Allegheny General Hospital
LifeFlight

Adult Protocols

Version 2016

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GENERAL PATIENT PROTOCOL

Protocol:

1. Oxygen saturation will be monitored on all patients.

2. Optimally, O_2 saturations should be maintained >95%. Provide for a Patent airway and administer supplemental oxygen as necessary to maintain this level.

3. If the patient is peripherally vasoconstricted and pulse oximetry is unable to be obtained, then at minimum, a non-rebreather facemask with high flow oxygen will be applied. Monitor $ETC0_2$.

4. Orotracheal intubation is the definitive airway of choice if the patient is unable to be adequately oxygenated or ventilated, if the airway is at risk for aspiration and/or obstruction, or if there is significant head injury. Use c-spine precautions as indicated.

5. The Rapid Sequence Intubation protocol will be used to facilitate orotracheal intubation.

6. Endotracheal intubation will be confirmed by at least auscultation and either capnometry or capnography.

7. Capnography is the method of choice for airway intubation confirmation and monitoring. All intubated transports will have capnography initiated and a waveform printout placed on the patient's record.

8. If airway control proves extremely challenging, notify Medical Command of your need for airway assistance upon landing. The Attending Physician/Designee will be available to assist with additional advanced airway control methods.

9. Initiate 2 IV lines, 18g or greater in the trauma patient. Transport should not be delayed to initiate IV access unless necessary to establish airway via RSI. Keep attempts limited to 2 per crewmember prior to transport. If peripheral IV not possible, consider IO, Femoral access, or ETT (for initial resuscitation meds only).

10. All medications that can be administered by IV can also be administered via the IO route. (Note: IO Adenosine will be more effective if administered at the humeral head site).

11. Provide for continuous cardiac monitoring.

12. Vital signs including pulse ox reading every 15 minutes x6, then every 30 minutes throughout transport if normal and stable. When titrating vasoactive medications, monitor BP both before and after titration.

13. If invasive lines in place, monitor during transport if patient on IABP or transport time >45 minutes.

14. Soft restraints should be applied when safety is a concern for crew and patient.

15. Document reevaluations according to patient care standards.

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AIRWAY/ KING LTSD PROCEDURE

Indications:

1. An unconscious patient with absent gag reflex.
2. Inability to endotracheally (ET) intubate after no more than three attempts.
3. Inability to ET intubate due to patient location or positioning (entrapment).
4. Alternative airway of choice in patients with a known Latex allergy.

Contraindications:

1. Intact gag reflex.
2. A patient under three feet tall.
3. Ingestion of caustic substances.
4. Known history of esophageal varicies or cancer.

Procedure:

1. Determine the appropriate size tube:

    a. Size 2 – Patient height ranges from 3 to 4 ft.
    b. Size 3 – Yellow – Patient height ranges from 4 to 5 ft.
    c. Size 4 – Red – Patient height ranges from 5 to 6 ft.
    d. Size 5 - Purple – Patient height is 6 ft. or greater.

2. Test the cuff inflation system for air leak.
3. Apply water-soluble lubricant to distal tip.
4. Hold the King airway at the colored connector with your dominant hand.
5. Perform a chin and tongue lift with your non-dominant hand. C-spine precautions as indicated. A laryngoscope can also be used to displace the tongue.
6. Introduce the tip into the patient's mouth using a lateral approach.
7. Advance the tip behind the base of the tongue, at the same time; rotate the tube back to midline so that the blue orientation line faces the patient's chin.
8. Without excessive force, advance the tube till the base of the colored connector is at the teeth or gums.
9. Inflate the airway cuffs using the following guideline:
    1. Size 2 add 40 ml.
    2. Size 3 add 50 ml.
    3. Size 4 add 70 ml.
    4. Size 5 add 80 ml.
10. Attach the bag valve to the airway.

11. While bagging the patient, gently withdraw the airway until ventilation becomes easy and free flowing.
12. Adjust cuff inflation if necessary to obtain a seal as peak ventilatory pressure employed, just enough to make the chest rise and fall. DO NOT put more air in the cuff than the maximum amount printed on the tube. If the cuff does not hold air, the King airway must be immediately replaced.
13. Auscultate to assure good bilateral breath sounds and that no gastric sounds are heard. If you hear air movement into the epigastrium, decrease the peak pressure exerted with the bag valve. If this does not help maximize cuff pressures or reassess tube size.
14. Secure the airway and attach EtCO2 monitoring equipment. All patients who are endotracheally intubated or have an alternative airway must have continuous pulse oximetry and EtCO2 monitoring throughout the transport.
15. Lubricate a gastric tube (up to 18 Fr in size) and insert it into the LTSD's gastric access lumen. Apply intermittent suction to reduce gastric pressure and contents.
16. If a patient has vomited with a King airway in place, you must deflate the cuff, remove the King and aggressively suction/clear the patient's airway before replacing the King. (Note, if the King is saturated with vomitus, it must be cleaned off before replacing it or replaced by a new one).

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AIRWAY – FOREIGN BODY OBSTRUCTION

Criteria: Universal choking sign, history consistent with foreign body aspiration, inability of patient to exchange air.

Protocol:

1. Provide supplemental O_2 to keep SaO_2 >95%.

2. If inability to exchange air: deliver abdominal thrusts (chest thrusts if pregnant or obese). Repeating until successful or patient loses consciousness.

3. If patient becomes unconscious, perform tongue-jaw lift followed by finger sweep to remove any visible foreign body, and then attempt ventilation. If unsuccessful, reposition head and attempt ventilation.

4. If unable to ventilate, give 5 abdominal or chest thrusts, followed by finger sweep to remove visible foreign bodies. Then attempt ventilation.

5. If unsuccessful use SLAT maneuver; simultaneous laryngoscopy and abdominal thrust, then remove a visualized foreign body with Magill forceps.

6. If unsuccessful, perform Percutaneous Cricothyrotomy.

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AIRWAY / HYPOXIA

Criteria: Respiratory distress
Decreased level of consciousness with potential for unprotected airway
Burns with potential for airway compromise
Face/neck trauma with potential for airway compromise
Cyanosis/hypoxia unimproved by supplemental O_2 therapy.

Protocol:

1. Establish airway, head tilt chin lift or triple airway maneuver in the trauma patient.

2. Nasal airway if gag reflex present and no signs of facial trauma.

3. Oral airway in the unconscious patient without gag reflex.

4. If SaO_2 <90% after supplemental O_2, prepare for oral or nasal intubation by pre-oxygenation with BVM. (Refer to RSI protocol)

5. If Sat O_2 ≥90% and there is no gag reflex, preoxygenate with O_2 15 L via NRFM then intubate to protect airway.

6. A maximum of 3 intubation attempts are to be made prior to transport.

7. Consider King Airway or Cricothyrotomy if unable to intubate and cannot maintain O_2 Sat > 90% with BVM.

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AIRWAY/ RAPID SEQUENCE INTUBATION

Criteria: Difficult to intubate for reasons such as trismus, present gag reflex, combativeness.
Must be able to maintain airway post RSI if the intubation attempt is unsuccessful.

Contraindications:

1. Inability to maintain BVM seal and inability to perform surgical cricothyrotomy.
2. Succinylcholine should not be used in the following cases: Known pseudocholinesterase deficiency, burns or crush injuries greater than 48 hours old, history of neuromuscular disease, history of malignant hyperthermia, risk of hyperkalemia, and penetrating globe injuries. **Use Rocuronium 1mg/kg IV/IO in these scenarios instead of Succinylcholine.**

Protocol:

1. Preoxygenate patient with 100% O_2 15 1pm with NRFM then NC during attempt-No BVM-unless unable to maintain saturation ≥90%.
2. Induce unawareness: Etomidate 0.2 – 0.3 mg/kg IV/IO over 30 seconds. (May use Midazolam 0.1 mg/kg in normotensive patients or Ketamine 2mg/kg in Status Asthmaticus or profound hypotension).
3. Ketamine is the drug of choice in asthma. It can be used in head injured patients with hypotension. Ketamine is contraindicated in hypertensive patients, hypertensive head injured patients, and in patients with known cardiac risk factors. If increased bronchial secretions become an issue after Ketamine administration, you may give Atropine 0.5 mg as long as no contraindications exist. If an emergence phenomenon becomes an issue, you may administer Midazolam per the Sedation Protocol.
4. Induce paralysis: Succinylcholine 2 mg/kg IV/IO or 4 mg/kg IM. Apply cricoid pressure if needed unless forceful emesis occurs. **Substitute Rocuronium in place of Succinylcholine as indicated above.**
5. Orally intubate patient after adequate relaxation is achieved. If unable to achieve adequate relaxation, repeat initial succinylcholine dose, after giving 0.5 mg Atropine IV/IO. (Subsequent doses of Succinylcholine are associated with bradycardia, even in adults.)
6. If intubation attempts are unsuccessful after 3 minutes or sat <90%, ventilate the patient with BVM or place alternative airway and transport. (Limit intubation attempts to no more than 3 total).
7. If the patient deteriorates during this management, a surgical cricothyrotomy may be indicated.
8. After successful intubation refer to the Paralytic Protocol to confirm placement and for additional management.

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AIRWAY/SURGICAL CRICOTHYROIDOTOMY PROCEDURE

Indications:

Failure of endotracheal intubation.
Massive airway hemorrhage.
Persistent upper airway obstruction (mass, swelling, trauma).

Contraindications:

Ability to endotracheally intubate.
Ability to obtain adequate airway/oxygenation with a less invasive means.
Transection of trachea with reaction of distal end into mediastinum.
Fractured larynx and inability to find landmarks.
Children < age 10; Note: the size of each individual child can vary tremendously; each crewmember should use his/her best judgment as to whether the pediatric percutaneous cric equipment is of appropriate size.

Protocol:

1. Rapid access is critical.
2. Expose the neck and its landmarks.
3. Identify the cricothyroid membrane bordered by the thyroid cartilage superiorly and the cricoid cartilage inferiorly.
4. Prep site with Chloraprep and keep procedure as sterile as possible.
5. Utilize prepackaged percutaneous cricothryoidotomy kit.
6. Using the needle provided and on attached syringe, perform a needle crothyroidotomy, keep the bevel directed toward the feet.
7. As soon as air is aspirated stop, remove syringe, and advance guidewire.
8. Using the scalpel extend as midline longitudinal incision 1.5cm above and below the needle to facilitate passage of the airway.
9. Remove needle keeping guidewire in place.
10. Advance the percutaneous airway over the guidewire with the dilator stylet in place. You may need to extend the incision slightly or retract superior and inferiorly bordering cartilages to facilitate passage of the airway.
11. Once the airway has been placed, withdraw the guidewire and stylet.
12. Attach airway adapter to bag valve device and confirm placement and secure airway.

Alternatively you may identify landmarks as above and use the scalpel to make an opening, in the cricothyroid membrane, large enough to accommodate a Bougie and advance small (5.0 – 6.0) cuffed ETT over the Bougie into the airway-Refer to the official policy manual for additional instruction

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ALTERED MENTAL STATUS

Criteria: Decreased level of consciousness unrelated to trauma, hypothermia, hypotension or hypoxia.

Protocol:

1. Provide for a patent airway and provide supplemental O_2 keep SaO_2 >95%.

2. Rapidly determine Glucose by Glucometer, if less than 60 mg/dl give $D_{10}W$ 200 ml IV/IO bolus or Glucagon 1 mg IM (if no IV access)
3. Recheck blood glucose in 5 minutes if no change in mental status and repeat the $D_{10}W$ as above PRN.

4. Naloxone reversal of opioid coma and Flumazenil reversal of Benzodiazepine coma may be detrimental to crew/aircraft safety. Supportive care is the treatment of choice.

5. If the patient shows signs/symptoms of narcosis (pinpoint pupils, hypoventilation, and unresponsiveness) the crew may consider Narcan 2mg IV/IO/IN (MAD Protocol) x 1. If the patient awakens he or she should be ground transported to the nearest facility. If there is no response to Narcan continue with aeromedical transport.

6. Refer to dosage charts as needed

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AMPUTATION

Criteria: Non-crush amputation of extremity, multiple digits, thumb or injury of functional/occupational significance.

Protocol:

1. Provide for a patent airway and give supplemental O_2 to keep SaO_2 >95%.

2. Control obvious hemorrhage by applying direct pressure to wound and to proximal pulse point.

3. In the unlikely event the above measures do not control bleeding, apply a tourniquet to the thigh or arm proximal to the site of hemorrhage and place Combat Gauze directly on the bleeding vessels following the Hemostatic Dressing Protocol.

4. In the event that the tourniquet and Combat Gauze have controlled bleeding; after 15 minutes of no active bleeding you may attempt to release the tourniquet and keep the Combat Gauze in place. If bleeding resumes, replace the tourniquet. If the Combat Gauze dressing becomes completely saturated at any time, replace it with a new Combat Gauze dressing.

5. IV of NSS, bolus of 500 mL for BP < 90. May repeat x 1, then proceed to PRBCs/blood if BP still <90. **If bleeding is NOT controlled you may initiate PRBCs/blood per protocol as soon as possible.**

6. Dry sterile dressing to wound.

7. Keep stump elevated.

8. Retrieve amputated part if possible, and wrap in moist sterile dressing. Enclose in bag and place on ice. DO NOT SUBMERGE

9. Refer to "Pain Relief Protocol".

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ANAPHYLAXIS

Criteria: Exposure to allergens causing respiratory compromise, cardiovascular collapse (hypotension), and/or skin/mucosal involvement (hives, pruritus, flushing, or swelling of the lips-tongue-uvula).

Protocol:

1. Maintain airway and provide supplemental O_2 to keep SaO_2>95%.

2. If a patient perfusing well or if unable to obtain IV access quickly, give IM (in the anterior lateral thigh) Epinephrine1:1,000, 0.01 mg/kg (max dose 0.5mg) every 5 to 15 minutes as needed.

3. Establish IV of Normal Saline and give 500ml bolus, IV.

4. If patient not perfusing well or remains hypotensive after IM Epinephrine, give IV Epinephrine: dilute 1 ml of 1:10,000 solution in 9 ml of NS. Infuse 1 ml q 1-2 minutes IV/IO until patient improves. Monitor patient closely for potential dysrhythmia.

2. Pepcid 20 mg IV/IO. (H_2 Antagonist).

3. Benadryl 50 mg IV/IM or IO. (H_1 Antagonist).

4. Solumedrol 125 mg IV/IO x 1.

Contact Medical Command:

1. If the patient does not respond, consider Epinephrine Resistant Anaphylaxis and administer Glucagon 1 mg IV/IO.

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AORTIC DISSECTION

Criteria:

The acute onset of chest, back, or abdominal pain described as "sharp", tearing, or ripping."
Known or suspected aortic dissection with a HR >60 and/or systolic BP>120mmHg.

Contraindications:

Do not administer a beta blocker if SBP <100 mmHg or HR <40.

Protocol:

1. Oxygen 15 1pm by NRBFM.
2. Two large bore (preferably 16-14 ga.) IVs.
3. Discontinue Heparin or Thrombolytics.
4. If patient has been Heparinized and the aorta is known or strongly suspected to be leaking, obtain Protamine from the referring facility and administer 1mg IV for every 100 units of Heparin given to the patient.
5. Refer to "Pain Relief Protocol".
6. Goal is to quickly achieve and maintain a HR <60 and a SBP 100-120 mmHg.
7. If aortic rupture or associated cardiac tamponade is suspected refer to the appropriate corresponding protocol. (Aortic Rupture or Pericardiocentesis).
8. If HR >60 and SBP > 100-120 mmHg, administer Esmolol (Concentration based upon pharmacy standard) load with 500 mcg/kg over one minute then start infusion at 50 mcg/kg/min. Titrate the infusion up by 50 mcg/kg/min every 2 minutes to get a HR ≤ 60 or a maximum infusion rate of 200 mcg/kg/min.
9. If known, document the type of dissection by the Stanford classification:
   a. Type A (ascending and arch)
   b. Type B (descending)

Contact Medical Command:

1. If the target heart rate is still not achieved, repeat a bolus of Esmolol 500 mcg/kg over one minute and continue the infusion at 200 mcg/kg/min. Subsequent boluses can be considered if necessary.
2. If the HR is < 60 and the SBP is > 120 mmHg initiate a Nicardipine infusion at 5 mg/hr. Titrate up by 1.25 mg/hr. every 5 min. to maintain a SBP of 100-120 mmHg. The maximum dose is 15 mg/hr.
3. If patient becomes hypotensive (SBP <100 mmHg) turn off Beta Blocker and Nicardipine infusions, begin fluid bolus of 250mL of NSS IV and evaluate needs to refer to the protocols as listed above in step 7.

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AORTIC RUPTURE

[Extending Aortic Aneurysm with or without Rupture]

Criteria:

1. Known or suspected aortic rupture.
2. Rapidly expanding aortic aneurysm.
3. Acute onset of "sharp" "tearing" chest, back, or abdominal pain associated with hypotension or signs of poor perfusion.

Protocol:

1. Oxygen 15 1pm NRBFM.
2. Two large bore (preferably 16-14 ga.) IVs.
3. Note whether or not the patient is anticoagulated. Discontinue any anticoagulants the patient may be on such as Heparin or Thrombolytics.
4. If SBP <90 mmHg or signs of poor vital organ perfusion, resuscitate with IV NSS and blood transfusions with goal of SBP 90-100 mmHg.
5. If patient has been Heparinized, obtain Protamine from referring facility and administer 1mg IV for every 100 units of Heparin given to the patient.
6. Refer to "Pain Relief Protocol".
7. If known, document the type of dissection by the Stanford classification:
   a. Type A (ascending and arch)
   b. Type B (descending)

Contact Medical Command:

If SBP >120 mmHg, discuss with Medical Command Physician the possible use of a Beta Blocker and Nicardipine per the "Aortic Dissection Protocol". This therapy would not likely be needed in a patient with a true rupture of the aorta.

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ADMINISTRATION OF BLOOD
(ADULT)

Criteria: Victim of blunt or penetrating trauma who is exhibiting signs of early or late shock with persistent ongoing blood loss.

Penetrating traumatic arrest of less than 5 minutes duration.

Persistent signs or symptoms of shock in a patient with a known or suspect source of ongoing blood loss. Consider the co-administration of Tranexamic Acid, see the Trauma-Multisystem Protocol.

Protocol:

1. Maintain patent airway and provide supplemental 0_2 to keep SaO_2 >95%.
2. Infuse 0 negative PRBC/Whole blood (per #s 3 and 4) wide open to blood or trauma tubing applying pressure bags if necessary (Use type specific or cross-matched blood if available from referring institution). Repeat additional units of PRBC's or Whole blood if SBP remains <90 or on going blood loss is suspected.
3. Give O positive/negative **whole blood** to males ≥ 18 years of age or post menopausal / post hysterectomy females.
4. Give O negative PRBCs to pre-menopausal females first. However, do not hesitate to give O positive (if that is all that is available) in emergent situations only (see Blood Administration Policy).
5. If patient develops signs of anaphylaxis, sudden rash, back pain or chills, discontinue infusion, follow Anaphylaxis Protocol, and call Medical Command.

Contraindications:

Do not administer blood products for blunt trauma arrest unless there is a ROSC and the arrest is believed to be due to hemorrhagic shock.

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BURNS

Criteria:
Full thickness burns > 10% BSA
Full and partial thickness burns >20% BSA
Burns of the hands, feet, face, perineum or genitalia
Circumferential burns of an extremity or chest wall
Chemical or electrical burn
Inhalation injury
Burns associated with other injuries

Protocol:

1. Establish a patent airway and provide supplemental 0_2 to keep SaO_2>95%. If evidence of acute inhalation injury, intubate prior to transport.

2. Establish IV/IO of NSS; calculate fluid replacement by rule of nines, by using 3ml X wt. in kg X %BSA. Give one half of the volume over the first 8 hours of injury and the second half over the next sixteen hours. (This does not include any volume necessary to replete intra-vascular volume immediately.)

   Do not use the formula for electrical burns. Use clinical perfusion parameters and, if myoglobinuria is present, run IV wide open until urine is clear.

3. Perform escharotomies for circumferential chest burns, only if patient cannot be adequately ventilated with intubation and positive pressure ventilation.

4. Refer to the "Pain Relief Protocol".

5. Prevent hypothermia; remove wet dressings and dress wounds with dry dressings. Circumferentially wrap patient's body with space blanket and cover head.

6. Chemical Burns:
   c. Powder: Brush or blow off and flush skin with fluids for 30 minutes.
   d. Liquid: Remove all clothing and flush skin as above
   e. Thermal: Remove clothing
   f. Phosphorus or Magnesium: DO NOT FLUSH, but brush off solid contamination.

