Monroe-Livingston Regional EMS

Specialty Care Paramedic Clinical Guidelines

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SPECIALTY CARE TRANSPORT SCOPE OF PRACTICE

The MLREMS Specialty Care Transport Paramedic provides a level of care above that of the Paramedic in order to safely provide interfacility transport of critically ill patients. These Specialty Care Transport Clinical Guidelines are to be used only by credentialed MLREMS SCT Paramedics and are to be used in concert with the Paramedic scope of practice when performing an interfacility transport. These Clinical Guidelines do not limit the ability of an EMS clinician to transport a patient with or without the pathophysiology to which a Clinical Guideline is written, but rather are only to be used during interfacility transports of patients with additional medications and/or devices not described under New York State Collaborative ALS Protocols including but not limited to:

- Patients that have more than one vasoactive medication.
- Patients that are orotracheally or nasotracheally intubated, or have a tracheostomy tube and are unstable, who require advanced mechanical ventilation management based on their condition.
- Patients that are being hemodynamically monitored with invasive monitoring devices, including arterial, PA Catheter (Swan Ganz) or similar central access devices.

The following Clinical Guidelines are considered standing order except if notification is made to contact medical control, which is considered Absolute On-Line with no exception for radio or phone failure. All MLREMS Paramedic Clinical Guidelines are standing order for the Specialty Care Transport Paramedic when executing an interfacility transport except in cases identified as Absolute On-Line with no exception for radio or phone failure.

Most importantly, these Clinical Guidelines are not intended to address every clinical presentation encountered by an SCT Paramedic. Rather, they are intended to provide evidence-based guidance for the most common transports performed by SCT Paramedics where standing order clinical guidance is prudent. The SCT Paramedic will engage with credentialed, direct, on-line medical control to discuss and develop treatment plans where indicated for the patients they transport.

SPECIALTY CARE TRANSPORT STANDARD OF CARE

These “Specialty Care Transport Clinical Guidelines” are only to be used by personnel designated as a “Specialty Care Transport Paramedic” by the MLREMS Medical Director. The Clinical Guidelines are NOT to be used for routine 9-1-1 system responses for service. Routine advanced life support care is directed by the most recent version of the New York State ALS Collaborative Protocols. They are meant to act as general guidelines for rendering medical care and/or treatments and may not be inclusive for every situation. The Clinical Guidelines should be regarded as the prevailing norms of treatment and should be considered prudent in the delivery of medical care. Deviation from these Clinical Guidelines may be necessary based on patient need and must be documented.

All patients being transported by a Specialty Care Transport Paramedic should have the following in place prior to leaving the referring facility:

- Stable airway
- Cardiac monitor – 3-lead with 12-lead capability immediately available
- If clinically indicated, a minimum of two intravenous lines (peripheral or central)
- Continuous pulse oximetry, blood pressure (invasive or noninvasive), and capnography (when clinically indicated; required for any patient on a ventilator)
- Vital signs taken a **minimum** of every 15 minutes unless a change occurs which requires immediate repetition of them
- Vital signs taken a **minimum** of every 5 minutes if any vasoactive or sedating type medications are being infused
- Confirmation that any medications being infused in the same IV line are compatible
- Any continuous medication infusion requires the use of a continuous electronic infusion device
- Continuous temperature monitoring for patients when clinically indicated

All patients should be maximally stabilized to the extent possible prior to transport, including intubation and peripheral or central venous access if necessary. It is the responsibility of the sending facility to ensure that stabilization is complete. In the event the Specialty Care Transport Paramedic does not feel the patient is stable for transport, they must communicate with both the sending facility and SCT Medical Control before transport is initiated.

SPECIALTY CARE TRANSPORT MEDICAL CONTROL

Medical Control for Interfacility Transports by a Specialty Care Transport Paramedic is provided by Physicians designated by the Monroe Livingston Regional EMS Medical Director (hereafter identified as "SCT Medical Control"). The Provider must have a means of direct communication to the SCT Medical Control Physician on-call at all times during their care of the patient.

Specialty Care Transport Medical Control and Communication Failures

Contact with SCT Medical Control will be dictated by clinical needs and should be available at all times. In the event of being unable to contact the SCT Medical Control, the following options exist:

1. Direct contact with a designated back-up MLREMS approved SCT Medical Control (if available).
2. Direct contact with standard medical control.
3. In the event of failure of all of the above, Clinical Guidelines will be regarded as standing order, however procedures requiring absolute on-line medical command should not be undertaken unless in a life-threatening emergency situation.
4. In the event of a procedure requiring absolute on-line direction being undertaken without medical control, the procedure and events surrounding it must be reviewed within 24 hours by the agency Medical Director.

Orders from transferring/receiving physicians

During inter-hospital transport, medical crews will be asked to continue treatment initiated at the transferring hospital. These orders must be written and signed by the referring physician. If at any time the Paramedic questions orders from a referring or receiving physician, SCT Medical Control **MUST** be contacted. Likewise, any time a transferring or receiving physician asks the Specialty Care Transport Paramedic to carry out medical treatment for which they have not been trained, or which appears to be in conflict with established treatment Clinical Guidelines, SCT Medical Control **MUST** be contacted before initiating care.

Potentially Unstable Transports

It is the expectation of the sending facility to provide sufficient interventions to stabilize the patient prior to transport. If, in the opinion of the Paramedic, the patient is not stable for transport, discussions with the sending facility and SCT Medical Control should occur to determine how best to stabilize the patient for transport. Potential solutions include further interventions (such as intubation) at the sending facility, use of another transport unit or agency with additional capabilities, or non-transport.

Intubation before transport is the responsibility of the sending facility and should be done by them. Transport should not commence until the sending facility has successfully managed to create a stable airway. In the event that they refuse, contact SCT Medical Control.

ANALGESIA

INDICATIONS

Patients being transported by SCT providers with pain or discomfort

MANAGEMENT GOALS

- Reduce pain and discomfort
- In some disease states, reducing circulating catecholamines is critical
- In ventilated patients, improve ventilator synchrony

CARE GUIDELINES

- Contact SCT medical control if considering more than one sedating agent
- Acetaminophen 1000 mg oral or IV if none given in previous six hours
- Ketorolac 15mg IV if no NSAIDS given in previous eight hours
- Fentanyl: Bolus 1-1.5 mcg/kg IBW (max 100 mcg/dose) IV. Initiate infusion as needed at 1 mcg/kg/hr ABW. For inadequate analgesia re-bolus and increase by 50 mcg/hr every 10 minutes to max 250 mcg/hr
- Morphine 0.05-0.1 mg/kg (max 10 mg/dose) IV, may repeat 0.05 mg/kg every 10 minutes
- Ketamine 0.3 mg/kg IBW (max 30 mg) in 100 mL over 15 minutes, may repeat x 1 in 30 minutes

TREATMENT CONSIDERATIONS

- Patients often benefit from more than one agent to provide pain relief. Especially for patients with only partial relief after adequate doses of opioids, consider adding non-opioid agents in the appropriate patient. Discuss with SCT medical control if planning to use multiple sedating agents
- For some critically ill patients pain relief is more than comfort. For example, reducing circulating catecholamines in aortic dissection can reduce blood pressure and heart rate, and controlling pain in ACS may improve ischemia from a partial blockage

ANALGESIA AND SEDATION OF THE INTUBATED PATIENT

INDICATIONS

Patients who are intubated and mechanically ventilated

BACKGROUND

Patients requiring new mechanical ventilation via endotracheal tube or front of neck access often have pain and anxiety and frequently develop psychiatric complications during their ventilator course. Additionally patients may work against the ventilator or pull lines and tubes including self-extubation. For patient comfort and safety almost all newly ventilated patients should receive analgesia first followed by sedation for a calm and compliant patient transport. Positive pressure ventilation reduces preload and cardiac output. Many analgesics and sedatives cause some vasodilation or even direct myocardial depression. Expect most patients to have some decrease in blood pressure.

