

Therapeutic Hypothermia Emergency & Critical Care Units

Policy

Patients undergoing Post Cardiac Arrest Therapeutic Hypothermia (PCATH) will have nursing care provided according to the following policy.

Scope

Registered Nurses (RNs) working in the Emergency Department (ED) and the adult/pediatric Critical Care Units in which use of the PCATH is approved by the medical directors.

Inclusion Criteria

- A. Post – cardiac arrest with Return of Spontaneous Circulation (ROSC) within 15 minutes and patient remains unresponsive
- B. Age < 70
- C. Temperature > 34 C
- D. Physician/Biotel discretion

Exclusion Criteria

- A. Traumatic Arrest (obvious bleeding noted as cause for hypovolemia)
- B. Do Not Resuscitation (DNR) or Do Not Intubate (DNI)
- C. Pre – Arrest cognitive status is severely impaired (unable to perform ADL's independently)
- D. Pre – Arrest Glasgow Coma Scale < 6
- E. ROSC > 15 minutes

Relative Exclusion Criteria

- A. Coagulopathy
- B. Life threatening arrhythmias
- C. Severe cardiogenic shock
- D. Sepsis
- E. Pregnancy

Background

Brain temperature during the first 24 hours after resuscitation from cardiac arrest may have a significant impact on survival and neurologic recovery. Cooling to 32 – 34° C for 24 hours may improve survival and increase the chance of neurologic recovery.

Effects of Therapeutic Hypothermia

- A. Shifts the oxyhemoglobin disassociation curve to the left. This causes a decrease in metabolic rate and oxygen consumption
 - 1. For every degree below 37° metabolic rate decreases 7%
 - B. Initially causes sinus tachycardia followed in the later stages by sinus bradycardia
 - C. Severe Hypothermia may cause arrhythmias
 - 1. Increased risk for arrhythmias < 30° C
 - 2. Increased risk for ventricular fibrillation < 28° C
 - 3. Myocardium is less responsive to defibrillation and antiarrhythmic agents at <30°
 - D. Decreases cardiac output and increases systemic vascular resistance
 - E. Can induce Coagulopathy which is treatable with platelets and fresh frozen plasma (FFP).
 - F. Hypothermia – induced diuresis is to be expected and should be treated aggressively with fluid and electrolyte repletion. Magnesium, phosphorus, and potassium should be monitored closely and maintained in normal range.
 - G. Decreased insulin secretion and sensitivity leads to hyperglycemia, which should be treated aggressively
 - H. Activates the sympathetic nervous system causing vasoconstriction and shivering. Shivering increases oxygen consumption by 40 – 100%. Sedatives, opiates and neuromuscular blockers can counteract these responses and enhance the effectiveness of active cooling.
- NOTE: Initiating paralysis in a patient who is already hypothermic should be avoided because it can result in a precipitous drop in the core body temp.
- I. Elderly and small pediatric patients will cool more quickly than younger or obese patients
 - J. Re – warming must proceed slowly over 12 – 24 hours (at least) to prevent vasodilatation, hypotension, and rapid fluid, electrolyte shifts and brain protection.
 - 1. Re – warm at a rate of 0.5°/hr