8. Trauma patients with >10% BSA third degree or >15% second degree burns, should be transported to facilities with both burn and trauma resources.

Contact Medical Command

1. Consider limb escharotomy if there has been no distal pulse for >four hours.

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CARDIOGENIC SHOCK / ROSC

Indications: Congestive heart failure or symptomatic hypotension in the presence of recent MI/myocardial insult.

Criteria:

Symptomatic hypotension	Cyanotic
Decreased cardiac output/cardiac index	Oliguria
Tachycardia >120 BPM	Decreased LOC
Tachypnea	JVD
Decreased SaO_2 <90%	Peripheral edema
Cool, clammy skin	

Protocol:

1. Establish and maintain a patent airway and provide supplemental O_2 attempting to keep SaO_2 >95%.
2. If SaO_2 < 90% or respiratory distress evident, consider BiPap or intubation.
3. If lung sounds are clear and hypotension is present, administer a 1 – 2 L Normal Saline bolus. Monitoring cardiopulmonary status during bolus.
4. If SBP <90 mm Hg (MAP <65 mmHg) after fluid bolus, begin Norepinephrine. Start at 0.1 mcg/kg/min to 0.5 mcg/kg/min for a SBP > 90 mmHg or MAP ≥65 mmHg. (Concentrations per pharmacy standard). As a temporizing measure till the infusion is mixed, you may use "push-pressor Epinephrine: draw up 1 ml of Epi 1:10,000 in a syringe of 9 ml of normal saline. This produces a 1:100,000 solution, administer 1 – 2 ml every 2 minutes until the vitals stabilize or your Norepinephrine infusion is ready to start.
5. If cardiogenic shock is present with pulmonary edema initiate vasopressor therapy as above. If no improvement the patient will require BiPAP or intubation for positive pressure ventilation (then consider IVF boluses with vasopressors).
6. If CHF/Pulmonary Edema present with SBP>100mmHg refer to CHF/Pulmonary Edema Protocol.

Contact Medical Command

1. If hypotension is refractory to normal saline bolus and Norepinephrine infusion, add an Epinephrine infusion 0.1 -0.5 mcg/kg/min and titrate for a SBP >90 mmHg or MAP ≥ 65 mmHg.

2. If the patient is already on Dopamine consider switching to Norepinephrine as above. You may contact command to consider continuing the Dopamine at 2-20 mcg/kg/min and titrate for SBP>90 mmHg (MAP ≥ 65 mmHg). Keep in mind that Dopamine increases the chances for dysrhythmia and other adverse outcomes.

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CHF / PULMONARY EDEMA

Indications: Signs of CHF/Pulmonary Edema with SBP >100mmHg.

Criteria:

Prior history of CHF	Pink frothy sputum
Tachypnea/Respiratory distress	Peripheral edema
Orthopnea or PND	Rales, rhonchi, and/or wheezes
JVD	Decreased SaO_2 especially if <90%

Protocol:

1. Establish and maintain a patent airway. Provide supplemental O_2 attempting to keep SaO_2 > 95%.

2. If SaO_2 <90% with supplemental O_2 consider BiPAP (initial settings IPAP of 10 and EPAP of 5 cmH2O) or intubation.

3. If SBP <90mmHg treat per Cardiogenic Shock Protocol and consider intubation.

4. If SBP >100mmHg, initiate Nitroglycerine infusion (Concentrations per pharmacy standard) at 10 mcg/min and titrate for effect to decrease afterload/improved patient's symptoms. You may administer Nitroglycerine 0.4 mg SL every 5 minutes (up to 3 doses) until the infusion is ready, as long as the SBP is maintained.

5. If SBP >100mmHg and peripheral edema present administer: Furosemide 0.5mg to 1mg/kg IV/IO.

Contact Medical Command

If no response to the above treatment, consider repeating Furosemide and call command for options.

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CHEST PAIN

Criteria:

1. Generally described as heavy, squeezing, crushing, or pressure-like pain which is sub-sternal with radiation to the arms, shoulder, or jaw.
2. SBP above 90mm Hg unless another parameter given by medical command.

Contraindications:

1. The patient with known left main lesion or critical aortic stenosis must not have his or her blood pressure dropped significantly by NTG. NTG should be titrated cautiously and SL NTG should be avoided. Small doses of IV Morphine are usually safest in this setting. Nitrates should also be used with caution in the setting of an inferior MI with associated bradycardia and possible posterior extension.

2. Pain that is described as "sharp, tearing, or ripping," that began suddenly, was most severe at its beginning, and arises in the back or below the waist is not usually cardiac, and may represent an aortic dissection. NTG, heparin, and ASA are contraindicated in this setting. (Refer to Aortic Dissection and Aortic Rupture Protocols)

Protocol:

1. Maintain patent airway and provide supplemental O_2 if $Sa\text{-}O_2<95\%$.
2. Aspirin 81 mg X4 chewed, if not already given.
3. Perform an immediate 12-lead EKG as soon as possible to assess the need for early STEMI activation.
4. For pain control, consider NTG (*) 0.4mg SL q 5 min x3 as long as SBP >90mm Hg. Add Morphine 2 – 5mg IVP q 5 min as long as SBP >90mm Hg.
5. May initiate NTG (*) infusion (Concentrations per pharmacy standard) at 20 mcg/min and titrate NTG drip, increased by 10 mcg/min every 3 – 5 minutes, maintaining SBP > 90 mmHg or MAP ≥ 65 mmHg.
6. If NTG ineffective or contraindicated, give Morphine, 2 – 5 mg IVP, q 2-3 minutes, maintaining SBP>90.
7. In the event of hypotension below 90mm Hg systolic, you may discontinue NTG or decrease NTG by 10 mcg every 3-5 minutes and administer 250 – 500 ml NSS as a bolus.

Contact Medical Command

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1. For continued hypotension, repeat fluid bolus x1, wean NTG further, and see protocol for Cardiogenic Shock and CHF/Pulmonary Edema.
2. Acute MI patients should be started on Heparin and ASA at the referring facility, unless contraindicated or otherwise requested by the receiving MD.
3. Thrombolytics should be started before transport unless the patient is being flown for emergent PTCA.

CAVEATS:

1. In general:
   a. Limit systolic blood pressure drop by 10% if the patient was previously normotensive.
   b. Limit systolic blood pressure drop by 30% if the patient was previously hypertensive.
   c. Avoid dropping the systolic pressure below 90 mm Hg.

2. A large bore IV with NSS on macrodrip tubing should always be available for patients who are at risk for developing hypotension with NTG. This is especially common in IWMIs and RV MIs, but can occur in AWMIs as well.
   a. The decision to give a fluid bolus for hypotension is based, to a great degree, on the presence or absence of rales heard during the bedside exam and whether or not the patient is intubated.

(*) Do not administer NTG to patients with history of taking Phosphodiesterase Inhibitors such as: Viagra and Levitra within the last 24 hours or Cialis within the last 48 hours.

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PREHOSPITAL STEMI

Criteria: This protocol pertains to scene responses for patients with acute onset of chest pain.

Protocol:

1. This protocol assumes that all applicable steps in the CHEST PAIN protocol have been addressed.
2. Perform and interpret a 12-lead EKG to confirm STEMI.
3. Once a STEMI is confirmed transport immediately to a system STEMI Center. If the patient requests another center or if another center is significantly closer, contact Medical Command to confirm that the facility's Cath Lab and crew are available to accept the patient.

Contact Medical Command

System STEMI Centers:

Allegheny General Hospital
Forbes Regional Hospital
Jefferson Hospital
West Penn Hospital
Saint Vincent Erie, PA

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COMBATIVE PATIENT

Criteria: Patient exhibiting signs of agitation, psychosis or hallucinations which pose threat to self or crew. Note: Flight crew can decline air transport and assist in ground transport. Remember to consider Excited Delirium in patients who exhibit such behavior, appear hyperthermic, have a possible history of drug ingestion, and who have fought with police.

Relative Contraindications: Consider relative because the safety of the mission is paramount.
CHI
Metabolic/endocrine disorder
Hypotension
Drug overdose
Consider other treatable causes, i.e. hypoxia and hypoglycemia.

Protocol:

1. Maintain a patent airway and provide supplemental O_2 to keep SaO_2 >95%.

2. Obtain glucometer reading. If <60 mg/dL administer $D_{10}W$ 200 ml IV/IO. Recheck blood glucose if 5 minutes if no change in mental status and repeat $D_{10}W$ as above PRN.

3. If not hypoglycemic:
   a. Ketamine 2 mg/kg IV/IO or 4 mg/kg IM.
   b. Alternatively; Midazolam 0.1mg/kg (max 10mg) IM/IV/IN (MAD Protocol). May repeat in 3 min if unsuccessful and no contraindications exists.

4. Apply soft wrist restraints as needed for transport.

5. If these measures prove unsuccessful-consider following RSI Protocol and paralyze with Rocuronium 1mg/kg IV, once successful intubation is confirmed. Continue appropriate Sedation and Paralysis as indicated per protocol.

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DETERMINATION OF DEATH IN THE FIELD/ TERMINATION OF RESUSCITATION

Criteria: Advanced signs of death, obvious lethal injuries, or failure to respond to resuscitative efforts.

Protocol:

1. If a patient is found in cardiopulmonary arrest or arrests during your encounter, resuscitative efforts need to be performed immediately, where the patient is found, unless the scene is unsafe. In that situation the patient must be moved quickly to the nearest safe area to initiate resuscitation. The best chance of survival is when resuscitative efforts are performed immediately in the safest possible environment.

2. Resuscitative efforts must include "high-performance" CPR with uninterrupted chest compressions in a pit-crew configuration. Additional efforts are per your protocols. "High-performance" CPR/resuscitation cannot be adequately or safely performed in a moving ambulance.

3. If there are advanced signs of death or obvious lethal injuries, resuscitative efforts do not need to be initiated. You can proceed to contacting Medical Command below.

4. If resuscitative efforts are already underway upon your arrival or you initiated them and the patient has failed to respond and/or ETCO2 remains <10 mmHg, contact Medical Command for further direction.

5. If the crew and Medical Command agree that there is no indication for continued resuscitation and the environment is conducive for termination, proceed with steps 1 and 2 below.

6. If the scene is not conducive for termination of resuscitation, ground transport to the nearest facility can be performed following these guidelines:
   a. Consider termination of resuscitation while enroute.
   b. If CPR is in progress the use of a mechanical CPR device is preferred for the safety of crew members.
   c. At no time is transport via "lights and siren" permitted while CPR is in progress. Safe and efficient resuscitation requires an easy/comfortable ride to the hospital, speed is not the answer.

Contact Medical Command

1. If the circumstances permit, request permission to cease resuscitative efforts.

2. In the prehospital setting, provide EMS with a completed "In-Flight Flow sheet" for the medical examiner. Please include:
   a. The Medical Command Physician's name.
   b. Time of death.
   c. LifeFlight's phone number.

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DIABETIC KETOACIDOSIS

Criteria: Hyperglycemia, with acidosis and ketones.

Protocol:

1. Maintain patent airway and provide supplemental O_2 to keep SaO2 >95%.

2. Infuse 1 liter of NSS wide open, begin second liter to run over 30 minutes.

3. If available from outlying facility, Regular Insulin bolus 0.1 units/kg IV. Followed by infusion at 0.1units/kg/hr. If blood glucose drops below 250mg/dl, decrease infusion to 0.05 units/kg/hr.

4. Monitor blood glucose every 30 minutes during transport.
   If glucometer reading <180mg/dl continue insulin infusion at 0.05 units/kg/hr, initiate maintenance IVF D5NS and contact medical command.

Contact Medical Command

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ASYSTOLE

Criteria: Absence of pulse or heart sounds.
Asystole documented in 2 leads.

Protocol:

1. Establish unresponsiveness.

2. Initiate CPR (2 minute cycles of uninterrupted chest compressions, except for defib or cardioversion, stop only for evidence of ROSC including: abrupt sustained increase in ETCO2 ≥40 mmHg, return of pulse/BP, or spontaneous arterial pressure waves during intra-arterial monitoring).

3. If the patient is pregnant and the uterus measures above the umbilicus, continuous manual left uterine displacement must be continued throughout the resuscitation.

4. Intubate and ventilate with 100% 0_2 and monitor ETCO2.

5. Epinephrine 1mg IV/IO, repeat every 3 – 5 minutes.

6. Consider possible causes:
   a. Hypovolemia
   b. Hypoxia
   c. Acidosis
   d. Hypo/Hyperkalemia
   e. Hypoglycemia
   f. Hypothermia
   g. Toxins/OD
   h. Cardiac Tamponade
   i. Tension Pneumothorax
   j. PE/MI
   k. Trauma

Contact Medical Command

1. Give Sodium Bicarbonate 1mEq/kg if patient is known to have a preexisting bicarbonate responsive acidosis, hyperkalemia, or tricyclic drug overdose.

2. If asystole persists consider: quality of resuscitation, atypical clinical features/diff. dx, and the need to cease efforts.

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BRADYCARDIA

Criteria: Absolute bradycardia (heart rate <50). Chest pain, shortness of breath, decreased level of consciousness, hypotension, shock, pulmonary congestion, CHF, acute MI.

Contraindications/ Cautions:

1. Atropine should be used cautiously when symptomatic third degree block with wide QRS complexes or second degree Mobitz II occurs in the setting of an acute anterior wall MI. Please contact medical command when considering its administration.

2. Atropine is contraindicated in narrow angle glaucoma, prostatic hypertrophy, and myasthenia gravis.

3. Heart transplant patients will not respond to Atropine and must be given Epinephrine or paced to increase their heart rate.

Protocol:

1. In patients with anterior MI's with evidence of new BBB, second degree AVB, or third degree AVB, place external pacing electrodes prior to transport. Pace if they develop symptomatic bradycardia. If they do not have a second degree AVB type II or a third degree AVB you may give Atropine 0.5 mg IV/IO, may repeat q 3 minutes as needed to a maximum of 3 mg.

2. Consider transcutaneous temporary pacing for any symptomatic bradycardia unresponsive to intial atropine dose (preferable to pace rather than use atropine in type II second degree AV block or third degree AV block with wide complexes). Do not delay transcutaneous pacing in a symptomatic patient while awaiting IV access.

3. If bradycardic and hypotensive with acute IWMI and/or RVMI, give a 250ml NSS fluid challenge. May repeat x 3 if O_2 Sat> 90% and there is no evidence of pulmonary edema.

4. If hypotension and bradycardia persists in spite of above interventions start Dopamine at 2 – 5 mcg/kg/min and increase rapidly to 5 – 20 mcg/kg/min as needed. (Concentrations per pharmacy standard)

Contact Medical Command

1. If Dopamine is ineffective, or hypotension is associated with severe bradycardia, begin an Epinephrine infusion (Concentration based upon pharmacy standard) and titrate to desired hemodynamic response 0.005 – 0.2 mcg/kg/min.

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PULSELESS ELECTRICAL ACTIVITY (PEA)

Criteria: Absence of pulse and respirations. Presence of electrical activity on the monitor.

Contraindications: None

Protocol:

1. Establish unresponsiveness.
2. Begin CPR (2 minute cycles of uninterrupted compressions) except for defib or cardioversion, stop only for evidence of ROSC including: abrupt sustained increase in ETCO2 ≥40 mmHg, return of pulse/BP, or spontaneous arterial pressure waves during intra-arterial monitoring).
3. If the patient is pregnant and the uterus measures above the umbilicus, continuous manual left uterine displacement must be continued throughout the resuscitation.
4. Intubate.
5. If trauma arrest, perform bilateral pleural decompressions.
6. Begin 500ml NSS IV/IO bolus, repeat x 3 prn after brief reevaluation of the patient status.
7. Epinephrine 1 mg IV/IO, repeat every 3-5 minutes.

Contact Medical Command

Consider possible causes (and treatments):

a. Hypovolemia (volume infusion)*
b. Hypoxia (ventilation)*
c. Cardiac tamponade (volume infusion until percardiocentesis can be performed)*
d. Tension pneumothorax (chest tube/needle decompression)*
e. Hypothermia (rewarming)*
f. Massive PE (thrombolytics, rapid transport for surgery)
   - Consider tPA 0.6 mg/kg up to 50 mg IV push may repeat X1 in 15 minutes if no response. (Obtain from referring facility).
g. Drug overdose of tricyclics, digitalis, beta blockers, and calcium channel blockers
h. Hyperkalemia (Sodium Bicarbonate)
i. Acidosis
j. Massive acute MI

* Initially addressed prior to contacting Medical Command.

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ROSC/ Induced Hypothermia

Criteria:

1. ROSC after primary V-fib or V-tach cardiac arrest, patient remains comatose requiring advance airway management.
2. Cardiac Arrest not due to trauma or hemorrhage.
3. Age >18 years old.
4. Initial temperature >36°C.
5. No purposeful response to noxious stimuli.

Contraindications:

1. Age less than 18 years.
2. Pregnancy
3. Arrest due to trauma or hemorrhage.
4. Initial temperature <36°C.
5. $ETCO_2$ reading <20 mmHg.

Protocol:

1. Assure airway secured (ETT or Alternative Airway) and $ETCO_2$ reading >20 mmHg.
2. Perform neurologic exam, confirm no appropriate response noxious stimuli.
3. Expose patient (protect modesty).
4. Apply cold packs to axilla and groin.
5. Midazolam 0.1 mg/kg (max of 5 mg) IV/IO.
6. Rocuronium 1 mg/kg IV/IO
7. Follow Sedation and Paralytics Protocols.
8. Normal Saline bolus 30 ml/kg max of 2 liters IV/IO
9. Maintain MAP ≥ 65 mmHg. Refer to Cardiogenic Shock Protocol as needed.

Contact Medical Command:

1. As soon as cooling measures are initiated.
2. Any complications or deterioration in patient status.

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TACHYCARDIA: ATRIAL FIBRILLATION OR FLUTTER

Criteria: SBP > 90. Absence of the following symptoms: chest pain, shortness of breath decreased level of consciousness, shock, pulmonary congestion, heart failure, acute MI.

Contraindications: If **unstable** with chest pain, pulmonary edema or BP <90 systolic, proceed directly to the cardioversion protocol or Contact Medical Command if patient has a long-standing history of atrial fibrillation.

Protocol:

1. Maintain a patent airway and provide high flow O_2 to keep SaO_2 >95%.

2. Consider possible underlying causes: acute MI, hypoxia, PE, electrolyte abnormalities, medication toxicities, and thyrotoxicosis.

3. Consider use Diltiazem 20 mg IV/IO over 2 minutes (or 0.25 mg/kg) to control ventricular response. Start an infusion at 5 mg/hr. If unsuccessful, after 15 minutes, give Diltiazem 25 mg IV/IO and increase infusion to 10 mg/hr. Hold Diltiazem infusion for HR < 60 or SBP < 100 mmHg. (Concentrations per pharmacy standard)

4. Or, consider Lopressor 5 mg IV/IO over 2-5 minutes. May repeat every 5 minutes to a total of 15mg. Hold HR <60 or SBP <100 mmHg.

Contact Medical Command

For refractory tachycardia consider:

Diltiazem 15 mg IV/IO over 2 minutes. If unsuccessful at 15 minutes, give Diltiazem 20 mg IV/IO. If successful, then begin infusion at 5-15 mg/hr. Titrated to control heart rate. Hold for heart rate <60 or SBP <100mmHg.

OR

Amiodarone 150 mg IV/IO over 10 minutes. Consider repeat in 10 minutes if unsuccessful. If successful, begin infusion at 1 mg/min. (Concentrations per pharmacy standard)

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TACHYCARDIA: PSVT

Criteria: Narrow complex, SBP >90. Absence of serious signs and symptoms related to the tachycardia: chest pain, dyspnea, decreased level of consciousness, hypotension, pulmonary congestion, acute MI.

Contraindications: If unstable and HR>150, go to Cardioversion Protocol

Protocol:

1. Maintain patent airway and provide supplemental O_2 to keep Sa-O_2 > 95%.
2. Adenosine 6 mg rapid IVP over 1 second. For diagnostic purposes, make note of underlying rhythm during Adenosine effect.
   a. Adenosine is contraindicated in poisoning/toxin-induced tachycardia, and second or third degree heart blocks.
   b. Larger doses are required in patients taking Theophylline or Caffeine.
   c. Reduce the dose to 3 mg in patients on Dipyridamole and Carbamazepine, heart transplant patients, and if given via central venous access.
3. If no response after 1 – 2 minutes, give Adenosine 12 mg rapid IVP over 1 second.

