

THAMES VALLEY & WESSEX NEONATAL OPERATIONAL DELIVERY NETWORK

**THERAPEUTIC COOLING GUIDELINE:
NURSING CARE ON THE NEONATAL UNIT**

Approved by /on:	Thames Valley & Wessex Neonatal ODN Governance Group, ratified 5 th June 2019.
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Related documents	<p><u>References</u></p> <p>Adams.A et al (2015) <u>Thames Valley & Wessex guidelines for assessment and initiation of therapeutic hypothermia (cooling) treatment for babies presenting with moderate or severe hypoxic ischaemic encephalopathy.</u> Version 2, TVNN Neonatal ODN,</p> <p>Azzopardi.D (2015) <u>E-mail to Denis Azzopardi-</u> clarifying best practice for temperature correcting blood gases. Oxford Neonatal Unit. 09.01.2015.</p> <p>BAPM (2010) <u>Position statement on therapeutic cooling for neonatal encephalopathy.</u> British Association of Paediatric Medicine. London.</p> <p>Bliss (2012) <u>HIE (Hypoxic-ischaemic encephalopathy): Information for parents.</u> Bliss, London.</p> <p>N.Chirinian (2011) Therapeutic Hypothermia for Management of neonatal asphyxia: What nurses need to know. Critical care Nurse. June 2011, Vol 31, No 3, ppe1-e12.</p> <p>Fairchild. K et al (2010) Therapeutic hypothermia on neonatal transport: 4year experience in a single NICU. <u>Journal of Perinatology</u>, Vol 30, pp324-9.</p> <p>Holton.T (2014) <u>Therapeutic hypothermia in the neonate. Clinical Guidelines- Nursing.</u> The Royal Children's Hospital Melbourne. Found at www.rch.org.au</p>

	<p>Kendall.G et al (2011) Passive cooling for initiation of hypothermia in neonatal encephalopathy. <u>Archives of disease in childhood, fetal and neonatal edition</u>. 2010, Vol 95, F408-412</p> <p>Lambrechts.H and Bali.S (2010) <u>Therapeutic Hypothermia for infants >35weeks with moderate or severe Hypoxic ischaemic Encephalopathy (HIE) clinical guideline</u>. Northern Health and Social care Trust. England.</p> <p>LeMyre.B (2018) Hypothermia for newborns with hypoxic ischaemic encephalopathy. Canadian Paediatric Society, June 2018, <u>Paediatric Child Health</u>. Vol 23, No 4, pp285-91.</p> <p>Mania.N et al (2013) Elimination of Admission Hypothermia in Preterm Very Low-Birth-Weight Infants by Standardization of Delivery Room Management. <u>Permanente Journal</u>, Summer, Vol 17, No 3, pp8-13.</p> <p>Martinello. K et al (2017) Management and investigation of neonatal encephalopathy: 2017 update. <u>Archives of Disease in Childhood, Fetal and Neonatal Edition</u>, 102, F346-58.</p> <p>Mitchell.A and Johnston.E (2011) Provision of therapeutic hypothermia during neonatal transport. <u>Infant</u>, Vol 7, no 3, pp79-82.</p> <p>Mosalli.R (2012) Whole body cooling for infants with Hypoxic –Ischaemic Encephalopathy, <u>Journal of Clinical Neonatology</u>. April-June, Vol 1, no 2, pp101-6.</p> <p>Olsen.S et al (2013) Optimising therapeutic hypothermia for neonatal encephalopathy. <u>Paediatrics</u>. http://pediatrics.aappublications.org/content/early/2013/01/02/peds.2012-0891</p> <p>RCH (2014) Therapeutic hypothermia in the neonate. The Royal Children’s Hospital, Melbourne. www.rch.org.au/rchcpg/hospital-clinical-guideline-index/therapeutic-hypothermia</p> <p>RCUK (2015) Resuscitation Council (UK) Guidelines 2015 found at- https://www.resus.org.uk/resuscitation-guidelines/resuscitation-and-support-of-transition-of-babies-at-birth/</p> <p>Reynolds.R and Talmage.S (2011) "Caution! Contents should be Cold":</p>
<p>Implications of race, equality & other diversity duties for this document</p>	<p>This guideline must be implemented fairly and without prejudice whether on the grounds of race, gender, sexual orientation or religion.</p>

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1.0 Aim of Guideline Framework

To provide a framework for carrying out therapeutic cooling on Neonatal Units in Thames Valley & Wessex Neonatal ODN.