MANAGEMENT GOALS

- Provide for patient safety and comfort
- Improve ventilator synchrony

CARE GUIDELINES

- Soft restraints should be applied for patient safety if appropriate

Analgesia:

- Fentanyl: Bolus 1-2 mcg/kg IBW (max 100 mcg/dose) IV/IO. Initiate infusion at 1 mcg/kg/hr ABW. For inadequate analgesia re-bolus and increase by 50 mcg/hr every 10 minutes to max 250 mcg/hr
- Ketamine may be used for analgesia, sedation or both. Doses of 0.2-0.3mg/kg will produce analgesia but not sedation, consider adding additional sedation (below)

Sedation:

- Ketamine: Bolus 1 mg/kg IV IBW and start infusion 1 mg/kg/hr. If inadequate sedation re-bolus and increase 0.5mg/kg every 30 minutes to a maximum of 3 mg/kg.
- Midazolam: Bolus 2 mg, and start infusion at 2 mg/hr. If inadequate sedation re-bolus and increase by 2 mg/hr every 10 minutes up to max 6 mg/hr

  OR
- Propofol: Initiate infusion at 10 mcg/kg/min ABW, if inadequate sedation increase by 10 mcg/kg/min every 5 minutes to max of 50 mcg/kg/min

If adequate sedation is not achieved with max doses of analgesic and sedating medications, contact SCT Medical Control for further recommendations

Neuromuscular blockade:

> ***All patients who are neuromuscularly blocked must receive analgesia and sedation unless specifically contraindicated and approved by SCT Medical Control***

If analgesia and sedation alone does not provide for ventilator synchrony, call SCT Medical Control to discuss neuromuscular blockade

TREATMENT CONSIDERATIONS

- Most intubated patients should have safe analgesia and sedation established prior to initiating transport. This may mean starting or increasing medications prior to leaving
- For patients found on sedation only, consider adding analgesia. This may allow the sedation dose to be reduced which often improves hemodynamics
- For patients with hypotension or shock optimize volume status with crystalloid boluses and initiate/ titrate vasopressors as indicated. Hypotension should not preclude adequate analgesia and sedation
- Adequate analgesia and sedation will make mechanical ventilation much easier and ultimately more successful (see below for ventilator management)

AORTIC DISSECTION (NOT AAA)

NOTE

This protocol does NOT apply to symptomatic or ruptured abdominal aortic aneurysm (AAA). Patients with symptomatic or ruptured AAA have an entirely different disease process and need immediate transport to the closest appropriate facility and should not wait for an SCT provider.

INDICATIONS

Known or suspected aortic dissection.

BACKGROUND

The aorta is the largest vessel in the body and nearly all of the blood ejected from the left side of the heart passes through it. Many patients we interact with have chronic defects of the vessel layers due to smoking, vascular disease or congenital connective tissue disorders. Acute or acute on chronic injuries to the aorta typically include aortic dissection in the chest or symptomatic/ ruptured aortic aneurysm in the abdomen and can lead to rapid decompensation and death without immediate medical therapy and surgical correction.

MANAGEMENT GOALS

- Aggressive treatment of pain, nausea/vomiting and anxiety
- Reduce further dissection by reducing the rate and pressure of each heart beat. Goal HR < 70 bpm, Goal SBP 90 mmHg while allowing normal perfusion of other organs

CARE GUIDELINES

- Confirm the patient's symptoms, vital signs and the diagnosis of aortic dissection
- Ensure two patent large bore IVs
- Reduce pain ideally to 0/10 (see Analgesia)
  - Ketamine typically contraindicated for this disease state
  - NSAIDS are typically contraindicated for this disease state
- Treat any nausea or vomiting:
  - Ondansetron 4 mg IV, may repeat every 15 minutes up to 16 mg
- Consider mild sedation if patient is still anxious after adequate analgesia:
  - Midazolam 1-2.5 mg IV, may repeat every 10 minutes to max 20 mg (cautious use due to hypotension with other blood pressure lowering agents)
  - Ketamine typically contraindicated for this disease state
- If HR is >70 bpm after controlling pain, reduce HR to <70 bpm with normal mental status
  - Esmolol: Bolus 500 mcg/kg over 1 minute, then start infusion at 50 mcg/kg/min May increase by 50 mcg/kg/min every 5 minutes up to a max of 200 mcg/kg/min (hold for HR < 60 bpm)

- After heart rate <70 bpm, reduce SBP to goal SBP 90 mmHg with normal mental status
  - Nicardipine: Initiate infusion at 5 mg/hr, increase by 2.5 mg/hr every 5 minutes to a max of 15 mg/hr When at goal, decrease the infusion rate to 3 mg/hr and re-titrate to avoid hypotension from drug accumulation
- If target HR and BP are not achieved or maximum doses of medications are reached contact SCT Medical Control for further recommendations

TREATMENT CONSIDERATIONS

- For other aortic pathology, clarify the diagnosis and treatment plan with the sending physician and SCT Medical Control prior to initiating transport.

BLOOD PRODUCT CONTINUATION

INDICATIONS

Patients requiring blood product continuation during the course of their interfacility transport.

PROCEDURE

1. Prior to transporting the patient, the Paramedic MUST check the following:
    a. Confirm the written physician order for blood transfusion.
    b. Make sure the patient is wearing an ID bracelet with his/her name and hospital ID number from the hospital of origin.
    c. Identify the patient with the nurse and verify the Patient ID band against the blood label and blood order for name, blood type and unit identification number. Verify exact spelling of the patient's first and last name, medical record/ID number and an expiration date/time.
    d. Verify IV catheter size and document (IV catheter size should be large enough to minimize hemolysis – no smaller than 20 gauge catheter should be used. If a 20 gauge catheter is used, avoid rapid infusion under pressure).
    e. Verify the patency of the infusion site and document.
    f. Verify the infusion rate as ordered by the MD.

    Important information about blood and blood components includes the following:
    - No blood container may be vented
    - All blood components must be administered through a filter (170 to 260 microns standard)
    - No medications or intravenous solutions may be added to or infused through the tubing with blood or blood components, with the exception of 0.9% Sodium Chloride solution (Normal Saline)

2. If possible, all blood should be prepared for administration and hung prior to leaving the sending facility. If transport time exceeds the time for administration of blood hanging and additional units are required, each unit must be verified using the above procedure and the signature of the reviewing nurse and the Paramedic must be documented on the transfusion record.

3. Blood and FFP not being infused must be kept in a shipping container where the temperature is maintained between 1 and 10^0C. Dry ice is NEVER to be used to cool blood or blood components. Blood removed from this cold storage container must be used immediately. Platelets and cryoprecipitate *must* be stored between 20-24°C.

