Hospital of the University of Pennsylvania
Post-Cardiac Arrest Care / Induced Hypothermia Pathway Order Set

CALL THE RESUSCITATION TEAM: 267-253-9035

Admission

- ICU admission order set
  - Post Cardiac Arrest Early Goal Directed Therapy
    - Therapeutic Hypothermia

Code Status:

- Full Code

Exclusion/Contraindications:

- Pulseless > 60 minutes
- > 12hrs since Return of Spontaneous Circulation (ROSC) (Data suggests cooling patients as soon as possible post-cardiac arrest)
- Glasgow Motor score >5
- Minimal pre-morbid cognitive status
- Other reason for coma: Inter-cranial hemorrhage (ICH), Sub-arachnoid hemorrhage (SAH), Sedation
- Sepsis as etiology for arrest
- DNAR/DNAI status (for induced hypothermia only)
- Significant trauma, especially intra-abdominal such as splenic or liver laceration (due to increased risk of bleeding)

Post Cardiac Arrest Early Goal Directed Therapy

Equipment List

- Arterial line kits (both radial and femoral)
- Presep central venous catheter
- Two one liter bags of 0.9% NaCl at 4 degrees Celsius
- Gaymar III external cooling system
  - One Gaymar torso and two thigh cooling pads/or Artic Sun system
- Temperature probe foley catheter with appropriate adapter for cooling device
- Neuromuscular blockade equipment
Peripheral Nerve Stimulator
- Consider use of BIS monitor and sensor for monitoring sedation
- Fluid warmer if needed

### IV Fluids

**Note:** If Acute Coronary Syndrome suspected first transfuse blood to Hgb ≥10.

- **Patient with MAP < 80 mmHg:** 0.9% NaCl IV x 2 liters – titrate to CVP 8-12 mmHg, until MAP > 80 mmHg and ScvO2 greater than or equal to 65% unless signs of Pulmonary Edema
- If K less than 5, switch to Lactated Ringers after 2 liters 0.9% NaCl infused - titrate to CVP 8-12 mmHg, until MAP > 80 mmHg and ScvO2 greater than or equal to 65% unless signs of Pulmonary Edema
- **If ScvO2 < 65% with no CHF:** continue with 0.9% NaCl boluses up to a total of 2 liters and titrate to CVP >8 mmHg and ScvO2 greater than or equal to 65%.
  **Note:** If showing signs of congestive heart failure STOP resuscitation. If no signs of CHF and additional resuscitation needed, continue with Lactated Ringers if K+ less than 5.0 mEq/l

### Vasoactive Agents

- STAT ECHO to determine Ejection Fraction

- **Hypotension, Ejection Fraction greater than or equal to 50%**
  - Norepinephrine infusion: Begin at 2-4 mcg/min, titrate to maintain MAP >70-80 mmHg

- **Hypotension, Ejection Fraction less than 50%**
  - Begin Dobutamine infusion at 2.5 mcg/kg/min to maintain ScvO2 >65%. (max infusion rate 20 mcg/kg/min)
  - Norepinephrine infusion: Begin at 2-4 mcg/min, titrate to maintain MAP >70-80 mmHg.
  - If MAP < 70 begin Dopamine at 2.5 mcg/kg/min and titrate up to maintain MAP > 70-80

- **Co-oximetry/ScvO2 < 65% with CVP 15-20 mm Hg or CHF**
  - Begin Dobutamine infusion at 2.5 mcg/kg/min to maintain ScvO2 >65% (max infusion rate 20 mcg/kg/min)
  - Consider transfusing Packed Red Blood Cells to keep Hemoglobin greater than or equal to 10 g/dL once CHF clears

- **Hypertension**
  - Begin Nitroglycerin infusion at 10 mcg/min (max 200 mcg/min) for MAP >100 mmHg (titrate to MAP 80-100 mmHg)
- **Tachycardia or acute ischemia/MI without LV dysfunction:** Initiate Esmolol and titrate to HR <100. Initiate 50 mcg/kg/min, increase by 50 mcg/kg/min increments to max rate of 300 mcg/kg/min

### Therapeutic Hypothermia

**Note:** Consider Head CT prior to initiating Therapeutic Hypothermia as deemed medically necessary.

**Note:** These are exclusion criteria only. If the patient is not excluded by these criteria, hypothermia should be performed unless contraindicated on a case by case basis.

