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## Passive Cooling in Referring Centers for Babies at Risk for Hypoxic Ischemic Encephalopathy

### Overview:

Hypoxic-ischemic encephalopathy (HIE) affects approximately 1-6 per 1000 live births, with an estimated 20% mortality and 25% neurodevelopmental impairment in survivors. Current evidence indicates that moderate hypothermia to a core temperature of 33-34°C improves survival and neurological outcomes at 18 to 24 months for infants with moderate HIE.

HIE is often unanticipated, and many infants are initially cared for in rural or non-tertiary care sites. The current protocols require cooling to begin within 6 hours of birth and suggest that cooling as early as possible is the ideal. Therefore it is important that professionals involved in caring for infants in non-tertiary care sites recognize when cooling may be beneficial. For babies born outside of a tertiary care centre this means cooling needs to be initiated prior to the arrival of the Neonatal Transport Team, in consultation with a receiving neonatologist

Passive cooling has been shown to be a simple, safe and effective technique to initiate therapeutic hypothermia prior to the arrival of the Neonatal Transport Team. Passive measures allow the baby to cool naturally with no external intervention.

Therapeutic hypothermia is the standard of care for infants with moderate-severe HIE who meet the inclusion criteria.

### Purpose:

To provide clear, consistent guidance for physicians and nurses in centres not providing tertiary care for newborns, in order to facilitate early cooling, at the direction of the receiving Neonatologist.

### Guideline:

**Assessment and Referral:** Normal Thermal Care:

1. Babies are resuscitated according to the recommendations outlined in the Neonatal Resuscitation Program (NRP) most current edition.  
**NOTE:** \*\*Ensure skin temperature probe is in place, infant care centre set to servo control with temperature set to 36.5°C. **Avoid hyperthermia.**
2. As soon as possible after resuscitation and stabilization **AND BEFORE 6 hours of age**, infants born with evidence or perinatal asphyxia and greater than or equal to ( $\geq$ ) 35 weeks gestation should be assessed for inclusion **Criteria A or Criteria B.**

### Criteria A:

Umbilical cord **pH** less than or equal to ( $\leq$ ) 7.00 or base deficit greater than or equal to ( $\geq$ ) -16

**OR**

## **Criteria B:**

Umbilical cord gas or capillary, venous or arterial blood gas within 1 hour of birth with pH 7.01 to 7.15 or base deficit -10 to -15.9 **AND**

1. History of acute perinatal event (such as but not limited to cord prolapse, placental abruption or uterine rupture) **AND**
  2. Apgar score of less than or equal to ( $\leq$ ) 5 at 10 minutes or at least 10 minutes of positive pressure ventilation.
3. If Infant meets **Criteria A** or **Criteria B**, perform a baseline assessment **for Neurological entry Criteria C:**

### **Moderate to severe encephalopathy demonstrated by:**

- I. Clinical seizures within 6 hours of birth  
**OR**
  - II. At least one sign in three or more of the 'moderate' or 'severe' columns in the **Encephalopathy Assessment Table (APPENDIX A)**
4. Call Neonatologist on call at the Janeway. Health Science Centre Switchboard 777-6300.
5. If the baby meets **Criteria A** and **Criteria C** OR **Criteria B** and **Criteria C** the referring physician should discuss the option of cooling with the parents and if consent obtained initiate **passive cooling** at the direction of the Neonatologist.

