



CLINICAL PRACTICE GUIDELINE
NEWBORN EMERGENCY TRANSPORT SERVICE (NETS WA)

Hypoxic Ischaemic Encephalopathy (HIE) / Asphyxia

This document should be read in conjunction with the [Disclaimer](#)

Brain injury following ischaemia and reperfusion insult can be understood as follows:

- Primary neuronal death (usually around birth).
- Latency period.
- Reperfusion injury (> 6 hours post injury). Seizure activity increased in this time.

Depending on the severity of brain injury, hypoxic ischaemic encephalopathy (HIE) may develop after birth. Significant HIE can result in multi-organ failure.

- Coagulopathy.
- Renal/ hepatic dysfunction.
- Hypotension.
- Respiratory failure.
- PPHN

Clinical Staging of HIE

The presence of moderate/severe HIE is defined as seizures **OR** presence of signs in at least three of the six categories given below:

Category	Mild encephalopathy	Moderate encephalopathy	Severe encephalopathy
Level of consciousness	Alert	Lethargic	Stupor/coma
Spontaneous activity	Normal activity	Decreased activity	No activity
Posture	Normal	Distal flexion Full extension	Decerebrate
Tone	Normal	Hypotension	Flaccid
Primitive reflexes	Normal suck Exaggerated moro	Weak suck Incomplete moro	Absent suck Absent moro
Autonomic system:			
Pupils	Dilated/reactive	Constricted	Dilated/non-reactive
Heart rate	Tachycardia	Bradycardia	Variable heart rate
Respirations	Regular respiration	Periodic breathing	Apnoea

General Management

- Intubation and ventilation if having seizures with unsafe airway, recurrent apnoea or respiratory depression.
 - Beware not to over-ventilate (aim for $\text{PaCO}_2 > 35$).
- UVC if difficult IV access; UAC desirable if requiring inotropes (and does not prolong transport significantly).
- Blood pressure support with volume (10-20 mL/kg normal saline boluses) or inotropes.
 - Dobutamine may be better, as myocardial contractility may be poor.
 - Beware over-judicious inotrope use (especially dopamine), as cerebral vasoconstriction may be detrimental.
 - Beware fluid overload, as may have compromised myocardium, and cerebral oedema.
- Avoid hypoglycaemia (aim for $\text{BGL} > 3\text{mmol/L}$), correct other electrolyte disturbances.
- Fluid restrict to 40-50 mL/kg/day. However, **avoidance of hypoglycaemia is MORE important than fluid restriction**; consider increasing the concentration of glucose, or increase maintenance fluids to 60 ml/kg/day.
- IV antibiotics.
- Treat seizures (see Guidelines on [Seizures](#)).
- Consider **systemic cooling to 33-34°C**.

Inclusion Criteria for Cooling

1. ≥ 35 weeks gestational age.
2. < 6 hours post birth (commence as soon as possible, the earlier the better).
3. Evidence of asphyxia as defined by the presence of at least two of the following four criteria:
 - APGAR < 6 at 10 minutes or continued need for resuscitation with positive pressure ventilation +/- chest compressions at 10 minutes.
 - Any acute perinatal event that may result in HIE (i.e. abruption placenta, cord prolapse, severe foetal HR abnormality etc.).
 - Cord pH < 7.0 or base deficit of 12 or more.
 - If cord pH is not available, arterial pH < 7.0 or BE > 12 mmol/L within 60 minutes of birth (if able to do gas).
4. Clinically defined moderate or severe HIE as per Sarnat Staging (see [Table](#) above).

Management of Systemic Cooling

PASSIVE Cooling

This is often effective and should be tried first for 1 hour by turning the warmer off and keeping the baby undressed and leaving the nappy unfastened.

- Strictly 15 minutely per axilla temperature measurements.
- Facilities for full cardiopulmonary monitoring (ECG and SaO_2) should be available.

ACTIVE Cooling

- **ACTIVE** Cooling may be started before the arrival of the NETS team **after discussion with the NETS CONSULTANT** in centres where the NETS Team is more than 1 hour away.
- Rectal probe for measurement of core temperature; if no rectal probe available, do 15 minutely per axilla temperature measurements. For the Neocot - connect temperature probe to monitor (T2).
- ECG monitoring, oxygen saturation monitoring.
- Nurse baby undressed and leave nappy unfastened.
- **ACTIVE** cooling involves applying cold packs (in cotton bags) to the baby according to temperature algorithm (see [Table](#) below) and aiming to achieve target range within 1 hour. (**Never** use ice packs).
- Maintain axillary/rectal temperature at 33-34°C.
- **WATCH TEMPERATURE CLOSELY.** Babies can become severely hypothermic if left unchecked. If axillary temp drops to < 34°C, remove **all** cold packs and set radiant warmer on manual and gradually adjust heater output to maintain axillary temp at 33-34°C.
- Leave ventilation humidity at normal temperature.
- When the infant is ready for transfer, reduce the temperature of the Neocot, but avoid switching it off to allow air circulation, consider reducing temperature in aircraft/ambulance during summer/hot days.
- Advise/reassure parents Re: appearance, cool to touch, explain the procedure.

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

Caution: Watch temperature range more closely in infants treated with anticonvulsants or muscle relaxants as they may cool much quicker.

Related WNHS policies, procedures and guidelines

[NETS WA Clinical Guidelines: Seizures](#)

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