

Hurley Medical Center
Standard Practice
Adult Post Cardiac Arrest / Targeted Temperature Management

Purpose: Comprehensive post-arrest care is essential for addressing the systemic impacts of ischemia-reperfusion injury caused by cardiac arrest and is a critical element in achieving optimal patient outcomes post-cardiac arrest. Standardizing these interventions can reduce variations in care and has been shown to increase survival rates and improve neurological outcomes. The imperative lies in ensuring consistent high-quality care.

Policy:

A. Patient Selection

1. Immediately subsequent to Return of Spontaneous Circulation (ROSC), attention should be paid to the optimal support of organ systems. Identification and treatment of the cause of cardiac arrest should be performed with a particular focus on preventing reperfusion injury related to ischemia. Additionally, consideration should be given to the initiation of Targeted Temperature Management (TTM) for comatose (defined as absence of meaningful response to verbal commands) patients who demonstrate sustained circulation greater than 20 consecutive minutes.
2. Evaluation of the patient's appropriateness for TTM should be considered based on the following inclusion/exclusion criteria:
 - a. Inclusion criteria:
 - i. Intubation during or following cardiac arrest with mechanical ventilation
 - ii. Comatose with no meaningful response to verbal stimuli and a Glasgow Coma Scale score of less than 9
 - iii. An elapsed time of less than 12 hours from the time ROSC was obtained
 - b. Exclusion criteria:
 - i. Age < 18 years
 - ii. Uncontrolled arrhythmias

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- iii. Poor prognosis determined by the patient's primary treatment team
 - iv. Mean arterial pressure (MAP) less than 65mm Hg despite aggressive fluid resuscitation and vasopressor support
 - v. Major traumatic injury or isolated head injury
 - vi. Major operative procedure within the previous 72 hours of cardiac arrest
 - vii. Severe coagulopathy or uncontrolled bleeding
 - viii. Core temperature (rectal, esophageal, bladder) < 30° C on initial measurement post arrest
3. Initiation and management of TTM should not delay reperfusion therapy, imaging studies, or continuous renal replacement therapy where warranted.

B. Initiation Phase Procedure (First 24 hours)

1. Place core temperature probe (i.e. urinary, esophageal, rectal, etc.) for reliable and continuous monitoring of patient temperature.
2. If necessary, apply temperature management device (i.e. Arctic Sun, Altrix, Blanketroll, etc.) according to device specifications to maintain the patient's target temperature between 36° C – 37.5°C (set temp 37°C). If a patient presents with an initial temperature of <36°C consider slow rewarming with a goal increase of 0.25°C to 0.33°C per hour.
3. Shivering will be assessed and monitored by the bedside nurse hourly utilizing the Bedside Shivering Assessment Scale (BSAS). Shivering will be controlled utilizing the shivering order set as follows:
 - a. If a temperature management device is used for cooling, apply an air warming blanket (especially over the patient's extremities) while cooling pads provide ongoing cooling. This facilitates stimulation of warmth to areas of skin receptors not covered with the cooling pads and can reduce shivering.
 - b. If surface warming is unsuccessful/unavailable and BSAS score is ≥1, optimize analgesic infusion according to titration order parameters and

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- consider the administration of PRN Meperidine to lower the patient's shivering threshold.
- c. If analgesic optimization and Meperidine administration is unsuccessful, administer PRN doses of neuromuscular blocking agent. Assess baseline Train of Four setting (mV) and response prior to administration of the first dose of neuromuscular blockade.
 - d. If PRN paralytic bolus is not consistently or adequately controlling shivering, advance neuromuscular blocking agent to a continuous infusion and begin continuous Bispectral Index (BIS) monitoring for sedation titration and hourly Train of Four (TOF) monitoring for titration of the continuous neuromuscular blockade infusion.
 - e. See Appendix B for ordering details.
4. Optimize vital signs with particular attention to adequate oxygenation while avoiding hyperoxia
 5. Obtain 12 lead ECG and consider PCI for STEMI pattern changes
 6. Obtain baseline labs (including basic metabolic panel, electrolytes 2 panel, CBC with differential, and PT/PTT) and schedule them for every 6 hours.
 7. Consider placing consultations for Neurology and Cardiology. Consider placing consultation for Obstetrics/Maternal Fetal Medicine if the patient is pregnant.
 8. Obtain baseline CT of the head without contrast.
 9. Order baseline EEG.
 10. Vital signs (BP, RR, HR, Temp) every hour x 24 hours and then per unit standards after.
 11. Pupil assessments every 4 hours. Utilize the pupilometer when available. Ongoing, objective assessment of pupils will assist with neuroprognostication.
 12. Notify the critical care treatment team at any time during TTM protocol upon development of complications, including but not limited to:
 - f. MAP less than 65 mmHg
 - g. Uncontrolled arrhythmias
 - h. Oxygen saturation < 88% on 100% FiO₂ for > 15 minutes
 - i. Uncontrolled bleeding

