

**LEHIGH VALLEY HOSPITAL HEALTH NETWORK
CLINICAL PRACTICE GUIDELINE**

Therapeutic Hypothermia After Cardiac Arrest

APPROVED BY:

FILE: CPG-H

I. Introduction/Purpose:

The goal of this guideline is to provide evidence based recommendations that can be used by primary care physicians, neurologists, cardiologists, intensivists, and nurses who provide care for patients who have suffered an anoxic injury who meet inclusion criteria for therapeutic hypothermia.

This guideline addresses general care practices and treatment interventions specific to stages of induction, maintenance, and re-warming of patients.

This guideline is written for the management of therapeutic hypothermia in the presence of a potential anoxic injury and is not meant to supersede physician clinical diagnosis and subsequent orders.

II. Definitions

Hypothermia: Temperature below 36.4° Celsius.

Mild Hypothermia: Temperature 32° C(89.6°F) to 35° C(95°F).

Moderate Hypothermia: Temperature 28° C(82.4°F) to 32°C (89.6°F).

Severe Hypothermia: Temperature, 28°C (82.4°F).

Induced Hypothermia: Intentional cooling by surface means transfer of heat from the skin to the coolant circulating through the coils of a cooling device or central means circulatory heat exchange in a cardiopulmonary bypass machine.

Arctic Sun Temperature Management System: A thermoregulatory device that monitors and controls patient temperature within a range of 33° Celsius to 37° Celsius. The temperature-controlled water circulation ranges from 4° Celsius and 42° Celsius.

Return of Spontaneous Circulation (ROSC): Re-establishment of effective perfusion of organs and tissues.

III. Scope

This guideline may be used with adult patients in a critical care environment in whom an anoxic injury is suspected and who meet the inclusion criteria (Appendix A).

IV. Guideline

1. Once therapeutic hypothermia is identified as an appropriate treatment option (See Appendix A for Inclusion/Exclusion Criteria), the medical team will adhere to specific treatment recommendations of the International Liaison Committee on Resuscitation (ILCOR) and the American Heart Association.
2. Hypothermia should be initiated within four to six hours of return of spontaneous circulation to prevent reperfusion complications.
3. Therapeutic hypothermia consists of three very distinct stages that require different interventions to limit or eliminate complications (Appendices B, C, D).
 1. Induction
 2. Maintenance
 3. Re-warming
4. Target temperature should be 33° C for 24 hours.
5. Infuse 2 liters iced Lactated Ringers (4°C) over 15 minutes each liter.
6. Maintain MAP \geq 75 or SBP \geq 90 using appropriate vasopressive agents.
7. Obtain accurate patient height and weight prior to induction.
8. Obtain central line/arterial line access prior to induction.
9. Sedation and neuromuscular blockade should be initiated at the time of induction to prevent shivering and re-evaluated once goal temperature has been achieved. Sedation is mandatory while on neuromuscular blockade.
10. Maintain BIS Monitor reading of 40-60. Change BIS sensor every twenty-four hours (Recommended).
11. Administer Acetaminophen 650 mg Per Rectum every 6 hours around the clock. Do not exceed 4000mg or 6 doses per day.

12. In the presence of a neuromuscular blockade, monitor neurological status by pupillary response every hour and notify MD of changes or nystagmus.
13. Pharmacological properties of medications may be altered due to lower body temperature. Monitor serum medication levels (when available) and effects of ordered medications.
14. Determination of brain death can not take place until patient is returned to a euthermic state and adequate clearance of sedative medication (48 hours from discontinuation of sedation/paralytic agents).
15. Discussions regarding termination of care or withdrawal of therapy should be coordinated through attending physician. Therapeutic hypothermia extends decision-making until rewarmed, sedation cleared and complete neurological exam possible.
16. In the event that continued clinical care is deemed medically futile, patient should be rewarmed and exited from cooling protocol under the direction of the attending physician.

V. Documentation

1. Record water temperature readout from Arctic Sun Cooling Machine every hour.
2. Record BIS readout every hour.
3. Record patient temperature obtained via rectal/bladder probe every hour.
4. Record skin care provided every 2 hour.

VI. Implementation Process and Monitoring

1. Monitor hemodynamic indicators for potential complications including: bradycardia, tachycardia, hypotension, hypertension, and cardiac arrhythmia.
2. Ventilator Associated Pneumonia (VAP) Precautions performed and documented.
3. Identification of seizure activity may be revealed through pupillary changes and/or nystagmus. Patients suspected of seizures should have diagnostic EEG.
4. Abnormal results of serial testing of electrolytes, coagulation markers, and arterial blood gases must be reported to the MD immediately.
5. If patient suspected of seizure activity begin Levetiracetam (Keppra®) 500mg IV twice daily.
6. If Dilantin is given for suspected seizure activity, monitor therapeutic drug levels.

