

Title:	Therapeutic Hypothermia (cooling) guideline		
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Scope	For use within London Neonatal Transfer Service		
Applies to	<i>All Neonates referred and transferred by NTS who meet criteria for cooling</i>		

This guideline relates to the management of therapeutic hypothermia (cooling) during transport for infants with hypoxic ischaemic encephalopathy. The decision to treat infants with cooling remains the responsibility of the attending senior clinician at the referring unit. Equivocal cases may be discussed with the local cooling centre. For a summary of cooling criteria see Appendix A.

First line management is with active cooling but if this is not available passive cooling should be commenced by the local unit and a referral made to EBS/NTS for transfer to a cooling centre. A Neomate checklist is available to assist, see Appendix B.

REFERRING UNIT PASSIVE COOLING CHECKLIST

- Perform a neurological examination and document a modified Thompson's score, see Appendix C.
- Document the admission temperature and start continuous rectal temperature monitoring, if not available axilla temperatures should be **measured every 15 minutes**.
- Turn off incubator, open portholes and nurse the baby naked apart from a nappy.
- Active cooling techniques such as fans should not be implemented without rectal temperature monitoring to avoid excessive hypothermia.
- Target temperature is 33-34°C. The baby's temperature must not fall below 33°C. If it trends below 33°C reverse the above actions.

NTS COOLING CHECKLIST

- A baby requiring uplift for cooling is a **local time-critical transfer unless active cooling is available at the referring unit**.
- En-route set the incubator at 28°C and open the portholes to allow the incubator to cool down.
- Active cooling needs to be commenced as soon as possible after arrival on the referring unit.
- While there are no absolute contraindications for considering cooling therapy, babies with concomitant severe hypoxemic respiratory failure, coagulopathy +/- DIC or other rare conditions where cooling might deteriorate physiological stability should be discussed with NTS and cooling unit consultant.

SYSTEMS BASED CONSIDERATIONS FOR TRANSFER OF COOLED BABIES

Airway & Breathing	<ul style="list-style-type: none"> • If the baby's neurological status impacts on breathing efficacy then consider mechanical ventilation. • Hypocarbia is a particular risk in these babies when mechanically ventilated. If hypocarbia persists despite reduction of the minute volume discuss further interventions with the on-call consultant.
Cardiovascular	<ul style="list-style-type: none"> • Bradycardia (to around 100 bpm) is common during cooling. • Beware that tachycardia in a cooled baby suggests pain or significant sepsis. • Circulatory support may be required if associated with multiorgan dysfunction. Aim for a mean arterial blood pressure >40 mmHg. • If the blood pressure remains low despite volume replacement, start dopamine 5-10 micrograms/kg/min, and/or dobutamine 5-10 micrograms/kg/min. • Thrombocytopenia and clotting abnormalities can occur and treatment should be discussed with the duty consultant.
Fluids	<ul style="list-style-type: none"> • Renal function is commonly impaired following severe perinatal asphyxia. Most infants require fluid restriction to 40-60 ml/kg/day (30 ml/kg/day in renal failure). • Keep an accurate record of fluid balance.
Neurology	<ul style="list-style-type: none"> • The cooling proforma (Appendix C) should be completed during transfer. • If CFM is available it should be reviewed and the recording photographed or printed for transfer to the receiving unit. • Seizure management needs to be guided by local protocols. 1st line anticonvulsant is phenobarbital (20 mg/kg, followed by 10 mg/kg if seizures persist), second line is phenytoin (18 mg/kg) and third line is midazolam (50-100 mcg/kg). • Signs of infant distress during cooling include tachycardia (>110 bpm), facial grimacing and irritability. Infants should be sedated with intravenous morphine.
Infection	<ul style="list-style-type: none"> • In view of risk factors and full intensive care always treat with first line antibiotics. • Consider paracetamol in pyrexia/septic babies.
Skin care	<ul style="list-style-type: none"> • Cooling causes poor skin perfusion and can result in subcutaneous fat necrosis. Carefully inspect the skin (including the back) in cooled infants and complete a body map.

APPENDIX A: ELIGIBILITY AND TOBY COOLING CRITERIA

A hypoxic-ischaemic insult occurring around the time of birth may result in an encephalopathic state characterised by the need for resuscitation at birth, neurological depression, seizures and electroencephalographic abnormalities and may account for up to 30% of cases of cerebral palsy. Cooling is an effective treatment for moderate and severe hypoxic ischaemic encephalopathy if initiated in the first 6 hours of life.

Infants ≥ 36 weeks completed gestation who meet the following criteria may be considered for treatment with cooling:

- Evidence of perinatal asphyxia
- Signs of encephalopathy

Cooling is contraindicated in the following situations:

- Conditions requiring immediate or imminent surgery
- Congenital abnormalities indicative of a poor long-term outcome

Cooling should be used with caution in babies with unstable respiratory and cardiovascular function. Consider withholding cooling in babies who are moribund with severe encephalopathy.