Contact Medical Command

4. If no response and the QRS complex is narrow and the BP is still normal or elevated:
   a. Give Diltiazem 20mg IV/IO (0.25mg/kg) over 2 minutes to control ventricular response.
   b. If ineffective or PSVT recurs and BP still normal or high after 15 minutes, give Diltiazem 25mg IV/IO (0.35mg/kg). Diltiazem should be given with caution in patients on long-term Beta blocker therapy.
   c. Begin infusion of Diltiazem at 5 to 15 mg/hr titrated to control rate. Hold for HR <60 or SBP <100mmHg. (Concentrations per pharmacy standard)
   k. Consider DC cardioversion. Refer to Cardioversion Protocol.
5. Consider B-Blockers, Digoxin, or Amiodarone.
6. If complex is wide-see "Wide Complex Tachycardia of Uncertain Origin".
7. If patient becomes hypotensive or unstable, go to synchronized cardioversion.

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TACHYCARDIA: UNSTABLE
(Cardioversion)

Criteria: Heart rate ≥150. Serious signs and symptoms related to the tachycardia: chest pain, shortness of breath decreased level of consciousness, shock, pulmonary congestion, heart failure, acute MI.

Contraindications: Cardioversion is seldom required for heart rate <150 BPM.

Protocol:

1. Maintain a patent airway and provide supplemental O_2 to keep SaO_2>95%.
2. May give a brief trial of medications, based on the arrhythmia protocol.
3. May premedicate if possible with Etomidate 0.1-0.2 mg/kg IV/IO or Midazolam 0.1mg/kg (max 5mg) IV/IO (Caution in hypotension.)
4. Synchronized cardioversion begin as follows and increase in a step-wise fashion:
    a. Narrow regular, SVT or AF 50-100J.
    b. Narrow irregular, Afib 120-200 J biphasic or 200 J mono.
    c. Wide regular, Monomorphic VT 100 J
    d. Wide irregular, Polymorphic VT: treats as VF, Unsynchronized defibrillation Biphasic 200J or maximum output.
    e. If delays in synchronization occur and clinical condition is critical, go immediately to unsynchronized shocks.

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TACHYCARDIA: VT

Criteria: Wide complex tachycardia, SBP>90. Absence of the following symptoms related to the tachycardia: chest pain, shortness of breath decreased level of consciousness, shock, pulmonary congestion, heart failure, acute MI.

Contraindications:

1. If unstable and HR >150, go to Cardioversion Protocol.
2. If slow VT (rate near 100 BPM) following a thrombolytic agent, contact Medical Command prior to initiating drug treatment. (Treatment may not be necessary).

Protocol: Maintain a patent airway and provide supplemental O_2 to keep SaO_2 > 95%.

1. Procainamide 20 – 50 mg/min to a maximum total dose of 17 mg/kg, hypotension, 50% widening of the QRS, or suppression of the arrhythmia.
2. If Procainamide is effective, follow boluses with a drip of 1 – 4 mg/min. (Concentrations per pharmacy standard)
3. OR Give Lidocaine 1.0 – 1.5 mg/kg IV/IO, followed every 5 – 10 minutes by Lidocaine 0.5 to 0.75 mg/kg up to a maximum of 3 mg/kg.
4. If Lidocaine effective, follow boluses with a continuous drip of 2 – 4 mg/min. (Concentrations per pharmacy standard)
5. If Procainamide or Lidocaine are ineffective, Amiodarone 150mg bolus over 10 minutes. May repeat infusion q 10 minutes as needed. If successful, start slow infusion 360mg/6hours at 1mg/min. Max. cumulative dose of Amiodarone is 2.2 Gm/24 hours.
6. If ineffective, consider synchronized cardioversion.

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VENTRICULAR FIBRILATION & PULSELESS VENTRICULAR TACHYCARDIA

(Defibrillation Protocol)

Criteria: Absence of pulse and respirations, VF or VT on monitor.

Contraindications: Any time electrical shock cannot be safely delivered in the aircraft.

Protocol:

1. Establish unresponsiveness and assess ABCs.

2. Perform CPR until defibrillator ready. . Monitor ETCO2 for ROSC.

3. If the patient is pregnant and the uterus measures above the umbilicus, continuous manual left uterine displacement must be continued throughout the resuscitation.
4. Confirm VF/VT on monitor and absence of pulse.

5. Defibrillate X1 at 200 biphasic or maximum output.

6. If VT/VF continues resume CPR, intubate and obtain IV/IO access
7. Give Epinephrine 1mg repeat as needed every 3 -5 minutes during VT/VF, shocking at maximum output, 60 seconds after each dose.
8. Perform CPR for 2 minutes, reassess, if VT/VF persists shock at maximum output then:

   Amiodarone 300 mg IV/IO. Push diluted in 20-30 ml of NSS or D5W. Consider repeating 150 mg in 3-5 minutes to a max. of 2.2 gm/24 hours. If successful start infusion at 1 mg/min. (Concentrations per pharmacy standard)

   OR

   Lidocaine 1.5 mg/kg IV/IO – repeat in 3-5 minutes followed by 0.5mg/kg every 8-10 minutes to a maximum of 3mg/kg. Lidocaine drip 2-4 mg/min. once spontaneous circulation restored. (Concentrations per pharmacy standard)

   OR

   Procainamide 20-50 mg/min, up to a total of 17 mg/kg consider in the case of known or suspected WPW.

   OR

   Magnesium Sulfate 1-2 grams over 1-2 minutes for hypomagnesemia, Torsades de Pointes, or severe refractory VF;

9. If V-fib persists, then defibrillate at maximum output.

10. If circulation returns refer to ROSC / Induced Hypothermia Protocol

Contact Medical Command

For refractory VF/VF consider:

a. Sodium Bicarbonate for known preexisting bicarbonate-responsive acidosis, preexisting hyperkalemia or tricyclic antidepressant overdose.

b. Change the axis of defibrillation by placing the pads in an anterior-posterior orientation.

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WIDE COMPLEX TACHYCARDIA OF UNCERTAIN ORIGIN

Criteria: SBP >90. Absence of serious signs and symptoms related to the arrhythmia: chest pain, shortness of breath, decreased level of consciousness, shock, pulmonary congestion, acute MI.

Contraindications: If unstable and HR >150, go the Cardioversion Protocol.

Protocol: Maintain patent airway, Provide supplemental O_2 to keep SaO_2 >95%.

Patients with Normal Cardiac Function:

1. Amiodarone 150mg IV/IO over 10 minutes. May repeat q10 minutes. Max 2.2 Gm/24 hours. If successful, start infusion at 1 mg/min. For first 6 hours, then 0.5 mg/min. (All drip concentrations per pharmacy standard)

OR

2. Procainamide 20-50mg/min/IV/IO. Until a max of 17 mg/kg., hypotension or 50% widening of the QRS, or suppression of the arrhythmia. If successful, start drip at 1-4 mg/min.

OR

3. Lidocaine 1 – 1.5 mg/kg IV/IO followed every 5-10 minutes by Lidocaine 0.5 -1.75 m g/kg up to a total of 3 mg/kg. If effective, follow bolus with continuous drip of 2-4 mg/min.

4. Synchronized cardioversion. (Cardioversion Protocol)

Contact Medical Command

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HEMORRHAGIC SHOCK

Criteria: Hemorrhage or volume depletion with impaired tissue perfusion

Protocol:

1. Provide for a patent airway and give supplemental O_2 to keep Sa O_2>95%.

2. Control active external bleeding points by direct pressure, use of pressure points, tourniquet (if an extremity), and if needed Combat Gauze (see Hemostatic Dressing Protocol).

3. 500 ml fluid bolus of NS, may repeat x3.

4. Hang 1 unit PRBC/Whole blood (per protocol) wide open, may repeat as necessary.

5. Refer to Administration of Blood Protocol.

6. Persistent hypotension after appropriate initial resuscitation in a patient with a known or suspect source of ongoing blood loss. Consider the co-administration of Tranexamic Acid, see the (Trauma-Multiple System Protocol).

Note: Blood should be transfused if there is evidence of impaired tissue perfusion (signs of early or late shock) or significant or uncontrolled hemorrhage.

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HYPER-REACTIVE AIRWAY

Criteria: Status Asthmaticus
SOB and respiratory failure related to bronchospasms
Wheezing

Protocol:

1. Maintain a patent airway and provide supplemental O_2 to keep SaO_2>95%.
2. Perform RSI as indicated. The induction agent of choice in this situation is Ketamine 2 mg/kg IV/IO. Do not use Ketamine in hypertensive patients or those with cardiac risk factors. See RSI Protocol.
3. a. Albuterol 5 mg aerosolized. May repeat Albuterol as often as necessary.

   b. For intubated patients, Albuterol two doses MDI in-line. May repeat as necessary or provide continuous aerosolized Albuterol treatments.
4. Solumedrol 125mg IV/IO.
5. Consider Epinephrine 1:1000 0.3ml IM if patient has no history of cardiovascular disease

Contact Medical Command

1. Magnesium Sulfate 2 gm IV/IO over 20 minutes.

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HYPERTENSIVE EMERGENCY

(Associated with Angina or MI)

Criteria: BP > 200 systolic or > 120 diastolic.

Protocol:

1. Provide for a patent airway and give supplemental O_2 to keep SaO_2>95%.

2. Nitroglycerin drip at 20 mcg/min. Titrate NTG drip, increase by 10 mcg/min every 3-5 minutes, keeping systolic BP>90. (Concentrations per pharmacy standard)

3. If BP drops below 90 systolic, discontinue drip if necessary, and give 500 mL NSS fluid bolus.

Contact Medical Command

1. For refractory hypertension consider one of the following:
   a. Labetolol 20 mg IV/IO q 10 min times 2 doses.
   b. If heart rate is <60 per minute, Hydralazine 10 mg IV/IO, may repeat 10 to 20 mg q 10 min times 2 doses.
2. Lopressor 5mg slow IV/IO every 5 minutes (x3 doses) for a total of 15mg, hold for HR <60 or SBP <100. Not routinely given in the setting of acute MI.

CAUTION: There is a real risk associated with the rapid lowering of blood pressure. In the prehospital setting, BP should not be lowered by more than 25% of the original reading.

ASYMPTOMATIC patients, regardless of their blood pressures values, do not warrant emergency therapy. A hypertensive emergency is not based on blood pressure values alone, but rather acute symptomatic complications secondary to the elevated BP.

(*) Do not administer NTG to patients with history of taking Phosphodiesterase Inhibitors such as: Viagra and Levitra within the last 24 hours or Cialis within the last 48 hours.

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PREHOSPITAL ACUTE STROKE

Criteria: This protocol pertains to patients in the prehospital setting who are not hypoglycemic and who have at least one abnormal finding in the three signs evaluated by the Cincinnati Stroke Scale. Particular attention must be paid to individuals who were last seen normal less than 4.5 hours prior to our initial encounter with the patient. Such patients should be immediately transported to an accredited Stroke Center for potential intravenous tPA or endovascular therapy.

Rapid Arterial Occlusion Evaluation Scale (RACE Score)

Facial Palsy- weakness on one side of the face with smile

Score
0 = Absent
1 = Mild (some facial movement)
2 = Moderate to severe (little to no facial movement)

Arm Motor Function- Close their eyes and hold arms straight out in front of them for 10 seconds.

Score
0 = Normal to mild
1 = Moderate (able to lift arm but not hold for 10 seconds)
2 = Severe (unable to raise arm)

Leg Motor Function- as them to lift each leg and hold for 5 seconds.

Score
0 = Normal to mild (able to lift and hold for 5 seconds)
1 = Moderate (able to lift but not hold for 5 seconds)
2 = Severe (unable to lift a leg off the bed at all)

Head and Gaze Deviation- If the patient's head or eyes are toward one side, ask them to look toward the other side.

Score
0 = Absent (able to shift gaze past midline)
1 = Present (unable to gaze past midline)

If a right-sided deficit is found, check for aphasia (inability to say or hear words correctly). Ask them to close their eyes and make a fist

Score
0 = Performs both tasks correctly
1 = Performs one task correctly
2 = Performs neither task

If a left-sided deficit is found, check for agnosia (inability to process sensory information). Touch the affected arm and as them "Whose arm is this?" Then ask them, "Do you feel weak in this arm?"

Score
0 = Patient recognizes his/her arm and its impairment
1 = Does not recognize his/her arm or that there is impairment
2 = Does not recognize his/her arm nor that there is impairment

A total Score > 1 implies that a stroke is likely.
A total Score > 5 implies an Emergent Large Vessel Occlusion (ELVO) is likely.

Protocol:

1. Maintain airway and give supplemental O_2 to keep $SaO_2 \geq 95\%$.
2. Determine blood glucose via Accucheck and treat symptomatic hypoglycemia.
3. Apply the RACE Stroke Scale.
4. Confirm the last time the patient was seen normal.
5. Identify the witness and obtain contact information of the witness.
6. If the time of onset is less than 4.5 hours ago and the patient has a positive RACE Stroke Scale with symptoms suspicious for an acute stroke a score >1 but <5, prepare for immediate transport to the nearest Accredited Stroke Center.
7. If the RACE Stoke Score is >5, this is indicative of an ELVO, prepare for immediate transfer to the nearest Comprehensive Stroke Center.
8. If available, obtain 12-lead EKG from EMS. Do not delay transport.
9. Hypertensive patients from the prehospital setting with symptoms of acute stroke should not have their BP lowered in the prehospital environment.
10. Notify Stroke Center immediately of potential a candidate for IV tPA and provide them with patient weight, time patient was last seen normal, and ETA.
11. Administer appropriate sedation only if required for mission safety per the Sedation Protocol.

Contact Medical Command

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INTERHOSPITAL ACUTE STROKE

Criteria: This protocol pertains to patients being transferred to an accredited Stroke Center with a suspected acute stroke.

Rapid Arterial Occlusion Evaluation Scale (RACE Score)

Facial Palsy- weakness on one side of the face with smile

Score
0 = Absent
1 = Mild (some facial movement)
2 = Moderate to severe (little to no facial movement)

Arm Motor Function- Close their eyes and hold arms straight out in front of them for 10 seconds.

Score
0 = Normal to mild
1 = Moderate (able to lift arm but not hold for 10 seconds)
2 = Severe (unable to raise arm)

Leg Motor Function- as them to lift each leg and hold for 5 seconds.

Score
0 = Normal to mild (able to lift and hold for 5 seconds)
1 = Moderate (able to lift but not hold for 5 seconds)
2 = Severe (unable to lift a leg off the bed at all)

Head and Gaze Deviation- If the patient's head or eyes are toward one side, ask them to look toward the other side.

Score
0 = Absent (able to shift gaze past midline)
1 = Present (unable to gaze past midline)

If a right-sided deficit is found, check for aphasia (inability to say or hear words correctly). Ask them to close their eyes and make a fist

Score
0 = Performs both tasks correctly
1 = Performs one task correctly
2 = Performs neither task

If a left-sided deficit is found, check for agnosia (inability to process sensory information). Touch the affected arm and as them "Whose arm is this?" Then ask them, "Do you feel weak in this arm?"

Score
0 = Patient recognizes his/her arm and its impairment
1 = Does not recognize his/her arm or that there is impairment
2 = Does not recognize his/her arm nor that there is impairment

A total Score > 1 implies that a stroke is likely.
A total Score > 5 implies an Emergent Large Vessel Occlusion is likely.

Protocol:

1. Maintain airway and give supplemental O_2 to keep $SaO_2 \geq 95\%$.
2. Determine that an adequate blood glucose has been confirmed and treat symptomatic hypoglycemia.
3. Apply the RACE Stroke Scale.
    a. If the score is >1 but <5 assure transfer to an Accredited Stroke Center.
    b. If the score is >5 assure transfer to a Comprehensive Stroke Center.
4. Confirm the last time the patient was seen normal, witness and contact information if available.
5. Confirm that the EKG shows no evidence of STEMI.
6. Treat elevated blood pressure readings according to the following parameters: (1) if head CT is normal, shows suspected ischemic stroke without hemorrhage, (2) no head CT is available, or (3) patient has already received IV tPA:
    i. If SBP is > 180 mmHg
        1. Labetolol 20 mg IV/IO q 10 min times 2 doses. Goal is to lower BP by no more than 25%
    ii. If hypertensive and HR < 60, Labetalol relatively contraindicated.
        1. Hydralazine 10 mg IV/IO, may repeat 10 to 20 mg q 10 min times 2 doses.
    iii. If unsuccessful controlling BP:
        Initiate a Nicardipine infusion at 5 mg/hr. Titrate up by 1.25 mg/hr. every 5 min. to maintain a SBP <180 mmHg (reduce the SBP by no more than 25% of it's original reading). If 25% of the original reading is >180 mmHg, notify command. Maximum dose is 15mg/hr. (Concentration per pharmacy standard)

7. If head CT reveals suspected or confirmed stroke with intracerebral hemorrhage:
    i. If SBP is > 160 mmHg
        Labetolol 20 mg IV/IO q 10 min times 2 doses.
        Goal is to lower B/P by no more than 25%.
    ii. If hypertensive and HR < 60: (Labetalol relatively contraindicated)
        Hydralazine 10 mg IV/IO, may repeat 10 to 20 mg q 10 min times 2 doses.
    iii. If unsuccessful controlling BP:
        Initiate a Nicardipine infusion at 5 mg/hr. Titrate up by 1.25 mg/hr. every 5 min. to maintain a SBP <160 mmHg. Maximum dose is 15mg/hr.
    iv. If intubated and chemically paralyzed or has exhibited seizure activity:
        Fosphenytoin 20 mg PE / kg IV/IO - Contraindicated in bradycardia or 2nd or 3rd degree AV blocks.)
8. Administer appropriate sedation only if required for mission safety per the Sedation Protocol.
9. During transport, if possible, elevate the head of the bed to 35 degrees.

Contact Medical Command

1. The LifeFlight crew administration of IV tPA for acute ischemic stroke is to be determined by agreement between the referring physician and receiving Neurologist. This agreement is to be confirmed by the Flight Command Physician. Crews must contact Command prior to administration of IV tPA to confirm this approval.
2. If approved, IV tPA is to be administered by the Flight crew as directed by the AGH Comprehensive Stroke Center Policy; "Guideline for Administration of IV Tissue Plasminogen Activator" outlined below:

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SUBJECT: GUIDELINE FOR ADMNISTRATION OF INTRAVENOUS TISSUE PLASMINOGEN ACTIVATOR FOR ACUTE ISCHEMIC STROKE

DATE: June 14, 2012

1. This memorandum amends any previous publications covering the same material.

2. PURPOSE
To delineate specific guidelines for the administration of intravenous thrombolysis for acute ischemic stroke (t-PA, Activase, Alteplase) [1]

3. GUIDELINE

1. Patient Evaluation

a. All patients with acute ischemic stroke and a time of stroke symptom onset **≤ 4.5 hours** will be evaluated for potential eligibility for intravenous thrombolysis in accordance with AHA/ASA recommendations. [2]

b. Selected patients with acute ischemic stroke with a time of stroke symptom onset **3-8 hours** may be evaluated for potential endovascular therapy.

c. Evaluation will include clinical history, neurological examination including documentation of the NIHSS, non-contrast CT of brain, stroke panel laboratory testing and clinical assessment.

d. Notification of the hospital pharmacy of the patient's weight by calling pager 359-8220 (pager #2402). Pharmacy will initiate "Tissue Plasminogen Activator (t-PA) for Stroke Standby Procedure"

e. The attending neurologist or neurology resident will complete the **Checklist for Contraindications to IV Tissue Plasminogen Activator in Stroke**.

2. Physician responsibilities and process for administration of IV tPA:

a. Check the tissue plasminogen activator (t-PA) dose calculator (0.9mg/kg body weight dose with a maximum dose of 90mg) on the back of the order sheet.

b. Notify pharmacy to admix t-PA based upon the patient's weight.

c. Initiate **Tissue Plasminogen Activator (t-PA, Activase, Alteplase) Administration Stroke** orders set.

d. Obtain prepared Tissue Plasminogen Activator (t-PA) from the pharmacy.

e. Confirm the dose with the physician's order sheet.

f. Infuse 10% of total dose of tissue plasminogen activator (t-PA) as a slow IV push bolus **over 1 minute**. The RN will document the time and amount of dose on the **Stroke Flow Sheet**.

g. The IV tPA bolus is then followed by a continuous infusion of tissue plasminogen activator therapy (90% of total dose) in an IV minibag (1 mg/ml). The IV tPA infusion is administered **over 60 minutes** using a monitored infusion pump.

h. The RN will document the total dose and time the IV t-PA bolus and infusion were administered on the **Stroke Flow Sheet**. The RN will also document the time the infusion of IV tPA was completed.

i. Initiate **Management of Patients Receiving IV Tissue Plasminogen Activator (t-PA, Activase, Alteplase)** orders signed by the physician.

j. Arrange for admission to the NICU

3. Management of Patients Receiving Intravenous Tissue Plasminogen Activator

a. Monitor and document on the **Stroke Flow Sheet.**

b. Vitals signs and neuro checks q 15 minutes for 2 hours after start of IV tPA then q 30 minutes for 6 hours, then q 1 hour for 16 hours.

c. Notify the neurology resident or attending neurologist immediately if the patient develops new headache, change in vital signs or neurological status, nausea or vomiting.

d. Avoid arterial puncture, central venous access and nasogastic tube insertion (if possible) for the first 24 hours after Tissue Plasminogen Activator infusion. If clinically indicated, arterial samples should be drawn from the radial artery.

e. Avoid Foley catheter insertion during Tissue Plasminogen Activator infusion and for 30 minutes after completion of the infusion.

f. Patients who have received IV tPA should not receive unfractionated heparin, low molecular weight heparins, aspirin, clopidogrel, warfarin, nonsteroidal anti-inflammatory drugs, or other antithrombotic/antiplatelet

g. drugs for 24 hours from the start of Tissue Plasminogen Activator therapy.