7. Obtain an arterial blood gas 30-60 minutes after any change in ventilatory support.
8. Documentation of end tidal CO₂ via continuous Metavision download. Maintain CO₂ within normal homeostatic ranges.
9. Meticulous skin care must be performed every two hours and as necessary to detect and/or prevent skin breakdown.
10. Placement of blankets or foot/hand warmers will not compromise the cooling process.
11. Monitor for systemic complications related to hypothermic state.
12. Evaluation of hypothermia and the outcome of patients will be monitored through chart audits. Clinical signs/symptoms pre-treatment and post-treatment will include the documentation of Glasgow Coma Scale. The Outcome Pittsburgh Cerebral Performance Scale will be used to evaluate functional status upon discharge from the acute setting.

VII. Evidence Summary

Medline, CINAHL, OVID, and Cochrane databases were reviewed for articles with the keywords hypothermia, induced hypothermia, cardiac arrest, and neuroprotection. Relevant references from the obtained references were reviewed. The findings of the articles are summarized below and are shown in the evidence table.

Based on Level I and Level II evidence the American Heart Association and ILCOR have recommended that unconscious adult patients with spontaneous circulation after cardiac arrest should be cooled to 32-34° C for 12-24 hours when the initial rhythm was ventricular fibrillation.

Complications associated with cooling can include coagulopathy, arrhythmia, and electrolyte abnormalities with the induction of hypothermia.

Temperature elevation above normal can create significant imbalance between oxygen supply and demand that can impair brain recovery.

Tight blood sugar control using infusion of insulin reduces hospital mortality rates in critically ill patients who require mechanical ventilation.

VII. References

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VIII. Attachments

Attachment A: Inclusion/Exclusion Criteria

Attachment B: Therapeutic Hypothermia Algorithm Preparing for Induction

Attachment C: Therapeutic Hypothermia Algorithm Maintenance of Hypothermia

Attachment D: Therapeutic Hypothermia Rewarming

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XII. Origination Date

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XIII. Revision Date

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XIV. Disclaimer

This policy and the implementing procedures are intended to provide a description of recommended courses of action to comply with statutory or regulatory requirements and/or operational standards. It is recognized that there may be specific circumstances, not contemplated by laws and regulatory requirements that make compliance appropriate. For advice in these circumstances, consult with the Department of Legal Services and/or Risk Management.

Appendix A

Mild Hypothermia for Post Cardiac Arrest

Inclusion:

1. Age 18 years or less than 80 years.
2. Females less than 50 years of age should have pregnancy test.
3. Witnessed cardiac arrest.
4. Cardiac arrest with return of normal rhythm. (Initial rhythm VF or pulseless VT; PEA can be considered if returned to normal rhythm and other criteria met.)
5. Persistent coma as evidenced by no eye opening to pain after resuscitation (No waiting period required.)
6. Blood pressure can be maintained at least 90 mmHg systolic either spontaneously or with fluid and pressors (not IABP).
7. Interval of no more than 60 minutes from collapse to restoration of spontaneous circulation.
8. Initiate within 6 hours of initial collapse.

Exclusion:

1. Another reason to be comatose (drug overdose, status epilepticus).
2. Pregnancy (consideration of fetal viability).
3. A known terminal illness preceding the arrest.
4. Known, pre-existing coagulopathy or bleeding.
5. Response to verbal commands after return of spontaneous circulation and before hypothermia.
6. Evidence of hypotension, mean arterial pressure less than 60 mmHG for more than 30 minutes after return of spontaneous circulation, despite epinephrine infusion (a systolic blood pressure of less than 90 mm HG despite vasoactive infusion).
7. Hypoxemia (arterial oxygen saturation less than 85 percent) for more than 15 minutes after return of circulation and before hypothermia.
8. Pre-existing DO NOT INTUBATE code status and patient not intubated as part of resuscitation efforts.
9. Pre-existing advanced medical illness which precluded possibility of a meaningful recovery.

Outcomes:

