

# POST-CARDIAC ARREST TARGETED TEMPERATURE MANAGEMENT CVICU CLINICAL PRACTICE GUIDELINES

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**PURPOSE:** To provide multidisciplinary care guidelines for initiation and management of patients requiring post-cardiac arrest targeted temperature management (TTM) characterized by active fever prevention and early treatment.

**Goal:** Aggressive maintenance of normothermia to maximize neuroprotection.

## **INCLUSION CRITERIA**

- Ability to initiate protocol within 12 hours of return of spontaneous circulation (ROSC) after a suspected cardiac arrest.
- Patient not following verbal commands after ROSC. Exam used should be last reported or witnessed exam prior to sedation/paralytics.
- Estimated time from arrest to ROSC less than 60 minutes.

## **RELATIVE EXCLUSION CRITERIA**

- No-flow time of >10 minutes (no chest compressions) or CPR duration of >60 minutes.
- Severe hemodynamic instability characterized by inability to maintain a MAP >60mmHg with two vasopressors agents or < 20 minutes without the need for CPR.
- Known terminal illness (pre-arrest condition suggested survival to 6 months is unlikely)
- Patient known to not want advanced lifesaving interventions

**Goals of care discussion should be held as soon as possible** with health care proxy to ensure that TTM is in line with patient's wishes. Educate the family that TTM is an intensive therapy, and meaningful neuro-prognostication should not be expected until ~4 days after ROSC.

## **Consults**

- Palliative care consult should be considered for all TTM patients
- All patients with unwitnessed arrest with possible fall or chin impact and all witnessed arrests with fall or apparent injury should receive Trauma consults.
- Neurology consult for suspected seizures
- Tennessee Donor Services to be consulted by nursing

## **HANDOVERS**

- When a resuscitated cardiac arrest patient is admitted to the ED, the CCU Fellow or his/her designee goes to the ED to assist and to receive handover report from the ED physician.
- If a patient is to be admitted to the ED for CT Head and Cervical Spine, Cardiac Access center personnel provide report to the ED Clinical Staff Leader (CSL). If the patient is to be admitted to the Cath Lab or CVICU, report is provided to the CVICU CSL.

## **INITIATION AND MANAGEMENT OF TARGETED TEMPERATURE MANAGEMENT (TTM)**

### **1) Temperature**

-Temperature to be monitored continuously and recorded q1hr via a bladder thermometer. If foley catheter is not indicated or available, the core temperature may be assessed by esophageal or intravascular probe; rectal probe can be used if esophageal or intravascular not available.

-Participants who have an initial temperature between 30-33°C may be actively rewarmed to 33°C at 0.33 degree per hour, at which point active rewarming should be suspended. However, passive rewarming between 30-33°C may also be used, if preferred by the treating physician.

-Patients with an initial body temperature above 33°C should not be actively rewarmed to normothermia.

- Maintain temperature <37.5 °C for 72 hours from time of arrest with continuous temperature monitoring with hourly document of temperature.
  - Acetaminophen-650mg rectally q 6hr for all patients w/o significant hepatic impairment for 72hrs from arrest.
  - If temperature is  $\geq 37.5$  °C and <37.8 °C: completely expose patient and lower ambient temperature. Consider preparing for initiation of cooling device if temperature trajectory suggests 37.8 °C will be surpassed.
- If temperature is measured  $\geq 37.8$  °C any time within 72hrs post arrest, initiate Artic Sun device and target 37.5 °C (Note: if patient is awake and extubated then external cooling device does not need to be initiated)
  - If shivering occurs during Artic Sun use, anti-shivering measures such as increased sedation if tolerable, acetaminophen, magnesium infusion (goal Mg level 3-4mg/dL, given 4g bolus and start infusion at 0.5g/hr), extremity counter-warming, buspirone (30mg q8h), or clonidine. Paralysis protocol and sedation guidance below.

### **2) Hemodynamic Monitoring**

- **Arterial Line**
  - All patients – unless contraindicated or hemodynamic stability clearly demonstrated. Preferential sites: radial > femoral > brachial > axillary (axillary and brachial insertions should be discussed with attending prior to attempting)
  - Procedural sheaths should be removed as soon as alternate arterial access can be established and when the ACT is less than 180.
- **Central line**
  - All patients, unless contraindicated or  $\geq 2$  reliable 20 gauge or greater PIVs established.
  - PA catheter at the discretion of the treatment team

### **3) Hemodynamic Management**

- Mean arterial blood pressure (MAP) should be above 65 mmHg to reverse the acute shock state (ideal MAP is 80 to 100 mmHg to optimize cerebral perfusion if reasonably obtainable).
- Norepinephrine is the preferred initial vasopressor for MAP<65mmHg
- Nicardipine – initiate if MAP >100 but no lower than 80mmHg

- Avoid hypovolemia. Consider targeting CVP of ~12mmHg and urine output of >0.5 mL/kg per hour.
- Antibiotics should not be initiated empirically without evidence of infection

