



Management of Hypoxic Ischaemic Encephalopathy (HIE) in Neonatal Transport

Scope (Staff):	Nursing and Medical Staff
Scope (Area):	NETS WA

Child Safe Organisation Statement of Commitment

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this [disclaimer](#)

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Aim

- To identify neonates with HIE early and correctly administer 'Therapeutic Hypothermia' (TH) in a timely manner.
- Arrange safe transfer to a tertiary NICU, with a consistent approach to thermoregulation, taking into account the clinical situation.
- To manage co-existing multi-organ dysfunction and provide supportive care.

Key points

- Early identification and initiation of therapeutic hypothermia in babies who have moderate or severe HIE is the most effective way to improve patient outcomes.
- Evidence-based neuroprotective supportive care offers the best opportunity for improving outcomes.
- The clinical assessment of encephalopathy (Sarnat stage) may change over time; repeat examination over the first 6 hours is essential to ensure neuroprotective care is initiated promptly.
- Amplitude integrated electroencephalography (aEEG) on transport and telehealth consultation are both tools that may help earlier identification and treatment of infants with moderate/severe HIE.
- Passive and Active cooling are both methods for providing TH. Active cooling must only be undertaken by the NETS WA team and/or by a tertiary Neonatal Unit.

NETS WA Therapeutic Hypothermia Clinical Decision Support Tool

- See [Appendix 1](#) for the therapeutic hypothermia clinical decision-making tool. This supports decisions regarding TH outside the tertiary setting.
- The diagnosis and management of moderate or severe HIE has well established criteria, which are summarised in Appendix 1 and described in more detail in the [CAHS Hypoxic Ischaemic Encephalopathy and Therapeutic Hypothermia guideline](#). Use the Therapeutic Hypothermia Eligibility and Monitoring form (MR461) to document the eligibility and clinical examination during the first 6hrs of life.
- There may be uncertainty about the diagnosis and the decision to use TH. If there are indeterminate signs of encephalopathy or clinicians are uncertain of the [modified Sarnat examination](#) at the referring centre. The TH clinical decision

support tool helps to decide the appropriate management under these circumstances, integrating the use of aEEG on transport and Telehealth (Neovision).

Therapeutic Hypothermia Algorithm

- See Appendix 2 for the thermoregulation algorithm.
- Once a decision has been made to commence therapeutic hypothermia, the following TH algorithm must be followed.
- It is recommended that a decision is made to either treat with TH or keep the baby normothermic and not aim for temperatures in between these two groups i.e. 34-36.5°C.
- Temperatures above or below the target range of 33-34°C are associated with poorer outcomes. Therefore, 15min axillary temperatures are required to closely monitor this, until the NETS team arrives, who will insert a rectal probe for continuous monitoring.
- **Caution:** Monitor temperature range closely, infants with HIE lose heat quickly owing to a loss of central temperature regulation processes; anticonvulsants or muscle relaxants may also add to this.

PASSIVE Cooling

- No active processes (such as fans or wet cloths) for cooling the infant should be undertaken, the infant should be allowed to cool down of their own accord.
- Passively cooling an infant should occur in an area that allows constant monitoring of the infant by clinical staff and under the guidance of NETS WA.

ACTIVE Cooling

- Active cooling will be commenced by the NETS WA team on arrival. Until then passive cooling is adequate with regular temperature monitoring as described above.
- A Rectal temperature probe is also used for the measurement of core temperature.

Neuroprotective Supportive Care

Respiratory

- Respiratory support should be considered if baby has inadequate respiratory drive or is having medication for treating seizures
- Avoid hypoxia/hyperoxia (excessive oxygen, keep PaO₂ in normal range) and hypocapnia (don't chase though; low metabolic state = low CO₂ state)
- Use low tidal volumes; ideally VG ventilation

Cardiovascular

- Perinatal asphyxia (HIE) is associated with impaired myocardial contractility, reduced cardiac output, systemic hypotension and pulmonary hypertension
- Assess perfusion, blood pressure, base deficit, lactate and consider need for volume/inotropes
- Cautious fluid resuscitation only if evidence of hypovolaemia
- Maintain normal blood pressure with mean at least 45 mmHg
- Bradycardia (HR 80-100) is expected in cooling