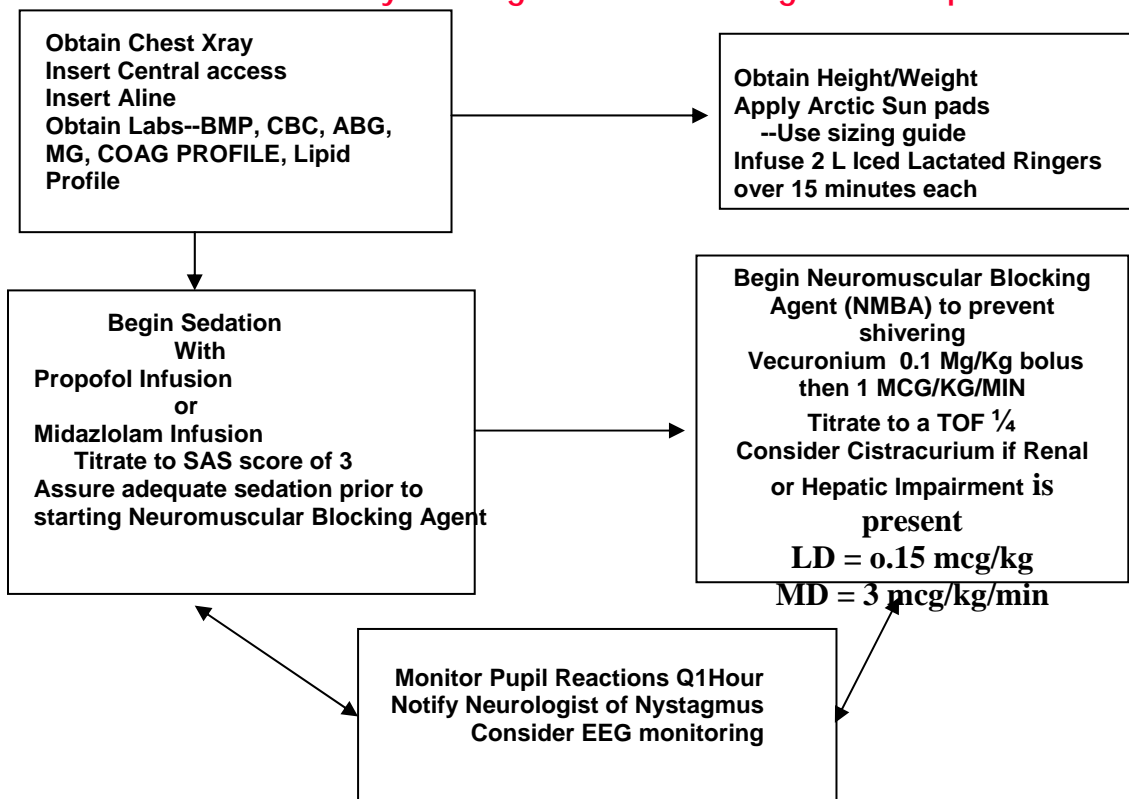
Measured by the Pittsburgh cerebral-performance categories:

1. Good recovery (discharged to home)
2. Moderate recovery (discharged to rehabilitation)
3. Severe disability (discharged to nursing home)
4. Vegetative state
5. Death

THERAPEUTIC HYPOTHERMIA ALGORITHM

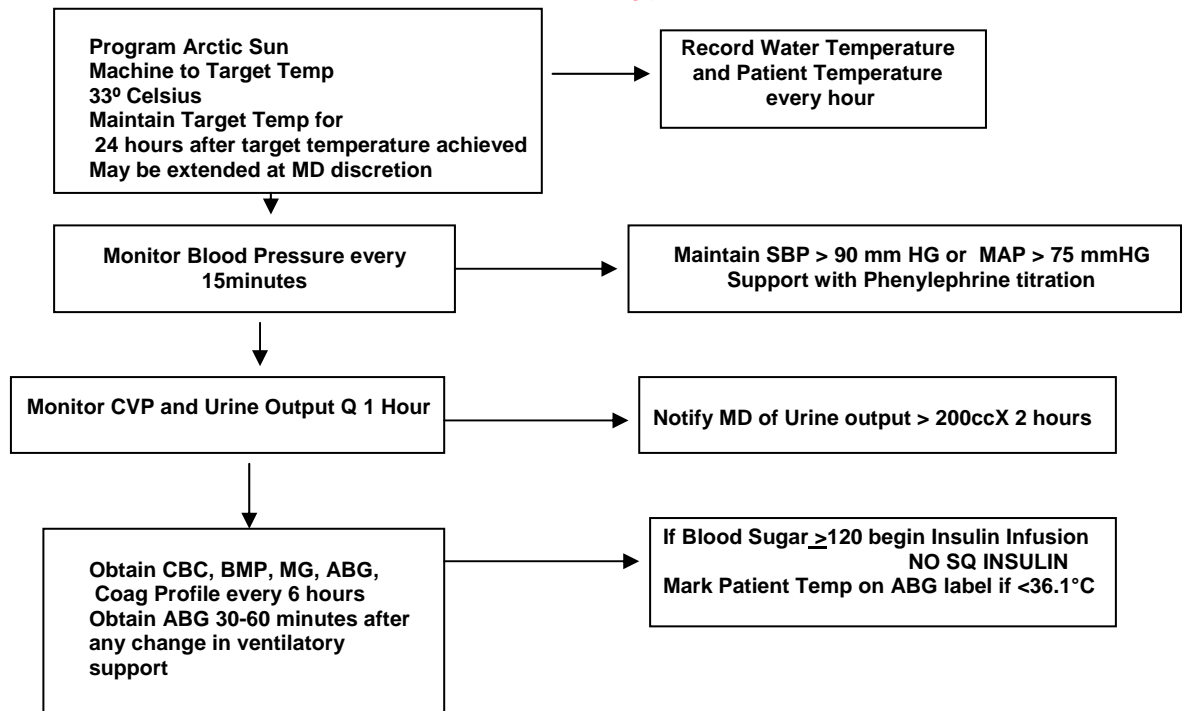
Preparing for Induction

Do Not Delay Cooling While Performing Initial Steps



Appendix C THERAPEUTIC HYPOTHERMIA ALGORITHM

Maintenance of Hypothermia



Appendix D

THERAPEUTIC HYPOTHERMIA ALGORITHM

Rewarming