2.0 Scope of Guideline Framework

The Guideline applies to all Neonatal Units and Maternity Units covered by Thames Valley & Wessex Neonatal ODN. This includes the following hospitals:

Thames Valley	
Buckinghamshire Healthcare NHS Trust	- Stoke Mandeville Hospital, Aylesbury
Frimley Health NHS Foundation Trust	- Wexham Park Hospital, Slough
Milton Keynes University Hospital NHS Foundation Trust	- Milton Keynes General Hospital
Oxford University Hospitals NHS Foundation Trust	- John Radcliffe Hospital, Oxford
Royal Berkshire NHS Foundation Trust	- Reading
Wessex	
Dorset County Hospital NHS Foundation Trust	- Dorset
Hampshire Hospitals NHS Foundation Trust	- Basingstoke
Hampshire Hospitals NHS Foundation Trust	- Winchester
Isle of Wight NHS Trust	- St Mary's Hospital
Poole Hospital NHS Foundation Trust	- Poole Hospital
Portsmouth Hospitals NHS Trust	- Queen Alexandra Hospital
Salisbury NHS Foundation Trust	- Salisbury
University Hospital Southampton NHS Foundation Trust	- Princess Anne Hospital
Western Sussex Hospitals NHS Foundation Trust	- St Richard's Hospital, Chichester

3.0 Guideline summary

- Normothermia should be maintained during resuscitation, with clinical assessment for cooling taking place after the patient has been stabilized following resuscitation.
- For passive cooling- follow local policy or network guideline
- For active cooling – follow local policy or network guideline
- During cooling continuously monitor and record hourly;
 - Heart rate
 - Respiratory rate
 - Oxygen Saturations
 - Invasive blood pressure
 - Surface temperature –from cooling machine surface probe
 - Core temperature-from cooling machine rectal probe
 - Set temperature- from cooling machine
 - 2nd rectal temperature – from unit monitor, as a safety back up.
 - Pain score

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Neonatal Generic email: england.tv-w-neonatalnetwork@nhs.net

Neonatal Website: <https://southodns.nhs.uk/our-networks/neonatal>

- Position the baby where possible with the head in line with the body.
- All babies who are receiving active cooling must receive CFM monitoring.
- Cooled babies should be observed closely for signs of electrical and clinical seizures.
- If the baby's heart rate is greater than 110 then pain/ distress, hypovolaemia or hypotension should be considered.
- When doing blood gases, the actual temperature of the baby should be inputted into the gas machine, allowing the blood gas to be corrected for temperature.
- Every 3-6hours open the cooling jacket and assess the baby's skin, then reposition the baby so that the area of skin under maximum pressure is altered.
- Rewarming begins after 72 hours of cooling. The local medical guideline or network guideline for rewarming should be followed.
- The CFM remains monitoring the baby for 24hours after rewarming has been achieved.
- A rectal probe remains in situ for 24hours after rewarming has been achieved.
- Keep parents informed about all aspects of their baby's care and encourage them to participate in their care, as appropriate.

4.0 Background Information

Therapeutic cooling has been found to be beneficial for term newborns with Hypoxic Ischaemic Encephalopathy (HIE.) Research has shown that without intervention, a baby who has moderate encephalopathy after birth has a risk of death of less than 10%, but their risk of surviving with a physical disability is approximately 33%. Research has also shown that for babies demonstrating severe encephalopathy, the risk of mortality is up to 60%, with the majority of babies who survive going on to have disability at age 18months of age.

The use of therapeutic cooling for a 72 hour period after birth has been found to reduce mortality without increasing major disability in survivors. Research studies have identified that the benefits of cooling outweigh the possible short term adverse effects of the cooling process. However, the current evidence does not support the cooling of infants with mild HIE, or those born before 36 weeks gestation.