4. Complications from IV Tissue Plasminogen Activator Administration

    a. There are 4 major complications of IV Tissue Plasminogen Activator administration

        i. Intracranial hemorrhage
        ii. Extracranial hemorrhage
        iii. Angioedema
        iv. A disseminated intravascular coagulation-like syndrome produced by clot lysis (can occur for several hours after IV Tissue Plasminogen Activator administration)

    b. The neurology resident or attending neurologist should be paged STAT to immediately assess patients for a suspected complication of IV t-PA.

Ashis H. Tayal, M.D.
Medical Director Comprehensive Stroke Center

Reviewed and revised 6/09, 5/10, 5/12, 8/13

[1] Guidelines for the Early Management of Adults with Ischemic Stroke - A Guideline From the American Heart Association/ American Stroke Association Stroke Council, Adams HP, del Zoppo G, Alberts MJ, et.al. *Stroke* 2007;38:1655-1711.

[2] Expansion of the Time Window for Treatment of Acute Ischemic Stroke With Intravenous Tissue Plasminogen Activator. A Science Advisory From the American Heart Association/American Stroke Association. del Zoppo GD, Saver JL, Jauch EC, Adams HP. *Stroke* 2009 (published on-line).

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INTERHOSPITAL CONFIRMED INTRACRANIAL HEMORRHAGE

Criteria: This protocol pertains to the interhospital transportation of patients with radiographic confirmation (CT or MRI) of an intracranial hemorrhage.

Protocol:

1. Maintain airway and give supplemental O2 to keep sat ≥ 95%.
2. Maintain a systolic BP 120 mmHg to 160 mmHg as close as possible.
3. Labetolol 20 mg IV/IO q 10 min times 2 doses unless contraindicated by the presence of bradycardia.
4. In the presence of bradycardia use Hydralazine 10 mg IV/IO, may repeat 10 to 20 mg q5 minutes times 2 doses.
5. If steps 3 or 4 are unsuccessful at controlling BP or have already been attempted by the referring; Initiate a Nicardipine infusion at 5 mg/hr. Titrate up by 1.25 mg/hr. every 5 min. to maintain a SBP <160 mmHg. Maximum dose is 15mg/hr. (Concentration Per pharmacy standard)
5. If intubated and chemically paralyzed or has exhibited seizure activity administer: Fosphenytoin 20 mg PE / kg IV/IO.
   Contraindicated in bradycardia or 2nd or 3rd degree AV blocks.
7. Determine the patient's INR and notify LifeFlight Control as soon as possible to inform Medical Command and the receiving physician.
8. Administer appropriate sedation only if required for mission safety per the Sedation Protocol.
9. During transport, if possible, elevate the head of the bed to 35 degrees.

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HYPERTHERMIA

Secondary to Heart Stroke
Secondary to Malignant Hyperthermia
Secondary to Neuroleptic Malignant Syndrome

Hyperthermia Secondary to Heart Stroke

Criteria: Patients with core body temperature > 105.8°F or 41°C, but may be lower.
Severe CNS dysfunction
Hot skin with or without sweating

Protocol:

1. Secure and maintain ABS's
2. Remove from heat environment
3. Remove clothing.
4. Rapid cooling
   a. Evaporative cooling by keeping skin wet and maintain cool environment.
   b. Ice packs to head, neck, axilla, groin.
   c. Chill IV solutions with ice packs.
   d. Gastric lavage with 500 ml chilled saline.
5. Modify/stop cooling measures at or above 39°C (102.2°F) to avoid hypothermia overshoot.
6. Administer NSS 1 liter bolus, cold preferred. May repeat as needed.
7. For seizures, see the Seizure Protocol.
8. For shivering, administer Midazolam 0.1 mg/kg (max 5mg) IV/IO/IM, or IN (MAD Protocol). Refer to Dosage Charts. May repeat a max of 0.1 mg/kg every 5 minutes prn shivering. Consider (Paralytic Protocol).
9. For altered mental status, obtain glucometer reading and give Dextrose 10% IV/IO per protocol as indicated.
10. Avoid adrenergic drugs that may cause vasoconstriction without improving cardiac output or perfusion.
11. Avoid Atropine and other anticholinergics that inhibit sweating.
12. Avoid Succinylcholine in RSI, substitute Rocuronium 1 mg/kg IV/IO, due to potential for acute kidney injury and hyperkalemia in severe cases.

Contact Medical Command

1. For seizures not controlled by Midazolam, initiate Fosphenytoin loading dose of 20 mg PE/kg IV/IO, no faster than 150 mgPE/min.
4. For shivering not controlled by Midazolam, give Lorazepam 0.05-0.1 mg/kg (max 4 mg) IV. Avoid Chlorpromazine (anticholinergics).

5. For documented myoglobinuria – Open IV/IO NSS wide and give Mannitol 12.5 gm to increase renal blood flow. (Consider Foley Catheter) (Obtain Mannitol from referring).

6. For cerebral edema, i.e. evidence of increased ICP, 1 g/kg Mannitol, and restrict fluids.
7. For Acidosis (corrected pH <7.1), consider $NaCO_3$.

Hyperthermia Secondary to Malignant Hyperthermia

Criteria:
1. Severe hyperthermia
2. Muscular rigidity
3. $EtCO_2$>60 mm Hg
4. Change T> 1° C q 15 minutes.

Acidosis s/p recent surgery under general anesthesia
Use of induction agents such as Succinylcholine, Halothane, Methoxyflurane.

Protocol:
1. Immediate cooling measures as per heat stroke protocol.
2. Monitor for lactic acidosis, hyper/hypokalemia, hypoglycemia, hypocalcemia, high-output cardiac failure, myocardial necrosis or infarction, rhabddomyolysis and renal failure. Interventions are similar to heat stroke protocols.
3. Notify Medical Command that Dantrolene should be at bedside on patient arrival.

Hyperthermia Secondary to Neuroleptic Malignant Syndrome

Criteria: Hyperthermia secondary to antipsychotic meds such as Haldol, Thiothixene, Piperazine, manifested by muscular rigidity, tachycardia, dyspnea or urinary incontinence.

1. Treatment with cooling measures as in heat stroke.
2. Notify Medical Command to have Dantrolene at bedside on patient arrival.

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HYPOTHERMIA

Criteria: Patients with core body temperature <36°C.

Protocol:

1. For all hypothermic patients:
   a. Maintain airway, breathing, and circulation.
   b. Monitor cardiac rhythm.
   c. If trauma involved, maintain immobilization on LBB, HID, hard collar and refer to multiple trauma protocol.
      Otherwise, maintain horizontal position.
   d. Avoid rough movement and excess activity.
   e. Remove wet garments.
   f. Protect against heat loss and wind chill by using blankets and other insulating equipment such as space blanket and circumferential wrap.
   g. If a scene flight patient is pulseless begin treatment as outlined and initiate transport immediately. Note: This represents a deviation from our usual policy of not transporting patients who are in arrest.
   h. If hot packs are used on the patient, insulate with a towel or cravat.

2. For mild hypothermia (34° - 36°C)
   a. Passive rewarming as above and keep environment warm.

3. For moderate hypothermia (30° - 34°C)
   a. Passive rewarming as above.
   b. Active external rewarming of truncal areas only (hot packs to axilla and groin).

4. For severe hypothermia (<30°C)
   a. Active internal rewarming
      a. Warm IV/IO fluids (42°C). (May use hot packs)
      b. Warm, humidified O_2 (42°-46°C). (May warm humidifier with hot packs).
      c. Warm lavage 500 ml saline by NG and/or Foley.

5. If pulse/breathing absent:
   a. Start CPR
   b. Defibrillate VT/VF as indicated at Max output.
   c. Intubate
   d. Ventilate with warm, humid oxygen (42° - 46°C).
   e. Establish IV/IO if not previously done.
   f. Infuse warm normal saline (42°C).

NOTES: 1. If core temperature <30°C:
   a. Continue CPR

b. Withhold IV/IO medications.
c. Limit defibrillation to 360J X1 until temp >30°C.

2. If core temperature > 30°C:
   a. Continue CPR.
   b. Give IV/IO medications as indicated (but at longer than standard intervals).
   c. Repeat defibrillation for VF/VT as core temperature rises.

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IABP Systolic Hypertension

Criteria: Patients on an IABP with a systolic blood pressure (SBP) and /or augmentation pressure >180 mmHg, confirmed by manual BP cuff.

Protocol:

1. Confirm the accuracy of the arterial line as follows:
   a. Rezero transducer
   b. Assure transducer is leveled to the fourth intercostals space at the mid-axillary line (Phlebostatic Axis).
   c. Check a manual cuff pressure against the arterial line while the IABP is on 1:1 (An accurate arterial line is one that correlates with a manual BP cuff within 20 mmHg).

2. If the arterial line pressure is validated to be accurate and is greater than 180 mm Hg, or the cuff systolic pressure is greater than 180 mm Hg: Contact Medical Command for orders.

Contact Medial Command:

3. For combination of both systolic and augmentation pressure hypertension (Pressure >180 mmHg):
   a. Initiate and titrate a NTG infusion or administer Morphine to decrease the systolic and/or augmentation pressure to below 180 mm Hg. (If you believe that anxiety is a factor, consider Morphine first.)
4. If only the augmentation pressure is greater than 180 mm Hg, and the systolic pressure is much lower, either:
   a. Consider reducing the IAB AUGMENTATION from "MAX" to a point where the augmentation blood pressure is less than 180mmHg. (Verify that the IABP STATUS indicator light [lower left area of the monitor screen] is moving at least 50% with each inflation).
   b. Consider changing the IAB Frequency Rate to 1:2. (This is the least desirable action, since it reduces augmentation by half.)

(*) Do not administer NTG to patients with history of taking Phosphodiesterase Inhibitors such as: Viagra and Levitra within the last 24 hours or Cialis within the last 48 hours.

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IABP – Ruptured Balloon

Criteria: Blood or "rust" flecks in the helium lumen of the IAB catheter. There may also be a "gas loss" alarm.

Contraindications: None.

Protocol:

1. Place IABP on standby.
2. Do not inflate the balloon for any reason.
3. If in a hospital, contact Medical Command, who should contact the attending physician to remove the IAB.
4. If enroute, determine if the ETE to either the referring or receiving hospital is 20 minutes or less, then contact LF Control to arrange diversion to the closer hospital. Medical Command should then be notified to contact the attending physician, at the closer facility, to ask them to remove the IAB.
5. If enroute, and there is no hospital within 20 minutes, or if on a fixed wing flight:

Contact Medical Command

1. Remove the IAB as described in the LifeFlight Procedure: Removal of Intra-Aortic Balloon (IAB) Catheters by LifeFlight Nurses

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Removal of Intra-Aortic Balloon (IAB) Catheters by LifeFlight Nurses

Purpose: Safe removal of IABP catheters from patients by LifeFlight Nurses when a physician is not available to perform the task within 20 minutes of IAB rupture.

Person(s) who may perform:

LifeFlight Registered Nurses
Flight Physicians

Equipment:

6 4x4 gauze dressings
Clothe tape or Elastoplast
Ace wraps
Suture removal kit
Betadine swabs
Sterile gloves
60 ml syringe
Stopcock
Atropine, 1 bristojet
Sandbag, if available

Procedure:

1. If the patient is on Heparin, discontinue it, unless the Medical Command Physician instructs you not to.
2. Instruct the patient on what to expect (bleeding, groin pressure for 30 minutes).
3. Assemble Combat Gauze (Hemostatic Dressing Protocol) or 6 4X4s, cloth tape or Elastoplast, ace wraps, suture removal kit, betadine swabs, sterile gloves, 60 ml syringe with attached stopcock, 1 amp Atropine, sandbag if available.
4. Remove groin dressing, clip sutures.
5. Attach the 60 ml syringe with the stopcock to the IAB catheter. Withdraw helium until a strong resistance is felt. Close the stopcock to the patient.
6. Be prepared to give Atropine, if the patient becomes bradycardic during groin pressure.
7. If an introducer sheath is used, withdraw the IAB catheter until the base of the balloon is at the tip of the introducer, and then withdraw the IAB and introducer sheath as a unit. Do not pull IAB catheter through the introducer sheath.
8. Withdraw the IAB catheter, while applying pressure distal to the puncture site. (If undue resistance is felt, discontinue withdrawal, as a clot may have formed inside the balloon, preventing its withdrawal without an arteriotomy.)
9. Allow free proximal bleeding for 3 heart beats, then apply the pressure above the puncture site to allow a few seconds of back bleeding.

10. Apply the Combat Gauze directly into and on the site (Hemostatic Dressing Protocol) or 6 sterile 4X4s on the site then apply manual pressure directly to the puncture site for 30 minutes.
11. Evaluate distal pulse while manual pressure is maintained. If necessary, adjust the amount of manual pressure to allow for adequate peripheral perfusion. If bleeding continues after 30 minutes, apply additional manual pressure.
12. Apply pressure dressing using multiple 4X4s, Elastoplast or Ace wraps. Apply sand bag, if available.
13. Maintain HOB flat for 6 hours.
14. Examine the limb distal to the insertion site for signs of ischemia. After removal of the balloon, evaluation and documentation of distal pulses, color, warmth, and capillary refill should occur every 15 minutes. Notify Medical Command Physician, (who will notify the receiving physician) if signs of ischemia are present.
15. Inspect the entire introducer and balloon catheter to be sure that the entire device has been removed. Save the IAB catheter and introducer for the receiving physician to inspect.

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ALTERED MENTAL STATUS WITH SIGNS AND SYMPTOMS OF BRAINSTEM HERNIATION

Criteria: Trauma patients with altered level of consciousness. Stroke patients, near drowning patients, post cardiac arrest patients, other intracranial pathology with altered level of consciousness and/or acute focal neurological changes.

Contraindications: None.

Protocol:

1. Maintain patent airway and provide supplemental O_2 to keep SaO_2 >95%.
2. Intubate patient, using RSI protocol, if GCS is less than or equal to 8 (or any patient that cannot follow commands).
3. Ventilate, maintaining $EtCO_2$ at 30 to 35 mmHg ($EtCO_2$ usually 2-5 mmHg less than PCO_2).
4. HOB elevated 30 degrees unless contraindicated d/t immobilization for trauma. If on LBB, elevate head of LBB approximately 30 degrees.
5. Promote venous drainage from head by keeping neck straight and C-collar loose.
6. Avoid glucose containing IV solutions.
7. Maintain IVs and KVO rate unless fluids needed to support BP.

Contact Medical Command

1. Consider Mannitol 0.5 grams/kg IV/IO (to be obtained from referring hospital) or Lasix 1 mg/kg (preferred in children) for acute neurological deterioration.
2. Consider a Foley and NG (oral gastric if trauma patient).

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NAUSEA/VOMITING

Criteria: Treatment or prevention of motion sickness, nausea or vomiting.

Contraindications: Comatose state
Patients who have received large amounts of CNS depressants
Hypersensitivity to Promethazine/Sulfites

Protocol:

1. Maintain patent airway and provide supplemental O_2 to keep SaO_2>95%.

2. Administer:
   Zofran 4-8mg IV/IO, or IM (May repeat in 15 minutes if needed)
   or
   Benadryl 25 mg IV/IO or IM (Avoid in cases where sedation is not desired).

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NEAR DROWNING

Criteria: Patients who has survived, at least temporarily, after suffocation by submersion in water.

Protocol:

1. Maintain a patent airway and provide supplemental O_2 to keep SaO_2>95%. Most will require intubation and mechanical ventilation.

2. Assume trauma, immobilization per protocol for transfer.

3. Use PEEP cautiously, starting at 5cm H20 pressure for all ages. Titrate level of PEEP to maintain sats as above.

4. Secure 2 large bore IV lines. Treat symptomatic hypotension with fluid challenge of NSS 500 ml; repeat x 1 if needed.

5. Follow the appropriate protocols for life threatening dysrhythmias.

6. If time permits, orogastric tube should be placed to LCS.

7. Maintain body temperature. Remove wet clothing, circumferentially wrap in blankets and space blanket. If hypothermic, follow hypothermia protocol.

Contact Medical Command

1. If patient remains hypotensive despite fluid challenges, may consider Norepinephrine 0.1 – 0.5 mcg/kg/min.
   or Dopamine at 5 mcg/kg/min, titrating to 20 mcg/kg/min to maintain SBP>90 mmHg. (Concentrations per pharmacy standard)

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NEUROGENIC SHOCK

Criteria: Patients with cervical or high thoracic spine injury, hypotension, bradycardia (relative or absolute), hypothermia

Protocol:

2. Maintain patent airway and provide supplemental O_2 to keep SaO_2>95%.
3. Maintain full immobilization.
4. In the absence of hypovolemia, patients with SBP 80 – 90 with suspected cord injury may be considered "normotensive".
5. Manage symptomatic hypotension with a fluid challenge of NSS 500 mL IV/IO. May be repeated to a maximum of 3 liters or signs of pulmonary edema develop.
6. Treat symptomatic bradycardia (HR<40), with Atropine 0.5 mg IVP.
7. If the patient remains hemodynamically unstable, consider Norepinephrine 0.1 to 0.5 mcg/kg/min. (Concentrations per pharmacy standard)

NOTE: Patient should be transported circumferentially wrapped in thermal blankets with space blanket to maintain body temperature.

Contact Medical Command

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OCULAR INJURIES

Criteria: History of trauma to eye or exposure to caustic agent
Penetrating wound with or without impaled object.

Protocol:

1. Provide for a patent airway and give supplemental O_2 to keep SaO_2>95%.

2. Follow multiple trauma protocol, if traumatic injury warrants. Do not be distracted by a gruesome eye injury.

3. If exposure to caustic agent not reactive to water, irrigate eye with sterile water for 30 minutes or until conjunctival pH is 7.4-7.6.

4. If penetrating wound or ruptured globe, cover injured eye with fox shield, and over the other eye with gauze. Maintain low altitude/cabin pressure. Aggressively prevent vomiting, per Nausea protocol.

5. Treat pain per "Pain Relief" protocol.

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PACING, TRANSCUTANEOUS

Criteria: Hemodynamically Unstable Bradycardia
Refractory Tachycardia

Contraindications: C-spine injury
Flail chest

Note: Apply pacing electrodes prophylactically in MI patients with new BBB.

Protocol:

1. For symptomatic bradycardia or cardiac arrest set rate at 80.
2. Increase mA in increments of 10 until capture, or maximum of 150 mA. Verify capture by checking pulse.
3. If no capture, initiate appropriate protocol for life-threatening dysrhythmias.
4. Consider sedation with Midazolam 0.1mg/kg (max 5mg) IV/IO. (You may substitute other Benzodiazepines at the appropriate dose). Refer to Sedation Protocol.
5. Morphine Sulfate 2 mg IV/IO every 3 minutes as needed for pain. Refer to Pain Relief Protocol.

Contact Medical Command

1. Consider override pacing for refractory V-Tach.

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PAIN RELIEF

Criteria: Patient experiencing pain rated at or above "3" based on a zero to ten scale (0 = no pain 10 = excruciating) or per the non-verbal pain score on the next page.

1. Chest pain from any cause.
2. Acute pain due to a suspected or diagnosed leaking/expanding aneurysm or aortic dissection.
3. Acute pain secondary to trauma resulting in:
    a. Suspected fractures
    b. Dislocations
    c. Sprains
    d. Lacerations
    e. Abrasions
    f. Burns

Contraindications:

1. Altered mental status compromising airway patency.
2. Clinical shock-as evidenced by symptomatic hypoperfusion.

Protocol:

1. Administer Morphine Sulfate 4-8 mg IV/IO every 5 minutes prn.
2. May administer Morphine Sulfate 6-8 mg IM every 5 minutes prn as an alternative if there is no vascular access.
3 Fentanyl may be substituted for Morphine at the following dose: 1-2 mcg/kg slow IV/IO over 1 – 2 minutes or IM/IN (MAD Protocol). Maybe repeated in 15 minutes prn. Refer to Dosage Charts
4. The patient's vital signs must be obtained and documented prior to administration. Be alert for symptoms of hypoventilation or hypotension.
5. Vital signs and the patient's response to the pain medication must be documented after administration.
6. In cases of intractable pain, not responsive to the management above; Ketamine 0.2 mg/kg can be administered IV/IO every 3 minutes, until appropriate analgesia (without inducing unresponsiveness) is achieved. Once analgesia is achieved the dose can then be repeated as needed, for pain control, no more frequently than every 10 minutes. You can add narcotic analgesics as needed, at the lower dose, as directed above. Remember that the goal is pain control, not sedation.