4. Prepare the Y-Type administration set.

    a. Y-type blood administration sets can be used to administer a maximum of two units of whole blood or packed RBCs simultaneously, but usually only one unit at a time is hung per administration set. Should two (2) units be transfused simultaneously two (2) separate IV sites are required.
    b. Close both roller clamps
    c. Spike a 1000mL bag of 0.9% normal saline and prime tubing (make sure drip chamber is filled with enough saline to saturate the filter to prevent hemolysis as blood drips from the bag). Close roller clamp.
    d. Spike unit of blood component.
    e. Open the roller clamp between the unit and drip chamber, making sure the filter is covered with liquid.
    f. Prime the remaining length of tubing.
    g. Administration sets are required to be changed after four (4) hours

5. Attach the administration set to the primary IV line or insertion site.

6. Adjust the rate of infusion to infuse 10 to 15 drops per minute for the first 15 minutes.

7. Monitor the vital signs every 5 minutes during the first 15 minutes of the transfusion, then at least every 15 minutes for the remainder of the infusion. Temperature must be included in vital signs, as an increase in temperature is an early sign of transfusion reaction.

8. Monitor the patient for any signs of transfusion reaction, including temperature changes, as described above. Stop the transfusion immediately if the patient becomes agitated, short of breath, tachycardic, hyperthermic, or develops a rash, chills, hematuria, or any other symptoms described below. If the provider is concerned that there MAY be a transfusion reaction occurring, the transfusion should be stopped immediately. The following are signs of the most common types of transfusion reactions that may occur:

    a. Hemolytic reactions
        i. Hemolytic reactions are the most life-threatening. Clinical manifestations may vary considerably: fever (<1^{0}C [mild] to >2.5^{0}C [severe]), chest or back pain, pain at the infusion site, hypotension, nausea, generalized bleeding, impending sense of doom or oozing from surgical site(s), shock. The most common cause is from ABO incompatibility due to a clerical error or transfusion to the wrong patient. Chances of survival are dose dependent. Therefore, it is important to stop the

transfusion immediately if a hemolytic reaction is suspected. Do not discard blood, blood product container or administration set.

b. Febrile, non-hemolytic reaction
    i. Chills and fever (rise from baseline of 1^0C or 1.8^0F)

c. Allergic reaction
    i. Characterized by appearance of hives and itching (urticaria or diffuse rash)

d. Anaphylaxis
    i. May occur after administration of only a few milliliters of a plasma-containing component. Symptoms include coughing, bronchospasm, respiratory distress, vascular instability, nausea, abdominal cramps, vomiting, diarrhea, shock and loss of consciousness

e. Transfusion-Associated Cardiac Overload (TACO)
    i. Characterized by dyspnea, headache, peripheral edema, coughing, frothy sputum or other signs of congestive heart failure occurring during or soon after transfusion (restrict fluids).

f. Transfusion-Related Acute Lung Injury (TRALI)
    i. Characterized by dyspnea, pulmonary edema and symptoms similar to Acute Respiratory Distress Syndrome (ARDS), usually within 6 hours after transfusion. Consider oxygen and ventilator support.

9. If a transfusion reaction occurs or is suspected:
    a. Stop the transfusion immediately; keep saline open at a KVO rate.
    b. Do not discard any blood, blood product container(s) or tubing used
    c. Treat the patient for shock as needed
    d. Administer Diphenhydramine 50 mg IV or IM as necessary.
    e. Consider Epinephrine per Anaphylaxis/Allergic Reaction Protocol if anaphylaxis is evident.
    f. Contact medical control prior to any administration of epinephrine intravenously.
    g. ***UNDER NO CIRCUMSTANCES MAY THE TRANSFUSION BE RESTARTED UNTIL THE PATIENT HAS BEEN EXAMINED BY A PHYSICIAN.***

10. Documentation must include the completion of NYS DOH Form 5209 (Blood Transfusion Record) and if necessary, NYS DOH Form 5210 (Blood Transfusion Transfer Orders) which shall be scanned and electronically attached to the prehospital care report. Additionally, the prehospital

care report should reflect the product type transfused, amount transfused, temperature, any adverse reactions noted and any subsequent treatment.

11. Calcium Chloride 10% (1 g) may be considered if massive transfusion (5-6 units).

12. Medical control must be contacted prior to initiating any additional units of blood products.

GENERAL INDICATIONS AND GUIDELINES FOR THE ADMINISTRATION OF VARIOUS BLOOD PRODUCTS

Product	Composition/Volume	Indications	Administration
Packed Blood Red Cells	300 ml whole blood with 80% of plasma removed	Anemia, shock	100 mL/hr to wide open
Fresh Frozen Plasma	200 - 250 mL of fluid portion of blood with clotting factors (platelets, RBC's and WBC's removed)	Need for clotting factors (massive transfusion, DIC, etc.)	2 units at a time, over 60 min
Cryoprecipitate	20 – 30 mL; contains clotting factors VIII, XIII, and fibrinogen	Need for clotting factors (Von Willebrand Disease, low fibrinogen, bleeding following rTPA)	Several units (150mL) at once, wide open
Albumin 5% or 25%	50 – 100 mL of the plasma protein albumin	Shock, burns	Use 15 micron filter at 5-10 mL/min (5%) 2-3 mL/min (25%)
Platelets	200-300 mL of platelets	Massive transfusion, thrombocytopenia	Wide open for life threatening hemorrhage or total in 60 min
Whole Blood	500 mL of all blood components with added preservatives	Severe hemorrhage with volume deficit and anemia	Wide open

BRAIN INURIES AND ELEVATED INTRACRANIAL PRESSURE

INDICATIONS

History of brain injury (traumatic, intracranial hemorrhage, or mass) with GCS ≤ 8

BACKGROUND

Normal function of the brain relies on adequate Cerebral Perfusion Pressure (CPP). Because the skull is a fixed volume space:

CPP = Mean Arterial Pressure (MAP) – Intracranial Pressure (ICP)

Patients must have a high enough blood pressure to move blood into the brain AND a low enough ICP to allow the blood to flow. Whether increased ICP results from a traumatic brain injury (TBI) or a cerebrovascular accident, the assessment and management is similar. Management should be aggressive and focus on prevention of secondary brain injury by avoiding hypoxia and hypotension. Signs and symptoms of intracranial hypertension include: Deteriorating GCS, Pupillary abnormalities, Posturing (extensor) and Cushing's reflex (Hypertension, Bradycardia and Irregular respirations).