These guidelines have been produced to direct nursing staff in their care of neonates receiving therapeutic cooling and are based on research findings and agreed current best practice. This nursing guideline is intended to complement medical guidelines for therapeutic cooling, so offers generic guidance on safe and effective nursing care of babies requiring cooling. User instructions for different medical devices will not be given, as user manuals and local training procedures should be covering this aspect of care. Specific discussion of a particular medical device will only be made- if pertinent to improving nursing care.

For accessibility, the guidelines have been collated under distinct subheadings, in the order that information is likely to be needed in practice. However, the reader is strongly advised to read the guidelines in full and to seek the advice and support of more senior or experienced colleagues in the practice setting.

4.0 Guideline Framework

4.1 Timing of Decision to Cool

- Normothermia should be maintained during resuscitation (Resuscitation Council (UK) 2015).
- The clinical assessment for cooling should only take place after the patient has been stabilized following resuscitation.
- Cooling therapy (either passive or active cooling) should not be commenced until the infant meets the clinical criteria for cooling, which requires a neurological assessment **after at least 30 minutes of age**. In all but the most severe cases, **this assessment will take place following transfer to the neonatal unit**.
- Babies born outside a hospital setting (e.g. at home, or standalone midwifery unit), who require a significant resuscitation, should, where possible, be nursed on a transwarmer, with suitable clothing, hat and blankets during ambulance transfer to avoid excessive hypothermia. The patient should be kept normothermic until stabilization has occurred at the receiving hospital. Following this, a formal neurological assessment can be completed, and decisions made about whether cooling therapy should be commenced.
- If attending a delivery where the baby requires significant resuscitation or is born in very poor condition, nursing staff can prompt the resuscitation leader, as it may be appropriate to ensure venous and arterial cord gases are taken.
- Whilst awaiting a definite decision to cool, ask a team member to gather equipment that would be required if the decision is made to commence therapeutic cooling. This will enable cooling to commence in a timely and efficient manner, if this decision is made to proceed to therapeutic cooling.

4.2 After the Decision to Cool

- Site a rectal temperature probe.
 - Mark with white tape around the probe, 1cm longer than the depth you intend to insert it. It will then be very clear if the probe position has moved.
 - Lubricate probe with lubricant gel.
 - Place probe 3-6cm deep into the rectum- depending on the size of the baby, unless cooling machine instruction manual directs otherwise.
 - Secure the probe to the upper thigh.
- Document initial temperature (rectal if available)
- **Follow cooling protocol for local unit, either Passive Cooling or Active Cooling.**
- For passive cooling- follow local policy or network guideline (*see appendix 3 of Network Medical Guidelines*) This will always include;
 - Turn incubator or overhead heater off
 - Do not dress the baby
 - Do not cover the baby
 - Do not nurse baby on heat retaining surface such as 'sheepskin'
- For active cooling – follow local policy.
 - Do not use ice packs- as severe hypothermia can result
 - Do not use a fan without rectal probe in situ.
 - The temperature range desirable for formal cooling is 33-34°C. This cannot be measured using an axilla thermometer as they are not accurate at such low temperature levels.
- Staff should be aware that once a baby is cooled their peripheral perfusion will be reduced, which may make it more difficult to site peripheral venous lines (pvl). Staff may choose to site one or more pvl before commencing cooling- although it is important that the commencement of cooling process is not delayed.

- Begin to temperature correct blood gases when cooling is commenced.