#### 4) **Sedation, Comfort, Paralysis (e.g., shivering)**

- Goal RAAS of -4 for first 24hrs post-arrest with no interruptions for SATs or SBTs
- Propofol infusion: Begin at 20 mcg/kg/min. Propofol should not be decreased to less than 20mcg/kg/min if neuromuscular blockers have been administered and are still in the system. In the setting of paralysis and hemodynamic instability, propofol and can be switched to midazolam.
- If propofol is not hemodynamically tolerated, consider midazolam infusion: begin at 2 mg/hr. If changed to midazolam, fentanyl should not be discontinued.
- Fentanyl infusion: initiate at 50 - 100 mcg/hr
- In the scenario that a body temp of  $\leq 37.5$  °C cannot be achieved and maintained with the Artic Sun, paralytics should be initiated:
  - Vecuronium bolus: 0.1mg/kg bolus followed by 0.1mg/kg bolus q4h PRN for shivering.
  - Obtain baseline TOF pre-paralytic (if possible), then Q1 hour TOF monitoring with target of 1-2/4 twitches until neuromuscular blockade is stopped.
  - Titrate sedation to BIS of 40 – 60. If BIS is less than 40, decrease sedation (ie propofol to 20mcg/kg/min unless a physician order is received to increase dose as increased dose may be indicated for seizure treatment).
  - If paralyzed: monitor for seizures with continuous EEG.
  - Discontinue neuromuscular blockade q12-24hrs to evaluate for shivering and need for paralytic. Discontinue at 72hrs and stop active temperature control if patient is shivering to allow for neuro-prognostication.
  - Note: oral medications can be administered via NG/OG tube in paralyzed patients

#### 5) **Cervical Spine Assessment and Management**

- Ideally, all suspected trauma should receive a CT Head and CT Cervical Spine without contrast on admission. Such patients arriving from outside hospitals or facilities are routed through the ED for these CT studies.
- Per Level One Trauma Center standards, Trauma consults are ordered for all patients with:
  - Unwitnessed arrest with possible head/chin impact
  - Witnessed arrests with fall or apparent injury.
- Cervical collars are placed and spine precautions are utilized for all patients with unwitnessed arrests or arrests with fall.
  - C collar padding to be changed qShift. If help is needed, engage nursing in trauma ICU
  - **POSITIVE C-Spine CT:**
    - Do not place pillows under the head
    - Log roll turns with head holds
    - Head of bed should be elevated to ~30 degrees
    - Follow any additional recommendations from the trauma consult team

- **“NEGATIVE” C-Spine CT:**
  - A normal C-spine CT scan alone does not “clear the spine”. CT cannot detect ligament injuries. Collars remain in place until cleared by the spine consult service. The clearance procedure requires active patient participation.
  - With properly placed collar, may be turned without head holds
  - Head of bed may be elevated
- **NO NECK CT RESULTS:** Treat as cervical spine injury present (i.e. positive CT) until cleared
- VUMC’s Cervical Collar Clearance Protocol can be followed by a member of the primary team to clear the spine if that provider is comfortable executing the protocol.
- Cervical MRI should be obtained at hospital day 3 or 4 to clear C-Spine if not already cleared (obtain at same time as brain MRI for neuroprognostication)
- Note: spine precautions must be maintained while placing IJ central lines if the cervical spine has not been cleared. This involves having a team member maintain cervical traction and alignment while another places the line.

#### **6) Seizure Assessment and Management**

- Seizure assessment is accomplished through physical assessment or EEG
- Continuous EEG monitoring is not required for all TTM patients but should be initiated if seizures are suspected or if paralyzed.
  - EEG monitoring can be ordered (*for this patient group only*) without first initiating a Neuro Consult.
  - EEG results are remotely monitored, and the Neuro team contacts the Primary team if seizure activity is diagnosed.
    - In-house neurology can review EEG on STAT basis if needed
  - Official EEG reports are present in the electronic record.
- If seizures are present or suspected:
  - Give 1000 mg levetiracetam IV and 2mg lorazepam IV
  - Consider an increase in the propofol or midazolam infusion rate and/or a 2 mg midazolam IV bolus.
  - Consult Neurology STAT
  - If seizure presence is confirmed, give 500 mg levetiracetam IV BID until Neurology management recommendations are received. Do not schedule recurrent anti-seizure medications without Neurology input if seizures are not confirmed.

#### **7) Neuroprognostication**

- Unless it is unethical to do so, neuroprognostication should not happen until 72hrs after arrest. Neurology should be consulted ~72hrs after arrest to perform neuroprognostication unless patient is neurologically normal or surrogate decision maker has decided to initiate comfort care.
- In unresponsive patients at 72 hours post-arrest, place neurologic consultation to determine the utility of brain imaging for prognosis (brain MRI is indicated at hospital day 3 or 4 for such patients).

8) Admission Algorithms for Code STEMI ICE and Code ICE



