Atrium Health
Greater Charlotte Market
ADULT Post-Cardiac Arrest Resuscitation Care
Emergency Department / Inpatient
Clinical Practice Guideline

EXECUTIVE SUMMARY

This guideline outlines optimal post-cardiac arrest resuscitative care that includes active temperature, hemodynamic, and ventilator management to improve survival and neurologic outcome in patients resuscitated from cardiac arrest. It is based on the 2020 AHA Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, the European Resuscitation Council and European Society of Intesnive Care Medicine guidelines 2021: post-resuscitation care, and the most recent evidence as of this clinical practice guideline release.

Key Revisions (2024 Periodic Review):

1. Proactive temperature management with target of 37C to ensure fever avoidance.
2. Shivering prevention modifications to align with 37C target.
3. Change in blood pressure management to a target 65 to 75 mmHg.
4. Removal of induction phase and alignment with new order set launched on January 10, 2024.
5. Addition of revised activation processes.

Scope:

Disease/Condition(s): Out-of-hospital cardiac arrest (OHCA) and in-hospital cardiac arrest (IHCA)
Clinical Specialty: Emergency Medicine, Cardiology, Critical Care, Neurology
Intended Users: Physicians, Advanced practice providers, Nurses, Pharmacists

Major Outcomes Considered: Sudden cardiac death, survival, morbidity, neurological recovery.
Authors: Post-Resuscitation Collaborative (a sub-committee of the Atrium Health Resuscitation Committee); Contact for Changes: Leslie London or Dr. David Pearson, Emergency Medicine

Release Date: January 2024 | **Next Review Date:** January 2027

RECOMMENDATIONS

Inclusion Criteria:

(1) Adults (age ≥ 18 years)
(2) Comatose (GCS < 9 or no motor response to loud stimuli)
(3) Intubated
(4) ROSC following resuscitation from cardiac arrest regardless of initial rhythm

Exclusion Criteria:

Absolute Contraindication:

(1) Severe terminal illness preceding the cardiac arrest
(2) Do Not Resuscitate (DNR) Status
(3) Advanced directives indicating no intervention for life support.

Relative Contraindications:

(1) Resuscitation time (time of collapse to ROSC) > 60 minutes for initial rhythm of VF/VT.
(2) Resuscitation time (time of collapse to ROSC) > 40 minutes for initial rhythm of PEA or witnessed asystole.
(3) Unwitnessed asystole regardless of resuscitation time
(4) Traumatic arrest due to exsanguination: Patients involved in a traumatic event (i.e., motor vehicle crash) with the participating event of cardiac arrest without evidence of significant traumatic injury should be considered.
(5) Imminent cardiovascular collapse despite aggressive resuscitative measures.
(6) History of moderate to severe dementia.
(7) If recovery from the underlying disease process that led to the cardiac arrest is unlikely, do not proceed with aggressive resuscitative measures via this guideline.

*** The inclusion and exclusion criteria are provided as a guideline and clinical discretion supersedes these criteria if the benefit outweighs the risk. ***

Activation and Logistics:

(1) For Level 1 Cardiac Arrest Receiving Facilities: Activate **CODE ROSC** via Secure Chat groups.
(2) For Level 2 Cardiac Arrest Referring Facilities: Upon meeting inclusion/exclusion criteria, Activate ADULT CODE ROSC via the Atrium Health-Physician Connection Line (PCL) at 704-512-7878 or other connection line that ensures patient tracking). If questions arise regarding the candidacy of the patient for the ADULT CODE ROSC pathway, discussion with the transferring Emergency Medicine and Pulmonary Critical Care (PCC) Medicine physicians at the Level I Center should be done.
(3) Comatose cardiac arrest patients with ST-elevation myocardial infarction (STEMI) are potential candidates for emergency percutaneous coronary intervention (PCI). Activation of Code STEMI should be done per clinical pathway shown in Appendix 1.
(4) Once the patient is at the Level I Cardiac Resuscitation Center, Pulmonary Critical Care Consultants (PCCC) and Cardiology consultant teams should be consulted for shockable initial rhythm; if PEA/asystole, PCCC should be consulted and will notify Cardiology teams as needed.

NEW Order Set: ADULT CRIT Targeted Normothermia. Utilize the ADULT CRIT Targeted Normothermia order set. This includes nursing interventions, testing, medications inclusive of shivering prevention, vasoactive agents, electrolyte replacement, antimicrobials, and shivering treatment & analgosedation.

Temperature Management with Target 37°C Guidance:

1. **ED/non-ICU Management**: The primary goal is to prevent fever and patients should have early active temperature management device utilized to maintain temperature at 37C. If prolonged delays in transfer/transition to ICU, implementation of active temperature management device (Arctic Sun or Zoll), if available, should be implemented to ensure temperature does not go above 37.8C. If at a facility without an active controlling device (Arctic Sun or Zoll), then utilize other

surface temperature management device if available, ice packs, or cold IV fluids to decrease temperature to target of 37C.