Fluids and Electrolytes

- Risk of fluid overload while baby is oliguric
- Restrict fluids to 40-50ml/kg/day - consider increasing glucose concentration if low PGL
- Avoid hypoglycaemia and hyperglycaemia
- Urinary catheterisation may be required if baby is sedated with morphine

Sedation and Analgesia

- Hepatic and renal injury and cooling therapy can all affect drug metabolism
- Morphine bolus 50micrograms/kg followed by infusion starting at 5mcg/kg/hour

Infection

- HIE is often associated with infection or inflammation
- Ensure blood culture has been taken and start regular first line Neonatal broad spectrum antibiotics (Benzylpenicillin and Gentamicin)
- Beware nephrotoxic medications and give renal doses where appropriate

Seizures

- If seizures are present follow [seizure management guideline](#) (phenobarbitone first line)

Contra-indications to cooling

- Coagulopathy and active, severe bleeding - absolute contraindication
- SpO₂ not in target range (>95%) when on maximal respiratory support, due to severe respiratory failure/PPHN - relative contraindication, consider temperature control in this setting

References and related external legislation, policies, and guidelines (if required)

External Legislation, Standards and Policy (list and hyperlink)

Cannavò L, Perrone S, Gitto E. Brain-Oriented Strategies for Neuroprotection of Asphyxiated Newborns in the First Hours of Life. *Pediatr Neurol.* 2023 Jun;143:44-49. doi: 10.1016/j.pediatrneurol.2023.02.015. Epub 2023 Mar 2. PMID: 36996760

O'Dea M, Sweetman D, Bonifacio SL, El-Dib M, Austin T, Molloy EJ. Management of Multi Organ Dysfunction in Neonatal Encephalopathy. *Front Pediatr.* 2020 May 15;8:239. doi: 10.3389/fped.2020.00239. PMID: 32500050; PMCID: PMC7243796

Neuroprotection Care Pathway for Scottish Cooling Group: [Neuroprotection Care Pathway for the Management of Infants with Hypoxic-Ischaemic Encephalopathy \(perinatalnetwork.scot\)](#)). Accessed 5th July 2024.

Queensland Hypoxic Ischaemic Encephalopathy guideline: [Guideline: Hypoxic ischaemic encephalopathy \(HIE\) \(health.qld.gov.au\)](#). Accessed 5th July 2024.

Useful resources (including related forms) (if required)

List and hyperlink the titles of useful resources, do not hyperlink MR forms


Related CAHS internal policies, procedures and guidelines (if required)

[Hypoxic Ischaemic Encephalopathy \(HIE\) and Therapeutic Hypothermia \(health.wa.gov.au\)](#)

[Seizures Neonatal \(health.wa.gov.au\)](#)

Hypoxic Ischaemic Encephalopathy (HIE) and Birth Asphyxia

This document can be made available in alternative formats on request.

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Compassion
Excellence
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Appendix 1: Therapeutic Hypothermia Algorithm

Meets ALL 3 criteria

1. Neonatae ≥ 35 weeks gestation. 2. < 6 hrs post-birth (if 6-12hrs TH can be considered for TH following a discussion between the Receiving Ward Neonologist and the NETS consultant). 3. Suspected asphyxia - requires at least two of the following (see list on far left)