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j. Significant pupillary changes

E. Secondary Phase Procedure (24-72 hours)

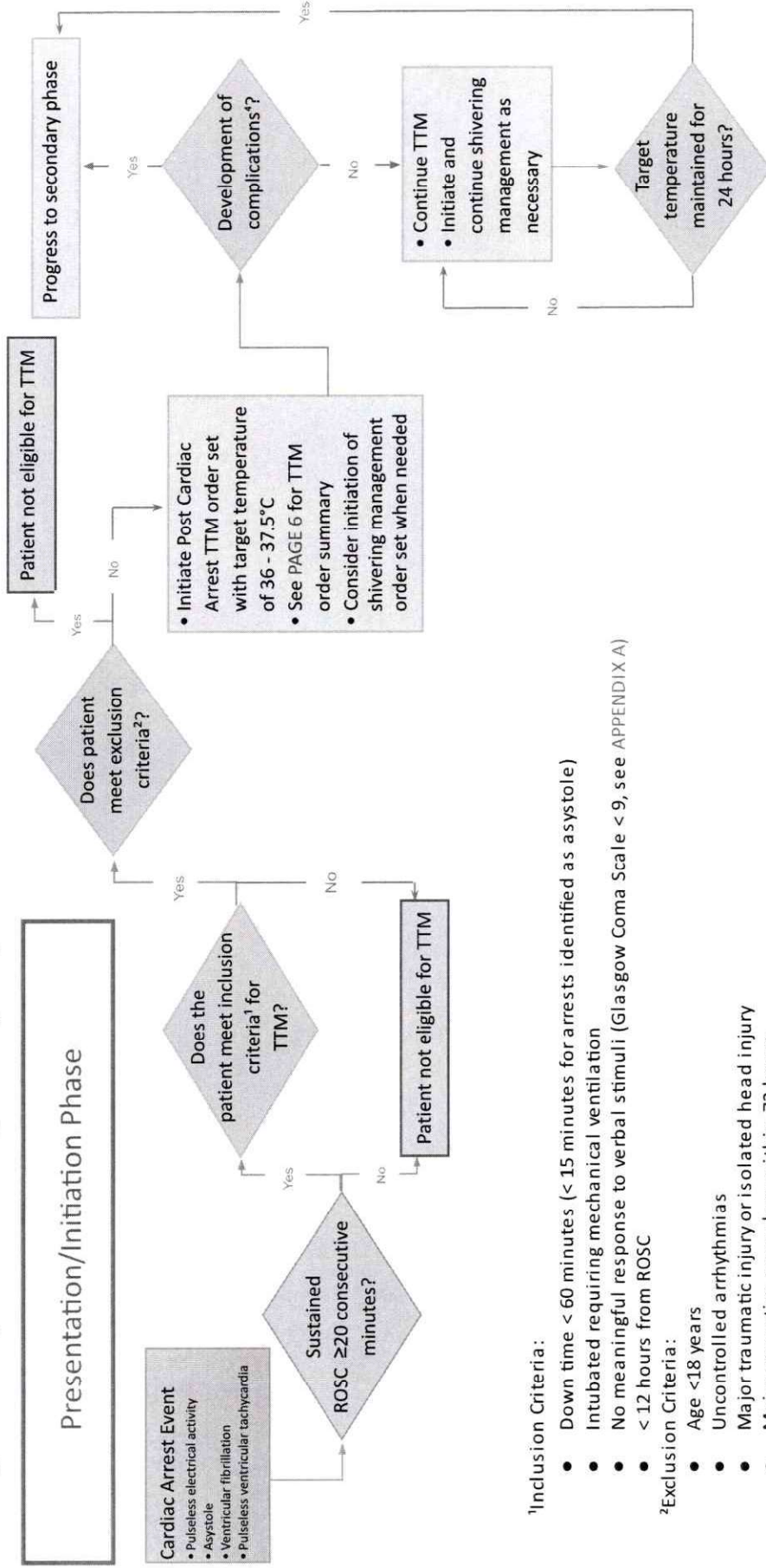
1. Continue to use the temperature management device to maintain normothermia (36.0° C to 37.5° C) for an additional 48 hours or until discontinued by the primary treatment team.
2. Collaborate with radiology for completion of repeat head CT without contrast and neurology for repeat EEG.
3. Collaborate with neurology for multimodal neurological prognostication utilizing:
 - a. Clinical examination
 - b. Electrophysiology
 - c. Biomarkers
 - d. Imaging
 - e. Pupillary assessments
4. Though assessment and clinical data are collected throughout the entire post arrest care treatment period, evaluation of aggregated assessment information and prognosis should be deferred until ≥ 72 hours after arrest

