

Applies To: **UNM Hospital** Responsible Department: Adult Critical Care Effective Date:

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| Title: Post Cardiac Arrest Care Guideline | | **Guideline** |
| **Patient Age Group:** | ( ) N/A ( ) All Ages ( ) Newborns ( ) Pediatric (x ) Adult | |

# DESCRIPTION/OVERVIEW

This guideline is to provide up to date, evidence based support in clinical decision making in adult post cardiac arrest care. Topics to be covered include Targeted Temperature Management (TTM), ICU management, considerations for imaging post arrest, considerations for consultation for PCI / reperfusion, considerations for ECPR / ECMO management, and neuroprognostication after cardiac arrest.

# REFERENCES

1. Bernard SA, Gray TW, Buist MD, et al. Treatment of comatose survivors of out-of-hospital cardiac arrest with induced hypothermia. N Engl J Med. 2002 Feb 21;346(8):557-63.
2. Callaway CW, Donnino MW, Fink EL, et al. Part 8: Post-Cardiac Arrest Care: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2015 Nov 3;132(18 Suppl 2):S465-82.
3. Chan PS, Berg RA, Tang Y, et al. American Heart Association’s Get With the Guidelines–Resuscitation Investigators. Association Between Therapeutic Hypothermia and Survival After In-Hospital Cardiac Arrest. JAMA. 2016 Oct 4;316(13):1375-1382.
4. Nielsen N, Wetterslev J, Cronberg T, et al. Targeted temperature management at 33°C versus 36°C after cardiac arrest. N Engl J Med. 2013 Dec 5;369(23):2197-206.
5. Jerry P. Nolan, Claudio Sandroni,4, Bernd W. Böttiger, et al. European Resuscitation Council and European Society of Intensive Care Medicine guidelines 2021: post‑resuscitation care. Intensive Care Med (2021) 47:369–421.
6. Yannopoulos D, Bartos J, Raveendran G, Walser E, et al. Advanced reperfusion strategies for patients with out-of-hospital cardiac arrest and refractory ventricular fibrillation (ARREST): a phase 2, single centre, open-label, randomised controlled trial. Lancet. 2020 Nov 12:S0140-6736(20)32338-2.
7. Dankiewicz J, Cronberg T, Lilja G, et al; TTM2 Trial Investigators. Hypothermia versus Normothermia after Out-of-Hospital Cardiac Arrest. N Engl J Med. 2021 Jun 17;384(24):2283-2294.

# AREAS OF RESPONSIBILITY

# Emergency Department

# RN

# PCT

# MD / APP

# Adult ICUs

# RN

# PCT

# MD / APP

# GUIDELINE STEPS

1. Inclusion Criteria
   1. Status post cardiac arrest with return of spontaneous circulation (any presenting rhythm)
   2. No purposeful response to verbal commands immediately post-arrest
   3. Intubated and mechanically ventilated
2. Exclusion Criteria
   1. Baseline mental status prior to cardiac arrest not responsive
   2. Age less than 18 and pregnancy are relative exclusions (lack of data)
   3. Cautions (relative)
      1. Temp < 33 C
      2. Cardiogenic shock
      3. Sepsis
      4. Known active or ongoing bleeding
3. Initiation of Post Cardiac Arrest Care Protocol
   1. At the time of arrival of a patient with out-of-hospital cardiac arrest with return of spontaneous circulation (ROSC), the Emergency Department will initiate the TTM Protocol immediately upon patient arrival. In the event that a patient arrives in cardiac arrest, but ROSC is achieved in the Emergency Department, the EDRU team will initiate the TTM protocol immediately thereafter.
4. Targeted Temperature Management

Goal temperature is 36.5° C, reflecting the most recent large randomized controlled trial, TTM-2. While it does not appear that aggressive temperature reduction has a benefit in this population based on current trials, if there is a specific indication for a lower temperature, this may be targeted at the discretion of the faculty member.

