**HYPOTHERMIA/CARDIAC ARREST SURFACE COOLING ORDERS**

**Cooling /Rewarming Protocol** *(Equipment is located in medication room of the DOC- door code 40369)*
- Initiate cooling with iced saline gastric lavage and ice packs on patient’s axilla and groin until cooling blankets started.
- Lay a single layer sheet on top of each cooling blanket.
- Wrap patient in 2 cooling blankets/sheet (sheet side to patient) by “log-rolling” patient.
  —1 blanket wrapped around torso and the other around the pelvis and legs
- Select the “MANUAL” mode on cooling machine and set the set point temperature on the cooling unit to 5° C.
- Once patient temp of 33° C is achieved (will take about 3-8 hrs), select the “AUTO” mode on the cooling machine and set target temperature to 33° C.
- After 24 hours at 33° C, rewarmed passively to 36.5° C by setting the cooling unit to “MANUAL” mode and re-set unit by increasing target temp by 1° C every 4 hours.
- If experiencing difficulty re-warming as above, use heated ventilator air to provide core re-warming.
- **Stop all potassium administration 8 hours prior to re-warming. DC all potassium in runs and IVF.**
- At end of cooling, order 2 cooling blankets and send all equipment to DOC, NOT Central Supply.
- **In order for patients to achieve and maintain target hypothermia of 33° C complete sedation AND paralysis must be achieved with continuous infusion of appropriate medications (see below).**

**Sedation**
- Propofol initiated at 5 micrograms/kg/minute IV and titrated by 5 micrograms/kg/min IV every 5 minutes to a goal of 30 - 50 micrograms/kg/min or as tolerated by blood pressure
- Midazolam initial dose 0.01 – 0.03 mg/kg IV, then 0.02 mg/kg/hr IV titrate up to 0.1 mg/kg/hr IV. If Midazolam is started in ER, switch to Propofol once in CCU
- **Titrate to sedation as observed by hemodynamic parameters**

**Paralysis**
- Pancuronium 0.1 mg/kg bolus then 1 microgram/kg/minute
- Vecuronium 0.1 mg/kg bolus then 1 micrograms/kg/minute
- Titrate to 1-2/4 TOF q1h to suppress shivering
- Keep head of bed at 30° while receiving paralytics
- Lacrilube to eyes q8h while receiving paralytics
- Discontinue paralytics after patient is warmed to 36.5° C

**Blood Pressure and Volume Management**
- Target systolic BP > 90, MAP > 80 mmHg to maintain cerebral perfusion
- Goal CVP > 4-6 mmHg or PCWP > 8 mmHg

**DVT Prophylaxis** *(if patient not receiving heparin drip for other indication)*
- Heparin 5000 units SQ q12h for patients weighing ≤ 70 kg
- Heparin 5000 units SQ q8h for patients weighing > 70 kg

**SUP Prophylaxis**
- Famotidine 20 mg IV q12h
- Famotidine 20 mg per NG/NJ q12h
- Lansoprazole 30 mg per NG/NJ qD

Physician’s Signature and pager/contact no.: ___________________________ Date/Time: __________
HYPOTHERMIA/CARDIAC ARREST
SURFACE COOLING PROTOCOL
(equipment is located in medication room of the DOC—door code 40369)

Cooling Protocol:
--Initiate cooling with iced saline gastric lavage and ice packs on patient’s axilla and groin until cooling blankets started
--Lay a single layer sheet on top of each cooling blanket
--Wrap patient in 2 cooling blankets/sheet (sheet side to patient) by “log-rolling” patient—1 blanket wrapped around torso and the other around the pelvis and legs
--Select the “MANUAL” mode on cooling machine and set the set point temperature on the cooling unit to 50°C
--Once patient temp of 33°C is achieved (will take about 3-8 hrs), select the “AUTO” mode on the cooling machine and set target temperature to 33°C

In order for patients to achieve and maintain target hypothermia of 33°C complete sedation AND paralysis must be continued with continuous infusion of appropriate medications (see below).

