SUBJECT: Post Cardiac Arrest Hypothermia Protocol - Use of the ICY Catheter and CoolGard 3000

PURPOSE: To guide the health care team in the post cardiac arrest initiation and management of induced hypothermia.

CRITERIA FOR INITIATION AND DISCONTINUATION
A. Initiation Criteria: Immediately upon admission to the Intensive Care post cardiac arrest.
   1. Cardiac arrest in which the presenting rhythm is ventricular fibrillation
B. Exclusion Criteria:
   1. Patient has regained consciousness after return of spontaneous circulation
   2. Pregnancy or possible pregnancy
   3. Mean arterial pressure less than 60 mm Hg
   4. Pre-existing coagulopathy or thrombocytopenia
C. Discontinuation Criteria: 24 hours post initiation or upon physician’s order.

RESPONSIBILITIES: Physicians, Critical Care Registered Nurses, Respiratory Care Practitioners and Pharmacists

TOPIC/INSTRUCTIONS:

A. MONITORING
   1. Continuously monitor patient’s core body temperature per bladder temp probe. Document temperature approximately every 1 hour.
   2. Monitor blood pressure every 15 minutes for the first hour and at least hourly to detect changes with cooling or rewarming.
   3. Monitor for signs of shivering, including involuntary skeletal muscle movement, or ECG artifact
   4. Laboratory Data: K+ every 4 hours; Phosphorous every 8 hours, Platelet count, PT/INR, PTT every 8 hours.

B. INITIATION OF COOLING
   1. In the emergency department cooling should be initiated using a fan, or avoiding blankets and any efforts to rewarm patient.
   2. Intubate and begin mechanical ventilation, if not done already.
3. Begin passive cooling:
   a. Apply ice packs around head, neck, axilla and groin.
   b. Apply cooling blanket over torso and limbs.
4. Provide analgesia, sedation and neuromuscular blockade:
   c. Fentanyl 2 mcg/kg bolus then continuous infusion at 50-100 mcg/hr
   d. Midazolam 5 mg bolus then infusion 3-5 mg/hr sedate to Riker score of -2 or -3
   e. Once analgesia and sedation is achieved begin neuromuscular blockade. Vecuronium 0.08 mg/kg bolus then continuous infusion 0.8-1.2 mcg/kg/min, titrate to TOF response of 2:4
5. Once sedation and paralysis achieved begin active cooling:
   a. Place ICY catheter in the femoral vein.
   b. Attach to the CoolGard 3000 thermal regulation system which monitors catheter performance and measures temperature via a connection to the bladder
   c. Set target temp to 33°C
   d. Cool for 18 –24 hours once target temperature of 32-34°C is reached, not to exceed 24 hours total

B. REWARMING
1. Begin rewarming 18-24 hours after target temperature is reached (or once 24 total hours of cooling has occurred)
2. Set the CoolGard temp to slowly rewarm the patient to 36.5°C. Set rate at 0.5 to 0.65°C/hour
3. When > 36°C, discontinue neuromuscular blockade first and then taper sedation.

KEYPOINT: Rapid rewarming may potentially lead to respiratory acidosis, hyperkalemia, and cause sudden vasodilation and severe hypotension. Rapid rewarming or temperature greater than 37°C may be detrimental to neuro status.

C. POTENTIAL ADVERSE EFFECTS OF COOLING
1. Shivering – shivering increases the metabolic demands of the brain. Avoid shivering by sedating and chemical paralyzing patient prior to aggressive cooling. Maintain sedation and chemical paralysis until temperature is 36°C.
2. Bradycardia - bradyarrhythmias are common and may not be symptomatic. Treat first with an IV chronotrope infusion; Dopamine 5-20 mcg/kg/min or Epinephrine 2-10 mcg/min. Consider transcutaneous pacing or transvenous pacing if patient symptomatic.
3. Alterations in fluids and electrolytes;
   a. Diuresis – cooling cause inhibition of antidiuretic hormone, resulting in diuresis. Monitor urine output and replace fluids as needed.
b. Hypokalemia/hyperkalemia – cooling causes potassium to shift intercellularly. While cooling administer potassium to maintain serum K+ at 3.5mmol/L. Once warming is begun potassium will shift into the extracellular space.

c. Hypophosphatemia - Phosphate also shifts intercellularly with cooling. Replace phosphate as needed.


5. Coagulopathy – the biochemical and enzymatic reactions of the coagulation cascade are temperature dependent, hypothermia also alters the functioning of platelets. Monitor for signs of bleeding, platelet count, PT/INR and PTT. Administer platelets and clotting factors as indicated.

References:


University of Chicago Hypothermia after Cardiac Arrest Protocol