### Sedation/Anesthetic/Neuromuscular Blocker (NMB)

- Fentanyl IV Drip NSS (8000mcg/250mL). Administer per ICU protocol (Critical Care Nursing Policy CCC-05-05). If using BIS monitor, titrate to 40-60.
- Propofol IV Drip (1000mg/100ml). If using BIS monitor, titrate BIS to 40-60. Monitor per ICU protocol. Max rate of 80 mcg/kg/min
  **Note:** Propofol interferes with measurement of aPTTs. Please consider this when ordering propofol on patients already on heparin and use Factor Xa levels to monitor anticoagulation
- Lorazepam IV Drip (2mg/ml). Administer per ICU protocol
- Pancuronium IV Drip NSS (100mg/250 ml) Administer per ICU protocol (Critical Care Nursing Policy BCC-03-26). Initiate pancuronium before initiating cooling. Dosing recommendations: 0.1 mg/kg loading dose followed by a continuous infusion of 0.33-2 mcg/kg/minute. *Do not use in patients with renal or hepatic insufficiency or cardiac instability
- Cisatracurium IV Drip (200mg/250ml). Administer per ICU protocol (Critical Care Nursing Policy BCC-03-26). Initiate cisatracurium before initiating cooling. Dosing recommendation: 0.15 mg/kg loading dose followed by a continuous infusion of 1-3 mcg/kg/min
- Ophthalmic Lubricant Ointment 3.5gm – Dose 1 application Both Eyes Every 2 hours for: Eye Lubrication Prophylaxis

### Nursing

- **Cooling**
  - Infuse 2 liters 0.9% NaCl at 4° C over 30 minutes if no evidence of Pulmonary Edema; See Critical Care Nursing Policy: Post cardiac arrest therapeutic hypothermia policy BCC-04-05
  - Insert foley with temperature probe
  - Goal temperature of 32-34° C as soon as possible (within 4 hours) using Automatic Mode of Gaymar III cooling device (or Arctic Sun)
## Re-warming
- Initiate 24 hrs after target temperature was reached per RN policy
- Increase blanket temperature 0.5 degrees every 2 hours
- Hold all K+ containing fluids if K+ > 3.5 immediately before and during re-warming
- Change IV fluids to 0.9% NaCl, titrate to CVP >8 mmHg, maintaining a MAP >80 mmHg, and no evidence of shock (by exam, urine output, lactate, and ScvO2)
- Stop NMB infusion after core temperature reaches 36° C
- Meperidine 12.5-25 mg q4-6 hrs IVP (but not to exceed 100 mg/day) can be used to treat shivering once NMBs have been stopped (if renal failure or oliguria isn’t present and patient not taking an MAO inhibitor or Buspirone or SSRI). Warning: Should NOT be given at all in late term pregnancy or for prolonged use at any time during pregnancy
- Maintain normothermia for 24 hours (using Tylenol then reinstitute cooling blanket to target temperature of 37 degrees Celsius as needed)

### Initial Laboratories
- Beta HCG on all women of childbearing age
- ABG with Ionized Calcium and Magnesium
- CBC/platelets / PT / PTT/INR, Fibrinogen
- Electrolyte “panel 7”, plus iCa / Mg / Phos, Cl-, Glucose
- Amylase, Lipase
- Liver Function Panel
- Lactate, CPK-MB, CK, Troponin
- Cortisol level
- Pan-culture - Blood Culture, Urine Culture, Urinalysis, Sputum Culture (if appropriate)
- Toxicology screen if appropriate
- Co-oximetry Panel (Central Venous)

### Serial Laboratories:

**Note:** For ABG and Co-oximetry Panel: Use temperature correction for temperature <32° or >40°. The temperature should be written on a bright sticker and attached to the syringe and it should also be indicated when ordering the lab.

- ABG q 6 hrs and prn
- Co-ox Panel (Central Venous) q 1-2 hrs for first 6hrs – until re-warming process complete then q 6 if continuous Sv02 catheter not used
- Glucose, K+, and lactate q 6 hrs - until re-warming process complete
- Repeat CPK-MB, CK, Troponin at 6 hrs x 2 - until re-warming process complete
- CBC/ PT/ PTT/INR, fibrinogen, P7/ Ca/ Mag/ Phos q 12 hr x 4

**Monitoring:**

- **Continuous EEG monitoring - once paralyzed, page EEG fellow at 404-6771** before midnight if at all possible
- Core Temperature - continuous
- CVP q 1-2 hours with Vital Signs during active cooling/re-warming; q 4 hours during maintenance