## **Passive Cooling: Refer to algorithm**

1. **INITIATE CONTINUOUS AXILLA TEMPERATURE MONITORING**
  - a. Place/reposition servo control probe in baby's axilla and record temperature.
  - b. Obtain axilla temperature using thermometer and document.
2. Initiate/continue cardiorespiratory and oxygen saturation monitoring.
  - a. Record baseline vital signs; heart rate, respiratory rate, blood pressure
  - b. Place O<sub>2</sub> saturation probe on right hand/wrist and record saturation.
3. Turn off heat source by:
  - a. Switching infant care centre to **manual** mode and decreasing heater to **0%** output. This allows for a continuous display of baby's axilla temperature as registered on temperature probe **OR**
  - b. Turn off infant care centre. When infant care centre is turned off a continuous display of axilla temperature is not possible.
4. Document time heat sources removed and time **TARGET** temperature 33.0°C -34.0°C reached.
5. Document **axilla temperatures**, both by servo probe and thermometer **every 15 minutes**. (Appendix B)
6. Record all other **vital signs**; heart rate, respiratory rate, blood pressure and oxygen saturation a **minimum of every 30 minutes**.
  - a. Alterations in heart rate and blood pressure are common during cooling. In general heart rate can decrease by 14 beats/min below baseline for each °C drop in temperature (sinus bradycardia with heart rate 80-100 beats per minute). As a result there may be a corresponding increase in blood pressure.
7. If axilla temperature remains greater than (>) 34°C or less than (<) 33°C notify neonatologist for further direction.

8. If axilla temperature is within TARGET range of  $\leq 34^{\circ}\text{C}$  and  $\geq 33^{\circ}\text{C}$  continue to monitor and document temperature every 15 minutes.
9. All other care recommendations as per consultation with Neonatologist.

### **References:**

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## APPENDIX A:

### Encephalopathy Assessment Table

Category	Normal	Mild	Moderate	Severe
Level of alertness	<input type="checkbox"/> Alert, normal sleep-wake cycles	<input type="checkbox"/> Hyperalert	<input type="checkbox"/> Lethargy	<input type="checkbox"/> Stupor or coma
Spontaneous activity	<input type="checkbox"/> Normal	<input type="checkbox"/> Normal	<input type="checkbox"/> Decreased activity	<input type="checkbox"/> No activity
Posture	<input type="checkbox"/> Flexed	<input type="checkbox"/> Mild distal flexion	<input type="checkbox"/> Arms flexed, legs extended (decorticate)	<input type="checkbox"/> Arms extended and internally rotated, legs extended with feet in forced plantar flexion (decerebrate)
Tone	<input type="checkbox"/> Normal	<input type="checkbox"/> Normal to mild hypotonia	<input type="checkbox"/> Hypotonic	<input type="checkbox"/> Flaccid
Primitive reflexes	<input type="checkbox"/> Normal suck and Moro	<input type="checkbox"/> Weak suck, strong Moro	<input type="checkbox"/> Weak suck, incomplete Moro	<input type="checkbox"/> Absent suck, absent Moro
Autonomic (one of) <ul style="list-style-type: none"> <li>• Pupils</li> <li>• Heart rate</li> <li>• Respirations</li> </ul>	<input type="checkbox"/> Reactive <input type="checkbox"/> Normal <input type="checkbox"/> Normal	<input type="checkbox"/> Dilated reactive <input type="checkbox"/> Tachycardia <input type="checkbox"/> Normal	<input type="checkbox"/> Constricted <input type="checkbox"/> Bradycardia <input type="checkbox"/> Periodic breathing	<input type="checkbox"/> Dilated or non-reactive <input type="checkbox"/> Variable heart rate <input type="checkbox"/> Apnea
Seizures	<input type="checkbox"/> None	<input type="checkbox"/> None	<input type="checkbox"/> Common	<input type="checkbox"/> Uncommon

# APPENDIX B



## Passive cooling data collection

Baby's name:

Gestational age at birth: \_\_\_\_ weeks \_\_\_\_ days

Birth weight: \_\_\_\_\_ grams

Apgar score:            1 min: \_\_\_\_\_      5 min : \_\_\_\_\_    10 min: \_\_\_\_\_      20 min: \_\_\_\_\_

Cord blood gas:        pH: \_\_\_\_\_            Base excess: \_\_\_\_\_

Date and time of birth: \_\_\_\_\_      Age Passive Cooling initiated:    Hrs. \_\_\_\_ mins: \_\_\_\_

Age when target temperature first achieved (33.0°C – 34.0°C): \_\_\_\_\_

Baby's age in hours	Axilla temperature (°C) at age				Vital signs	
	Record every 15 minutes Probe/thermometer				HR / RR / BP/ O <sub>2</sub> sat	
	00	15	30	45	00	30
Birth						
1						
2						
3						
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