


*****This guideline is for use by tertiary centres. Therapeutic hypothermia should NOT be done outside of a level 3 NICU. Referral to a tertiary center by community hospitals should be executed as soon as possible following delivery to ensure time to reach target temperature is optimised*****

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	ACTS: Neonatal Therapeutic Hypothermia Clinical Practice Guideline	Version: 1A

1.0 Introduction

Hypoxic ischemic encephalopathy (HIE) is defined as an abnormal neurologic state in the neonatal period arising as a result of hypoxic-ischemic insult. The long-term neurodevelopmental outcome for neonates who have suffered brain injury from a birth related hypoxic-ischemic insult is often poor. There is evidence from both animal and human studies that induced hypothermia provides a mechanism for neuroprotection, reducing the severity of brain injury and improving neurological outcome in many patients.^{1-2, 5-10} All infants with HIE should be assessed for eligibility to receive total body cooling. Evidence suggests that hypothermia in neonates with moderate to severe HIE reduces the severity of brain injury and leads to improved neurological outcome. Therapeutic hypothermia is now considered to be the standard of care for HIE in in term infants meeting criteria outlined below.

INCLUSION CRITERIA

Infant should fulfill all 4 criteria:


1. GA \geq 35 weeks
2. Less than 6 hours post delivery
3. Evidence of intrapartum hypoxia defined as:

EITHER Cord or postnatal blood gas within one hour of birth with pH \leq 7.00 **OR** base Deficit \geq 16

OR If pH 7.01-7.15 or BD -10 to -15.9

OR if no blood gas available:


- Evidence of acute perinatal event that may result in HIE (e.g. abruption placentae, cord accident, uterine rupture, maternal trauma or cardiorespiratory arrest, late or variable decelerations etc.) **AND** one of the following:
- Apgar score 5 or less at 10 minutes, need for mechanical ventilation or resuscitation at 10 minutes

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4. Signs of moderate or severe encephalopathy described within the Modified Sarnat Score, defined by presence of 3 or more of the items in the 6 categories below **OR presence of seizures**

Category	Mild Encephalopathy	Moderate Encephalopathy	Severe Encephalopathy
1. Level of consciousness	<input type="checkbox"/> Hyperalert	<input type="checkbox"/> Lethargic	<input type="checkbox"/> Stupor/coma
2. Spontaneous activity	<input type="checkbox"/> Normal	<input type="checkbox"/> Decreased	<input type="checkbox"/> No activity
3. Posture	<input type="checkbox"/> Mild distal flexion	<input type="checkbox"/> Strong distal flexion <input type="checkbox"/> Truncal extension	<input type="checkbox"/> Decerebrate (arms extended and internally rotated, legs extended with feet in forced plantar flexion)
4. Tone	<input type="checkbox"/> Normal	<input type="checkbox"/> Mild hypotonia	<input type="checkbox"/> Flaccid tone
5. Primitive reflexes			
Suck	<input type="checkbox"/> Weak	<input type="checkbox"/> Weak	<input type="checkbox"/> Absent
Moro	<input type="checkbox"/> Strong	<input type="checkbox"/> Incomplete	<input type="checkbox"/> Absent
6. Autonomic system			
Pupils	<input type="checkbox"/> Dilated, responsive	<input type="checkbox"/> Constricted	<input type="checkbox"/> Skew deviation, dilated/non-reactive to light
Heart rate	<input type="checkbox"/> Tachycardia	<input type="checkbox"/> Bradycardia	<input type="checkbox"/> Variable HR
Respirations	<input type="checkbox"/> Normal	<input type="checkbox"/> Periodic breathing	<input type="checkbox"/> Apnea

5. *USE THE MODIFIED SARNAT SCORE TO MAKE DECISION TO INITIATE THERAPEUTIC HYPOTHERMIA. In addition, please complete the THOMPSON score

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Thompson Score

Sign	Score 0	1	2	3
Tone	__ Normal	__ Hypertonic	__ Hypotonic	__ Flaccid
LOC	__ Normal	__ Hyper alert stare	__ Lethargic	__ Comatose
Seizures	__ None	__ Infrequent < 3/day	__ Frequent > 2/day	
Posture	__ Normal	__ Fisting, cycling	__ Strong distal flexion	__ Decerebrate
Moro	__ Normal	__ Partial	__ Absent	
Grasp	__ Normal	__ Poor	__ Absent	
Suck	__ Normal	__ Poor	__ Absent ± bites	
Respiration	__ Normal	__ Hyperventilation	__ Brief apnea	__ IPPV (apnea)
Fontanel	__ Normal	__ Full, not tense	__ Tense	
SUB-TOTAL				
TOTAL				