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Post Cardiac Arrest Targeted Temperature Management (TTM)



¹Inclusion Criteria:

- Down time < 60 minutes (< 15 minutes for arrests identified as asystole)
- Intubated requiring mechanical ventilation
- No meaningful response to verbal stimuli (Glasgow Coma Scale < 9, see APPENDIX A)
- < 12 hours from ROSC

²Exclusion Criteria:

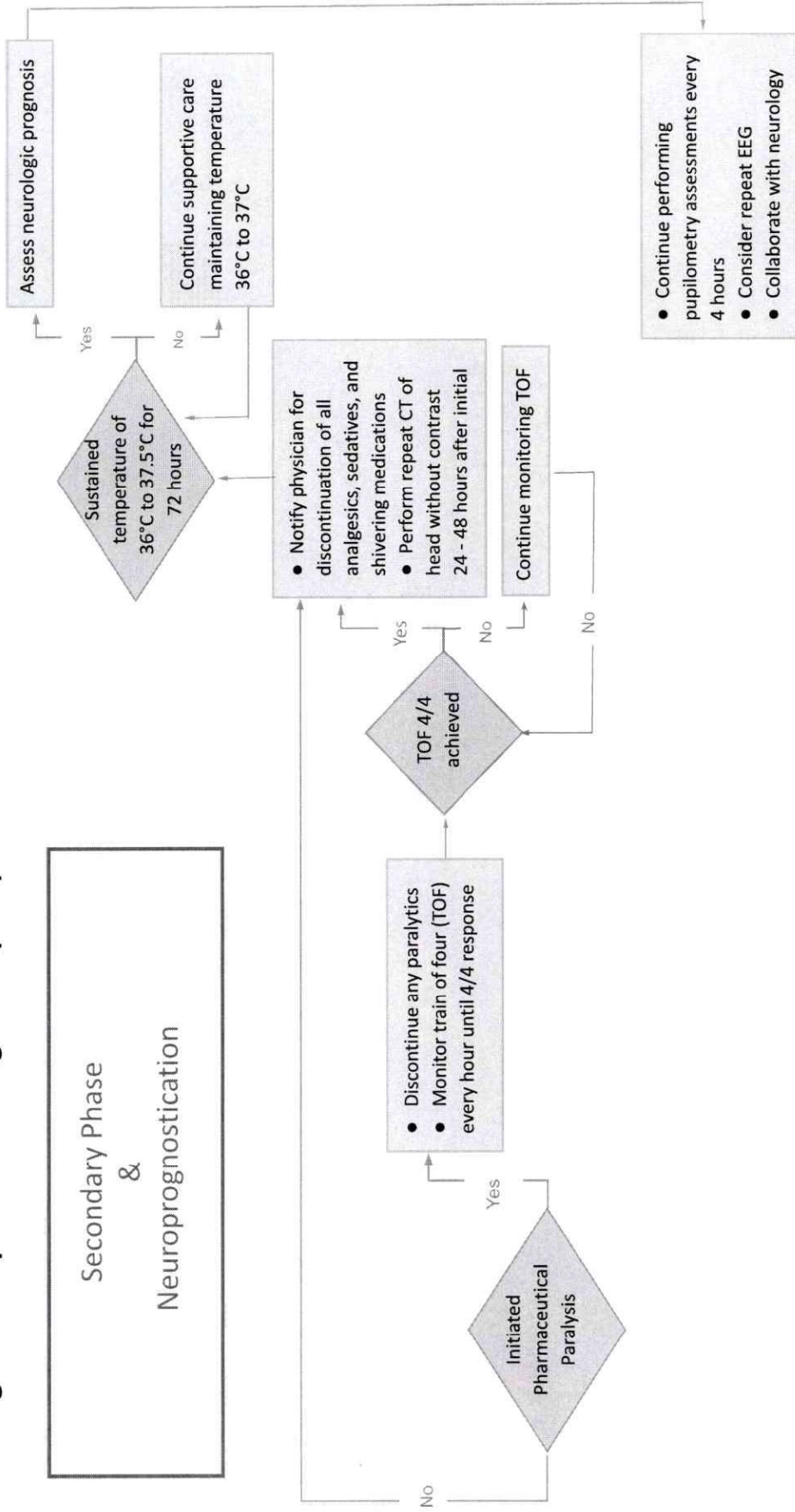
- Age < 18 years
- Uncontrolled arrhythmias
- Major traumatic injury or isolated head injury
- Major operative procedure within 72 hours
- Known severe coagulopathy or uncontrolled bleeding
- Hypothermia – rectal/bladder/esophageal temperature < 30°C upon initial measurement
- Mean arterial pressure (MAP) < 65 mmHg despite aggressive fluid resuscitation and vasopressor support
- Poor prognosis determined by the primary treatment team

