poor perfusion is suggested by central cyanosis, tachypnea, altered level of consciousness, weak or absent peripheral pulses, or hypotension for age [SBP < 70 + (2 x age)].
2. Appropriate vagal maneuvers include:
   a. Infants and young children: Cover entire face with large bag of ice without occluding the airway.
   b. Older children: Valsalva (blow through obstructed straw) and/or carotid sinus massage.
3. Adenosine must be given by rapid IV/IO push (over 1-3 seconds) by immediate bolus of 5 -10 mL NSS. Adenosine success may be enhanced by administration through an antecubital IV with the arm elevated above the level of the heart during injection.
4. In unstable patients, do not delay cardioversion for administration of sedation or trial of adenosine. In borderline unstable patients, adenosine may be tried and conscious patients should be sedated before cardioversion.
5. Possible causes of sinus tachycardia include:
   a. Fever
   b. Shock
   c. Hypovolemia (e.g. vomiting/diarrhea, blood loss)
   d. Hypoxia
   e. Abnormal electrolytes
   f. Drug ingestions
   g. Pneumothorax
   h. Cardiac tamponade

Performance Parameters:
A. Review for documentation of vital signs and rhythm after each medication or cardioversion.
B. Review for correct documentation of rhythm and for inclusion of rhythm strip in PCR.
WIDE COMPLEX TACHYCARDIA – ADULT

Initial Patient Contact – see protocol #201

Manage Airway/ Ventilate, if needed
Apply Oxygen
Monitor ECG & Pulse Oximetry

Unstable with serious signs or symptoms
Related symptoms uncommon if HR <150

STABLE

IV/IO Access
12-Lead ECG, if available

Regular Wide QRS Rhythm?

REGULAR

First consider
Adenosine 6 mg IV/IO (if available)
May repeat 12 mg IV

Lidocaine 1.5 mg/kg IV/ IO

OR

Amiodarone 150 mg IV/IO infused over 10 minutes (if available)

Contact Medical Command

Consider repeat
Lidocaine 0.75 mg/kg IV/IO or
Lidocaine infusion at 2-4 mg/min

OR

Consider repeat
Amiodarone dose or
Amiodarone infusion (1 mg/min) (if available)

Contact Medical Command

UNSTABLE

IV/IO Access
Consider Sedation, if conscious
(see box below)
DO NOT delay cardioversion

Synchronized Cardioversion
100 joules
If no conversion, repeat at
200, 300, 360 joules until conversion

Contact Medical Command

Amiodarone
150 mg IV/IO infused over 10 minutes (if available)

OR

Magnesium
2 g IV/IO (if available)

If unstable, repeat synchronized cardioversion after antidysrhythmic

Sedation Options:
(Choose one)
(Titrated to minimum amount necessary)
Midazolam 1-5 mg IV/IO (0.05 mg/kg) titrated;
Diazepam 5-10 mg IV/IO (0.1 mg/kg) titrated;
Lorazepam 1-2 mg IV/IO (0.1 mg/kg, max 2 mg/dose) titrated
WIDE COMPLEX TACHYCARDIA – ADULT

Criteria:
A. Symptomatic adult patients with heart rates >100 bpm and wide QRS complex (≥ 0.12 sec). It is uncommon for serious symptoms to be related to tachycardia if heart rate is <150 bpm.

Exclusion Criteria:
A. Sinus tachycardia with aberrancy - treat underlying cause rather than rhythm. Causes may include:
   1. Trauma – Follow appropriate trauma protocol.
   2. Fever.
B. PEA – Follow PEA Protocol #3041A.

Possible MC Orders:
A. Synchronized cardioversion.
B. Amiodarone (if available) 150 mg IV/IO infused over 10 minutes. May be repeated as needed up to 2.2 gm in 24 hours.
C. Consider sodium bicarbonate if suspected hyperkalemia or overdose.
D. Consider calcium chloride, 10 ml of 10% solution IV (if available) if suspected renal failure/ dialysis patient or overdose of calcium channel blocker.
E. Consider glucagon, 3-10 mg (0.05mg/kg) IV (if available) if suspected calcium channel blocker overdose that is unresponsive to calcium chloride.

Notes:
1. Many patients who present with wide complex tachycardia have evidence of cardiovascular dysfunction (low blood pressure, chest pain, congestive heart failure, altered level of consciousness). Some of these patients are unstable (such as shock, pulmonary edema, decreased level of consciousness) and require immediate synchronized cardioversion. The rest who have mild hypotension, mild shortness of breath/scattered rales, chest discomfort and a GCS >13 may be treated with medications. If the patient develops unstable signs/symptoms at any time during treatment, proceed immediately to the cardioversion column. The following chart illustrates the continuum from borderline to critically unstable.

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</tr>
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<td>GCS 14-15</td>
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</tr>
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</table>

2. Regular wide complex tachycardias include ventricular tachycardia and SVT with aberrancy. If the patient has a previous history of coronary artery disease, then VT is most likely. If VT with aberrancy is suspected, adenosine (if available) may be tried. If sinus tachycardia is noted, treat the underlying cause with other appropriate protocol.

3. Vagal maneuvers may be considered. Avoid carotid massage if patient is older than 50 y/o or has history of hypertension.
4. Adenosine must be given by rapid IV push (over 1-3 seconds) by immediate bolus of 20 mL NSS. Adenosine success may be enhanced by administration through an antecubital IV with the arm elevated above the level of the heart during injection.

