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## 1. PURPOSE AND INTENT


- 1.1. To limit anoxic brain injury and improve neurological recovery following cardiac arrest.
- 1.2. To aid in the practical application of the Targeted Temperature Management Post Cardiac Arrest order set.

## 2. DEFINITIONS

- 2.1. **Targeted Temperature Management (TTM):** The process of achieving and maintaining body temperature at a set-point or pre-defined range for a set period of time.
- 2.2. **Active Cooling:** Cooling the patient using ice packs, cold intravenous (IV) fluids, forced air, or water cooling blankets.
- 2.3. **Passive Rewarming:** Active cooling measures are gradually reduced or withdrawn to allow the patient to return to normothermia.
- 2.4. **Active Rewarming:** Warming the patient using warm blankets, warm forced air, and/or warm IV fluids.

## 3. GUIDELINES

- 3.1. TTM is to be ordered by the Critical Care/Cardiology/Emergency Attending physician or delegate utilizing the Targeted Temperature Management Post Cardiac Arrest order set. While the procedure may be initiated in the ED, the patient is to be transferred to the ICU as soon as possible after initiation.  
  
The Critical Care / Cardiology Attending physician has final responsibility for determining whether or not TTM should be continued if the procedure has been initiated outside of the ICU. If possible, the ED Attending physician is to consult with ICU before starting TTM.
- 3.2. Coronary reperfusion strategies may be implemented during TTM. An urgent Cardiology consult or discussion with the Interventional Cardiologist is recommended.
- 3.3. TTM can be continued for patients going to the cardiac catheterization lab. Consider the use of ice packs or other easy to transport cooling modalities. Active cooling may be stopped if necessary and resumed when the patient returns.

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3.4. Inclusion Criteria for TTM (ALL criteria must be met):

- Cardiac arrest of presumed cardiac etiology
- Return of spontaneous circulation (ROSC) for greater than 20 minutes
- Persistent Glasgow Coma Scale (GCS)  $\leq 9$
- Less than 8 hours elapsed since ROSC

3.5. Exclusion Criteria for TTM:

- Systolic blood pressure (SBP)  $< 80$ mmHg despite vasopressors, inotropes, and/or mechanical cardiovascular support
- Initial temperature under 30°Celsius
- GCS  $\geq 10$  or improving rapidly, or patient following commands
- Comatose state prior to cardiac arrest
- Terminal illness preceding arrest
- Known pre-existing pathological coagulopathy that cannot be reversed
- Unwitnessed arrest with a presenting rhythm of asystole

3.6. Duration of Target Temperature is a multi-staged approach. (Refer to “*Appendix A Targeted Temperature Management Time Course: 72 hours*”):

**Active Cooling (hours 0-28):** During this phase, the patient’s temperature is controlled using active measures to achieve a target temperature goal of 35-36°C.


- Goal is to achieve this temperature within 4 hours of ROSC.
- Duration of the Active Cooling Phase is 28 hours from the time TTM was initiated.

**Rewarming Phase (hours 28-36):** During this phase, the patient’s temperature is allowed to increase passively or is actively controlled to prevent temperatures greater than 37°C.

- Duration of the rewarming should occur over 8 hours.

**Monitoring Phase (hours 36-72):** During this phase, the patient’s temperature is monitored to prevented temperatures greater than 37.5°C.

3.7. For optimal results, a cooling device with external active cooling wraps (vest and / or leggings) is recommended to achieve and maintain TTM.

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3.8. Use of a peripheral nerve stimulator is strongly recommended in patients that receive neuromuscular blockade during induced hypothermia. Refer to: [Critical Care Clinical Guideline: Peripheral Nerve Stimulator: Train of Four Monitoring \(Adult\)](#).

#### 4. EQUIPMENT

- Continuous core temperature monitoring equipment (e.g. esophageal or rectal probe; pulmonary artery catheter)
- Active cooling device
- External cooling wraps (e.g. vests and / or leggings)
- Refrigerated Lactated Ringers IV solution (dependent on baseline temperature)


#### 5. PROCEDURE

Part A: [ACTIVE COOLING PHASE](#)


Part B: [REWARMING PHASE](#)

Part C: [MONITORING PHASE](#)

<b>Part A: ACTIVE COOLING PHASE (hours 0 - 28)</b>	
<b><u>PROCEDURE</u></b>	<b><u>SPECIAL CONSIDERATION</u></b>
1. Perform hand hygiene before direct patient contact and subsequently as clinically indicated.	
2. Perform and document a comprehensive baseline neurological exam and skin assessment prior to initiation of TTM.	
3. Insert temperature probe for continuous core temperature monitoring.	<p>The target temperature goal is 35-36°C. Core temperature is to be monitored continuously by at least one of the following methods:</p> <ul style="list-style-type: none"> <li>• Esophageal temperature probe</li> <li>• Rectal temperature probe</li> <li>• Pulmonary artery catheter</li> </ul>