* 1. Immediately after ROSC a core temperature probe should be placed for continuous temperature monitoring. A provider should be notified at a core temp of 37 in order to initiate immediate cooling measures.
  2. Cooling Methods:
     1. Surface cooling (preferred) should begin immediately with the use of the Arctic Sun or ice packs placed on the patient’s neck, torso, in the bilateral axilla, and on the femoral vessels bilaterally. Ice packs are a temporary measure and can be used to initiate cooling. Continued surface cooling should be provided with closed-loop cooling system (Arctic Sun). Simple cooling blankets such as the Blanketrol are not adequate for TTM.
     2. Consider placing an endovascular cooling catheter (femoral preferred) for maintenance and re-warming purposes if surface cooling options are not available or if patient otherwise needs central venous access.
     3. Placement of any cooling devices SHOULD NOT delay transport to PCI or other time sensitive critical intervention. If intervention is indicated, time expedient measures such as ice packs should be used temporarily.
        1. If active cooling is initiated, temperature should be measured through the use of foley temperature probe and/or esophageal temperature probe. Ideally, two temperature probes should be utilized for confirmation and correlation of body temperature.
  3. Maintenance of TTM and Shivering Management
     1. Goal temperature should be maintained for 24 hours irrespective of improvements in mental status
     2. If the patient is having shivering that is requiring intervention, the goal temperature may be increased up to 37.5 as needed to control shivering. Do not stop TTM, continued shivering should be managed via the UNM Shivering Protocol
     3. Fever should be avoided for 72 hours post cardiac arrest, and cooling devices may be continued as needed during this time. After this period fever should be managed and evaluated per standard ICU guidelines.
     4. Cooling catheters should be removed as soon as they are no longer needed for temperature management. If continued central access is needed, obtain alternate access (such as a PICC or alternative CVC site).