4.3 When cooling commenced

Monitoring

- Continuously monitor and record hourly;
 - Heart rate
 - Respiratory rate
 - Oxygen Saturations
 - Invasive blood pressure
 - Surface temperature –from cooling machine surface probe
 - Core temperature-from cooling machine rectal probe
 - Set temperature- from cooling machine
- During the initial cooling process there is a risk that the baby will be over cooled or under cooled, especially if passive cooling is occurring. To mitigate against this some units choose to record the baby's heart rate, respiratory rate and core temperature every 15mins for the first 1-2 hours of the cooling process, until the level of hypothermia has stabilised. **Ensure you follow your locally agreed policy on this.**
- Urine output should be measured 6 hourly as renal function can be compromised, both by the cooling process and the hypoxic insult.
- As a safety measure, some units will use a second rectal probe to measure core temperature. This is because of the rare chance of the cooling machine being faulty. If using a second probe, document this reading hourly and compare to core temperature reading from cooling machine. Report any deviation between the readings, greater than 0.2 °C to a senior nurse or the medical team.
- The rectal probe can be left insitu for the full time period of cooling and re-warming. It does not need to be removed and routinely cleaned during this time.
- The average heart rate for a cooled baby is 100. If the baby's heart rate is greater than 110 then pain/ distress, hypovolaemia or hypotension should be considered. If the baby is on significant amounts of inotropes then an elevated heart rate may be acceptable- but always report an elevated heart rate to the medical team.
- The standard parameters for heart rate and respiratory rate alarm settings should be altered according to the status of each baby.
- The baby should have a pain score assessed and recorded hourly, due to the high probability of pain or discomfort. Observation should also include indicators such as tone and alertness that may indicate a changing neurological status or development of seizures.
- Babies who are cooled, tend to have an elevated blood pressure. If the baby's blood pressure falls below 40mmHg, inform the medical team as active management may be required.
- A UAC and UVC will usually be sited for babies being cooled. As with any arterial line, the peripheral perfusion of the tissues proximal to the arterial line must be checked regularly. Although the baby's skin colour and temperature will be affected by the cooling process, the perfusion, colour and temperature of the lower limbs can be checked by comparing them to the perfusion, colour and temperature of upper limbs, which are unaffected by any arterial line. Document these observations hourly.

General Care

- If baby is receiving respiratory support, the heating and humidification levels should be set to their 'normal' settings.
- Respiratory secretions tend to be sticky when a patient is cold. Cooled babies are likely to

require more frequent suctioning – particularly on the 3rd day of cooling. This is important to help prevent chest infections.

- When doing blood gases, the actual temperature of the baby should be inputted into the gas machine, allowing the blood gas to be corrected for temperature.
- Enteral feeding is not contra-indicated in the cooling patient, but due to an increased risk of NEC milk feeds will be introduced cautiously. When available, breast milk would be used as a first preference. For those infants with severe HIE the medical team may decide to delay feeding until after the infant has been rewarmed.
- Hypothermia can affect coagulatory function, so staff should be vigilant for signs of bleeding such as bruising, excessive bleeding after heel-prick or veni-puncture and petechiae.
- It has been suggested that blood flow to the cooled baby's brain may be compromised if the baby is positioned during cooling, with its head turned to the side. The evidence base for this is unclear, but it seems sensible to nurse the baby where possible with the head in line with the baby's body (this may be supine or lateral) and to avoid extreme extension, contraction or twisting of the baby's neck.
- It is usual practice for cooled and ventilated babies to be sedated with intravenous morphine.
- It is common practice for non-ventilated babies to receive a low level of intra-venous morphine (10cmg/kg/hr). The baby's respiratory function will need to be monitored closely using continuous respiratory monitoring and careful observation.
- If you feel the baby is distressed or in pain, inform the nurse in charge, or the medical team. Pain relief and sedation can be increased, even if this requires commencing ventilation, in order to do this safely.

Skin Integrity

Babies being cooled have poor peripheral perfusion, reduced mobility and increased risk of fat necrosis. Every 3-6hours dependent on the baby's condition;

- Open the cooling jacket and assess the baby's skin, taking particular note of areas over the bony prominences, such as buttocks and spine.
- Reposition the baby, so that the areas of skin under maximum pressure are altered.
- Nursing the baby in the midline position does not require that they always be positioned supine. Midline positioning can be achieved with the baby nursed laterally, left or right and also a 'slightly tilted' position to the left or right.

Cerebral Function Monitoring

Where available, babies who are being cooled will have their cortical brain activity continuously monitored using a cerebral function monitor (CFM). An amplitude-integrated-electroencephalogram (aEEG) will be displayed on the CFM for continuous viewing and also recorded by the CFM.

- If CFM is available, it will be sited by someone competent to do so - this may be a member of the medical or nursing team.
- CFM may not be available during the initial assessment phase, or on units that passively cool, however, all babies who are receiving ongoing active cooling must receive CFM monitoring.
- Observe closely that the sub dermal needle electrodes do not become dislodged. Electrode dislodgement will cause the aEEG trace to be interrupted or become poor quality. Some machines have a traffic light system to guide staff, and will go from green, to amber or red if the trace quality reduces and action is required.
- Changes in the aEEG trace can indicate clinical or subclinical seizures or alteration in brain function and should be reported to the medical team.