5. Irregular wide complex tachycardias include atrial fibrillation, pre-excitation atrial fibrillation, polymorphic VT and torsades de pointes.

6. Begin with 100 joules if using a monophasic defibrillator or if ECG rhythm is atrial fibrillation.

7. If using a biphasic defibrillator, initial and subsequent countershock energy doses should be determined by agency medical director.

8. Unstable patients with known chronic atrial fibrillation may be refractory to cardioversion. Consider early Medical Command contact and rapid transport.

Performance Parameters:
   A. Review for correct documentation of rhythm and for inclusion of rhythm strip in PCR.
   B. Review for documentation of vital signs and rhythm after each medication or cardioversion.
WIDE COMPLEX TACHYCARDIA – PEDIATRIC

Initial Patient Contact – see protocol #201
Manage Airway/ Ventilate, if needed
Apply Oxygen
Monitor ECG & Pulse Oximetry
Consider 12-Lead ECG, if available and patient stable

Probable VT/ SVT
- History of abrupt rate changes
- P waves absent/abnormal
- HR not variable

Probable Sinus Tachycardia
- Known cause
- P waves present/normal
- Constant P-R; variable R-R
- Infants: rate usu. < 220 bpm
- Children: rate usu. < 180 bpm

Probable VT/ SVT
Unstable with signs of Poor Perfusion

STABLE
Consider vagal maneuvers
- Initiate IV/IO NSS

Adenosine 0.1 mg/kg IV/IO
- Maximum 6 mg (if available)
- May repeat with 0.2 mg/kg IV/IO
- Maximum 12 mg

Contact Medical Command

Lidocaine 1 mg/kg IV/IO

Amiodarone 5 mg/kg IV/IO
- infused over 20-60 minutes (if available)

Probable Sinus Tachycardia

UNSTABLE
Assess for cause of sinus tachycardia

Follow other appropriate protocol

Contact Medical Command
Initiate IV/IO NSS

DO NOT delay cardioversion
- If IV/IO readily available
- Adenosine 0.1 mg/kg IV/IO
- Maximum 6 mg (if available)
- May repeat with 0.2 mg/kg IV/IO
- Maximum 12 mg

Sedation before cardioversion
- if conscious (see box at right)

Synchronized Cardioversion
- 0.5 - 1 joules/kg
- If no conversion, repeat at 2 joules/kg.

Sedation Options:
- Midazolam 0.05 mg/kg IV/IO titrated
- Diazepam 0.1 mg/kg IV/IO titrated
- Lorazepam 0.1 mg/kg IV/IO (max 2 mg/dose) titrated

Effective 07/01/2016
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WIDE COMPLEX TACHYCARDIA – PEDIATRIC

Criteria:
A. Pediatric (preadolescent < 14 years of age) patient presenting with narrow QRS complex (> 0.08 sec) and symptomatic heart rates greater than normal for age.

Exclusion Criteria:
A. Tachycardia in trauma patients (see appropriate trauma protocol).
C. PEA - Follow PEA Protocol #3041P.

Treatment:
A. See accompanying flowchart.

Possible MC Orders:
A. Amiodarone (if available) 5 mg/kg IV/IO infused over 20-60 minutes.
B. Lidocaine 1 mg/kg IV/IO.
C. Procainamide (if available) 15 mg/kg IV/IO infused over 30-60 minutes. Avoid administering both amiodarone and procainamide.
D. Additional synchronized cardioversions.
E. Consider sodium bicarbonate, 1-2 mEq/kg IV/IO, if suspected hyperkalemia or overdose on tricyclic antidepressant or cocaine.
F. Consider calcium chloride, 0.2 mL/kg of 10% solution IV (if available) and glucagon, 0.1 mg/kg IV/IO (if available) if suspected overdose of calcium channel blocker.
G. WARNING: Calcium channel blocker medications should not be given for wide QRS rhythms.

Notes:
1. Poor perfusion is suggested by central cyanosis, tachypnea, altered level of consciousness, weak or absent peripheral pulses, or hypotension for age [SBP < 70 + (2 x age)].
2. Appropriate vagal maneuvers include:
   a. Infants and young children: Cover entire face with large bag of ice without occluding the airway.
   b. Older children: Valsalva (blow through obstructed straw) and/or carotid sinus massage.
3. Adenosine must be given by rapid IV push (over 1-3 seconds) by immediate bolus of 5-10 mL NSS. Adenosine success may be enhanced by administration through an antecubital IV with the arm elevated above the level of the heart during injection.
4. In unstable patients, do not delay cardioversion for administration of sedation or trial of adenosine. In borderline unstable patients, adenosine may be tried and conscious patients should be sedated before cardioversion.
5. May substitute lidocaine, 1 mg/kg IV/IO, repeated every 5 minutes to total of 3 mg/kg.
6. Possible causes of sinus tachycardia include:
   a. Fever
   b. Shock
   c. Hypovolemia (e.g. vomiting/diarrhea, blood loss)
   d. Hypoxia
   e. Abnormal electrolytes
   f. Drug ingestions
   g. Pneumothorax
   h. Cardiac tamponade
Performance Parameters:
   A. Review for documentation of vital signs and rhythm after each medication or cardioversion.
   B. Review for correct documentation of rhythm and for inclusion of rhythm strip in PCR.