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Non-Verbal Pain Scale

Categories	0	1	2	Pre-score	Intervention Score	Post Score
1. Face	No particular expression or smile	Occasional grimace, tearing, frown or wrinkled forehead	Frequent grimace, tearing, frown or wrinkled forehead			
2. Activity (movement)	Lying quietly, normal position	Seeking attention through movement of slow cautious movements	Restless activity and/or withdrawal reflexes			
3. Guarding	Lying quietly, no positioning of hands over areas of body	Splinting areas of the body, tense	Rigid, stiff			
4. Physiologic I (vital signs)	Stable vital signs, no change in past 4 hours	Change over past 4 hours in any of the following: SBP >20 HR >20 RR >10	Change over past 4 hours in any of the following: SBP >30 HR >25 RR >20			
5A. Respiratory	Baseline RR/Spo_2 Complaint with ventilator	RR >10 above baseline or 5% ↓ Spo_2 Mild asynchrony with ventilator	RR >20 above baseline or 10% ↓ Spo_2 Severe asynchrony with ventilator			
5B. Physiologic II	Warm, dry skin	Dilated pupils, perspiring, flushing	Diaphoretic, pallor			
			5A TOTAL			
			5B TOTAL			

Abbreviations: HR, heart rate; RR, respiratory rate; SBP, systolic blood pressure; Spo_2, oxygen saturation as measured by pulse oximetry.
[a] Reprinted with permission of Strong Memorial Hospital, University of Rochester Medical Center, developer and copyright holder of the scale.

PARALYTICS

Criteria: To facilitate ventilation in the intubated patient with confirmed tube placement.

Protocol:

1. Confirm placement of tube by auscultation of the epigastric area and lung fields; pulse ox reading; and $ETCO_2$ monitoring.

2. Assess the patient's status on the current ventilator settings. (Use ETCO2, pulse oximetry, and ABGs if available). If the saturations are acceptable and the ETCO2 or PaCO2 are low, your ventilator settings may never be adequate to compensate as well as the patient is doing. ***Caution utilizing chemical paralysis especially in severe metabolic acidosis.***

3. Rocuronium 1 mg/kg IV/IO. May repeat ½ initial dosage if desire effects not achieved.

4. During transport, may repeat initial dose every 20 minutes as needed.

5. If paralyzing an awake patient, administer Midazolam 0.1mg/kg (max 5mg), prior to initial Rocuronium dose.

6. Midazolam should be repeated 0.1mg/kg (max 5mg) every 30 minutes as long as patient is chemically paralyzed and hemodynamically stable If the patient is hypotensive you may replace Midazolam with Ketamine 2 mg/kg IV/IO every 15 minutes PRN for sedation. (You may substitute other Benzodiazepines at the appropriate dose). Refer to Sedation Protocol.

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POISONINGS / INGESTIONS
(ADULT)

Criteria: Known exposure to, or ingestion of a potentially lethal dose of a substance.

Protocol:

1. Provide for patent airway and oxygenation to maintain SaO_2 >95%. Provide for early intubation if substance is caustic. Use conservative respiratory management if substance is a petroleum distillate.

2. IV NSS at KVO rate; Cardiac monitor.

3. Avoid lavage or emesis when substance is caustic or petroleum based.

4. Skin decontamination for topical exposures should be performed prior to transport.

Contact Medical Command

1. Communicate substance(s) involved to Medical Command for more specific interventions.

2. Activated Charcoal/Sorbital 25 gm PO, indicated for acute ingestion only. Contraindications include: altered mental status, potential to lose airway patency, and prolonged time since ingestion.
(Activated Charcoal must be obtained from the referring facility)

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GENERAL HIGH-RISK OB ASSESSMENT AND DOCUMENTATION

Criteria: The general assessment and documentation to be performed on all high-risk obstetrical patients transports.

Assessment/Questions:

1. Note age of the patient. Teens and over 35 years predispose to complications.
2. Document Gravida/Para based upon TPAL:
   Term deliveries
   Pre-term deliveries
   Abortions (Spontaneous or therapeutic)
   Living children
3. Estimated date of confinement (EDC) is estimated from the first day of the last menstrual period (LMP) – 3 months + 7 days.
4. Has the patient had an ultrasound yet? If so, were there any significant findings? What was the EDC by ultrasound? Breech?
5. Document past medical history, HPI, medications, and allergies.
6. Document pertinent OB history:
   a. Prior SVD or C-sections
   b. Any prior delivery complications.
   c. Any complications with prior pregnancies.
   d. If multiparous, what was the length of her last labor?
7. Document history of current pregnancy:
   a. Is she actively having contractions?
   b. When did the contractions start?
   c. Any change in the intensity or frequency of the contractions?
   d. Is she having any back pain, pelvic pain, or rectal pressure?
   e. Any vaginal bleeding (how much) or loss of vaginal fluid?
   f. If bleeding has it been painful or painless?
   e. Does she smoke, drink alcohol, or abuse any drugs?
   If so, when was the last time and what substance was abused?
   f. Does the patient appear malnourished or obese?
   g. Has there been any prenatal care?
   h. Has there been any change in fetal activity recently?
   i. Haven any diagnostic tests been performed on this pregnancy?
8. Document initial vitals (T, HR, RR, BP, and SAO2) and repeat every 15 minutes or as indicated by a change in the patient's condition.
9. Transport the patient in a left lateral recumbent position to displace the weight of the fetus, off of the inferior vena cava, and increase venous return to the heart.
10. Fetal heart tones (FHT) should be assessed by doppler and also documented every 15 minutes or less if any changes are noted.
11. Document the referring's interpretation of bedside Fetal Monitoring

during the period prior to your departure. Make note of any of the following:

a. Accelerations
b. Variable decelerations
c. Late decelerations
d. Early decelerations
e. Bradycardia (HR < 120 bpm for 5-10 minutes or longer)
f. Tachycardia (HR > 160 bpm for 10 minutes or longer)

12. Gently palpate the fundus for strength, frequency, and duration of contractions.
13. Document the most recent cervical exam and the time of that exam.

a. ***If dilation is greater than 6 cm Medical Command must be contacted to approve continuation of transport and notify the Medical Director. Delivery is likely imminent and dispatch of the Neonatal Team may be more appropriate***

b. ***If it has been an extended period of time since the last pelvic exam and the patient appears to be actively laboring, contact Medical Command to request that the referring repeat the exam.***

c. If there has been a rupture of membranes, a sterile glove vaginal exam (SVE) should only been performed if delivery is thought to be imminent.
d. A SVE should never be attempted in the presence of vaginal bleeding unless an ultrasound has ruled out placenta previa.

Contact Medical Command:

1. If the circumstances in items 12 (a) or (b) occur.
2. If any contraindications for the initiation of maternal transport are encountered before leaving the referring facility. Such contraindications include:
    a. Inability to stabilize the mother's condition, such as inability to control hemorrhage.
    b. Acute fetal distress.
    c. Imminent delivery, especially when the transport vehicle doesn't allow adequate access to manage/resuscitate a mother and newborn.
    d. Lack of experienced team members to accompany the patient and handle the presenting situation.
    e. Hazardous road conditions that will prolong the transport time.

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PREGNANCY INDUCED HTN

(Pre-eclampsia / Eclampsia)

Criteria: All pregnant patients greater than 20 weeks gestation or recent post-partum with BP> 160/110
Acceleration of HTN in pregnancy (Pre-eclampsia)
Visual blurring
Headache
Seizures in pregnancy or recent post-partum (Eclampsia)

Protocol:

1. Maintain patent airway and provide supplemental O_2 to keep SaO_2>95%.
2. Transport in left lateral decubitus position
.
3. Calm environment and subdued lighting if possible.
4. If BP > 160/110, Hydralazine 5-10 mg IV/IO q 20 min. with a maximum total dose of 25 mg administered to keep BP <160/110. or Labetolol 20 mg IV/IO q 10 min. with a maximum total of 300mg administered.
5. For seizure activity, Magnesium Sulfate loading dose of 4-6 gm IV/IO over 20 minutes followed by maintenance infusion of 2 gm/hr if no sign of maternal depression (patellar reflexes or respiratory depression).
6. Assess FHT every 15 minutes or as necessary.

Contact Medical Command

1. If recurrent seizures, administer 2 gm Magnesium Sulfate over 3 – 5 minutes and refer to (Seizure Protocol) if seizure persists.
2. Keep Calcium Gluconate available for respiratory depression, 1 gm (10ml of a 10% solution) IV/IO over 3 minutes. Assist ventilation as necessary.

Reference: Hypertension in Pregnancy AGOG guidelines 2013.

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THIRD-TRIMESTER VAGINAL BLEEDING

(Abruptio Placenta, Placenta Previa, Uterine Rupture, Ectopic Pregnancy)

Criteria: Vaginal bleeding and/or severe abdominal pain may be present
Tachycardia with weak, thready pulse
Hypotension
Anxiety, confusion, restlessness
Decreased urine output

Protocol:

1. Maintain patent airway and provide supplemental O_2 to keep SaO_2>95%.
2. Initiate large bore IV with NSS 1 liter.
3. Assess presence and rate of FHT's and estimate bleeding.
4. If BP < 90 systolic administer 500 ml crystalloids. If no improvement, repeat NSS 500 ml.
5. If still no improvement, initiate 1 unit 0- PRBC,
6. Transport in left lateral decubitus position if tolerated.
7. Do not perform an internal exam.

Contact Medical Command

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TOCOLYTIC PROTOCOL

Criteria: Gestational age of 20 – 36 weeks when cervical effects of contractions are present.

Contraindications:
Imminent delivery
Acute vaginal bleeding
Preeclampsia or Ecclampsia
Sepsis
DIC
Maternal HR>120

Protocol:

1. Provide patent airway and provide supplemental O_2 to keep SaO_2 >95%.

2. Monitor frequency, duration and quality of contractions as well as FHT's.

3. Assess for any uterine tenderness, vaginal bleeding or discharge.

4. ***Confirm the results of the last pelvimetry; if dilation is greater than 6 cm Medical Command must be contacted to approve continuation of transport and notify the Medical Director. Delivery is likely imminent and dispatch of the Neonatal Team may be more appropriate.***

5. If they have not already received it, initiate NSS a 500 ml bolus.

6. If tocolysis has not already been initiated, proceed to steps 7 and 8 as they apply. We are no longer using Magnesium as a tocolytic however, you may still find patients who have been bolused with Magnesium and are on an infusion.

    a. If the patient is already on a Magnesium infusion and is < 32 weeks, proceed with Indocin step 7. If the Magnesium has been effective you may continue the Magnesium infusion at 2gm/hr. (Magnesium and Indocin can be coadministered). If the Magnesium has not been effective you may discontinue it and just use the Indocin.

    b. If they are on Magnesium and >32 weeks, assess vitals/confirm the effectiveness of the tocolysis.

If the Magnesium is effective and the patient is tolerating the Magnesium, you may continue the infusion at 2gm/hr. If tocolysis with Magnesium is ineffective in patients >32 weeks and their systolic BP is >100 mmHg, you may discontinue the Magnesium and proceed with Nefedipine in step 8. Nifedipine cannot be administered simultaneously with a Magnesium infusion and is contraindicated in hypotension.

c. If the Magnesium infusion is maintained monitor the patient for signs of respiratory depression or loss of DTRs.

7. If < 32 weeks gestation – give Indocin 150 mg PR, followed by 50mg PO every 6 hours.

8. If > 32 weeks gestation – give Nifedipine 20 mg PO followed by another 20 mg PO in 30 minutes. Nifedipine can then be repeated 20 mg PO every 3 hours PRN

9. Transport in left lateral decubitus position as tolerated.

Contact Medical Command

1. If tocolysis is ineffective, for possible consultation with the Perinatologist.

2. When on Magnesium if the patient develops signs of respiratory depression or loss of deep tendon reflexes administer Calcium Gluconate 10ml of a 10% solution.

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TRAUMA IN PREGNANCY

Criteria: Trauma in Pregnancy > 20 weeks gestation.

Protocol:

1. Maintain patent airway and provide supplemental 0_2 to keep SaO_2 >95%.

2. Immobilization as indicated, but tilt LBB 10-15° to the left. (Trauma/Spinal Immobilization Protocol).
3.
4. Assess FHT, vaginal bleeding or discharge.

5. Treat significant signs and symptoms according to protocol (Trauma-Multiple System Protocol).

6. Pregnant trauma patients who are ≥20 weeks gestation should be transported to the nearest trauma center with obstetrical capabilities in house, unless moribund conditions exist.

7. If absent VS in mother < 5 minutes, do not waste time assessing FHTs, perform CPR and transport to nearest facility for post-mortem C-section.

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SEDATION PROTOCOL

Indications: Intolerance of endotracheal tube.
Cardioversion
External pacing
Painful procedures (e.g.: splinting of isolated/angulated fractures)

Contraindications:
Airway compromise
Altered level of consciousness
SBP <100 mmHG
Inability to monitor pulse oximetry and ECG.
Procedures in patients with multiple injuries are best accomplished using the pain protocol.

Protocol:

1. Maintain patent airway and provide supplemental oxygen to keep SaO_2 >95%.
2. Apply ECG monitor and pulse oximetry and ETCO2 throughout the procedure.
3. Midazolam 0.1mg/kg (max 5mg) IV/IO/IM/IN (MAD Protocol for anxiolysis) hold for SBP <100 mmHg. Refer to Dosage Charts
4. Alternative for brief sedation:
    a. Etomidate 0.1 to 0.2 mg/kg IV/IO (splinting or cardioversion)
    b. Ketamine 2 mg/kg IM/IV/IO (not to be used in acute cardiac or hypertensive head-injured patients).
5. Alternative sedation or anxiolysis:
    a. Ativan 0.5 to 1 mg IV/IO
6. Analgesia: Administer Morphine 4-8 mg or Fentanyl 1-2mcg/kg IV, IO, if not contraindicated. Use smaller dose with Midazolam as combined effect of a narcotic and benzodiazepine may cause respiratory depression and hypotension.

Contact Medical Command

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SEDATION PROTOCOL / DIPROVAN (PROPOFOL) INFUSIONS

Indications: Intubated patient
Infused initiated by referring facility.
Patient tolerating infusion at referring facility.

Contraindications:

SBP<100mmHg	Pregnancy
Bradycardia	Pancreatitis
Metabolic acidosis	Severe hyperlipidemia
Rhabdomyolysis/Myoglobinuria	(Triglycerides > 350mg/dL)
≤12 years of age	

Protocol:

1. Maintain patent airway, confirm ETT placement, provide supplemental O_2 keep SaO_2 >95%, monitor pulse oximetry and ETCO2 continuously.
2. Confirm Vital Sign.
3. Obtain premixed Propofol from referring facility.
4. Continue infusion at the current rate if tolerated by the patient.
5. Titrate the infusion for appropriate level of sedation. (5 – 50 mcg/kg/min).
6. If hypotension, sudden bradycardia, or other symptoms of Propofol infusion syndrome occur, discontinue the infusion and follow the paralytic protocol.
7. Please refer to the following page: "Safety Alert: Guidelines for use of Propofol."

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SEDATION

To: Distribution

From: Michael Forbes, M.D.
Chair, Pharmacy and Therapeutics Committee

Date: April 1, 2003

Subject: SAFETY ALERT: GUIDELINES FOR THE USE OF PROPOFOL

Propofol is a sedative-hypnotic agent used for induction and maintenance of anesthesia and for sedation in the intensive care unit (ICU). It is a short-acting sedative hypnotic, which makes it more favorable in certain situations compared to other sedatives. Usual doses for Propofol for maintenance of anesthesia and ICU sedation are 50-200 mcg/kg/min. and 5-50 mcg/kg/min., respectively.

As with most other medications, Propofol can cause adverse effects. A few examples include bradycardia, hypotension, metabolic acidosis, and lipemia. Most of these adverse effects appear to be dose-related; however, certain populations in the critically ill may be more susceptible.

Propofol infusion syndrome is another less frequently reported adverse effect that was initially well documented in children, but more recently, in adults. In the majority of cases, the patients have developed relatively sudden-onset bradycardia which is resistant to treatment, plus at least one of the following: lipemia, enlarged liver, severe metabolic acidosis, or rhabdomyolysis (or myoglobinuria). There have been cases of suspected Propofol infusion syndrome in adults in the ICU receiving Propofol for sedation. In these cases, the suspected reaction was associated with a high infusion and/or duration of therapy >72 hours.

In a recent article, Kang (*Ann Pharmacaother* 2002;36:1453-6.) summarized published case reports consistent with this syndrome in adults. Several characteristics found in the adult population paralleled those described in children, including metabolic acidosis, rhabdomyolysis, and bradycardia. In a retrospective review, Cremer and collegues (*The Lancet* 2001;357:117-8.) reported an apparent Propofol infusion syndrome in seven of 67 head injury patients who received Propofol. The authors concluded this syndrome correlated with doses greater than 5mg/hr (~85mcg/kg/min.).

The following guidelines were developed and approved by the **P&T and Critical Care Committees** to promote safe and appropriate use of Propofol in critically ill patients. (These

guidelines do not pertain to the use of Propofol for anesthesia and conscious sedation; for more information, see Conscious Sedation Policy.)

Distribution: IVB, VA, VB, Physician Assistants, Nurse Practitioners, Clinical Education Specialists, Pharmacists

ADULT PROTOCOLS

PROPOFOL USAGE GUIDELINES

Purpose: The following guidelines for Propofol were developed to assure safe and effective usage of this agent in intubated, mechanically ventilated patients in the intensive care unit. These guidelines do not pertain to the use of Propofol for anesthesia and conscious sedation for more information, see the hospital Conscious Sedation Policy.)

Patient Criteria:

Propofol is only to be use in intubated, mechanically ventilated patients.

Propofol may be useful in patients who:

1. Are felt to require short-term sedation (less than 72 hrs)
2. Require continuous sedation and need to be awakened rapidly and predictably (e.g. frequent CNS assessment or rapid weaning from the ventilator).

Propofol should **NOT** be used for ICU sedation in:

1. Patients less than or equal to 12 years old.
2. Patients who are not intubated and mechanically ventilated.
3. Patients who are pregnant or nursing.
4. The first-line management of ICP control.
5. Propofol should be used cautiously in patients with pancreatitis, or hyperlipidemia as evidenced by increased serum triglyceride levels or serum turbidity (1ml of Propofol=0.1g of fat=1.1 Kcal).

Dosage and Administration

1. Maintenance dosages of Propofol must be individualized and titrated to clinical response slowly to avoid hypotension. Therefore, **bolus dosing in the ICU is not recommended**. (Use cautiously in patients who are hypotensive or hemodynamically unstable.)
2. The infusion should be initiated at **5-10mcg/kg/min** and should then be increased in **5 10 mcg/kg/min increments every 5-10 minutes** until the desired level of sedation is achieved. Waiting at least 5 minutes between dosage adjustments is important to allow distribution to occur.
3. It is important to note that the package insert states that most ICU adult patients can be sedated effectively within maintenance rates of 5-50mcg/kg/min., and sometimes higher.

4. Doses greater than **5mg/kg/hr (~85mcg/kg/min.)** have been associated with a lethal Propofol infusion syndrome and therefore should be avoided. If this dose is not

providing adequate sedation, consider adding adjunct medications (i.e. benzodiazepines, opioids). Also, consider discontinuing Propofol and administering alternative sedatives if Propofol length of therapy is greater than 72 hours.

Monitoring

1. Patients at risk of hyperlipidemia should be monitored for increases in serum triglyceride levels of serum turbidity. Limit lipid administration if triglyceride level is greater than 350 mg/dl.
2. Patients should be continuously monitored for early signs of significant hypotension and/or bradycardia.