- Whilst the baby is on the CFM all significant events should be 'marked'. This means recording the time and type of event against the aEEG trace, so any change in the aEEG can be understood in light of the event. See the machine's instruction manual for how to mark events. Events that need to be marked include;
 - Handling or medical procedures.
 - Seizures or abnormal movements observed.
 - Administration of anti-convulsants.

Seizures

- Cooled babies should be observed closely for signs of clinical seizures, which may include;
 - Lip smacking
 - Jerking movements of one or more limb
 - Back arching
 - Facial twitching
 - Eye rolling
 - Cycling of limbs
 - Excessive hiccoughing
- The nature of seizures and length of time of each episode spans should be documented in the nursing record as well as marked on the CFM.
- Report all episodes of clinical seizures to the medical team and treat as local policy directs.
- Babies having sub-clinical seizures may display subtle signs externally- for example vacant expression, sudden stillness, sudden agitation, apnoea, desaturation, or bradycardia. If these signs are seen, seizure activity may be noted on the CFM aEEG trace. Report such external signs or any possible CFM changes to the medical team.

Documentation

- It is usual practice to document these values every hour
 - Heart rate
 - Respiratory rate
 - Oxygen Saturations
 - Invasive blood pressure
 - Surface temperature –from cooling machine surface probe
 - Core temperature-from cooling machine rectal probe
 - Set temperature- from cooling machine
- If local policy in your unit, document heart rate, respiratory rate and core temperature every 15 minutes for the first 2 hours, when hypothermia is stabilizing.
- There are specific forms that need to be completed, showing how each baby is assessed and why the decision was made to commence therapeutic cooling. This will be completed by the medical team - usually the registrar and can be found in the Thames Valley and Wessex ODN Neonatal Network Medial Guideline for Assessment and Initiation of Therapeutic Hypothermia.

Rewarming

Rewarming will usually begin after 72 hours of cooling, unless the decision to cease cooling is made earlier. Whatever the situation;

- **Follow the NICU local medical guideline for rate and time interval of rewarming, usually 0.2-0.5°C**
- The risk of seizures is higher during and after rewarming, so the babies should be vigilantly monitored during this period.
- The baby's blood pressure should be watched vigilantly during rewarming, as the risk of low blood pressure increases as the baby's temperature rises back to 'normal'.
- If complications (seizures or hypotension) occur, inform medical staff and reduce the

temperature back down to the temperature at which the baby was previously stable. Further rewarming may need to be done more slowly.

- The cooling wrap can usually be removed 1 hour after normothermia has been achieved. See individual instructions for equipment in the local area.
- The CFM would usually remain monitoring the baby for 24hours after rewarming has been achieved.
- To ensure the baby's temperature remains stable after rewarming a rectal probe would usually remain in situ for 24hours. It does not need to be the probe from the cooling machine if it is more convenient to remove the machine.

Parents

- Verbal Parental assent is required for cooling. This will be taken by the medical team, and recorded in the baby's medical notes.
- Parents should be given a copy of the Bliss HIE - Information Leaflet for Parents (available free of charge on www.bliss.org.uk) or the local hospital information leaflet.
- Keep parents informed about all aspects of their baby's care and encourage them to participate in their care, as appropriate.
- If the baby is clinically stable then it is safe and acceptable for parents to cuddle the baby, with the cooling wrap insitu. Care needs to be taken that CFM leads are not dislodged and that the water feed in hoses for the cooling wrap are not accidentally kinked.
- If a baby is being cooled outside of standard trial guidelines, medical staff will ensure that parents are aware that treatment is not proven in this situation (see medical guidelines for standard criteria for cooling)
- Separation of the baby and mother/father is a significant issue when a term baby is unexpectedly admitted to the neonatal unit for cooling. This is exacerbated if the baby requires transfer to a tertiary centre for cooling, and the baby ends up in another hospital. Every effort should be made to;
 - Keep parents informed
 - Encourage parental visiting and involvement
 - Facilitate positive touch/ cuddles as possible/ appropriate

Version Control:

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