--After 24 hours at 33°C, rewarm passively to 36.5°C by setting the cooling unit to “MANUAL” mode and re-set unit by increasing target temp by 1°C every 4 hours
--At end of cooling, order 2 cooling blankets and send all equipment to DOC, NOT Central Supply

Sedation Protocol:
--IV Propofol initiated at 5 micrograms/kg/minute and titrated by 5 micrograms/kg/min every 10 minutes as needed to achieve sedation OR
--IV Versed initial dose 0.01-0.03mg/kg over 3-4 min, then 0.02mg/kg/hr titrate up to 0.1 mg/kg/hr to achieve sedation (if Versed is started in ER, switch to Propofol once in CCU)

Paralytic Protocol:  Titrate to ¼ TOF
--Pancuronium 0.1 mg/kg bolus then 0.05 mg/kg/hr OR
--Vecuronium 0.1 mg/kg bolus then 0.8-1.2 micrograms/kg/minute to prevent shivering

Paralytics and sedation may be discontinued once patient is rewarmed

Blood Pressure: Target systolic BP > 90, MAP > 80 to maintain cerebral perfusion

Volume Management: Goal CVP > 4-6 mmHg or PCWP > 8 mmHg using Normal Saline (CVP or PCWP monitoring not mandatory).

DVT Prophylaxis: Heparin 5000 units SQ Q12 hrs (or Q 8hrs if pt >70kg)
General Principles of Hypothermia

Clinical Effects of Hypothermia

Below 35\(^{0}\) C and above 33\(^{0}\) C
- Sensation of cold, skin cold to touch
- Slurred speech, shivering, incoordination, amnesia
- Intense vasoconstriction, cold-induced diuresis
- Bradycardia

Below 33\(^{0}\) C and above 27\(^{0}\) C
- Cyanosis, respiratory alkalosis, rigidity
- Arrhythmias, particularly A-fib

Below 27\(^{0}\) C
- Fixed/dilated pupils, very faint vital signs
- Risk of V-fib

Phases and Goals to reach 33-35\(^{0}\) C—Surface Cooling

Induction Phase
- Paralyze/Sedate
- Reach target quickly
- Avoid overshoot

Maintenance Phase
- Maintain temp
- Maximize physiology
- Avoid complications

Rewarming Phase
- Return to stable normothermia
- Avoid rebound hyperthermia

Induction Phase: Reach target temperature rapidly
- Don’t rewarm patient in ambulance or in ED
- Place cooling pads, ice bags, etc for maximal surface contact
- Use large gradient between blanket water and pt (pt 37\(^{0}\) C, blanket 4\(^{0}\) C); decrease gradient as patient approached target
- Paralyze and sedate
- Use techniques for core cooling
  - Iced gastric lavage
  - Room temperature ventilator gas

Maintenance Phase: Physiology of hypothermia
- Vasoconstriction: Diuresis \(\rightarrow\) low MAP
- Cardiac depression: Bradycardia, ECG changes, arrhythmias
- Electrolyte fluctuations: Intracellular shift of K, possible hyperglycemia
- Prolonged PT and PTT
Maintenance Phase: Avoid complications
- Skin care to avoid cold-related injury
- Frequent suctioning and pulmonary toilet
- Basic nursing care to avoid complications of immobility (DVT, UTI, skin breakdown)

Preparation for Rewarming
During rewarming the patient will:
- Vasodilate
- Shift cooler blood from the core as extremities warm → afterdrop

At the end of the maintenance phase:
- Volume load ~6-8 hours before rewarm starts
- Stop all KCl
- Allow patient to begin drifting upward

Rewarming Phase: Return to stable normothermia
- Warm no faster than $1^\circ$ C in 4 hours
- Use small temp gradients
- Apply blankets if needed
- Warm ventilator air
- Continue to support MAP and CPP
- Avoid afterdrop