MANAGEMENT GOALS

- Maintain normal oxygenation and ventilation
- Prevent hypotension (Goal MAP 80-100)
- Reduce cerebral oxygen demand
- Maintain normal ICP until definitive care
- Minimize external stimuli and maintain normothermia
- Treat coagulopathy as indicated
- Safe and expedient transfer to definitive care

CARE GUIDELINES

- If imaging was done at a sending facility, obtain a copy of the imaging and results or ensure the facility transmits the imaging and results to the receiving facility
- Maintain spinal motion restriction if indicated
- Maintain normothermia
- Elevate the head of bed to 30 degrees unless there is a contraindication
- Ensure neutral neck position and C-collar is not too tight to promote venous drainage
- Provide FiO2 of 100%. Gradually reduce FiO2 to maintain SpO2 >95%
- Monitor ventilation and ensure ETCO2 of 40 mmHg
- If the oxygenation and ventilation goals are not met, consider early intubation
- Maintain SBP 140-160 or target range requested by receiving facility

- For marked hypertension Nicardipine: 5 mg/hr, titrate by 2.5 mg/hour every 5 minutes to a maximum of 15 mg/hour. Reduce dose to 3 mg/hr once BP target is reached and re-titrate to goal BP.
- For SBP <110 or downtrending blood pressure:
  - Normal saline 20 mL/kg IV bolus, may repeat if lungs remain clear
  - Norepinephrine 2-8 mcg/min, increase by 2-4 mcg/min every 5 minutes to a max of 20mcg/min

- Manage any nausea or vomiting:
  - Ondansetron 4 mg IV, may repeat every 15 minutes up to 16 mg
- Provide excellent pain control (See Analgesia)
  - NSAIDS are contraindicated in severe TBI or intracranial hemorrhage
- For intubated patients ensure adequate analgesia and sedation (See Analgesia and Sedation of the Intubated Patient)
- Consider Neuromuscular blockade per Intubated and Chemically Neuromuscularly Blocked Patient Protocol
- Consider seizure prophylaxis:
  - Levetiracetam (Keppra) 20 mg/kg IV over 15 minutes (usual dose 500-1500 mg twice daily); status treatment doses may be as high as 40-60 mg/kg

    OR
  - Fosphenytoin 20 mg/kg (PE) at a max rate of 150 mg/min, diluted in at least 100 mL normal saline or Phenytoin 20 mg/kg at a max rate of 50 mg/min, diluted to a max concentration of 6 mg/mL (usually 250-500 mL NS) – can cause hypotension
- For patients with two or more signs of brain herniation (bradycardia, hypertension, acute posturing, acute pupillary changes) consider ICP lowering medication:
  - Hypertonic saline (preferred): 5 mL/kg of 3% saline IV over 10 minutes (central line preferred)
  - For patients with an adequate blood pressure ONLY - Mannitol (20%-25%) 1 g/kg IV bolus (rapid to develop osmotic gradient). Hypotension is an absolute contraindication to osmotic diuresis
- If an open skull fracture is suspected consider:
  - Ceftriaxone (Rocephin) 2 g IV
- For patients with a bleeding disorder, on anticoagulant or antiplatelet medications, discuss treatment/ reversal with SCT Medical Control if not already reversed by sending facility

CARDIOGENIC SHOCK

INDICATIONS

Hypotension (Mean Arterial Pressure MAP < 65 mmHg) and one or more signs of hypoperfusion:

- Overt signs of left ventricular failure
- Acute pulmonary edema
- Altered mentation
- Cool, mottled extremities
- Low urine output

BACKGROUND

Cardiogenic shock is characterized by a decreased pumping ability of the heart that causes shock despite adequate or excessive circulating volume. It most commonly occurs in association with, and as a direct result of, acute myocardial infarction (AMI). Similar to other shock states, cardiogenic shock is considered to be a clinical diagnosis characterized by decreased urine output, altered mentation, and hypotension. Other clinical characteristics include jugular venous distension, cardiac gallop, and pulmonary edema.

MANAGEMENT GOALS

- Maintenance of adequate tissue perfusion, as evidenced by clinical signs and symptoms
- Improvement in cardiac output and coronary perfusion
- Target MAP of 65 mmHg or greater
- Maintain urine output of at least 0.5 mL/kg/hour

CARE GUIDELINES

- Ensure two patent large bore IVs
- 12 lead EKG
- In patients experiencing cardiogenic shock *without* pulmonary congestion, administer 250 mL crystalloid fluid boluses PRN to obtain and maintain management goals. Observe patient carefully for development of pulmonary congestion.
- If MAP < 65 mmHg and there are signs of inadequate tissue perfusion or pulmonary congestion:
    - Epinephrine: Initiate infusion at 2 mcg/min (0.03 mcg/kg/min), increase by 2 mcg/min (0.01 mcg/kg/min) every 5 minutes up to 20 mcg/min (0.2 mcg/kg/min) or MAP > 65 mmHg

      OR
    - If norepinephrine was initiated by sending facility, then continue as follows:
        - Increase by 2 mcg/min (0.03 mcg/kg/min) every 5 minutes to a max of 20 mcg/min (0.5 mcg/kg/min) or MAP > 65 mmHg.
        - If 20 mcg/min (0.5 mcg/kg/min) is reached, contact SCT Medical Control to consider initiation of epinephrine infusion

OR

- If dopamine was initiated by sending facility, then continue as follows:
  - Increase by 5 mcg/kg/min every 5 minutes to max dose 20 mcg/kg/min or MAP > 65 mmHg.
  - If 20 mcg/kg/min is reached, contact SCT Medical Control

- If MAP > 65 mmHg and there are signs of inadequate tissue perfusion or pulmonary congestion:
  - Dobutamine: Initiate infusion at 5 mcg/kg/min and increase by 5 mcg/kg/min every 5 minutes up to 20 mcg/kg/min
  - If Milrinone was initiated by sending facility, then continue at the current dose. Contact SCT Medical Control if titration is necessary

- If the HR increases beyond 140 bpm or tachydysrhythmias are noted, hold further up titrations and immediately contact SCT Medical Control.

TREATMENT CONSIDERATIONS

- The patient in cardiogenic shock must be treated aggressively.
- If available, review chest x-ray, labs, 12 lead EKGs, echocardiograms, BNP, etc
- Central venous access is desirable if vasoactive medications are being administered
- Continuous arterial pressure monitoring is desired if possible
- If the patient is experiencing cardiogenic shock as a result of an MI, aspirin should be given and sending facility may initiate anti-thrombin therapy
- Caution with vasodilators and other agents that reduce preload or afterload
- Beta Blockers should be avoided
- Positive pressure ventilation (intubation or NIPPV) may improve coronary perfusion in patients with adequate or increased intravascular volume
- Caution with Dobutamine and Milrinone. Although Dobutamine and Milrinone increase contractility, they also decrease systemic vascular resistance (SVR) which may lead to hypotension. Some patients will benefit from a combination of a vasopressor and an inotrope such as Norepinephrine and Dobutamine

HYPERTENSIVE EMERGENCIES

INDICATIONS

Blood pressure > 180/110 mmHg with acute end organ injury due to severe hypertension:

- Acute change in mental status
- New focal neurological deficit
- Acute ischemic ECG changes
- Acute LV dysfunction
- Renal failure (increased serum creatinine or decreased urinary output less than 0.5 mL/kg/hr)

BACKGROUND

Hypertensive emergency, also called hypertensive crisis, is severe hypertension with acute impairment of an organ system (eg, central nervous system, cardiovascular, renal). In these conditions, the blood pressure (BP) should be lowered quickly over minutes to hours

In contrast, Hypertensive urgency is a situation in which the BP is a potential risk but has not yet caused acute end-organ damage These patients require BP control over several days to weeks. This condition will not typically require treatment in the out of hospital environment

MANAGEMENT GOALS

- Lower blood pressure 20% to stop end organ injury
- Avoid iatrogenic bradycardia, hypotension or other complications of our treatment

CARE GUIDELINES

- Consider arterial line placement prior to transfer if possible
- Identify and correct any treatable causes of hypertension (pain, pre-eclampsia, stimulant use or overdose, sedative or alcohol withdrawal, etc)
- If blood pressure >180/110 with evidence of end organ injury
  - If heart rate >70- Nicardipine: Initiate infusion at 5 mg/hr, increase by 2.5 mg/hr every 5 minutes to a max of 15 mg/hr Once at goal, reduce to 3 mg/hr and re-titrate to avoid hypotension