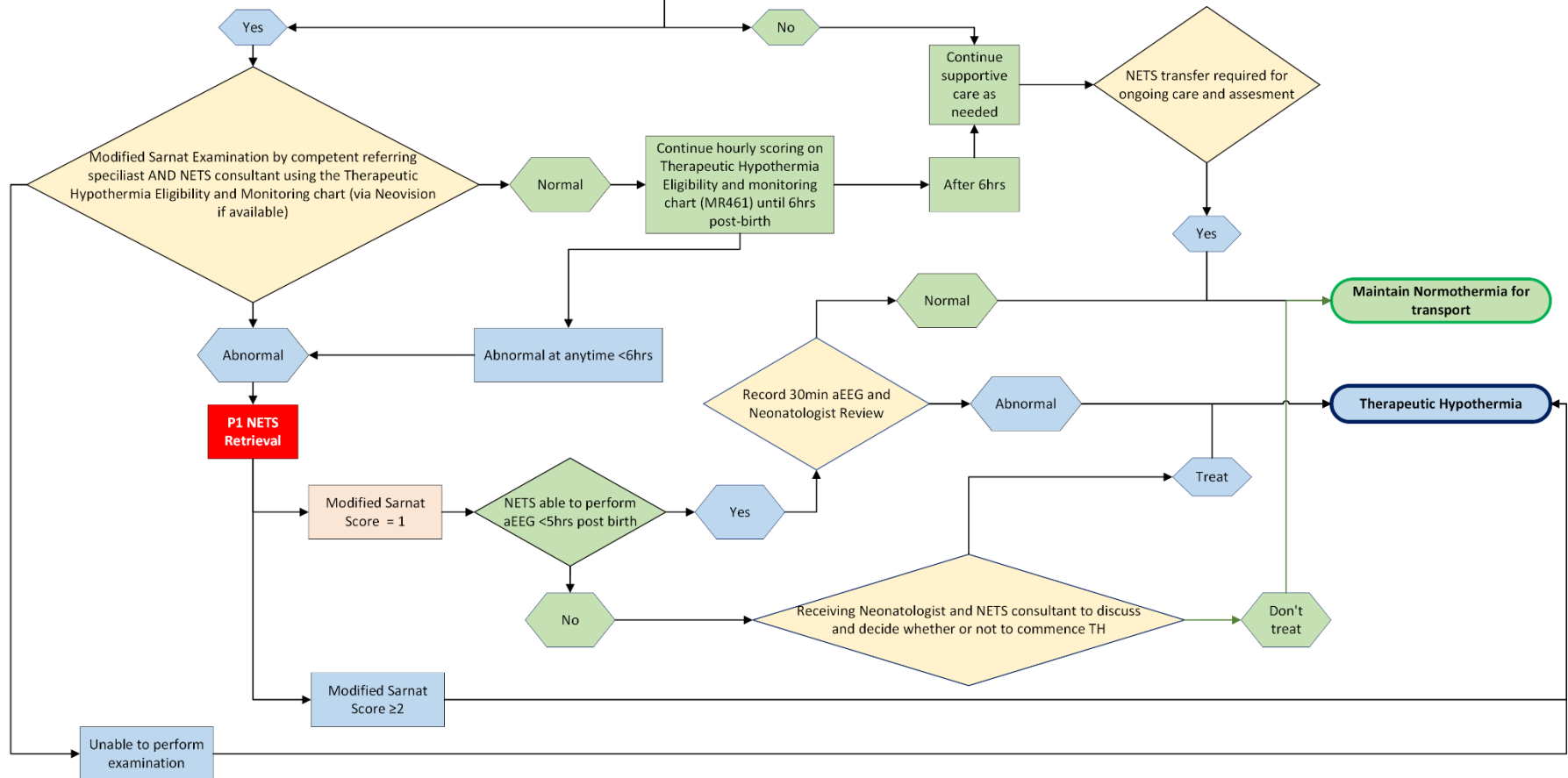
2 out of the 4 criteria below are required to meet definition for Suspected Asphyxia.