Approved by the P&T Committee March 18, 2003 and Critical Care Committee February 13, 2003

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SEIZURES (ADULT)

Criteria: Status Epilepticus

Protocol:

1. Maintain patent airway and provide supplemental O_2 to keep SaO_2>95%.

2. Establish IV or IO of NS at KVO.

3. Give Dextrose 10% per protocol IV/IO if Glucometer reading <60 or if Glucometer is not available to R/O hypoglycemia.

4. **Caution; if paralytics are administered proceed to #6.**

5. Administer Midazolam 0.15 mg/kg (max 10 mg) IV/IO/IM, or IN (MAD Protocol). Refer to Dosage Charts. May repeat a max of 0.1 mg/kg every 5min as needed.
   Alternatively you may administer: Ativan 2-4 mg IV/IO over 3 minutes or IM. May repeat in 5-15 minutes to a max of 8mg in 12 hours

6. Administer Fosphenytoin 20 mg PE/kg IV/IO at a rate not to exceed 150 mg PE/min. **Contraindicated in bradycardia or 2nd or 3rd degree AV blocks.**

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SEPSIS / SEPTIC SHOCK

Criteria: History of fever of uncertain origin or known infection associated with normal or low BP, tachycardia and tachypnea.

Protocol:

1. Provide for a patent airway and provide supplemental O_2 to keep SaO_2 >95%.

2. Resuscitation of NSS 500ml fluid boluses to total of 30 ml/kg; titrate to keep MAP ≥ 65mmHg.

3. If hypotension not responsive to fluid resuscitation, begin a Levophed (Norepinephrine) infusion 0.1 – 0.5 mcg/kg/min. (Concentrations per pharmacy standard). As a temporizing measure till the infusion is mixed, you may use "push-pressor Epinephrine: draw up 1 ml of Epi 1:10,000 in a syringe of 9 ml of normal saline. This produces a 1:100,000 solution, administer 1 – 2 ml every 2 minutes till the vitals stabilize or your Norepinephrine infusion is ready to start.

4. On interhospital transports, confirm that the appropriate broad-spectrum antibiotics have been ordered and continue any antibiotic administrations in progress or that have not been initiated yet. If none have been ordered, contact Medical Command to coordinate, with the referring Physician, which antibiotics need to be administered and initiate them during transport. (Antibiotics to be obtained from the referring facility).

Contact Medical Command

1. For refractory septic shock with known or suspected acidosis consider a Vasopressin infusion 0.01 to 0.1 units/min IV. Usual dose is less than 0.04 units/min. (To be obtained from referring facilities).

2. If Levophed (Norepinephrine) unsuccessful at 0.5 mcg/kg/min, SBP <70 mmHg and Vasopressin is not available consider adding an add Epinephrine infusion 0.1 to 0.5 mcg/kg/min, titrate for blood pressure >90 mmHg. (Concentrations per pharmacy standard)

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THROMBOLYTIC THERAPY, DISCONTINUATION OF

Criteria: Suspected aortic dissection: (sharp, tearing pain in back or abdomen, unequal pulses or blood pressures between arms, hypotension).

Acute change in neurological status and/or onset of severe headache, photophobia, and nuchal rigidity.

Acute onset of severe bleeding, including from mouth or gums, epistaxis, hematemesis, blood tinged urine or stool, back pain, hypotension.

History of any non-compressible puncture or other invasive procedure since admission to referring institution, with known or suspected uncontrolled bleeding.

Any contraindication to thrombolytic therapy (see LF procedures).

Acute anaphylactic reaction.

Contraindications:

None

Protocol:

1. Discontinue thrombolytic, Heparin and IIb/IIIa Inhibitors.
3. Administer pressure to any compressible sites of bleeding.
4. Consider use of Combat Gauze (Hemostatic Dressing Protocol) if wound is large enough to accommodate.
5. Administer NSS 250ml bolus for hypotension systolic BP<90. May repeat as needed x 3 or signs of pulmonary edema occur

Contact Medical Command

1. Evaluate need for blood products.

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TRAUMA/SPINE IMMOBILIATION

The following are subject to interpretation by the individual provider. When in doubt the patient should be immobilized following the state BLS Protocol.

Strongly consider Cervical Spine Immobilization in multiple trauma, high speed MVC, rollover or ejection.

Interhospital transports and patients who have had their spines cleared by referring physicians do not have to be re-immobilized for LifeFlight transport. If there are concerns of potential spinal injuries, distracting injuries, or cervical spine compromise, apply a c-collar and perform sliding transfers (while maintaining C-spine control) with each patient movement from one stretcher to another.

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TRAUMA- MULTIPLE SYSTEMS

Criteria: Blunt or penetrating trauma

Protocol:

1. Perform primary survey:
   a. Maintain patent airway and provide supplemental O_2 to keep SaO_2>95% with C-spine control. Anticipate RSI.
   b. Breathing assessment.
   c. Circulation with hemorrhage control in the following order: direct pressure, pressure points, tourniquet and or Combat Gauze (Hemostatic Dressing Protocol).
   d. Disability neurologic status.
   e. Expose the patient (as is possible) to identify injuries.
   f. Provide full immobilization to include long backboard, hard collar and HID in the prehospital environment, as indicated by the (Trauma/Spine Immobilization and State BLS Protocols).
   g. Life threatening problems found in this survey should be dealt with immediately.
   h. Initiate transport as soon as possible.
2. Resuscitate as appropriate.
   a. Initiate 2 large bore IV's (consider an IO if unsuccessful) and provide fluid resuscitation of NS to maintain adequate perfusion.
      i. If BP < 90 systolic and there is evidence of inadequate perfusion or if BP <70 systolic.
         1. Initiate 1,000 mL crystalloid bolus.
         2. If the Normal Saline bolus does not improve perfusion or there is evidence of ongoing hemorrhage then infuse 1 unit of PRBCs/whole blood per protocol. May repeat as indicated depending upon available blood products. Blood products are not indicated in traumatic arrest due to blunt trauma unless the patient is resuscitated (Refer to Administration of Blood Protocol).
         3. Continue Normal Saline resuscitation as indicated. Remember to resuscitate to the point of "permissive hypotension" only. We do not want to over resuscitate and dilute their clotting factors. Be content with systolic BPs of 100 mmHg as long as perfusion appears adequate.
         4. Administer Tranexamic Acid (TXA) to acutely injured trauma patients based upon the following guidelines: (Refer to TXA Checklist)
            a. Indications:
               i. Evidence of massive hemorrhage.

ii. Signs of poor perfusion requiring volume resuscitation.
iii. Systolic BP less than 90 mmHg and /or heart rate >110.
iv. 18 years of age or greater.
v. < 3 hours from time of injury.

b. Contraindications:
i. > 3 hours from time of injury.
ii. Isolated head injury.
iii. Known hypersensitivity to TXA.
iv. Disseminated Intravascular Coagulation (DIC).
v. Active evidence of intravascular clotting/know history of active DVT, PE, or Embolic Stroke.
vi. Known active aneurysmal Subarachnoid Hemorrhage.
vii. Known to be on anticoagulants: Heparin, Warfarin, Pradaxa, Lovenox.
1. This is not an antidote to anticoagulants.

c. Adverse Reactions:
i. Hypotension with rapid administration – infuse at recommended rate no faster than over 10 minutes.
ii. Thrombosis but thrombotic events have been similar to placebo in clinical trials.
iii. Seizures have been described in overdose situations.

d. Administration:
i. Bolus 1 gram/100 ml over 10 minutes.

b. Maintain body temperature with circumferential wrap and space blanket as appropriate for weather conditions.

Contact Medical Command

1. If there is evidence of massive hemorrhage and the patient appears to be displaying signs and symptoms of early-compensated shock without hypotension or tachycardia, contact Medical Command to consider the administration of Tranexamic Acid.

Tranexamic Acid Check List

If all of the following can be checked regarding this patient you may proceed with the administration of Tranexamic Acid per protocol.

_____ **Less than 3 hours from the time of injury.**

_____ **There is evidence of or potential for massive hemorrhage.**

_____ **Signs of poor perfusion and systolic BP < 90 mmHg and/or a heart rate > 110.**

_____ **The patient is 18 years of age or greater.**

_____ **The patient is not an isolated head injury.**

_____ **There is no known allergy to Tranexamic Acid.**

_____ **The patient is not in DIC.**

_____ **There is no known active evidence of the following disease processes:**

- **Rupture cerebral aneurysm**
- **DVT**
- **Pulmonary embolism**
- **Stroke**

_____ **The patient is not known to be taking anticoagulants such as:**

- **Warfarin**
- **Heparin**
- **Pradaxa**
- **Lovenox**
- **Xarelto**

All of the above are checked so proceed with the administration of Tranexamic Acid per the Trauma – Multisystem Protocol. If not, and you feel the patient is a candidate, Contact Medical Command.

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TRAUMATIC ARREST PROTOCOL

Criteria: This protocol pertains to patients found pulseless and apneic following apparent traumatic injuries. It assumes that all of the appropriately applicable steps in the Trauma Multisystem Protocol have been addressed and that signs of advanced death or obviously lethal injuries are absent.

Protocol:

1. Confirm cardiopulmonary arrest. Continuously monitor ETCO2 as an indicator of ROSC.
2. Initiate 2 minutes of continuous chest compressions at 100 compressions per minute. During the remainder of the resuscitation limit any interruptions in chest compressions to as few as absolutely possible.
3. Clinically evident signs of a tension pneumothorax should be addressed immediately with needle decompression or a pig-tail chest tube. (Pig-Tail Procedure)
4. Intubate or insert advanced airway adjunct (King airway).
5. Assure adequate volume replacement is initiated.
6. Administer Epinephrine 1 mg IV/IO and repeat as indicated.
7. If no response and even if good breath sounds are noted place bilateral pig-tail chest tubes.
8. If no response perform Pericardiocentesis (Pericardiocentesis Procedure). This may be performed immediately upon the clinical diagnosis of a pericardial tamponade i.e.: hypotension, JVD, and muffled heart tones.
9. If at any point during your resuscitation there is the return of any sign of life (return of pulses and or spontaneous respiratory effort, ETCO2 maintained >40 mmHg.) continue aggressive resuscitative efforts and transport immediately to the nearest trauma center.
10. If there is no response to resuscitation and the environment is conducive to discontinuing resuscitative efforts, contact Medical Command for pronouncement. Refer to the Determination of Death in the Field protocol.

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VENTRICULAR ASSIST DEVICES

Criteria: This protocol pertains to those patients being transported that have a ventricular assist device implanted. These devices include: LVADs, RVADs, and BiVADs. The overwhelming majority of these transports will be Left Ventricular Assist Devices.

Protocol:

1. Maintain patent airway and provide supplemental O2 to keep sat ≥ 95%.
2. Protect and secure the driveline at all costs, do not allow any tension to be pulled on the driveline. This can lead to insertion site breakdown and introduce a potential site for infection.
3. Determine the type of VAD (AGH is currently using the Heartmate II, III, or the Heartware). All devices are now axial flow, there are no more pulsatile devices being implanted. If the patient is not an AGH patient you may encounter a different device.
4. Remember the patient with axial flow devices may not have a palpable pulse and these devices do not have a backup pump like the old pulsatile devices.
5. Bring all equipment with you including any back up drivers and power sources as well as any manuals.
6. Consult and bring a trained family member with you on the transport, if available.
7. Determine the patient's home medications.
8. Treat the patient not the device. Look for symptoms of hypoperfusion of altered mental status.
9. It is preferred to confirm initial BPs with a Doppler first. NIBP devices can be used if their pressures correlate with the initial Doppler pressure only. NIBP devices may work but can show a narrow pulse pressure.
10. Axial flow VAD patients should be maintained with a mean BP of 65-85 mmHg.
11. Pulse oximetry works but may have a dampened waveform.
    a. These devices are very volume dependent. Treat "LOW FLOW" alarms with IV hydration. Boluses of 250 ml of Normal Saline to assure an adequate preload and reassess. Hold boluses for signs of severe failure, protect airway as indicated.
12. Maintain the required "fine" preload and afterload balance. Treat hypertension aggressively. For a MAP (Doppler Pressure) >100 mmHg:
    a. Labetolol 20 mg IV/IO q 10 minutes X2 doses, contraindicated in bradycardia.
    b. If the patient is bradycardic: Hydralazine 10 mg IV/IO, may repeat 10 – 20 mg q 10 min X 2 doses.
13. Treat V-fib and V-tach.
    a. Asymptomatic patients treat with volume replacement first, Pharmacology, then Defib/Cardioversion (per Vfib-Vtach protocols).
    b. Symptomatic patients defibrillate, no need to disconnect VAD controller.

14. If a VAD patient is unconscious:
    a. Auscultate over the epigastric area to determine if the device is still working. Functioning devices produce a low pitched humming sound. The Heartmate III has a pulsatile mode that gives it a very characteristic "revving" sound. This is normal.
    b. Determine a blood glucose level to rule out hypoglycemia.
    c. If the device is not working, the patient is unresponsive, and signs of poor perfusion are present, check the power source and connections. Enlist the help of families to assure batteries are charged and connected appropriately. Compare the device to the "Mechanical Circulatory Support Organization's" VAD reference for troubleshooting.
    d. If still not functioning; confer with the family to confirm the patient's wishes regarding resuscitative efforts then discontinue or start CPR and further resuscitative efforts as indicated.

Contact Medical Command:

1. As soon as possible upon determining if a VAD is:
    a. Non-functional.
    b. Not referenced in available material.
    c. Not responding per referenced material.
2. Any questions you may encounter. Remember that you can request a consult with the VAD support specialist on-call as well.

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ECMO Transports

Purpose: **To review important considerations regarding the performance of an ECMO rotor wing or ground transport by a LifeFlight team.**

Overview: ECMO (Extra Corporeal Membrane Oxygenation) transport is a specialty transport that requires planning from all team members before the mission is initiated. Generally a period of 30 minutes is required by the flight crew to adequately prepare equipment and receive medic command report before a crew will depart its base for a flight or CCGT.

1. ECMO can only be done by CCGT or in an EC 145 aircraft. If an IABP is present, it is LifeFlight's policy to request to disconnect the IABP for transport, otherwise the patient must be transported by CCGT. There is not room in the a/c for both the ECMO and IABP, not to mention that their simultaneous use is contra-intuitive.

2. Nursing crew should refer to the ECMO RN Transport Checklist (Attachment A) and receive medic command report (Attachment B) before leaving base. A crew receiving an ECMO flight alert while in flight should return to base before starting mission.

3. The ECMO team will consist of two flight nurses and one perfusionist. Referring facility may send their own perfusionist but most likely an AGH perfusionist will be used. The aircraft will go to AGH to get the PAC RAC mount and the AGH perfusionist if necessary. The AGH perfusionist will bring the LifeFlight approved equipment bag with their desired equipment.

4. If bleeding has been a problem for the patient, medic command should have the patient typed and crossed and have blood products available as needed at bedside. Flight nurses may administer fluids, blood products, and vasoactive medications per the perfusionist's recommendations to maintain required ECMO flow.

5. After the mission is completed a CQI form, will be completed in order to review mission issues, problems, & concerns to improve further ECMO missions.

Aircraft Configuration

Remove LBB, Pedi board, & state bag.
Vent bag must be repositioned to another area and secured.
Turn assessing nurse seat so it is aft facing.
Obtain PAC RAC mount at AGH and stow behind charting nurse seat during flight. (Not approved to be attached to the stretcher during any phases of flight)

Bed Side Considerations

Take LP 12, trauma bag, portable O2, PAC RAC mount, arterial line & other equipment as necessary to the bedside.

ECMO – The Perfusionist will prepare the ECMO equipment for transport. They are a great asset for patient care issues and logistics, use them.

RN's- Assess patient, update report, apply cardiac monitor, and prepare IV pumps, ventilator and IABP. Have a dedicated central IV line available for fluid administration. ***Depending on the type of ECMO, you may not obtain a*** **PULSE, NIBP, SPO2, or ETCO2 readings**.

ECMO Transport Considerations Protocol:

1. Confirm ETT placement, size, and depth.
2. Maintain minimal ventilator settings (copy them over from the vent at bedside) keeping ventilator pressures and volumes low.
3. Determine if any IV infusions are "non-essential" or can be converted to IV push PRN during transport.
4. Switch all essential IV infusions to transport pumps.
5. Label and secure all IV lines and sites, in particular, clearly identify and keep visible all sites available for medication administration.
6. Monitor arterial line and PA pressures on the cardiac monitor. Evaluate the PA catheter waveform. If not in the pulmonary artery, have it advanced or pulled back to the RA. Remember that RV placement will cause ventricular ectopy.
7. Monitor and try to maintain ETCO2 35 to 45 mmHg.
8. Administer IV fluids, blood products, and vasoactive medications per the Perfusionist's recommendations to maintain required ECMO flow. Document strict I/Os.

9. Monitor continuous ECG and NIBP.

10. Consider monitoring core temperature when such capabilities exist.

11. Confirm all ECMO arterial and venous lines are secured by suture or similar method.

12. Evaluate all surgical and vascular sites regularly for bleeding, especially after each move. Document these checks.

IABP-Plug the IABP in to charge ABS. Timing not critical. IABP will give you an arterial line to monitor. You may only obtain a MAP.

Ventilator- Likely not required ABS- if not bag the patient. Ventilator if used may be attached to head of stretcher on Fairfield rail. Oxygenation comes from ECMO. It is important to ventilate the patient to prevent atelectasis and for CO2 removal.

Pacemaker/ other equipment: Borrow referring facility pacemaker if patient requires A/V sequential pacing. If not, attach our transvenous pacemaker to the ventricular leads and pace the ventricles at a corresponding rate. For transports requiring return of perfusionist, consider using their IV pumps- they can be returned when perfusionist is returned.

Transfer to LF stretcher. Secure PAC RAC mount to the stretcher and secure ECMO equipment on PAC RAC with straps. Portable O2 tank required for ECMO. NOTE: CCGT requires patient be positioned with patient's head at the foot of the stretcher near the controls. Stretcher will be loaded normally into ambulance. Transfer patient to aircraft or ambulance.

LOADING PATIENT IN AIRCRAFT:
Position stretcher for loading. Remove ECMO equipment and put on aircraft floor aft of the IABP floor mount. PAC RAC mount is not approved for in flight use and must be stowed behind charge nurse seat during flight. Load patient as usual into aircraft taking care not to kink ECMO lines. Secure ECMO equipment to aircraft floor with two cargo straps in an X configuration. Assist perfusion in connecting ECMO power cord and low flow O2 source.


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ON

LOADING PATIENT IN AN AMBULANCE FOR CCGT:

Load ECMO cart first and *THEN STRETCHER NORMALY* in the ambulance. ECMO will be positioned in the area of the airway seat. Perfusion will provide direction. IABP if present will be secured at foot of stretcher.

Note: All equipment must be secured during transport in the aircraft and on CCGT. The transport cannot be initiated or continued if all equipment cannot be appropriately secured (strapped down).

ENROUTE:

Perfusionist will sit in the assessing nurse seat. Assessing nurses will administer medications, fluids, and blood products via peripheral or central venous access.

SPECIAL CONSIDERATIONS- CARDIAC ARREST

Seek perfusionist advice. VF/VT- Defibrillate as necessary. Use caution with defibrillation and CPR if instruments are in the chest. Asystole - Use the pacemaker. No need for immediate CPR as ECMO will deliver blood flow regardless. If patient does not respond, contact medic command for further orders.

UNLOADING PATIENT FROM AIRCRAFT:

Unload stretcher in normal fashion. Reinstall PAC RAC mount on stretcher. Remove ECMO from a/c and place on PAC RAC mount and secure. Portable O2 tank required for ECMO. Transfer to receiving facility.

Developed 01/12: T. Johnston RN, T. Farragher RN, P.S. Martin MD
Reviewed 1/16
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LifeFlight ECMO RN Transport Checklist
Policy C 16 Attachment A
01/04/13

___ Medic Command Report BEFORE leaving base.
___ LOX minimum of 2.0
___ Two full O2 D cylinders.
___ Trauma bag
___ Pacemaker
___ Narcotics/ Med box
___ Canonsburg bag
___ Blood/ cooler
___ Cell phone 412-359-3333 (Medic command)
___ IABP bag
___ Ventilator / vent bag
___ IV pumps X2 & chargers.
___ Obtain PAC RAC mount at AGH. (flights)
___ IABP pump and bag if IABP present. CCGT ONLY.
___ If patient has an IABP have command suggest disconnecting it for flight. If not this is a CCGT.