    OR
  - If heart rate is <70- Nitroglycerin: Initiate infusion at 20-50 mcg/min, increase by 10 mcg/min every 5 minutes up to a max of 100 mcg/min
- For BP >240/140 without evidence of end organ injury contact SCT Medical Control

TREATMENT CONSIDERATIONS

- Rapid reduction in BP is indicated in the setting of AMI, hypertensive encephalopathy, subarachnoid hemorrhage and aortic dissection (See Aortic Dissection)

- In most other cases, BP should be lowered no more rapidly than 10% per hour until a baseline blood pressure is reached
- Pain management is often helpful in lowering blood pressure, especially with headache
- If an aortic emergency is known or suspected, see Aortic Emergencies Protocol
- If hypotension or bradycardia occurs, discontinue antihypertensive infusions, elevate patients' feet and administer 250 mL crystalloid fluid bolus as needed Repeat as needed to maintain MAP of at least 65 mmHg and HR > 60 bpm and contact SCT Medical Control
- Clinicians are strongly encouraged to contact SCT Medical Control with any questions regarding blood pressure control

INFUSION MANAGEMENT

INDICATIONS

1. A medication pump is available and will enhance the safety of prehospital medication administration.
   OR
2. Patients requiring interfacility transportation are receiving medications other than isotonic crystalloids or antibiotics safe for gravity delivery.

CONTRAINDICATIONS

1. The patient is receiving more than three simultaneous infusions (Request SCT Paramedic).
2. The patient is receiving more than one medication which significantly affects patient hemodynamics (Request SCT Paramedic).
3. The paramedic has not been trained in the specific medication pump available.
4. The medications are unfamiliar to the paramedic and safety concerns cannot be resolved (Consider SCT Medical Control for further guidance).
5. No pump is available for interfacility transport of medications other than isotonic crystalloids or antibiotics safe for gravity delivery.

PROCEDURE

1. Confirm orders *including titration instructions* for each medication from sending physician, SCT Medical Control, OR the medication is given as described in the NYS ALS Collaborative Protocols
2. Check and confirm safe and reliable intravenous or intraosseous access
   a. Central access confirmed safe by the hospital is preferred for vasoactive infusions
   b. 18ga or larger IV access in the proximal arms is preferred
   c. IO access which is confirmed to be working appropriately may be considered
3. Confirm the compatibility of any medications which are infusing through a shared vascular access site
4. If the medication is not yet infusing, or requires transition from a sending facility pump to an agency-specific transport medication pump, program the pump according to prior training and manufacturers recommendations. Confirm the correct medication and infusion rate using the Medication Administration Cross Check (MACC) procedure with partner, or sending facility practitioner (physician, nurse, etc).
5. If the medication is already infusing, and the sending facility's medication pump will be utilized for the transport, confirm the medication pump is providing the ordered

medication and rate using the MACC procedure with partner or sending facility practitioner.

6. For multiple medications being transported, ensure each medication pump or channel and tubing is labeled and matches the bag or bottle infusing
7. The patient must be constantly monitored throughout the transport including:
    a. Continuous pulse oximetry.
    b. Continuous ECG monitoring.
    c. Frequent blood pressure monitoring.
    d. Frequent examination of the infusion site.
8. The medication pump should be stopped if the paramedic suspects infiltration and SCT Medical Control contacted for further orders
9. Medications may be discontinued when infusions are complete unless otherwise directed by sending physician or SCT Medical Control. If primary infusion, remove the administration tubing, flush the line with saline, and secure the saline lock. If secondary infusion, remove the administration tubing and maintain carrier infusion unless otherwise directed by sending physician or SCT Medical Control.
10. Contact SCT Medical Control for any adjustment to the infusion rate not covered by the sending facility or within the ALS Collaborative Protocols.

THORACOSTOMY (CHEST) TUBES

INDICATIONS

Patients being transported with thoracostomy tubes in place

BACKGROUND

Patients may receive a variety of chest tubes or drains for pneumothorax, hemothorax, pleural effusion or empyema. Tubes connecting the pleural space with the ambient environment may affect hemodynamics and pose a risk for infection or respiratory compromise

MANAGEMENT GOALS

- Safely maintain existing thoracostomy tubes and minimize discomfort
- Monitor for changes in patient condition during transport
- Ensure chest drains stay upright at all times

CARE GUIDELINES

- Confirm the type, location and depth of all lines and tubes before transport
  - Review chest x-ray or CT imaging of tube placement, if available
- Confirm thoracostomy tubes are securely attached to the patient. This should
- include: suturing to the skin, occlusive dressing to thoracostomy site, and taping of the thoracostomy tube to the patient.
- All thoracostomy tubes should be connected to a commercially available chest drain (Pleur-Evac) or a one way Heimlich valve
  - If being transported with Heimlich valve confirm arrow points away from patient
- Maintain suction at the level being provided prior to transport
- Re-examine the thoracostomy tube site and drainage system every 15 minutes
  - Mark output level upon departure from sending facility
  - Record tube output every 15 minutes
    - Contact SCT Medical Control for >500 mL in 30 minutes
- For sudden decompensation:
  - Place all thoracostomy tubes to suction
  - Consider causes of shock including underlying disease and pneumothorax
  - For tension pneumothorax treat with needle decompression as indicated
  - For other causes of shock treat as indicated
- Provide analgesia as needed (see Analgesia, above)

TREATMENT CONSIDERATIONS

In the event the Pleur-Evac is damaged, remove tubing from Pleur-Evac and place end of chest tube in bottle of sterile water. Contact SCT Medical Control if change in patient status

THROMBOLYTIC THERAPY (TPA - ALTEPLASE OR TNK - TENECTEPLASE)

INDICATIONS

Patients who received or are receiving thrombolytic medications

BACKGROUND

tPA and TNK are prescribed for patients with acute organ injury due to thrombo-embolism, typically Ischemic Stroke (CVA), Pulmonary Embolism (PE), or Acute Myocardial Infarction (AMI). These medications bind to fibrin clots and break them down, hopefully leading to reperfusion of the brain, lung or heart that was downstream from the clot. These medications also carry significant bleeding risks and patients will require close monitoring during transport.

MANAGEMENT GOALS

- Close monitoring of the patient's presenting condition and any bleeding complications
- Completion of thrombolytic medication started by the sending facility

CARE GUIDELINES

- Monitor patient's vital signs and neurologic exam at least every 15 minutes during transport (record NIHSS in patients being treated for stroke)
  - If the neurologic exam worsens, stop the infusion and contact the receiving facility and SCT Medical Control
  - Infusion should not be restarted until evaluated by the receiving facility
- Monitor for major/minor bleeding
  - Major bleeding: intracranial, retroperitoneal, gastrointestinal
  - Minor bleeding: gums, venipuncture sites, hematuria, hemoptysis, hematomas
  - If bleeding complications occur, contact the receiving hospital and SCT Medical Control and discuss stopping the infusion.
- In patients with ischemic stroke maintain SBP < 185 mmHg and DBP < 105mmHg
  - If HR >60 - Labetalol 10-20 mg slow IV push over 2 minutes. May double the previous dose and repeat every 10 minutes as needed (max dose 300 mg)

    OR
  - Nicardipine - Start infusion at 2.5-5 mg/hr, increase by 2.5 mg/hr every 10 minutes to max of 15 mg/hr. Once at goal, reduce rate to 3 mg/hr and re-titrate to avoid hypotension. If BP drops below 140/80 mmHg immediately hold infusion

TREATMENT CONSIDERATIONS

- SCT Medical Control must be consulted before restarting tPA infusion
- Contact SCT Medical Control for hypertension not responding to therapy above.