2. **ICU Management**:
    a. Upon arrival to the ICU, actively control patient temperature with a device (Arctic Sun or Zoll) with temperature set at 37°C with intended duration for **72 hours** after sustained return of spontaneous circulation. Keep pads in place if patient remains comatose and still requiring active temperature management. Temperature management device should be placed proactively before fever onset to ensure avoidance of fever.
    b. Water temperature for the Arctic Sun device < 20°C is indicative of an underlying fever and should prompt antipyretics and search for a potential source of infection.
    c. If patient remains comatose after 72 hours, please keep the temperature management device (with Arctic Sun pads) in place to ensure active control for an additional 24 hours.
3. **Duration of Active Temperature Management**: 72 hours from sustained ROSC.

Shivering Prevention:

1. Initiate shivering prevention via Adult CRIT Targeted Normothermia order set.
2. Order set contains acetaminophen, buspirone, and magnesium for shivering prevention.
3. Utilize socks on hands and feet as a mechanism for "counter rewarming" which facilitates temperature management.

Shivering Management & Analgosedation:

1. Initiate **fentanyl** for analgosedation and first option for shivering via order set. Set and titrate to resolution of clinical shivering. Set & titrate to Critical Care Pain Observation Tool (CPOT) and Bedside Shivering Assessment Scale (BSAS) goals per order set.
2. Initiate **propofol** or **dexmedetomidine** for sedation and/or second option for shivering.
3. with fentanyl via order set. Do NOT use dexmedetomidine for target RASS less than negative 2 Set and titrate to Richmond Agitation Sedation Scale (RASS) and BSAS goals per order set.
4. Chemical paralysis should only be used under extraordinary circumstances. Paralytic agents via a continuous infusion should be avoided. If the patient is chemically paralyzed, the target RASS is -4 to -5 and must be achieve PRIOR to initiation of chemical paralysis. Do NOT decrease infusion when patient is chemically paralyzed.
5. Sedation should be maintained for a minimum of 40 hours from ROSC time if findings suggestive of fever (i.e., Arctic Sun water temperature < 20°C). If no evidence of fever, intermittently holding sedation to assess neurological status is reasonable after 12 hours. If awake and following commands, then consider moving toward extubation. If remains comatose, then restart sedation for desynchrony, fever, or shivering control.
6. Overall, titrate ordered medications to achieve desired goals for pain, sedation, and shivering control.

Table 1. Bedside Shivering Assessment Scale[14]

Score	Type of Shivering	Location
0	None	No shivering is detected on palpation of the masseter, neck, or chest muscles
1	Mild	Shivering localized to the neck and 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

Hemodynamic Recommendations:

1. Target mean arterial pressure (MAP) ≥ 65 mmHg to 75 mmHg.
2. Anticipate hypotension and **early initiation of vasopressors** to avoid hypotension is preferred. Approximately, 50% of post-arrest patients will develop hypotension and/or post-cardiac arrest shock state early during management.
3. Norepinephrine is the preferred initial vasopressor. Notify provider if infusion rate is > 30 mcg/min.
4. Routine central venous catheters (CVC) are not mandatory unless patient requires vasopressor support. Avoid CVC placement in the LEFT subclavian vein to preserve this site for internal defibrillator placement.
5. Vasodilators, beta-blockers, and anti-dysrhythmics should be used judiciously.
6. Fluid resuscitation should be individualized to the patient.

Ventilator Recommendations:

1. Avoid hypoxia and hyperoxia. Aim for normoxia. Target P_AO_2 to approximately 100 mmHg. Titrate F_iO_2 rapidly while ensuring oxygen saturation remains 95% to 97%.
2. Avoid hyperventilation. Target P_aCO_2 40 – 45 mmHg or titrate $P_{ET}CO_2$ for 35 – 40 mmHg.

Neurology Consultation, EEG Monitoring, and Neurological Prognostication:

1. EEG monitoring should be considered and when utilized, should be instituted in the ICU. (see "Guideline for EEG Monitoring for Patients Undergoing Post-Cardiac Arrest Clinical Care Pathway").
2. Consult neurology for assistance with prognostication or seizure control as clinically indicated, but neurology consultation is not required to obtain EEG monitoring.
3. Neurological prognostication should be performed per institutional/hospital-specific guidelines.
4. Neurological prognostication is challenging in the post-arrest patient that undergoes therapeutic hypothermia and typically should not be attempted until 96 hours after ROSC with the exceptions of myoclonus status (as defined as generalized myoclonic convulsions in face and extremities and continuous for a minimum of 30 minutes) in the first 24 hours after admission, brain death due to cerebral herniation, or because of ethical reasons (for instance: previously unknown information about disseminated end-stage cancer or refractory shock with end-stage multi-organ failure). However, assumptions of a poor neurological function should be avoided as the sole reason for withdrawal of active treatment prior to 96 hours after ROSC.