Procedure

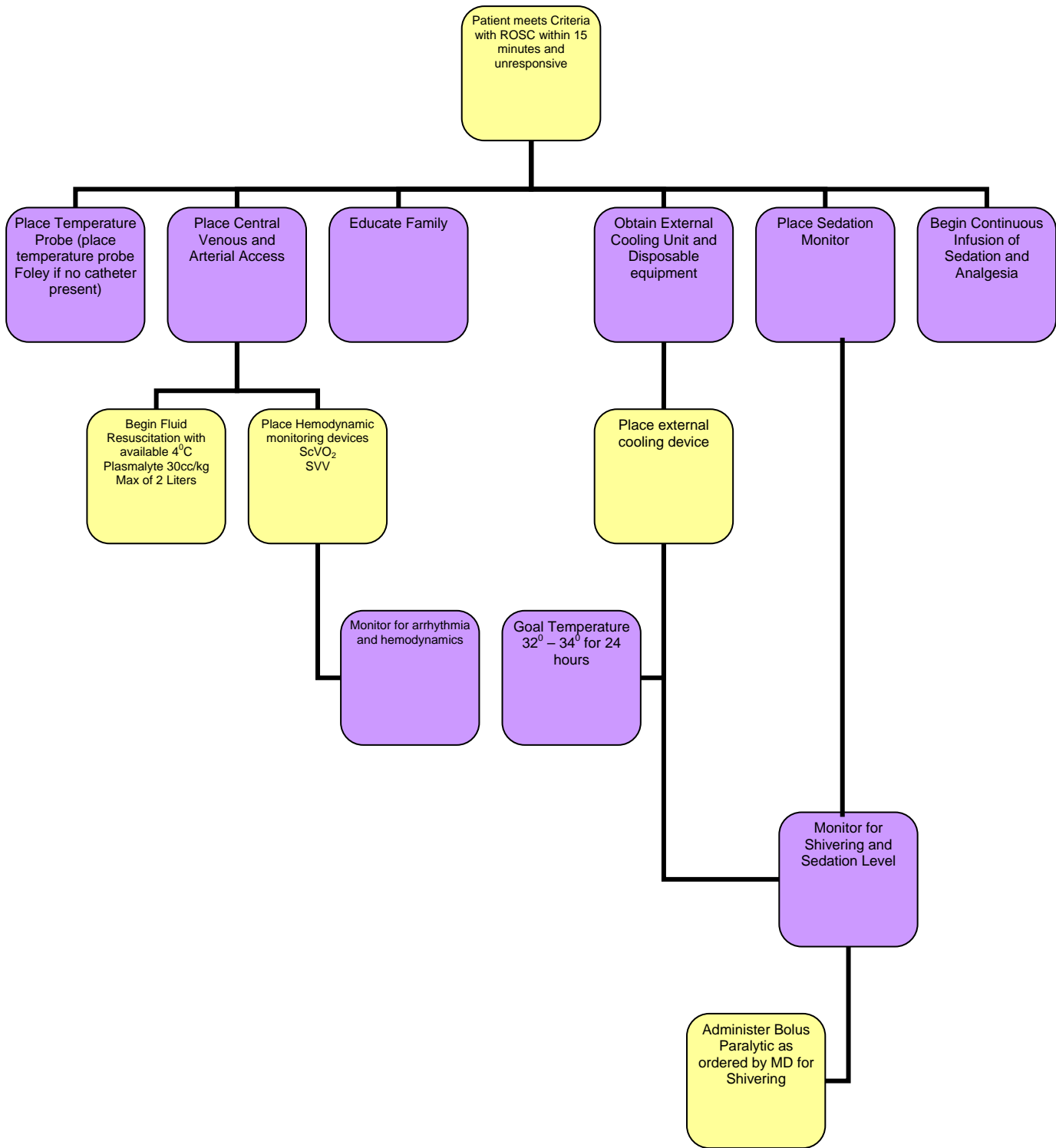
- A. Provide patient/family education and support
 1. Explain the purpose of hypothermia and the need for pharmacologic paralysis
 2. Encourage family to talk to the patient
 3. Provide emotional support and answer questions
 4. Offer pastoral care support to family
- B. Gather Equipment and Supplies for Cooling
 1. Fluid resuscitation shall be performed with Plasmalyte stored at 4⁰ C
 2. Central Venous and arterial access
 3. Hemodynamic monitoring device
 4. External cooling unit
 5. Temperature probe (if placing Foley, use temp probe catheter)
 6. Neuromuscular blockade available
 7. Sed Line monitor
 8. Ensure fluid warmer available
- C. Preparation for cooling
 1. Verify prescriber's order
 2. Ensure arterial and central venous access is obtained BEFORE hospital cooling begins (Once cool access is more difficult to obtain)
 3. Obtain baseline labs per prescriber's orders
 - a. Particular attention to electrolytes and ABG
 4. Obtain baseline EKG
 5. Place indwelling temperature probe (Bladder – ideal; if Foley already in place use oral or rectal probe)
 6. Thorough skin assessment
 7. Remove heated humidity from ventilator circuit and place HME in line.
- D. Cooling
 1. Infuse hypothermic IV fluids as needed for resuscitation
 2. Up to 2 liters of Plasmalyte may be given per MD order (frequently begun in the ED)
 3. Administer adequate continuous sedation and analgesic
 - a. Sed Line monitor shall be used to assess sedation level
 - b. CPOT shall be used to assess pain level
 4. Administer bolus paralytic per MD order as needed for shivering (typically needed at initiation of cooling)
 5. Place blankets or wraps appropriate for the external cooling unit
 6. Use external cooling unit per manufactures policy
 7. Cooling is maintained for 24 hours from time target temperature is reached unless further ordered by Intensivist.
- E. Monitoring
 1. Goal is to maintain patient's core temperature between 32⁰ – 34⁰ for 24 hours
 2. Monitor closely for arrhythmias (if temperature < 32⁰)
 3. Document temperature hourly