TRANSVENOUS (TEMPORARY) PACEMAKER

INDICATIONS

Patients being transported with a transvenous (temporary) pacemaker

BACKGROUND

Transvenous pacemakers are frequently placed as a bridge between transcutaneous pacing and the placement of a permanent pacemaker. Pacing wires are also left in place frequently after cardiac surgery until the patient stabilizes. Understanding the anatomy and equipment involved is pivotal to caring for these patients until definitive treatment can be performed

MANAGEMENT GOALS

Provide for safe transfer of patients with a transvenous (temporary) pacemaker

CARE GUIDELINES

- Check to assure the insertion site is covered with a clean and dry dressing
- Determine the depth of the pacing wires and ensure they are locked in place
- Secure the pacing generator and protect the controls with the plastic cover or confirm the screen is locked to prevent inadvertent adjustment
- Ensure transcutaneous pacing pads are in place with good AP placement as a backup

MANAGING COMPLICATIONS

Failure of transvenous (internal) pacing leading to symptomatic bradycardia should be treated with transcutaneous (external) pacing - follow standard protocols

If unable to maintain transvenous pacing contact SCT Medical Control

- Loss of electrical capture - may be due to movement of the wire or a high threshold
  - Check and tighten all connections
  - Contact SCT Medical Control for further guidance
  - Transcutaneous pacing as indicated

- Failure to pace (no spike present) – may be due to broken or loose connection, battery or circuit failure.
  - Check and tighten all connections.
  - Remove any equipment that might cause electrical interference
  - Replace the battery and/or pacing generator
  - Contact SCT Medical Control for further guidance
  - Transcutaneous pacing as indicated

- Pacing despite adequate intrinsic rate - may be due to undersensing
  - Check and tighten all connections
  - Increase the sensitivity of the pacing unit
  - Return the patient to a position where adequate sensing was last observed
    - This is often left lateral recumbent
  - Increase the pacing rate to override the intrinsic rhythm if possible.
  - Turn the pacemaker off but leave connected
  - Contact SCT Medical Control for further guidance
  - Transcutaneous pacing as indicated

- Intermittent pauses or paced rate below set rate - may be due to over-sensing
  - Oversensing lead to underpacing
  - Decrease the sensitivity on the pacemaker.
  - Replace the pacemaker generator if the problem continues.
  - Contact SCT Medical Control for further guidance
  - Transcutaneous pacing as indicated

Sedation and Analgesia:

- Provide all patients with analgesia, see Analgesia guideline
- For patients with ongoing distress despite analgesia, consider sedation
  - If SBP >90 and ongoing agitation/ discomfort consider sedation with Midazolam 1-2.5 mg IV, may repeat every 10 minutes to a max of 20mg

VENTILATOR MANAGEMENT

BACKGROUND

Mechanical ventilation provides artificial support of lung function, work of breathing and may improve ventilation and oxygenation in patients with respiratory failure. Mechanical ventilators use positive pressure ventilation and increase intrathoracic pressure, with the potential to affect nearly every body system. Understanding the theory and practice of mechanical ventilation is essential in selecting the proper ventilator settings for any given patient condition, to provide the maximum benefit and minimize the potential for ventilator-induced lung injury

MANAGEMENT GOALS

- Confirm and frequently re-assess ETT placement
- Maintain ANALGESIA AND SEDATION OF THE INTUBATED PATIENT (see above)
- Maintain adequate oxygenation, SpO2 > 92%
- Maintain adequate mechanical ventilation ETCO2 35 - 40 mmHg
- Prevent ventilator induced lung injury
- Maintain cardiac output after increase in intra-thoracic pressure

CARE GUIDELINES

Ventilator management can be complicated, consider discussion with SCT Medical Control

- Gather info: age, sex, weight, height and calculate IBW, PMH, current medical condition, medications, ABG's within last 30 minutes (if available), current ventilator settings
- Correlate ETCO2 with ABG or VBG if available
- Assess ETT placement, breath sounds, oxygenation, and ventilation status
- Assess sedation and neuromuscular blockade status (see above)
- All mechanically ventilated patients must be continuously monitored with ETCO2 capnography
- Recheck ETCO2, tube position and breath sounds after each patient movement
- Assess cuff pressure with disposable pressure syringe (goal 20-25 cmH2O)
- Consider placing a gastric tube for removal of stomach contents (orogastric tube only in head trauma patients)
- Elevate the head of the stretcher to 30 degrees unless there is a contraindication
- Prepare ventilator with adequate gas supply, pre-op checks and appropriate equipment
- Select initial ventilator settings
    - Use settings from referring facility, if available, as a starting point
    - Ventilation mode: Often SIMV or CMV is appropriate
    - Set FiO2: Initially 100% or previous settings if oxygenating well
    - Set PEEP: 5 mmHg for healthy lungs
        - Morbidly obese patients will require higher PEEP

- Set Tidal Volume: 6 ml/kg IBW in most patients
- Set Respiratory Rate: 14 bpm
  - Start at 12 or lower in asthma/ COPD exacerbations
- Confirm I:E Ratio: 1:4 for most patients (eg 1 second inhale: 4 second exhale)
- Confirm Inspiratory Flow Rate: 0.75-1 L/sec in most patients
- Set Pressure Alarms: Peak inspiratory pressure + 10-15 cm H2O

- Monitor SPO2, etCO2, exhaled tidal volumes, peak airway pressure, mean airway pressure, plateau pressures, and minute volume
- Adjust the ventilator to maintain oxygenation and ventilation
  - For SPO2 <92% increase FiO2 Q2 minutes. If still <92% increase PEEP
    - Increasing PEEP will increase mean airway pressure and reduce preload
  - For SPO2 >98% gradually reduce FiO2 to maintain an SpO2 of 92-98%
  - For etCO2 >45, depending on patient condition
    - Increase RR and monitor for breath stacking OR
    - Increase tidal volume
  - For etCO2 <35 evaluate for shock and treat if suspected
    - If low etCO2 due to overventilation and not shock, reduce RR and/or reduce tidal volume
- Adjustments beyond the following parameters require SCT Medical Control consultation
  - Respiratory rate < 8 or > 16
  - Tidal volume >8 or <4 ml/kg IBW
  - PEEP > 10 cm H2O
  - Sustained ETCO2 < 35 or > 45 mmHg
  - APRV or unfamiliar modes of ventilation

TREATMENT CONSIDERATIONS

- Patients found on mechanical ventilation should be transported on mechanical ventilation whenever possible
- Increasing PEEP, tidal volume and respiratory rate increases mean airway pressure
  - Increasing mean airway pressure decreases preload and may cause hypotension
  - Optimize volume status with crystalloid IVF and use vasopressors as needed
- Morbidly obese patients may be difficult to ventilate
  - Anticipate higher mean airway pressures to maintain recruitment
  - This does not necessarily correlate to higher plateau/ alveolar pressures
- Patients with asthma and COPD may be very difficult to ventilate
  - Should be receiving disease specific treatment (beta agonists, steroids, etc)
  - Increase expiratory time by decreasing RR first, then increasing I:E ratio
  - Monitor closely for breath stacking
  - May need to tolerate higher etCO2 to allow safe ventilation
- Patients with metabolic acidosis (DKA, overdose, sepsis) require high minute ventilation