Allegheny General Hospital
LifeFlight Protocols
Adult Protocols
Version 2016

ECMO Medical Command REPORT/ Checklist
Policy C-16 Attachment B
08/04/13

NAME: _____ Age: _____Weight: _____

Diagnosis: **PMH:**

Neuro:

Allergies:

Vitals: **Labs:**

Rhythm:

IV Drips:

Peripheral IV sites:

ECMO:	**V/A**	**V/V**	**Canulation sites _____**
Chest Tubes	**YES**	**NO**	**Site _____ Suction ____ Stable if clamped?**
Chest Open	**YES**	**NO**	**Site _____ #dressings _____ # instruments _____**
Ventilator	**YES**	**NO**	**Pres/Vol. TV____ FiO2 ____ SIMV/AC Rate ____ PS ___ PEEP ____**
Pacemaker	**YES**	**NO**	**Site _____ Settings: rate ____ mA _____ sensitivity _____**
Art line	**YES**	**NO**	**Site _____**
PA catheter	**YES**	**NO**	**Site _____**
Multi lumen	**YES**	**NO**	**Site _____**
IABP	**YES**	**NO**	**Site _____ IABP=GROUND TRANSPORT ONLY! Brand _____ Size _____ Settings 1:1 1:2 1:3 Fiber optic? YES NO *Ask for 2nd arterial line if possible.**

LifeFlight ECMO Transport Dispatch Checklist
Attachment C
08/04/13

ECMO Flight

___ Notify referring/ receiving facility extra assistance is required for patient transfers.

___ A perfusionist is required.

a. Referring facility may send their own perfusionist but they can only send one person. If they require more personnel (FRHC) the transport will have to be a CCGT.
b. If needed AGH perfusionist on-call will go. Pager # 7521 and likely will be coming from home. Aircraft will come to AGH to pick up perfusionist if necessary.

ECMO CCGT

___ Large box (type I or III) ambulance.
___ Working inverter or generator with 2 electrical outlets.
___ Main O2 is full.
___ Portable O2 E size preferred (2)
___ 2 crew members

___ **IABP** Yes/ No. If yes, notify the crew. CCGT only.
___ Fiber optic balloon? If yes notify crew.

___ **VENTILATOR** Yes/ No. If yes, notify the crew.

EMERGENCY PERICARDIOCENTESIS PROCEDURE

Person(s) who may perform to procedure:
LifeFlight Nurse or Physician.

Purpose: To remove sufficient (just enough) fluid from the pericardial sac to alleviate tamponade physiology and hemodynamic compromise.

Indications: Patients with known or suspected cardiac tamponade. Possible symptomatology: Beck's triad (i.e., hypotension, jugular vein distention, and muffled heart tones.) and/or paradoxical pulse. Also, as an integral component of the Trauma Arrest Protocol.

Contraindications:
Performance of this procedure in a patient who is hemodynamically normal.

Equipment: Utilize the COOK Percardiocentesis and Thoracentesis Set

Procedure: It is an expectation that the Nursing documentation include rationale for performing the procedure, and pertinent assessment of the patient prior to, during and after the attempt of this procedure.

A. Prep the xiphoid region with Chloraprep or Betadine and a sterile drape. Use sterile gloves for this procedure.
B. If the patient is conscious infiltrate the left xiphocostal region with 1% or 2% Lidocaine for local anesthesia.
C. If the patient has an ECG rhythm, constant ECG monitoring can be performed by attaching a V or red lead to one end of the alligator clip cable and the other end to the hub of the introducer needle.
D. Using a sterile scalpel make a 0.5 cm cut just to the left of the xiphoid.
E. Insert the introducer needle, into the cut, directed toward the left shoulder (pointed toward the top of the left scapula) at a 30° angle from the horizontal plane.
F. Advance approximately 2 cm then remove the inner stylet and attach a syringe.
G. Continue advancing the introducer needle with continuous aspiration applied by the syringe.
H. Stop if you see an injury pattern on the ECG, ectopy, or you aspirate blood/fluid.
I. A negative tap is defined as the development of ECG changes or the aspiration of > 100 ml of blood/fluid without clinical improvement in the patient. If these occur the procedure can be discontinued.
J. If the aspiration of blood/fluid results the clinical improvement of the patient, then the introducer needle needs to be replaced by the drainage catheter, using the following steps.

K. Slide the red Safe-T-J wire guide straightener over the flexible J portion of the guide wire. Seat the straightener in the hub of the introducer.
L. Advance the guide wire through the introducer and into the pericardial sac. The wire should advance without impedance.
M. Leaving the guide wire in place, remove the introducer.
N. Put the stiffening cannula into the drainage catheter.
O. Advance the stiffening cannula/drainage catheter until the tip is just posterior to the muscle fascia. In a thin person this would be less than 3 to 5 cm.
P. Hold the catheter and guide wire in place, then with a twisting motion remove the stiffening cannula.
Q. Advance the catheter into the pericardium. Note: The guide wire should always extend beyond the catheter tip.
R. Remove the guide wire.
S. Attach the connecting tubing/stopcock to the drainage catheter and aspirate.
T. Continuously reassess the patient and aspirate as the patient's clinical condition indicates.

Complications:

A. False negative assessment resulting in organ injury.
B. Pneumothorax.
C. Myocardial or coronary vessel laceration resulting in hemopercaridum.
D. Venous air embolism
E. Dysrhythmias.
F. Cardiac arrest/death.

Reviewed 1/16
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ABIOMED IMPELLA VENTRICULAR ASSIST DEVICE TRANSPORT

Purpose: To review important considerations regarding the performance the transport of a patient with the Abiomed Impella.

Person who may Perform: LifeFlight Registered Nurses

About the Impella System

The Impella (Abiomed Inc.) is an intravascular microaxial blood pump that supports a patient's circulatory system. The Impella catheter is inserted through the femoral or axillary artery into the left ventricle, or in the case of the LD, surgically via the ascending aorta. When properly positioned, the Impella delivers blood from the inlet area, which sits inside the left ventricle, through the cannula, to the outlet opening in the ascending aorta. Users monitor the correct positioning and functioning of the Impella on the display screen of the Automated Impella Controller.

Patient Transport with the Impella System

Patients placed on the Automated Impella Controller for either partial Impella 2.5 or full Impella 5.0 or LD circulatory support for periods up to 6 hours may be safely transported. Maintaining optimal patient hemodynamic status and correct Impella position are two key factors in managing patients during transport.

Types of Impella Devices

The Impella *2.5* provides 2.5 L/min flow via a peripherally inserted 9 french catheter through a 13 french femoral artery introducer. The Impella 5.0 provides 5 L/Min flow, is a 23 french central catheter and must be placed by femoral or subclavian surgical cutdowns. The Impella controller is a one-piece unit

Important Considerations

- Planning is critical to success. Abiomed representatives can help with planning for transport. They can be contacted 24 hours a day at 1-800-422-8666. Abiomed representatives may be at the bedside.
- The automated Impella Controller should be fully charged prior to transport. Keep the controller connected to AC power when possible.
- Do not stress the connector cable from the controller to the Impella Catheter. Such tension could move the catheter out of correct position and compromise patient circulatory support.
- Carefully monitor the purge pressures during changes in altitude.
- The controller should be positioned to allow easy access to the display screen and soft buttons to view alarms and make any necessary changes.

- Medical Command will make certain that patients are anticoagulated prior to transport. Anticoagulation labs will not be monitored during transport.
- Place the red Impella plug at the level of the patient's heart during transport.
- Decrease the flow rate if CPR is necessary.
- The Controller is designed to operate at least 60 minutes on battery power.

LifeFlight Procedures

1. The Abiomed Impella can be transported by CCGT or in an EC 145 aircraft. If an IABP is present it must be transported by CCGT. Note: This is unlikely as the two devices work against one another and the Impella representative will likely have had the referring discontinue to IABP or at least turn it off.
2. Nursing crew should refer to the ECMO RN Transport Checklist (Attachment A) and receive medic command report (Attachment B) before leaving base. A crew receiving an Impella flight alert while in flight should return to base before starting the mission.
3. A Perfusionist ***will not accompany*** patient.

Aircraft Configuration
Remove LBB, Pediatric board, & state bag.
Vent bag must be repositioned to another area and secured.
Turn assessing nurse seat so it is aft facing.

Bed Side Considerations
Take cardiac monitor, trauma bag, portable O2, arterial line & other equipment as necessary to the bedside.

RN- Assess patient, update report, apply LP 12, and prepare IV pumps, ventilator and IABP. Have a dedicated central IV line available for fluid administration.

Additional Impella Device Info:

1. Confirm Impella placement by echocardiography or fluoroscopy.
2. Note depth of insertion of catheter and tighten Tuohy bore on the catheter to prevent catheter migration. (Tighten all the way to the right)
3. We will take their Impella controller and return it back to the referring facility as soon as possible.
4. Contact 24-hour clinical support line (1-88-422-8666) with questions or concerns.
5. Unplug the Automated Impella Controller from AC power.
6. Rotate the T-knobs to unlock the controller from the cart.
7. Remove the purge solution from the IV pole on cart and place it on the IV pole of stretcher or transport vehicle.
8. Controller must be secured during transport..

Nursing Considerations:

1. Confirm ETT placement, size, and depth.
2. Maintain minimal ventilator settings (copy them over from the vent at bedside) keeping ventilator pressures and volumes low.
3. Determine if any IV infusions are "non-essential" or can be converted to IV push PRN during transport.
4. Switch all essential IV infusions to transport pumps. Try to wean the patient off of vasopressor agents if possible. Remember that the Impella is a VAD and vasopressor agents can severely limit its output.
5. Label and secure all IV lines and sites, in particular clearly identify and keep visible all sites available for medication administration.
6. Monitor arterial line and PA pressures on cardiac monitor. Evaluate the PA catheter waveform. If not in the pulmonary artery, have it advanced or pulled back to the RA. Remember that RV placement will cause ventricular ectopy.
7. Monitor and try to maintain ETCO2 35 to 45 mmHg.
8. Administer IV fluids, blood products, and vasoactive medications per protocol. Document strict I/Os.
9. Monitor continuous ECG and NIBP.
10. Consider monitoring core temperature when such capabilities exist.
11. Confirm all Impella lines are secured by suture or similar method.
12. Evaluate all surgical and vascular sites regularly for bleeding and note the depth of the Impella catheter especially after each move. Document these checks.

IABP. Plug the IABP in to charge ABS. IABP will give you an arterial line to monitor. If the IABP is still in place but has been turned off, manage it via the IAPB policies and protocols.

Ventilator- Ventilator if used may be attached to head of stretcher on Fairfield rail.

Pacemaker/ other equipment: Attach LF transvenous pacemaker to the ventricular leads and pace the ventricles at a corresponding rate. Borrow referring facility pacemaker if patient requires A/V sequential pacing.

Transfer patient to LF stretcher. The Impella controller has a bracket that allows it to hang from the stretcher siderail during transfer to ambulance or aircraft.

Loading Patient into Aircraft:
Position stretcher for loading. Remove Impella controller and put on aircraft floor aft of the IABP floor mount. Load patient as usual into aircraft taking care not to kink Impella lines.

Secure Impella controller to aircraft floor with two approved floor straps. Impella controller should be plugged into AC power.

Loading Patient into an Ambulance:
Position Impella controller where convenient and secure with 9' strap. Plug unit into AC power.

> **Note:** All equipment must be secured during transport in the aircraft and on CCGT. The transport cannot be initiated or continued if all equipment cannot be appropriately secured (strapped down).

Enroute:
Assessing nurse will administer medications, fluids, and blood products Monitor flow rate and speed every 10 minutes using the flowsheet.

Unloading Patient from Aircraft:
Unload stretcher in normal fashion. Remove Impella controller and hang on side rail.

Post Flight:
After the mission is completed a CQI form will be completed in order to review mission issues, problems, & concerns.

Special Considerations:

1. **CARDIAC ARREST**

VF/VT- Defibrillate as necessary. Asystole - Use the pacemaker. No need for immediate CPR as Impella will deliver blood flow regardless. If patient does not respond, contact medic command for further orders.
Remember that a patient with the 2.5 L/min Impella will have a pulse while the 5 L/min version may not.

2. **MALPOSITIONING OF CATHETER**

Should you receive a malposition alarm this indicates either the device has fully entered the left ventricle or it has migrated back into the ascending aorta. Flight RNs may use the controller to assist in repositioning of the Impella.

Reference: "Patient Transport with the Automated Impella Controller,"
Abiomed Inc. December 2011

Developed 09/12 T. Johnston RN
Reviewed 1/16
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MECHANICAL VENTILATION
(Pulmonetic LTV 1200 Ventilator)

Criteria: To optimize oxygenation and ventilation of endotracheally intubated patients. The ventilator is particularly recommended for patients in ARDS, those where bag-valve ventilation cannot maintain acceptable saturations, transport times exceeding 30 minutes, or any situation in which mechanical ventilation would facilitate management of the patient.

Contraindication:

Patient weight less than 5 kg.

Protocol:

1. Choose a power source (AC Adapter, LI ION Battery, or Lead Acid Battery).
2. Connect to the power source. If using Battery power note the battery time left as indicated by the Battery warning lights:
   a. Green indicates 1 hour.
   b. Yellow indicates 30 minutes.
   c. Red indicates less than 5 minutes of battery time.
3. Choose a circuit: Adult circuits for patient weigh> 20 kg and Pediatric for ≤20kg.
4. Connect the circuit to the LTV via the 22 mm adapter and filter.
5. Connect the "sense lines" to the LTV.
6. Turn to the LTV.
7. Patient Setting:
   a. Same Patient will display first, if it is the same patient that was previously on the vent, press the Select button
   b. If it is a new patient: Rotate the Set Value Knob clockwise until "New Patient" is displayed. Press the Select button to select "New Patient".
8. Set for Patient Size: Rotate the Set Value Knob clockwise to the correct patient size and press the Select button.
   a. Infant (5 kg to 20 kg)
   b. Pediatric (20 kg to 40 kg)
   c. Adult (> 40 kg)
9. Connect the circuit to the ET-tube or BiPaP mask. **Note: All endotracheally intubated patients must have the ET-tube placement confirmed according to protocol and must have continuous EtCO2 monitoring.**
10. If you are the first to put the patient on the ventilator you may utilized the built in "presets" and make adjustments accordingly or proceed with the following:
    a. Select between Volume (most common) or Pressure Ventilation.
    b. Select between Assist Control (most common) or SIMV.
    c. Set Rate to maintain EtCO2 at 35 to 45 mmHg (or prior acceptable value).

d. Set the Tidal Volume; usually 6 – 8 ml/kg of the patient's ideal body weight.
e. The Inspiratory Time (I – time) can be set but is usually at 1 second unless you are providing inverse ratio ventilations.
f. Set the FiO2; usually 100% for our patients unless otherwise indicated by Medical Command.
g. Set the Sensitivity; Pediatric patient's usually 2 to 3, Adults 3 to 5. (If the patient is awake, set the sensitivity where the patient can take a spontaneous breath without autocycling the vent).
h. Set the High Pressure Limit Alarm.
i. Set the Low Pressure Limit Alarm.
j. Set the Low Minute Volume Alarm.
k. Set the PEEP to 5 cm H20. If you need to increase PEEP to maintain sats notify Medical Command immediately.

11. If the patient is already on a ventilator:
    a. Assess the patient's status on the current ventilator settings. (Use EtCO2, pulse oximetry, and ABGs if available.) If the saturations are acceptable and the ETCO2 or PaCO2 are low, your ventilator settings may never be adequate to compensate as well as the patient is doing. Caution utilizing chemical paralysis especially in severe metabolic acidosis.
    b. If the patient's pulmonary status is acceptable on the current settings, copy them over to the LTV 1200 and continue to reassess.
    c. If the patient's pulmonary status is not acceptable proceed by adjusting settings using steps a through k above as indicated.
12. If the patient is already on Pressure Control Ventilation, at the referring, place them on the same settings. If adjustments need to be made contact Medical Command. Pressure Control Ventilation requires excellent sedation of the patient and possibly even chemical paralysis. The decision to use chemical paralysis requires thorough evaluation of the patient's condition using techniques outlined above in 11.a.
    a. If the patient is not oxygenating or ventilating appropriately with maximized Volume Control Ventilation and you are discussing changing to Pressure Control (PCV), Contact Medical Command for approval. Once approved set up PCV using the following steps.
        i. PCV requires appropriate paralysis and sedation of the patient.
        ii. Set the rate to 10 breathes per minute.
        iii. Select PCV.
        iv. Set PC to 25 cmH20. Peak Inspiratory Pressure (PIP) will be this number + PEEP.
        v. Set Inspiratory Time to 3 seconds (an I:E ratio of 1:1).
        vi. Decrease the sensitivity by setting the number to an 8 or 9 (the least sensitive) to prevent auto-cycling.
        vii. Set the PEEP to 5 cmH2O.
        viii. Try to maintain an approximate VTE (Expiratory Volume) of 6 to 8 ml/kg by first titrating the PC in 5 cmH2O increments, then the PEEP (if

ix. necessary) remember PIPs (PC + PEEP) should not exceed 40 cmH2O unless that is what is required to maintain an adequate oxygen saturation and you have secured a Medical Command order to do so.
x. If the patient's oxygen saturations respond well to these adjustments, PCV will work for this patient.
xi. Monitor ETCO2 closely, if it shows a trend of rising you may want to increase the respiratory rate to prevent the development of a respiratory acidosis. When this is done, keep the I:E ratio 1:1. This can be done in the following manner:
    1. Increase the rate to 12.
    2. To keep a 1:1 I:E you must decrease the Inspiratory time to 2.5. (60 sec. per minute / 12 breaths per min. = 5 sec. per breath. Inspiratory time 2.5 sec. and Expiratory time 2.5 sec. = 1:1.
    3. If the ETCO2 continues climbing you can increase the rate to 15.
    4. To maintain the 1:1 I:E decrease the Inspiratory time to 2. (60 sec. per minute / 15 breaths per min. = 4 seconds per breath. Inspiratory time of 2 sec. and Expiratory time 2 sec. = 1:1.
    5. Note: Using rates >20 breaths per minute takes us to Inspiratory times of approximately1 second or less giving us no benefit over Volume ventilation.

13. Document the following ventilator parameters on all patients at the institution of ventilations and if any changes occur during the transport.
    a. Volume or Pressure Control Ventilation (include Tidal Volume/Pressures)
    b. Rate
    c. FiO2
    d. PEEP
    e. Peak Inspiratory Pressure
    f. Any other parameters that may be unique to the case.
14. BiPAP / Non-invasive Ventilation
    a. The patient must be awake with intact airway reflexes.
    b. Select the appropriately sized mask.
    c. Initial pressures should be IPAP of 10 and EPAP of 5 cm H20.
    d. Remember the IPAP on this vent will always be 5 cm H20 above the PEEP therefore select the following settings:
        i. Set Pressure Support to 5 cm H20.
        ii. Set the PEEP to 5 cm H2O.

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BOUSSIGNAC CPAP

Indications:

1. To continue CPAP already initiated by EMS or referring hospital when an LTV 1200 ventilator is not available to provide BiPAP.

2. To initiate CPAP for conscious patients in respiratory distress when an LTV 1200 ventilator is not available to provide BiPAP.

Contraindications:

1. Unresponsiveness, or if the patient is unable to protect their own airway.
2. BiPAP is always preferred over CPAP due to better patient comfort and compliance.

Protocol:

1. Connect the CPAP extension to a source of oxygen capable of delivering up to 15 to 30 1pm.
2. Fit the mask snuggly on the patient's face and secure with straps.
3. Connect the manometer between the mask and the CPAP device.
4. Gradually turn on the oxygen until a flow rate of 15 1pm is reached.
5. Seal any air leaks by adjusting the straps inflating the cuff on the mask.
6. Adjust the flow meter to achieve the desired CPAP pressure. Start at 5 to 10 cm of H20.
7. Do not exceed 10 cm of H20 without advising Medical Command.
8. Patients on CPAP will have continuous pulse oximetry monitoring.
9. COPD patients should have EtC02 monitored by placing the nasal device under the CPAP mask. If you note rising EtCO2 and decreased mental status then CPAP must be discontinued.
10. If the patient becomes obtunded or looses the ability to protect their airway proceed to discontinue CPAP and proceed to the RSI Protocol as indicated.

Contact Medical Command

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PIG-TAIL CHEST TUBE THORACOSTOMY PROCEDURE

Person(s) who may perform the procedure:

LifeFlight Nurse or Physician

Purpose:

To re-expand the lung to as normal ventilation as possible in instances of tension pneumothorax or a large symptomatic pneumothorax. It can also be used in some instances to relieve symptoms in a hemothorax. Symptomatology may include any of the following: poor respiratory exchange, cyanosis, asymmetric chest wall movement, decreased or absent breath sounds, hyperresonance, distended neck veins, tracheal shift, circulatory collapse or shock. To be performed (as part of protocol) on all trauma arrests that have not responded to airway control and IV fluid resuscitation (sooner if obvious signs of tension pneumothorax are present).

Contraindications:

None

Procedure:

It is an expectation that the Nursing documentation include the rational for performing this procedure, pertinent assessment of the patient prior to, during, and after the attempt of the procedure. Pig-tail Chest Tube Thoracostomy is preferred to Needle Thoracostomy, for the treatment of pneumothorax. However, Needle Thoracostomy can be performed in this instance if the appropriate time or equipment is not available.