EXCLUSION CRITERIA:

1. Neonate <1.8 kg
2. Clinically significant coagulopathy or bleeding despite treatment
3. Moribund neonates, or neonates with major congenital or genetic abnormalities, in whom no further aggressive treatment is planned


****NOTE:** These inclusion/exclusion criteria are guidelines and infants may be cooled without these criteria with input from the MRP.

2.0 Procedure

2.1 Rectal or Esophageal Temperature Monitoring

Placement of rectal probe:

- Lubricate probe with water-based lubricant
- Measure 5 cm's in length from probe insertion tip. Insert probe 5 cm beyond anal sphincter, avoid further advancement to avoid risk of perforation
- Tape to infant's upper inner thigh to secure

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Placement of esophageal probe:

- Lubricate probe with sterile water or infant’s saliva
- Measure distance from tip of nose to earlobe to xyphoid process then subtract 2 cm from the length to approximate distance to lower esophagus
- Insert probe through nare until the desired length is reached
- Tape to infant’s face to secure
- Tip should be above stomach, verified by x-ray 2 view

Monitoring:

- Connect probe to patient monitor adaptor cable & module for continuous monitoring; set alarm limits (33.5 – 34.5)
- Document temperatures **q15 minutes**
- If necessary based on temperatures, make adjustments to the number of cool packs or the radiant warmer.


2.2 Passive Cooling

- Initiate passive cooling by turning **off the radiant warmer when the initial call comes from the referral hospital**
- Aim to achieve a target temperature of 33°C - 34°C by 60 minutes after initiation of cooling
- If passive cooling does not achieve temperature < 35.5°C within 60 minutes commence active cooling

2.3 Active Cooling

- Aim for core temperature 33°C - 34°C

Core Temperature Range	Number of cool packs to apply	Areas to apply
≥ 35.5 °C	2*	Under shoulders, across chest
34°C – 35.5°C	1	Across chest
*having more than 2 packs prevents radiant heat loss to environment & makes it more difficult to cool infant		

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When to Reduce Active Cooling:

- If the rectal temp is **<34.5°C** the patient is at risk of overcooling
- Core temp < 34.5°C, reduce active cooling by removing 1 cool pack at a time and reassess in 15 minutes
- Core temp < 34°C, stop active cooling (remove all packs)
- If temp **<33.5°C**, set warmer temp at 0.5°C above baby's current temp and increase by 0.5°C every hour until temp reaches 34°C

2.4 Discontinuing Therapeutic Hypothermia


Cooling is reduced or stopped if there is:

- Persistent hypoxemia - FiO2 1.0
- Life threatening coagulopathy/bleeding

3.0 Patient Considerations

3.1 Venous/arterial Access: consider central venous/arterial access (UVC/UAC) needs for patient monitoring prior to the cooling process as difficulties in obtaining access may occur related to decreased perfusion secondary to hypothermia. At the time of the initial admission or advice call the consulting MRP or delegate should discuss access with the referral physician; taking into consideration designated level of care, skill capabilities, and length of time prior to team arrival.

3.2 Analgesia/sedative treatment: indications for analgesia include agitation, pain or shivering response. Shivering leads to increased peripheral muscle oxygenation consumption. Although there is limited evidence in asphyxiated newborns, it theoretically may have a negative impact on the neuroprotective benefits of induced hypothermia. Neonates with excessive shivering should be considered for treatments with sedating effects e.g. morphine. The choice of sedative agent may depend on whether or not the patient is intubated. Infants with HIE have reduced morphine clearance and elevated serum morphine

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concentrations. In addition, potentially toxic serum concentrations of morphine may occur with moderate hypothermia and infusion rates > 5 microgram/kg per hour⁴.

4.0 Related Documents

Neonatology Clinical Practice Guideline: Hypoxic Ischemic Encephalopathy Clinical Pathway (iShare)


Link: [neonatology clinical practice guideline hypoxic ischemic encephalopathy clinical pathway \(iShare\)](#)

5.0 References

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