As early as possible after resuscitation and stabilisation the baby should be assessed according to TOBY criteria to see if cooling is appropriate:

A. Infants ≥ 36 completed weeks gestation admitted to the neonatal unit with at least one of the following:

- Apgar score of ≤ 5 at 10 minutes after birth
- Continued need for resuscitation, including endotracheal or mask ventilation, at 10 minutes after birth
- Acidosis within 60 minutes of birth (defined as any occurrence of umbilical cord, arterial or capillary pH < 7.00)
- Base Deficit ≥ 16 mmol/L in umbilical cord or any blood sample (arterial, venous or capillary) within 60 minutes of birth

Infants that meet criteria A should be assessed for whether they meet the neurological abnormality entry criteria B:

B. Seizures or moderate to severe encephalopathy, consisting of the following:

- Altered state of consciousness (reduced response to stimulation or absent response to stimulation) **and**
- Abnormal tone (focal or general hypotonia or flaccid) **and**
- Abnormal primitive reflexes (weak or absent suck or Moro response)

APPENDIX B: NEOMATE REFERRAL CHECKLIST

Following stabilisation with a systemic standard newborn life support approach use the following checklist to remember the most important steps in the management of a term baby with encephalopathy due to suspected hypoxic insult.

1. EARLY ASSESSMENT

Have you performed a formal neurological examination? Include at least tone, posture, suck and pupils. Perform this after arrival to your neonatal unit and certainly before giving muscle relaxants and sedatives.

Have you asked for cord gases?

Would this baby benefit from cooling? (Remember Toby cooling criteria – Appendix A).

- Still discuss with local cooling centre if only Criteria A is met.
- Start passive cooling as soon as possible: turn off heater, remove incubator lid/open doors. Use rectal temperature monitoring if possible every 15 minutes (axilla if not available). When temperature reaches 34.5C, turn incubator heater on to avoid over-cooling

Can you perform cerebral function monitoring? This is helpful information if available.

2. INFORMATION GATHERING



Cause: was there a sentinel event? For example: antepartum haemorrhage, abruption, cord prolapse.



Timings: first heart rate, first gasp, onset of regular respiration.

3. REFER EARLY

Call your local cooling centre for advice as early as possible

APPENDIX C: COOLING PROFORMA INCLUDING MODIFIED THOMPSON SCORE

 TOBY COOLING MONITORING SHEET 		
+		
Patient Reference Number		
Date & Time of Birth		
Referring Hospital		
Receiving Hospital		
Birth Weight / Current Weight		
Date & Time of admission to local unit		
Temperature on admission	Rectal / Axilla / Skin*	
Date & Time of local unit commencing cooling	Active / Passive*	
Temperature on local unit commencing cooling	Rectal / Axilla / Skin*	
NTS Arrival Date & Time		
Temperature on NTS arrival	Rectal / Axilla*	
Date & Time NTS commenced cooling	Active / Passive*	
Temperature on NTS commencing cooling	Rectal / Axilla*	
Date & time of achieving cooling target temperature (must be rectal) (33 - 34°C as per TOBY)	Age of Baby (in hrs)	
<small>*Please delete as appropriate</small>		
Please state any changes made to therapeutic cooling and the reason for this (i.e. cooling stopped due to baby being unwell, unable to actively cool due to equipment difficulties)		
<small>Last updated January 2017 by Dr Sophia Teoh</small>		

 TOBY COOLING MONITORING SHEET 					
Neonatal Encephalopathy Assessment Sheet					
Patient Referral No		Patient Age At Referral	(hrs)		
Patient Name					
Date & Time of Birth					
Criteria for considering therapeutic hypothermia:					
Criteria A from TOBY trial			Tick		
Infant's gestation ≥36 weeks					
APGAR score ≤5 at 10mins					
Blood gas pH within 1hr of birth ≤7.0 (cord gas or arterial or capillary gas)					
Continued need for resus at 10 min of age (Bag mask ventilation / ETT ventilation)					
Base deficit within 1hr ≥16.0 (cord gas or arterial or capillary gas)					
Neurological Assessment: Modified Thompson Score:					
Sign	0	1	2	3	Score
Alertness	Alert	Irritable	Poorly responsive	Comatose	
Tone	Normal	Hypertonia	Hypotonia		
Respiratory status	Normal	Respiratory distress (apnoea/needng O ₂)	CPAP/mechanical ventilation		
Reflexes	Normal	Hyperreflexia	Hyporeflexia	Absent reflexes	
Seizures	None	Suspected	Confirmed clinical seizure		
Feeding	Normal (breast/bottle)	NGT/NBM			
Total score (max 13)					
Date & Time of assessment					
Baby's age (in hours) at assessment					
Assessor (sign & print name)					
<small>Last updated January 2017 by Dr Sophia Teoh</small>					