- Start at 8ml/kg IBW, start respiratory rate closer to pre-intubation rate
- Monitor closely for breath stacking

APPENDIX - CONTINUOUS INFUSION MEDICATION REFERENCE

Medication (Drug Class)	Dose+	Additional Information Adverse Drug Effect (ADE)
Sedation/Analgesia (unless chemically paralyzed, then titrate sedation as appropriate)		
Midazolam (Sedative)	Intermittent: 0.05-0.1 mg/kg, may repeat every 10 min to max 20 mg Cont Infusion Initial: 1-2 mg/hr (bolus with initial starting dose) Titration: Increase by 1-2 mg/hr every 10 min as needed for sedation (bolus x 1 with the dose of the new rate at each titration) Usual: 1-6 mg/hr	Onset: 1-2 min Duration: 15-60 min ADE: hypotension
Propofol (Sedative)	Initial: 10 mcg/kg/min Titration: Increase by 5-10 mcg/kg/min every 5 min (may bolus with 10 mg every 10 min only if needed for sedation) Usual: 10-50 mcg/kg/min	Onset: 30-40 sec Duration: 1-3 min ADE: severe hypotension, bradycardia; be cautious with boluses and rapid titration
Fentanyl (Analgesic)	Intermittent: 0.5-1 mcg/kg, may repeat 0.5 mcg/kg every 10 min up to max 500 mcg Cont Infusion Initial: 25-100 mcg/hr (bolus with initial starting dose) Titration: Increase by 25-50 mcg every 5 min (bolus x 1 with the dose of the new rate at each titration) Usual: 50-250 mcg/hr	Onset: immediate Duration: 10-30 min ADE: serotonergic properties, do not use in suspected antidepressant overdose
Ketamine (Dissociative anesthetic – sedative and analgesic)	Intermittent: 0.5-1 mg/kg IV every 15 min as needed for sedation/analgesia (post-RSI), 1-2 mg/kg (RSI), 0.1-0.3 mg/kg max 30 mg in 100 mL NS over 15 min (analgesia, not intubated) Cont Infusion Initial: 0.5-1 mg/kg/hr (bolus with initial starting dose) Titration: Increase by 0.25-0.5 mg/kg/hr every 30 min (consider slower titration 0.1 mg/kg/hr if using lower doses; 0.05-0.5 mg/kg/hr) Usual: 0.1-4.5 mg/kg/hr	Onset: 1-2 min Duration: 15 min ADE: hypertension, tachycardia, do not use in cardiac ischemia
Vasopressors/Inotropes (Central line preferred. If only a peripheral line is available, Y-site with free flowing fluid)		
Norepinephrine (Vasopressor – alpha and beta [lesser effect] agonist)	Initial: 2 mcg/min (0.03 mcg/kg/min) Titration: Increase by 2 mcg/min (0.03 mcg/kg/min) every 5 min as needed for goal blood pressure Usual: 4-80 mcg/min If > 80 mcg/min (0.1 mcg/kg/min) contact Medical Control	Onset: immediate Duration: 2-5 min ADE: hypertension, bradyarrhythmias
Dopamine (Vasopressor – alpha and beta agonist; increasing dose increases alpha agonist effects)	Initial: 5-10 mcg/kg/min Titration: Increase by 5 mcg/kg/min every 5 min as needed for goal blood pressure up to 20 mcg/kg/min Usual: 5-20 mcg/kg/min	Onset: immediate Duration: 1-2 min ADE: hypertension, tachyarrhythmias
Epinephrine (Vasopressor – potent alpha and beta agonist)	Initial: 1 mcg/min (0.01 mcg/kg/min) Titration: Increase by 1 mcg/min (0.01 mcg/kg/min) every 5 min as needed for goal blood pressure Usual: 10-20 mcg/min (0.1-0.2 mcg/kg/min)	Onset: immediate Duration: 1-2 min ADE: hypertension, tachyarrhythmias
Phenylephrine (Vasopressor – potent alpha agonist)	Initial: 25 mcg/min Titration: Increase by 25 mcg/min every 5 min as needed for goal blood pressure Usual: 25-200 mcg/min	Onset: immediate Duration: 15-30 min ADE: hypertension, reflex tachycardia

Vasopressin (V1 agonist – vasoconstrictor; used in refractory sepsis)	Usual: 0.01-0.04 units/min	Onset: immediate Duration: 10-20 min ADE: hypertension, bradycardia, dysrhythmias
Dobutamine (Inotrope – beta agonist, increases cardiac output)	Initial: 5 mcg/kg/min Titration: Increase by 5 mcg/kg/min every 15 min as needed for tissue perfusion up to 20 mcg/kg/min Usual: 5-20 mcg/kg/min	Onset: immediate Duration: 1-2 min ADE: hypotension and tachydysrhythmias
Milrinone (Inotrope – phosphodiesterase III enzyme inhibitor, inhibits cAMP and increases ventricle contractility and cardiac output)	Initial: 0.375 mcg/kg/min Titration: Increase by 0.125 mcg/kg/min every 15 min as needed for tissue perfusion up to 0.75 mcg/kg/min Usual: 0.375-0.75 mcg/kg/min	Onset: 5-15 min Duration: 1-2 hr ADE: hypotension, ventricular arrhythmias (SVT, VT), shorten AV node conduction, dose reduce in renal impairment
Cardiovascular		
Esmolol (Beta-1 selective antagonist)	Load: 500 mcg/kg over 1 min Initial: 50 mcg/kg/min Titration: Increase by 50 mcg/kg/min every 5 min as needed for goal blood pressure and heart rate up to 200 mcg/kg/min Usual: 50-200 mcg/kg/min	Onset: 2-10 min Duration: 10-30 min ADE: hypotension, bradycardia, heart block
Nicardipine (Calcium channel blocker)	Initial: 2.5-5 mg/hr Titration: Increase by 2.5 mg/hr every 10 min as needed for goal blood pressure up to 15 mg/hr. Once at goal blood pressure, decrease rate to 3 mg/hr to prevent accumulation and hypotension (due to long half-life of the medication). Re-titrate as described above. Usual: 5-15 mg/hr	Onset: 5-10 min Duration: 15-30 min up to 4 hr ADE: hypotension
Nitroglycerin (Vasodilator – more effect on peripheral veins than arteries)	Initial: 20-50 mcg/min Titration: Increase by 5 mcg/min every 5 min as needed for goal blood pressure and pain control up to 100 mcg/min Usual: 20-100 mcg/min	Onset: immediate Duration: 1-3 min ADE: hypotension, bradycardia
Nitroprusside (Vasodilator – more effect on arteries than veins)	Initial: 0.3 mcg/kg/min Titration: Increase by 0.5 mcg/kg/min every 5 min as needed for goal blood pressure up to a max of 3 mcg/kg/min (may increase up to 10 mcg/kg/min but for no longer than 10 minutes total) Usual: 0.5-1 mcg/kg/min	Onset: < 2 min Duration: 1-10 min ADE: hypotension, reflex tachycardia, cyanide toxicity at high doses or renal impairment