**Nutrition - NPO**

- Insert OB tube, keep Head of Bed (HOB) greater than 30 degrees at all times and follow Gastric Residuals per ICU protocol
- X-ray to confirm placement of OGT

**Electrolytes**

- **Potassium Chloride (40 mEq in 100ml)**
  - Central 40 mEq Intravenous
  - 20 mEq/hour every 6 hours
  - PRN Hypokalemia <3.4
  - **Note:** For patients with renal insufficiency, call MD for adjusted dosing.
    - For potassium >3.5 Do Not Replete
    - For potassium 3.0-3.5: 40 mEq central or peripheral
    - For potassium 2.5-3.0: 60 mEq central or peripheral
    - For potassium <2.5: 40 mEq x 2 central or peripheral

- **Magnesium Sulfate Injection**
  - Give 2 gm Intravenous Once PRN Hypomagnesemia
  - As needed for magnesium levels less than 1.8

- **Calcium Chloride Injection**
  - Give 1 gm
  - Intravenous Every 4 hours
  - As needed for ionized calcium levels less than 0.9. If repleting, check ionized calcium levels every 4 hours

- **Sodium Phosphorus Infusion**
  - Give 10 mmol Intravenous Once
Note: If phosphate repletion is required for phosphate level less than 2.0 mg/dl collection frequency changes from every 6 hours to every 2 hours (post repletion) until phosphate level is greater than 2.0 mg/dl.
- For phosphate levels > 2.5 mg/dL – No Replacement Needed
- For phosphate levels 2.0-2.5 mg/dl – Replace with 10 mmol sodium phosphate
- For phosphate levels <2.0 mg/dl – Replace with 20 mmol sodium phosphate

Blood Products

- **Education:** if significant bleeding ensues while hypothermic, coagulopathy should be corrected aggressively. In the absence of overt bleeding, the decision to correct coagulopathy is up to clinical judgment after weighing the risks and benefits of blood product replacement in each individual case.

- **Note:** PRBC: Transfuse 1-2 PRBC to Hgb > or = 10 for patients with shock with ScvO2 less than 65, after correction of low CVP and MAP.

  - Platelet count < 20K or <50K with active bleeding: Platelets 6 units
  - With active bleeding - INR > 1.5: FFP _____2 units _____4 units
  - PRBC for any evidence of shock despite CVP>8-12 mm: ____1 unit ____ 2 units
  - PRBC for Hgb < 7: ______1 unit ______ 2 units
  - PRBC for Hgb < 10 if active bleeding: ______1 unit ______2 units PRBC

Pre-medications for PRBC & Platelets (unless hypothermia)

- Acetaminophen Tablet 325 mg – Total Per Dose 650 mg
- Diphenhydramine 25 mg IV – Total Per Dose 25 mg

Insulin Therapy

- Initiate per ICU Insulin Infusion Protocol for two consecutive blood glucoses > 150 mg/dL

Respiratory

- If ALI/ARDS use Low Stretch protocol
- Arterial pH Goal: 7.30 – 7.45. FiO2 60. Wean O2 for SaO2>92% or <95% or PaO2>65mmHg or <80mmHg
- Ventilator Modes – Low stretch protocol:
  Use patient height to calculate Tidal Volume (TV) per Predicted Body Weight (PBW) and gradually reduce TV to 6 ml/Kg/PBW
Radiology

- CXR now
- Repeat CXR in AM and after 72 hours
- Head CT to rule out intracranial hemorrhage if clinically appropriate

Cardiology

- **Call Cardiology pager for ALL post cardiac arrest patients**
- ECG STAT
- ECG q 8 hours x 2
- Stat echocardiogram (if not already performed in ED)
- Repeat echocardiogram 24-48 hours
- _ASA _325____mg Per rectum STAT

DVT Prophylaxis

- Heparin 5000 units SubQ q8 hrs
- Intermittent Compression Stockings

GI Prophylaxis

- ranitidine ____mg per NG/IV q_____hrs

Shivering

- Mereridine 12.5-25 mg q4-6 hrs IVP (not to exceed 100 mg) can be used to treat shivering once NMBs have been stopped (if renal failure or oliguria isn’t present and patient not taking an MAO inhibitor, Buspirone, or SSRI). **Warning:** Should NOT be given at all in late term pregnancy or for prolonged use at any time during pregnancy

Consults

- Cardiology consult (all post-arrest cases)
- Neurology
- Nutrition Support Services on day 3
- Maternal-Fetal Medicine if + HCG (prior to hypothermia)