A. Elevate the head of the bed or backboard to a 35-45 degree angle. (The level of the diaphragm can rise to the 2^{nd} or 3^{rd} intercostal space when the patient is in a supine position. This decreases the risk of intra-abdominal placement or injury to the diaphragm).
B. Locate the point of insertion on the affected side:
    a. 2^{nd} intercostal space, mid-clavicular line (air), across the top of the 3^{rd} rib.
    b. 4^{th} intercostal space, mid-axillary line(blood), across the top of the 5^{th} rib. (Needle Thoracostomy only)
C. Prep the skin with antiseptic solution and drape site.
D. Local infiltration of 2 to 5ml of 1% or 2% Lidocaine may be considered. For placement of a Pig-tail chest tube, use this infiltration to determine the approximate thickness of the chest wall.
E. Use the prepackaged scalpel to make a 1cm opening at the site to facilitate tube placement.
F. Using sterile gloves prepare the Pig-tail chest tube for placement. Grasp the chest tube at the length of the approximate chest wall thickness, as determined above.

G. Insert the chest tube to the predetermined depth (over the 3rd rib), remove the stylet and attach a syringe to confirm that you have entered the pleural space. If you cannot draw back air, replace the stylet and advance the chest tube. Repeat this procedure until air can be easily aspirated from the chest tube. Needle Thoracostomy is performed in the same manner but can also be placed in the 4th intercostal space mid-axillary line to remove air or blood (be certain to confirm placement by aspirating air with a syringe).
H. Once you have entered the pleural space, advance the chest tube at least until the first black line, to be certain that all of the chest tube holes are under the skin. To confirm placement, you can attach a syringe and should be able to draw back air.
I. Once you have confirmed placement of the chest tube, secure the tube with suture or a large occlusive dressing and attach a Heimlich Valve. The Pig-tail chest tube can also be attached to a pleurevac system.
J. Continuously reassess the patient's ventilator and hemodynamic status. If the chest tube does not seem to be working and you cannot aspirate air with a syringe, consider removing the securing material and rotate the chest tube 180 degrees. This should free up the end of the chest tube and allow it to continue draining. If this does not work you may have to remove and replace the chest tube depending upon the patient's ventilator and hemodynamic status.

Complications:

1. Local Cellulitis
2. Local Hematoma
3. Pleural Infection or Empyema
4. Pneumothorax
5. Intercostal Artery, Vein or Nerve Disruption
6. Internal Mammary or Internal Thoracic Artery Disruption
7. Solid or Hollow Viscous Injury

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INTRAOSSEOUS INFUSION/EZ-IO PROCEDURE

Person(s) who may perform the procedure*:* LifeFlight RN or Physician

Purpose*:* To provide fluid resuscitation/medication administration.

Indications: IV fluids or medications needed and a peripheral IV cannot be established in 2 attempts or 90 seconds AND/OR in patients who exhibit 1 or more of the following:

-An altered mental status (GCS 8 or less).
-Respiratory compromise
(SaO2 80% after appropriate oxygen therapy, respiratory rate <10 or > 40)
-*Hypolvolemic shock of any etiology.*

Contraindications:

-Fracture of the tibia or proximal humerus. (consider alternative site).
-Previous orthopedic procedures (Hx: IO within 24 hours, knee or shoulder replacement)
(consider alternate tibia).
-Pre-existing Medical Condition (tumor near site or peripheral vascular disease).
-Infection at insertion site (consider alternate site).
-Inability to locate landmarks (significant edema).
-Excessive tissue at the insertion site.

Equipment:

EZ-IO Driver
EZ-IO Needle Set
***Adult Needle FDA approved for age 12 (40 kg) and up**
***Peds Needle FDA approved for Neonate (3kg) to age 12 (39kg)**
****Caution utilizing the EZ-IO driver on patients < 3kg. Do Not Apply Pressure.**
Chloraprep
IV or Extension Set
10 ml Syringe
Tape or Gauze
Pressure Bag
2% Lidocaine (Preservative Free)
1% Lidocaine (optional)

Considerations:

Flow Rates:

Due to the anatomy of the IO space you will note flow rates to be slower than those achieved with IV catheters.
-Ensure the administration of a 10 ml rapid bolus (flush) with a syringe.
-Use a pressure bag or pump for continuous infusions.

Pain:
Insertion of the EZ-IO in conscious patients causes mild to moderate discomfort and is usually no more painful than a large bore IV.
-You may consider local infiltration of 1% Lidocaine.

IO infusion can cause severe discomfort for conscious patients.
-Prior to IO bolus or flush on an alert patient, SLOWLY administer 20 to 50 mg 2% Lidocaine (Preservative Free) through the EZ-IO hub.

Precautions: The EZ-IO is not intended for prophylactic use.

Procedure: Document rationale for performing this procedure; assessment of the patient prior to, during, and after the attempt of inserting the EZ-IO.

-Universal precaution measures.
-Determine EZ-IO Indications.
-Rule out contraindications
-Locate insertion site (Locate the tibial tuberosity 2 finger widths below the patella then go 1 finger width toward the flat surface of the tibia or utilize the humeral head)
-For conscious patients, you may consider local anesthetic (1% Lidocaine) at insertion site
-Prepare the EZ-IO driver and needle set
-Stabilize the leg or arm and insert EZ-IO needle set
-Remove EZ-IO driver from needle set while stabilizing catheter hub
-Remove stylet from needle set, secure stylet
-Confirm placement
-Connect primed EZ-Connect
-Conscious patients should now receive 20-50 mg 2% Lidocaine (Preservative Free) IO
-Flush or bolus the EZ-IO catheter rapidly with 10 ml of normal saline using a 10 ml syringe
-Place pressure bag or infusion pump of solution being infused where applicable
-Begin infusion
-Dress site, secure tubing and apply wristband
-Monitor EZ-IO site and patient condition
-If the Humeral head was used, secure that arm to the body to prevent rotation of the humeral head and accidental dislodging of the IO needle.

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NEEDLE THORACOSTOMY PROCEDURE

Purpose:

To provide a rapid means for the treatment of a tension pneumothorax, bilateral pneumothoraces or a large percent unilateral pneumothorax**.** When conditions do not allow for enough time to place a pig-tail chest tube.

Objective:

To re-expand the lung to restore as normal ventilation as possible. A tension pneumothorax, bilateral pneumothoraces, or a large percent unilateral pneumothorax which compromises respiratory status are the only true life-threat situations in which prompt intervention, without confirmative procedures, i.e. Chest X-Ray, is necessary.

Indications:

1. Poor respiratory exchange, cyanosis.
2. Asymmetrical chest wall movement.
3. Decreased or absent breath sounds.
4. Hyperresonace.
5. Distended neck veins
6. Tracheal shift
7. Circulatory collapse/shock.

Insertion Procedure:

1. Identify presence of a tension pneumothorax, bilateral pneumothoraces, or a large percent unilateral pneumothorax.
2. Position the patient in a semi-upright position at a 45 degree angle if possible (C-Spine injury has been ruled out). Insertion of the chest needle while the patient is laying flat increases the chance of injury to the diaphragm, which can rise as high as the 2^{nd} or 3^{rd} intercostal space.
3. Locate the point of insertion on the affected side:
   a. 4^{th} intercostal space, mid-axillary line (blood)
   b. 2^{nd} intercostal space, mid-clavicular line (air)
4. Insertion below the 5^{th} intercostal space increases the odds of injuring the patient's liver/spleen
5. Prepare the skin in the area using the appropriate antiseptic solution
6. A large bore catheter covered needle should be inserted at the prepared site sliding up over the top of the rib. By "hugging" the top of the rib, the intercostal arteries which run beneath each rib are avoided. The pop of the pleura identifies passage into the pleural cavity. If a tension pneumothorax is present, there will be a rush of air and dramatic relief of symptoms. The needle should then be removed, and the catheter connected to a Heimlich Valve.

7. Utilize the following catheters
    - **A. Adult 12-14 gauge French (3in length)**
    - **B. School age child use a 14-16 gauge French**
    - **C. Preschool child 16-18 gauge French**
    - **D. Neonate 18-22 gauge French.**
8. If needed for drainage purposes, the Heimlich valve may then be connected to a foley collection bag for accurate measurement of drainage. Remember that if the patient is then to be flown, to make pin holes in the top of the Foley bag so as not to airtrap and cause a tension pneumothorax
9. Secure the catheter and Heimlick valve with tape and dress the area to further assure against accidental removal.
10. Have the patient vigorously cough, watching expansion of the flutter valve to indicate evacuation of air from the chest.
11. One the pneumothorax is relieved; a chest tube should be inserted as soon as feasible as any delay may allow the pneumothorax to redevelop.
12. The procedure must be documented by recording the indications for the procedure, where the procedure was performed and the result of the procedure.

HELPFUL HINTS

1. The reinsertion of a catheter covered needle must always be through a new opening in the chest wall.
2. An improperly placed catheter may be adjusted by withdrawing the tube the necessary length. The position of the catheter must never be adjusted by advancing it after the initial insertion.
3. Occasionally blood will drain so rapidly, that the patient appears to be exsanguinating, if respiratory status and vital signs improve while the blood is being removed, keep the drainage going. If the patient's condition deteriorates, the patient may be bleeding from a large vessel which was temporarily tamponaded by the hemothorax and the catheter should be clamped or removed and the patient prepared to go to the OR.

COMPLICATIONS

1. Local cellulitis
2. Local hematoma
3. Pleural infections, empyema
4. Pneumothorax
5. Intercostal artery, vein, or nerve disruption
6. Internal mammary or internal thoracic artery disruption

REMOVAL PROCEDURE

1. Remove any tape which may inhibit rapid withdrawal
2. Place Vaseline gauze next to the catheter
3. While the patient is expiring, rapidly withdraw the catheter and occlude the small hole with Vaseline gauze.
4. Tape the Vaseline gauze in place for 6-12 hours to allow adequate sealing and prevent recurrence of a pneumothorax

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HEMOSTATIC DRESSING PROTOCOL

To rapidly control life threatening external hemorrhage

PROCEDURE:

A. INDICATIONS:
   1. Life threatening venous and/or arterial extremity hemorrhage not amendable to the placement of tourniquets
   2. Apply after tourniquet application to control hemorrhage. After a minimum of 15 minutes without any bleeding, team may attempt to release the tourniquet. If hemorrhage resumes, replace tourniquet and make no more attempts at early tourniquet release unless ordered by command.
   3. Life threatening venous and/or arterial hemorrhage from a junctional injury (axilla or groin) or neck
   4. Uncontrolled external hemorrhage from the scalp, thorax, or abdomen despite having applied adequate and continued pressure with non-hemostatic bandaging.

B. CONTRAINDICATIONS:
   1. None

C. EQUIPMENT:
   1. Combat Gauze: Roll or Z folded (4 in. X 4 yds.), vacuum packed gauze.
   2. Personal Protective Equipment

D. PROCEDURE:
   1. Examine the wound and identify the point of bleeding, specifically, the bleeding vessel.
   2. Sweep the wound clear of any accumulated blood or clots prior to packing.
   3. Pack Combat Gauze directly over the point of bleeding, starting with good initial contact and maintaining it throughout the packing.
   4. Pack the entire Gauze without losing or releasing contact with the point of bleeding
   5. Once the entire Gauze is packed, maintain pressure for 3-5 minutes.
   6. Avoid lifting the Gauze to re-assess during that period.
   7. If the Gauze soaks through and active bleeding continues, remove the entire Gauze and repeat steps 1-6 with a new Combat Gauze.
   8. If bleeding is relatively well controlled or hemostasis is established, cover the wound with a bandage to secure the Gauze in place for transport.

H. COMPLICATIONS:

1. Hemorrhagic Shock
2. Uncontrolled Hemorrhage

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Allegheny General Hospital
LifeFlight Protocols
Adult Protocols
Version 2016

MAD PROTOCOL
Intranasal Medication Administration

KEYWORDS: Intranasal, Medication, Mucosal Atomization Device, Emergency Department

I. POLICY

To outline the procedure for the administration of medications via the intranasal route for use in the Emergency Department setting

II. RESPONSIBILITIES

A. **Flight Nurse / Physician**

1. Assess for appropriate patient population/indication
2. Select medications/dosages as indicated
3. Assess for adverse events
4. Assess for appropriate patient population/indication
5. Administer medication intra-nasally, using a Mucosal Atomization Device (MAD)
6. Assessment and documentation of the level of sedation and/or pain when appropriate
7. Assess for adverse events.

III. DEFINITIONS

A. Intranasal medication administration – the delivery of medication into the nares for systemic absorption

B. Mucosal Atomization Device (MAD) - delivers intranasal medication in a fine mist which enhances absorption and improves bioavailability for fast and effective drug delivery

C. Medication administration indications relevant to this policy:

1. Treatment of seizures (adults and pediatrics)
2. Anxiety (adults and pediatrics)
3. Transient pain control (traumatic and non-traumatic) (adults and pediatrics)
4. Acute opioid overdose, or suspicion of overdose (adults and pediatrics)

**Intranasal drug administration at AGH is NOT intended to be used for conscious sedation* Contact Medical Command if no other option appears to be available.*

D. Medications relevant to this policy:

1. Sedatives
    a. Benzodiazepines
        i. Midazolam (5mg/mL concentration)
2. Analgesics
    a. Opioid Analgesics
        i. Fentanyl (50mcg/mL concentration)
3. Other
    a. Opioid antagonists/Reversal Agents
        i. Naloxone (1mg/mL concentration)

IV. PROCEDURES/PROTOCOLS

A. Collaborative evaluation of patient by physician, nurse, and/or pharmacist to determine appropriateness for intranasal route of medication administration
   1. Situations where intranasal drug administration may not be warranted due to the potential for decreased drug absorption/medication response:
      a. Epistaxis
      b. Nasal trauma
      c. Nasal septal abnormalities
      d. Nasal congestion/discharge

B. Nurse - perform baseline pain scale assessment when indicated

C. Physician or Flight RN (calculate dosage based on patient weight) therapy to be given via intranasal route *(Attachment 1)*

D. Nurse – administer medication therapy following the general medication administration procedure for intranasal drug delivery:
   1. Verify medication dosage based on patient weight
   2. Gather equipment (medication, 3cc syringe, MAD)
   3. Load syringe with appropriate volume of medication (add 0.1mL for dead space of MAD)
      a. Max volume amount per nostril = 1mL (if greater than 1mL per nostril is needed, consider dose titration with 5 – 10 minute intervals between drug administration)
   4. Attach MAD to 3cc syringe
   5. Place atomizer into the nostril
   6. Briskly compress syringe to administer one half of the volume in the 3cc syringe into the nostril as atomized spray
   7. Remove syringe from nostril and administer remaining volume into the second nostril

E. Assess patient for medication-related adverse events

F. Evaluate medication effectiveness

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Intranasal Medication Dosing Tables (Adult and Pediatric)

Intranasal Midazolam dosing table (5mg/mL concentration) – Based on a dose of 0.2mg/kg

Weight Increments (kg)	IN Midazolam Dose (mg)	Total Volume (mL)*
3 - 3.3	0.6	0.12
3.4 - 3.8	0.7	0.14
3.9 - 4.4	0.8	0.16
4.5 - 5.4	1	0.2
5.5 - 6.6	1.2	0.24
6.7 - 7	1.4	0.28
7.1 - 8.2	1.5	0.3
8.3 - 9.1	1.8	0.36
9.2 - 10.4	2	0.4
10.5 - 11.4	2.2	0.44
11.5 - 13.8	2.5	0.5
13.9 - 16.4	3	0.6
16.5 - 18.6	3.5	0.7
18.7 - 21.4	4	0.8
21.5 - 23.6	4.5	0.9
23.7 - 26.4	5	1
26.5 - 28.6	5.5	1.1
28.7 - 31.4	6	1.2
31.5 - 33.6	6.5	1.3
33.7 - 36.4	7	1.4
36.5 - 38.6	7.5	1.5
38.7 - 41.4	8	1.6
41.5 - 43.6	8.5	1.7
43.7 - 46.4	9	1.8
46.5 - 47.9	9.5	1.9
≥ 48	10	2

*Draw up an additional 0.1mL of midazolam into syringe to account for dead space in MAD

Subsequent Intranasal Midazolam Dosing:

Repeat Dosing (anxiolysis): allow a minimum of 10 minutes after initial dose to assess patient for the need of additional doses. If additional doses are needed, utilize ½ of the initial intranasal dose every 10 minutes until other access is established.

Repeat dosing (seizure control): If seizure persists > 3 minutes after initial dose, consider repeating dose at ½ the initial intranasal dose if intravenous access has not yet been obtained

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Intranasal Fentanyl dosing table (50mcg/mL concentration) – Based on a dose of 2mcg/kg

Weight Increments (kg)	IN Fentanyl Dose (mcg)	Total Volume (mL)*
3 - 3.3	6	0.12
3.4 - 3.8	7	0.14
3.9 - 4.4	8	0.16
4.5	9	0.18
4.6 - 5.4	10	0.2
5.5 - 6	12	0.24
6.1 - 6.9	12.5	0.25
7 - 8.3	15	0.3
8.4 - 9.4	17.5	0.35
9.5 - 10.9	20	0.4
11 - 11.3	22	0.44
11.4 - 13.7	25	0.5
13.8 - 16.6	30	0.6
16.7 - 18.1	35	0.7
18.2 - 22.3	40	0.8
22.4 - 22.7	45	0.9
22.8 - 27.4	50	1
27.5 - 32.9	60	1.2
33 - 37.9	70	1.4
38 - 41.2	80	1.6
41.3 - 45.9	90	1.8
46 - 55.4	100	2
55.5 - 62.4	120	2.4
62.5 - 68.1	130	2.6
68.2 - 80.9	150	3
81 - 89.9	170	3.4
90 - 94.9	180	3.6
≥ 95	200	4

*Draw up an additional 0.1mL of fentanyl into syringe to account for dead space in MAD
Maximum volume per nostril is 1mL. IN fentanyl doses > 100mcg should be divided into multiple increments allowing time for absorption between each intranasal administration (alternate nares until full dose is administered)

***MAX pediatric dose that can be given at one time = 100mcg*
***MAX adult dose that can be given at one time = 200mcg*

Subsequent Intranasal Fentanyl Dosing:

Repeat dosing: (pain control) allow a minimum of 10 minutes after initial dose to assess patient for the need of additional doses. If additional doses are needed, utilize ½ of the initial intranasal dose every 10 minutes until other access is established.

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External Ventricular Drain (EVD) Transport Protocol

Criteria: Transportation of a neurosurgical patient with an EVD in place.

Contraindications: None

Protocol:

1. Evaluate location of the EVD and the apparatus.
2. Maintain a clean and sterile dressing over the EVD site (obtain from referring if needed.)
3. Maintain the level of the head at 35° during transport.
4. If monitoring of EVD is not necessary, then,
    a. Close off EVD to patient
    b. Secure EVD from the apparatus to the patient's chest.
    c. Administer appropriate sedation only if required for mission safety per the Sedation Protocol.

5. If monitoring of EVD is required:
    a. When moving to the LF stretcher, align the leveling device at the level of the tragus.
    b. Maintain consistent level of the drip chamber, unless directed by the referring neurosurgeon.
    c. Administer appropriate sedation only if required for mission safety per the Sedation Protocol.

Contact Medical Command

1. Mental Status changes from baseline at referring.

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SAM Pelvic Sling II

(Pelvic Fracture Stabilization Device)

Criteria: To be used in adult patients with known or suspected open book pelvic fractures.

Contraindications: The patient is either too small or too large for the device.

Protocol:

1. Confirm the known or suspected diagnosis of an open book pelvic fracture.
2. Assure the patient's pain is addressed prior to application. (Pain Protocol).
3. It is best to have clothing removed but if not possible; remove all objects from the patient's belt, clothing, or pockets that could injure the patient when the sling pressure is applied.
4. Gently lift or logroll the patient onto the SAM Sling with the black side up.
5. Place the device at the level of the trochanters (hip joints).
6. Place the black strap through the buckle and pull it completely through.
7. Have an assistant hold the orange strap while you pull the black strap in the opposite direction until you hear and feel the buckle clink. The click indicates that you have reached a compressive force of no greater than 33 lbs.
8. Maintain the tension (at the click) and immediately press the black strap onto the Velcro surface of the device, to secure it.

Note: Do not be concerned if you hear a second click after the SAM Pelvic Sling is secured, it does not have to be tightened again.
The SAM Pelvic Sling II is MRI compatible.

To Remove: Life the black strap by pulling upward. Maintain tension and slowly allow the SAM pelvic sling to loosen.

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