1. ICU Maintenance and Supportive Therapy
   1. Airway and breathing:
      1. Maintain SpO2 94-98% or PaO2 55-100 mmHg
      2. Maintain normocapnia after initial resuscitation and when clinically appropriate
      3. Use lung protective ventilation with goal tidal volumes of 6-8 ml kg/ideal body weight
   2. Sedation, Analgesia and Paralytics
      1. If the patient is comatose, AVOID any sedative or analgesic medications
      2. Analgesia / Sedation (if indicated): Agents with a short and reliable half-life are preferred (avoid benzodiazepines or longer acting agents with unpredictable drug metabolism, propofol or dexmedetomidine preferred). Please see the UNM Adult ICU Analgesia and Sedation Guideline for further assistance.
   3. Hemodynamics
      1. Maintain MAP >65 or to maintain adequate urine output (0.5 cc/kg/hr) and lactate clearance
      2. Choose vasoactive agents as appropriate after assessment of cardiac function (eg. echocardiography, pulmonary artery catheter, PCI)
   4. Seizure Management
      1. All comatose post cardiac arrest patients should have continuous EEG monitoring initiated on admission to diagnose seizures or non-convulsive status epilepticus.
      2. Concern for active status epilepticus, either convulsive or nonconvulsive, should trigger a STAT EEG, either by standard EEG or Ceribell.
      3. Seizures should be treated with benzodiazepines followed by levetiracetam or valproate as first line anti-epileptic medications.
      4. Neurology consultation should be obtained to assist with seizure management.
   5. Electrolyte Management
      1. Routine chemistry panel should be obtained q 6 hours in the first 24 hours post-cardiac arrest
      2. Potassium goal should be 4-4.5 mEq/L
      3. Magnesium goal should be > 2 mg/dL
      4. Sodium goal should be 140 mEq/L with attention to avoid overly rapid correction
   6. Glucose management
      1. Standard per ICU protocol
         1. Insulin gtt should be strongly considered to maintain euglycemia
   7. Stress Ulcer Prophylaxis
      1. Standard per ICU protocol
   8. VAP Bundle
      1. Standard per ICU protocol
   9. Nutrition
      1. Consult to dietitian
      2. Can consider trophic feeds if temp <36, advance as tolerated if >/= 36
   10. Anticoagulation
       1. Standard ICU VTE prophylaxis
2. Considerations for Imaging
   1. If there is EKG evidence of STEMI, coronary angiography should be performed first (Level 1 STEMI alert) (see PCI considerations below). This should be followed by CT brain and/or CT pulmonary angiography if coronary angiography is nondiagnostic.
   2. If there are signs or symptoms pre-arrest suggesting a neurological or respiratory cause for arrest, perform a CT brain and/or a CT pulmonary angiogram
   3. See below for specific imaging considerations in E-CPR.
3. Considerations for consultation for PCI / reperfusion
   1. Emergent cardiac catheterization lab evaluation (Level 1 STEMI alert) (and immediate PCI if indicated) should be performed in adult patients with ROSC after cardiac arrest of suspected cardiac origin with ST-elevation on EKG. (This does NOT include LBBB or ST depression. Diagnosis should be made by ED attending rather than computer interpretation of ECG.)
   2. In patients with ROSC after OHCA *without* ST-elevation on EKG, urgent cardiac catheterization should be considered if there is a high probability of acute coronary occlusion (Urgent cardiology consult or “Level 2 STEMI alert”). This decision should be made in consultation with the emergency medicine physician, intensivist, and cardiologist.
4. ECPR / ECMO specific considerations
   1. For cardiac arrest that is refractory to conventional cardiopulmonary resuscitation, the use of extracorporeal membrane oxygenation should be considered and criteria reviewed.
   2. Imaging – During cannulation, appropriate imaging should be ordered by ED staff including CT head, CTA chest, CT abd / pelvis with contrast. Communication with CT techs regarding need for stat imaging is necessary.
   3. TTM with goal temp of 36 C recommended unless contraindicated, or unless the faculty member feels there is a strong indication for an alternative temperature.
   4. 2 arterial line set-ups should be available during cannulation. A right radial arterial line should be placed as soon as able. This should be placed by an experienced provider.
   5. A goal MAP of 65 should be targeted and the arterial waveform may not be pulsatile due to laminar ECMO flow.
   6. Vasoactives (epinephrine and norepinephrine) along with IV fluids will likely be needed after initiation of ECMO and should be prepared during cannulation.
5. Neuroprognostication
   1. In the absence of frank herniation or brain death, neuroprognostication should be deferred at least 72 hours after cardiac arrest or rewarming if patient received therapeutic hypothermia.
   2. No single exam finding, laboratory test, or other diagnostic study is considered to be 100% accurate at neuroprognostication; therefore, a multimodal approach to prognostication is recommended.
   3. For patients with a GCS motor score of 3 or less (without factors confounding mental status), consider the following to guide neuroprognostication as 2 or more of the following are associated with poor neurological outcome:
      1. Exam: No pupillary response (measured with pupilometer) or corneal reflex at 72 hours post cardiac arrest, or presence of status myoclonus in the first 72 hrs
      2. Somatosensory evoked potential (SSEP): bilaterally absent N20 SSEP wave greater than 24 hours after cardiac arrest
      3. EEG: suppressed background (w/wo periodic discharges) or burst suppression after 24 hours
      4. Biomarkers: Neuron specific enolase (NSE) > 60 µg/L at 48 and/or 72 hrs
      5. Imaging: CT or MRI Brain findings consistent with extensive anoxic injury
   4. Note that these are recommendations - two or more of any of these are reasonable prognostic tools, and advanced imaging or testing may not always be necessary.
   5. If two or more of the poor predictive factors above are not found, it is reasonable to continue supportive care, observe the patient, and readdress goals of care with the patient’s decision makers.
   6. Consider Neurology consultation if prognosis is not clear or requiring ancillary studies.

# DEFINITIONS

# SUMMARY OF CHANGES

N/A – New document

# RESOURCES/TRAINING

(Training programs, classes, HSC offices, other University or HSC documentation, telephone numbers, and other sources of help completing forms or carrying out procedures.)

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| **Resource/Dept** | **Contact Information** |
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# DOCUMENT APPROVAL & TRACKING

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| --- | --- | --- | --- |
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| **Committee(s)** | Critical Care Committee | | [Y or N/A] |
| **Nursing Officer** | Tom Roha, Exec Director | | [Y or N/A] |
| **Medical Director** | [Name, Department (or Chief Medical Officer)] | | [Y or N/A] |
| **Human Resources** | N/A | | [Y or N/A] |
| **Finance** | N/A | | [Y or N/A] |
| **Official Approver** | [Name, Title, Area] | | Y |
| **Official Signature** |  | Date: | |
| **Effective Date** | | [Day/Mo/Year] | |

**ATTACHMENTS**

(List and attach all forms needed to complete the procedure. A transaction flow chart might also be included in this section. Attach document(s), beginning on the next page, or provide an electronic file and list its filename here.)