Post-Arrest Emergent Cardiac Catheterization Guidance:

STEMI:

- Active Code STEMI for OHCA patients with suspected cardiac etiology of arrest, ST-segment elevation on ECG that meet STEMI criteria, and a MIRACLE2 score < 5 points (**see Appendix 1** for post-arrest emergent cardiac catheterization clinical pathway).
- For patients with a MIRACLE2 score ≥ 5 points, individualize patient care including consultation with interventional cardiologist.

No STEMI:

- For patients with suspected cardiac etiology of arrest and high-risk ECG findings (e.g., LBBB with Sgarbossa concordance, isolated posterior MI, aVR sign, Wellens, De Winter ST/T-wave complexes), case-by-case consideration is warranted and immediate consultation with interventional cardiologist recommended.
- For patients with suspected cardiac etiology without ST-segment elevation on ECG, case-by-case consideration is also warranted, however, evidence shows no difference in survival or neurological outcome at 90 days with immediate vs delayed angiography in patients resuscitated from cardiac arrest.

Disclaimer:

Clinical practice guidelines assist clinicians by providing a framework for the evaluation and treatment of patients. This guideline outlines the preferred approach for most patients. It is not intended to replace a clinician's judgement or to establish a protocol for all patients. It is understood that some patient will not fit

the clinical condition contemplated by a guideline and that a guideline will rarely establish the only appropriate approach to a problem.

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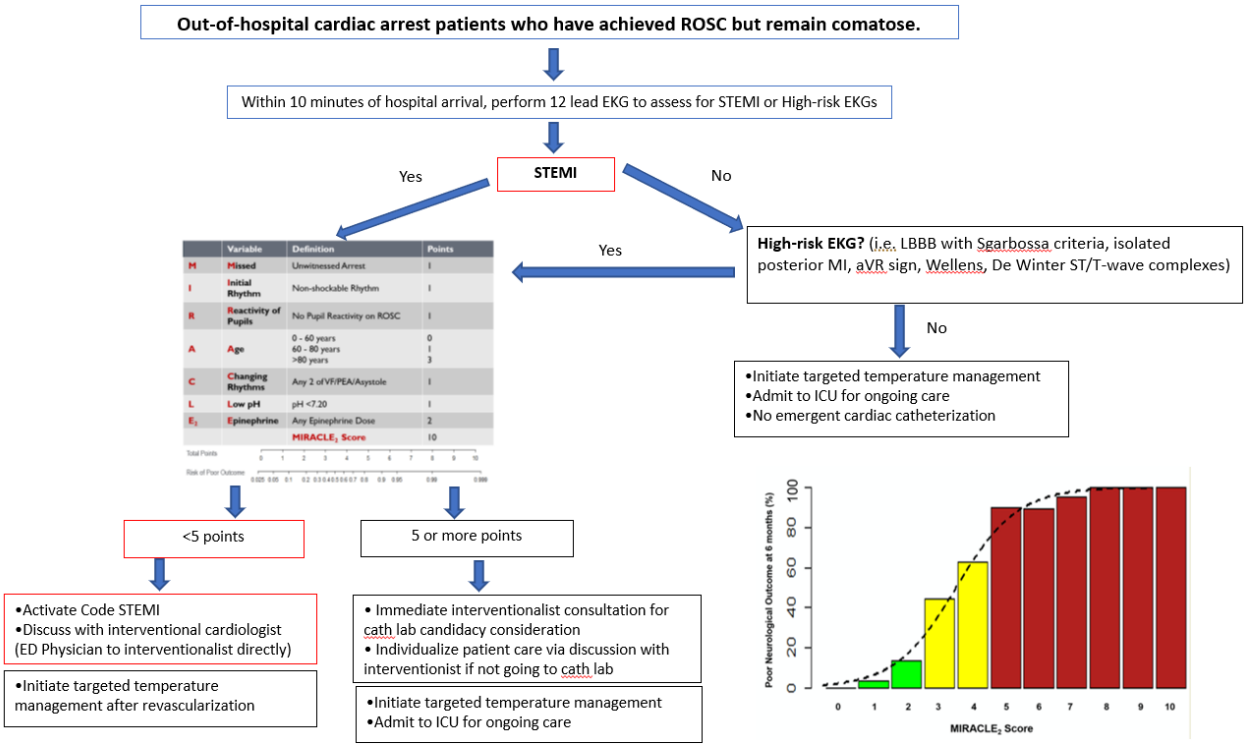
Based on initial versions of Carolinas Medical Center Therapeutic Hypothermia After VT/VF Arrest Care Guidelines, 3rd revision 10/2007. Original Authors: Alan Heffner, MD; Alan Jones, MD; David Pearson, MD.

History of Revisions: Revised 4/08; 1/15; 2/19; 8/21, 1/24
This Version: Atrium Health Resuscitation Committee Sub-Committee - Post-Resuscitation Collaborative - Approval: 2/2024

Appendix 1: Post-arrest emergent cardiac catheterization clinical pathway



Initial version of cardiac cath pathway: 9/2021. Revised April 2022.