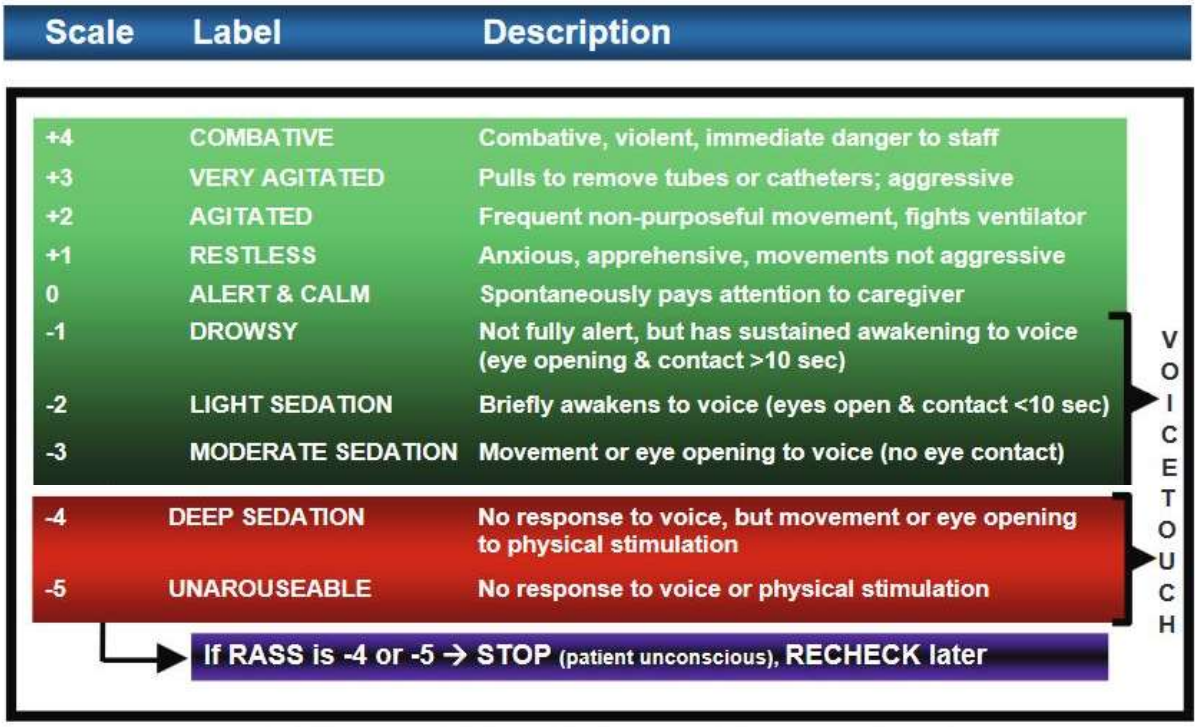
This chart is not all inclusive, consult electronic medication references or medical control with questions or unfamiliar medications.

Doses outside of the ranges listed should be discussed with medical control.

APPENDIX - IDEAL BODY WEIGHT TIDAL VOLUME TABLE

Male							Female						
Height (in)	**IBW (Kg)**	**4mL /kg**	**5mL /kg**	**6mL /kg**	**7mL /kg**	**8mL /kg**	**Height (in)**	**IBW (Kg)**	**4mL /kg**	**5mL /kg**	**6mL /kg**	**7mL /kg**	**8mL /kg**
46	26	103	129	155	180	206	**46**	26	102	128	153	179	205
47	28	110	138	166	193	221	**47**	27	109	136	163	191	218
48	29	118	147	177	206	236	**48**	29	115	144	173	202	231
49	31	125	157	188	219	250	**49**	31	122	153	183	214	244
50	33	133	166	199	232	265	**50**	32	129	161	193	225	257
51	35	140	175	210	245	280	**51**	34	135	169	203	237	271
52	37	147	184	221	258	295	**52**	35	142	177	213	248	284
53	39	155	194	232	271	310	**53**	37	148	186	223	260	297
54	41	162	203	243	284	324	**54**	39	155	194	233	271	310
55	42	170	212	254	297	339	**55**	40	162	202	243	283	323
56	44	177	221	266	310	354	**56**	42	168	210	252	294	337
57	46	184	231	277	323	369	**57**	44	175	219	262	306	350
58	48	192	240	288	336	384	**58**	45	181	227	272	318	363
59	50	199	249	299	349	398	**59**	47	188	235	282	329	376
60	52	207	258	310	362	413	**60**	49	195	243	292	341	389
61	54	214	268	321	375	428	**61**	50	201	252	302	352	403
62	55	221	277	332	387	443	**62**	52	208	260	312	364	416
63	57	229	286	343	400	458	**63**	54	214	268	322	375	429
64	59	236	295	354	413	472	**64**	55	221	276	332	387	442
65	61	244	305	365	426	487	**65**	57	228	285	342	398	455
66	63	251	314	377	439	502	**66**	59	234	293	351	410	469
67	65	258	323	388	452	517	**67**	60	241	301	361	422	482
68	66	266	332	399	465	532	**68**	62	247	309	371	433	495
69	68	273	342	410	478	546	**69**	64	254	318	381	445	508
70	70	281	351	421	491	561	**70**	65	261	326	391	456	521
71	72	288	360	432	504	576	**71**	67	267	334	401	468	535
72	74	295	369	443	517	591	**72**	68	274	342	411	479	548
73	76	303	379	454	530	606	**73**	70	280	351	421	491	561
74	78	310	388	465	543	620	**74**	72	287	359	431	502	574
75	79	318	397	476	556	635	**75**	73	294	367	441	514	587
76	81	325	406	488	569	650	**76**	75	300	375	450	525	601
77	83	332	416	499	582	665	**77**	77	307	384	460	537	614
78	85	340	425	510	595	680	**78**	78	313	392	470	549	627
79	87	347	434	521	608	694	**79**	80	320	400	480	560	640
80	89	355	443	532	621	709	**80**	82	327	408	490	572	653

APPENDIX - RICHMOND AGITATION-SEDATION SCALE (RASS)



Scale	Label	Description	
+4	COMBATIVE	Combative, violent, immediate danger to staff	
+3	VERY AGITATED	Pulls to remove tubes or catheters; aggressive	
+2	AGITATED	Frequent non-purposeful movement, fights ventilator	
+1	RESTLESS	Anxious, apprehensive, movements not aggressive	
0	ALERT & CALM	Spontaneously pays attention to caregiver	
-1	DROWSY	Not fully alert, but has sustained awakening to voice (eye opening & contact >10 sec)	VOICE
-2	LIGHT SEDATION	Briefly awakens to voice (eyes open & contact <10 sec)	VOICE
-3	MODERATE SEDATION	Movement or eye opening to voice (no eye contact)	VOICE
-4	DEEP SEDATION	No response to voice, but movement or eye opening to physical stimulation	TOUCH
-5	UNAROUSEABLE	No response to voice or physical stimulation	TOUCH

If RASS is -4 or -5 → STOP (patient unconscious), RECHECK later

Sessler, et al., Am J Repir Crit Care Med 2002, 166: 1338-1344 Ely, et al., JAMA 2003; 286, 2983-2991