³If temperature ≤ 36°C, no cooling required. If temperature > 36°C within 24 hours, initiate TTM

⁴See PAGE 3 for complications

Post Cardiac Arrest Targeted Temperature Management (TTM)

Secondary Phase
&
Neuroprognostication



Post Cardiac Arrest Targeted Temperature Management (TTM)

Initiation Phase	Secondary Phase
<ul style="list-style-type: none"> • Strict NPO • No spontaneous breathing trials • Pupil assessments every 4 hours utilizing the pupilometer. • Apply temperature regulation device: set target to 37° C (Avoid Temps >37.5°C) 	<ul style="list-style-type: none"> • Maintain temperature 36°C – 37.5°C
<ul style="list-style-type: none"> • Obtain baseline head CT w/o contrast. • Obtain baseline EEG. 	<ul style="list-style-type: none"> • Consult with neurology about performing repeat head CT and EEG without contrast 24-48 hours after initial head CT.
<ul style="list-style-type: none"> • Obtain baseline BMP, Lytes 2, CBC w diff, PT/PTT and schedule every 6 hours after baseline 	<ul style="list-style-type: none"> • BMP, Lytes 2, CBC w/ differential, PT/PTT daily (or more frequently as ordered at provider's discretion).
<ul style="list-style-type: none"> • Place consultations for: <ul style="list-style-type: none"> ○ Neurology ○ Cardiology • Hourly vital signs & neuro checks • Place core temperature probe • Control shivering per "shivering management" order set 	<ul style="list-style-type: none"> • Stop any neuromuscular blocker infusions • Continue to monitor paralysis via peripheral nerve stimulation (train of four) until 4/4 twitches noted at baseline mV. • Contact the provider for consideration of the discontinuation of all sedation, analgesia, and medications ordered for shivering. • Continue to monitor ≥72 hours. Collaborate with neurology for Neuroprognostication
<ul style="list-style-type: none"> • Monitor temperature continuously 	
<ul style="list-style-type: none"> • Notify the critical care treatment team upon development of complications, including but not limited to: <ul style="list-style-type: none"> ○ MAP less than 65 mmHg ○ Uncontrolled arrhythmias ○ Oxygen saturation < 88% on 100% FIO2 for > 15 minutes ○ Uncontrolled bleeding ○ Clinically significant pupillary changes 	

Appendix A: Glasgow Coma Scale (GCS)

Domain	Response	Score
Eye opening	Spontaneous	4
	To speech	3
	To pain	2
	None	1
Best verbal response	Oriented	5
	Confused	4
	Inappropriate	3
	Incomprehensible	2
	None	1
Best motor response	Obeying	6
	Localizing	5
	Withdrawal	4
	Flexing	3
	Extending	2
	None	1
Total score	Deep coma or death	3
	Fully alert and oriented	15

Appendix B: Bedside Shivering Assessment Scale (BSAS)

Score	Definition
0	None: no shivering noted on palpation of the masseter, neck, or chest wall
1	Mild: shivering localized to the neck and/or thorax only
2	Moderate: shivering involves gross movement of the upper extremities (in addition to neck and thorax)
3	Severe: shivering involves gross movements of the trunk and upper and lower extremities