1. Any acute perinatal event that may result in HIE (e.g. abruption of placenta, cord prolapse, sever FHR abnormality).

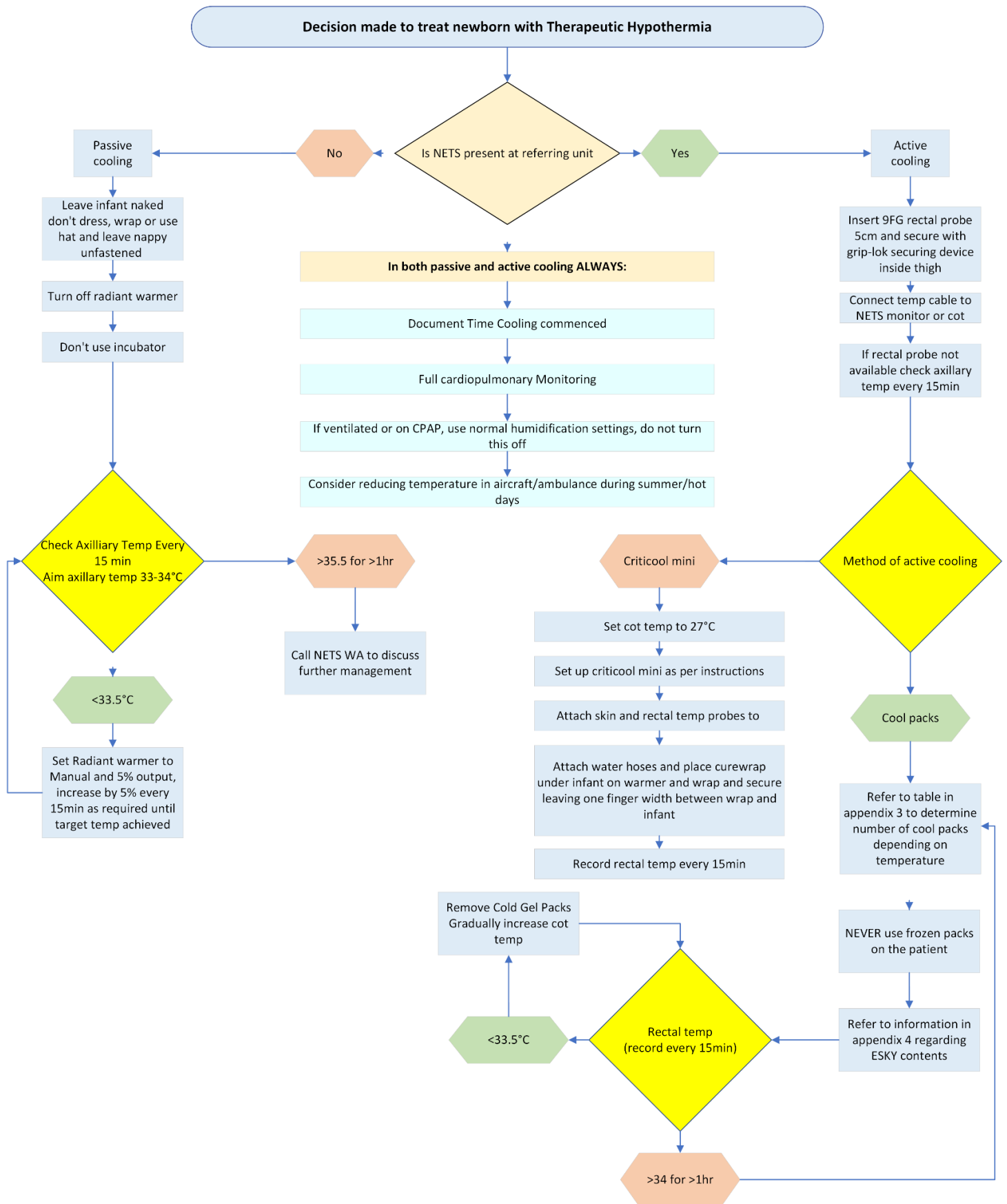
2. Apgar < 6 at 10min or continue to need resuscitation with IPPV +/- chest compressions at 10min

3. If cord pH not available, arterial pH < 7.0 or BE > 12 within 60min of birth (if able to do gas).

4. Cord pH < 7.0 or BE of ≥ 12



Appendix 2: Therapeutic Hypothermia Algorithm



Appendix 3: Cool pack application guide

Temperature algorithm	Number of cool packs to be applied for ACTIVE cooling	Areas to apply
> 37.0	4	Head, shoulders, neck, trunk
36.1 - 37.0	3	Shoulders, neck, trunk
35.1 - 36.0	2	Shoulders, trunk
34.1 - 35.0	1	Trunk
33.0 - 34.0	0	Nil

Appendix 4: Cooling Esky contents



COOLING ESKY CONTENTS

FRONT POCKET

- Cables to connect temperature probe to Philips X3 and Propaq Encore monitors – 1 each
- Disposable rectal temperature probe 9Fr x 2
- Disposable cotton gel pack covers x 6
- Grip-Lok securing tape x 2

MAIN COMPARTMENT – TO BE ADDED

- Cold gel packs at fridge temperature x 4 – Use first
- Frozen gel packs x 4 – used when defrosted
- Frozen ice bricks x 2 – To keep gel packs cold (Place bricks one either side in netting in esky)

Only cool packs for use on the baby – Never frozen

Please refer to NETS WA guideline
Hypoxic Ischaemic Encephalopathy (HIE)/Asphyxia