Post Cardiac Arrest Therapeutic Hypothermia PCATH

4. Hemodynamic Assessment
 - a. Monitor and document appropriate hemodynamics as ordered and available (ScVO₂, SVV, C.O, C.I, SVI)
 5. Obtain laboratory values per MD orders
 - a. ABG's shall be temp corrected
 - b. All lab values and interventions shall be documented
 - Electrolytes shall be drawn every 8 hours during cooling period
 1. Potassium shall be monitored Q 4 hours during hypothermic diuresis
 6. Obtain EKG if any rhythm changes from baseline
 7. Urine output is monitored and documented hourly
- F. Re – warming
1. Begin re – warming 24 hours after target temperature obtained unless ordered differently by attending physician
 2. Re – warm 0.5^o/hr unless ordered by Intensivist
 3. Re – warming too rapidly can cause vasodilatation, hypotension, and rapid electrolyte shifts
 4. Potassium shifts to extra cellular compartments during re – warming
 - a. STOP all potassium containing fluids
 - b. Continue to correct hypokalemia as needed
 5. Monitor glucose levels closely
 6. Monitor electrolytes every 4 hours during re – warming period
 7. Obtain EKG if any rhythm changes from baseline

References

1. Behringer, W., Bernard, S., Holzer, M., Polderman, K., Tiainen, M. And Roine, R. Prevention of postresuscitation neurologic dysfunction and injury by the use of therapeutic mild hypothermia. (2007) In N. Paradis., H. Halperin., K. Kern., V. Wenzel and D. Chamberlain (Eds. 2nd Edition) Cardiac Arrest: The Science and Practice of Resuscitation Medicine (pp. 848 – 884). Cambridge: Cambridge University Press.
2. Bernard, S. A., Gray, T.W., Buist M. D., Jones, B. M., Silvester, W., Gutteridge, G., and Smith, K. (2002). Treatment of comatose survivors of out-of –hospital cardiac arrest with induced hypothermia. *N Engl J Med.* 346: 557-63.
3. Jacobs, I. and Nadkarni, V. (2004) Cardiac Arrest and Cardiopulmonary Resuscitation Outcome Reports: Update and Simplification of the Utstein templates for Resuscitation Registries. *Circulation.* 110. 3385-3397.
4. Polderman, K., Rijnsburger, E. R., Peederman, S. M., and Girbes, A.R.J. (2005). Induction of hypothermia in patients with various types of neurologic injury with use of large volumes of ice-cold intravenous fluid. *Crit Care Med.* 33. 2744-2751
5. Resuscitation Council (UK) Resuscitation Guidelines 2005. pp.56-57
6. Sunde, K., Pytte, M., Jacobsen, D., Mangschau, A., Jensen, L. P., Smedsrud, C., Draegni, T., and Steen, P. (2007) Implementation of a standardised treatment protocol for post resuscitation care after out-of-hospital cardiac arrest. *Resuscitation.* 73. 29-39.
7. The Hypothermia after Cardiac Arrest Study Group. (2002). Mild therapeutic hypothermia to improve neurologic outcome after cardiac arrest. *N Engl J Med.* 346. 549-556.
8. Penn Medicine Hypothermia protocols;
<http://www.med.upenn.edu/resuscitation/hypothermia/protocols.shtml> [Accessed 7/1/2008].
9. Wake County EMS protocols;
<http://www.wakeems.com/> (Accessed 7/1/2008).



**Post Cardiac Arrest Therapeutic Hypothermia
PCATH**