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<b>Part A: ACTIVE COOLING PHASE (hours 0 - 28)</b>	
<b><u>PROCEDURE</u></b>	<b><u>SPECIAL CONSIDERATION</u></b>
	If unable to monitor by one of the above methods, measuring an oral temperature every 30 minutes is an acceptable alternative.
<b>4. Record the following times:</b> <ul style="list-style-type: none"> <li>• Time cooling started</li> <li>• Actual time targeted temperature is achieved</li> </ul>	<p>The goal is to achieve targeted temperature within 4 hours of cooling start time.</p> <p>All times should be documented in the patient's health record.</p>
<b>5. Record baseline temperature.</b> <ul style="list-style-type: none"> <li>• If baseline temperature is above 36°C, refer to Targeted Temperature Management Post Cardiac Arrest order set.</li> <li>• If baseline temperature is below 35°C, allow the patient to passively warm to goal temperature.</li> </ul>	<p>Passively allowing the patient to warm to goal temperature is preferred as actively warming the patient can cause peripheral vasodilation and hemodynamic instability.</p>
<b>6. Set the goal temperature on the active cooling device to achieve the desired patient temperature of 35 - 36°C.</b>	<p>Refer to device specific instructions.</p> <p>This is ideally achieved using an automated modality.</p> <p>Ensure no active heating is being used on the ventilator. A passive Heat and Moisture Exchanger (HME) is to be used in the ventilator circuit.</p>
<b>7. Place the external active cooling wraps (vest and / or leggings) on the patient.</b>	<p>Ensuring there are no folds or creases reduces the risk of pressure ulcer development and allows the water to flow through the wraps.</p>
<b>8. Start the active cooling device.</b>	
<b>9. Administer sedation/analgesia infusions as ordered in the Targeted Temperature</b>	

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<b><u>Part A: ACTIVE COOLING PHASE (hours 0 - 28)</u></b>	
<b><u>PROCEDURE</u></b>	<b><u>SPECIAL CONSIDERATION</u></b>
Management Post Cardiac Arrest order set.	
<b>10.</b> Wrap hands and feet with warm dry blankets or towels.	Warming the hands and feet can communicate to the hypothalamic thermoregulatory reflexes to suppress shivering.
<b>11.</b> Maintain the patient's temperature between 35 – 36 °C for 28 hours or as ordered.	
<b>12.</b> Observe for shivering.	Follow "Shivering Therapy" as ordered in the Targeted Temperature Management Post Cardiac Arrest order set.  Shivering works against cooling measures making it more difficult to reach and maintain target temperature.
<b>13.</b> Initiate enteral feeding as ordered by the physician / delegate.	
<b>14.</b> Assess skin integrity every 2 hours while external active cooling wraps (vest and / or leggings) are on the patient.	

<b><u>Part B: REWARMING (hours 28 – 36)</u></b>	
<b><u>PROCEDURE</u></b>	<b><u>SPECIAL CONSIDERATION</u></b>
<b>1.</b> Turn off active cooling device 28 hours after TTM is initiated, or as ordered by physician.	May leave external wraps on the patient.
<b>2.</b> Allow patients temperature to passively rewarm for the next 8 hours.	Patients should rewarm at a rate of 0.2 - 0.3°C per hour.  Active cooling measures may be reinitiated if the patient's temperature exceeds 0.5°C per hour or a temperature of 37°C.

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<b><u>Part B: REWARMING (hours 28 – 36)</u></b>	
<b><u>PROCEDURE</u></b>	<b><u>SPECIAL CONSIDERATION</u></b>
<b>3.</b> Notify physician if active cooling measures are reinitiated.	Active warming measures may be initiated if the patient does not return to normothermia, as directed by the physician.

<b><u>Part C: MONITORING PHASE (hours 36 – 72)</u></b>	
<b><u>PROCEDURE</u></b>	<b><u>SPECIAL CONSIDERATION</u></b>
<b>1.</b> Ensure temperature does not exceed 37.5°C for an additional 36 hours after the rewarming phase.	The use of active cooling measures may be reinitiated during this phase.  Hyperthermia in the post-arrest patient can potentiate brain injury.
<b>2.</b> Stop or aggressively taper sedation and analgesia 36 hours after active cooling is initiated, or as directed by physician.	Patients who rapidly awaken, and who follow commands, can be rewarmed at a faster rate. Care is to be taken to avoid temperatures exceeding 37.5°C.

## **6. DOCUMENTATION**


Document the following information and times in the Integrated Progress Notes, Flow Sheet or Electronic Patient Record, as applicable:

- Baseline neurological and skin assessment
- Time TTM started
- Actual time TTM is achieved (goal 35 - 36°C)
- Temperature (including route of measurement) and vital signs (every hour and PRN)
- Skin assessment (every two hours & PRN)
- Time to begin passive rewarming (28 hours after TTM started)
- Time to decrease / stop sedation (36 hours after TTM started)
- Time TTM discontinued or completed

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Appendix A: Targeted Temperature Management Bedside Reference Tool

