

Document Title:	PREVENTION AND MANAGEMENT OF NEONATAL HYPOTHERMIA		
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Related Trust Policies (to be read in conjunction with)	<p>04071 Standard Infection Prevention</p> <p>04072 Hand Hygiene</p> <p>06036 Maternity Record Keeping including Documentation in Handheld Records</p> <p>09111 Management of Breastfeeding in the Postnatal Period</p> <p>12025 Treatment of neonatal hypoglycaemia in the high risk infant</p> <p>04225 Examination of the Newborn Infant</p> <p>08074 Postnatal observations of babies born with prolonged rupture of membranes, meconium stained liquor and infants of group B streptococcus positive mothers who receive intravenous antibiotics in labour</p> <p>09127 Routine Postnatal Care of Women and their Babies</p>
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Document Review History:

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1.0	Sharon Pilgrim	clarification to 7.2	January 2010
1.1	Sharon Pilgrim	clarification to 3.1, 7.0	February 2010
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1.0 Purpose

- 1.1 The purpose is to ensure that infants are cared for in such a way as to maintain their body temperature within the normal range.
- 1.2 To ensure that if the infant becomes hypothermic the correct treatment is given.
- 1.3 To discuss the identification of infants who may benefit from therapeutic cooling and how this should be undertaken.

2.0 Equality Impact Assessment

- 2.1 Mid Essex Hospital Services NHS Trust is committed to the provision of a service that is fair, accessible and meets the needs of all individuals.
(Refer to Appendix F)

3.0 Normal Temperature

- 3.1 The normal temperature for a healthy infant is between 36.6°C - 37°C.
- 3.2 Body temperature below 36°C or above 37.5°C or a core peripheral difference of more than 3°C which does not respond to environmental manipulation is a marker of serious illness until proved otherwise.

4.0 Heat Production

- 4.1 During pregnancy maternal mechanisms maintain the intrauterine temperature. After birth the newborn must adapt to their environment by the metabolic production of heat.
- 4.2 Primary source of heat in the newborn is non-shivering thermogenesis which involves the utilisation of brown adipose tissue.
(Refer to Appendix B)

5.0 Mechanism of Heat Loss

- 5.1 The neonate has a large surface area for a small body mass and loses heat rapidly
- 5.2 Radiation is the loss from the infant to the surrounding objects.

- 5.3 Convection is heat loss from the skin to moving air this is dependent on air speed and temperature.
- 5.4 Evaporation is insensible water loss from the skin's surface and is dependent on three factors:
- How wet is the baby;
 - How immature and water permeable is the skin;
 - How much is the infant exposed to drying factors such as air movement.
- 5.5 Conduction occurs when the heat transfers from one object to another such as when the baby is placed on a cool surface.

6.0 At Risk Infants

- 6.1 Infants delivered by lower segment caesarean section (LSCS) are more likely to have problems with thermoregulation and respiration with both axilla and skin temperatures lower than those delivered vaginally.
- 6.2 Asphyxiated infant are more vulnerable to heat loss due to the process of resuscitation.
- 6.3 Infants with respiratory distress are more prone to hypothermia as the process of non-shivering thermogenesis requires the presence of oxygen to metabolise the brown fat.
- 6.4 Low birth weight/preterm infant have special problems with heat production due to the following points:
- Higher surface area to weight;
 - Highly permeable skin leads to increased trans-epidermal water loss;
 - Decreased subcutaneous fat with less insulative capacity;
 - Less developed stores of brown adipose tissue;
 - Inability to take in enough calories to provide nutrients for thermogenesis and growth;
 - Limited oxygen consumption.

7.0 Management to Prevent Heat Loss

- 7.1 Keep labour ward/theatre as warm and draft-free as possible.

7.2 Healthy term infants:

- Infant should be dried and skin to skin offered and commenced at the mother's request;
- A hat should be placed on the baby's head and the baby should be covered in warm towels;
- Early feeding should be offered;
- Take the 'axillary' temperature during initial examination after birth as per the 'Examination of the newborn infant' policy; register number 04225.

7.3 Sick or a preterm infant:

- Sick and preterm infants born after 30 weeks gestation should be dried at birth with warm towels and a hat put on the baby's head;
- Preterm infants born before 30 weeks should not be dried but should be placed in a plastic bag and their heads covered with a hat;
- Place under a radiant heater during examinations and procedures (Refer to the guideline for 'Examination of the newborn infant'; register number 04225);
- Nurse in a thermo neutral environment to minimise energy expenditure. Use of a skin probe and servo control will allow the incubator or resuscitaire thermostat to change in response to the infant's skin temperature;
- Nurse in a humidified incubator to reduce evaporative heat loss and decrease insensible water loss. (Refer to East of England Thermoregulation; registration number NEO-ODN-2016-11)

7.4 Infants requiring resuscitation:

- If the baby requires attention place on heated towels under a radiant heater and assess the infant's condition;
- If suspicion of perinatal hypoxia switch off heater and commence resuscitation. THINK COOLING. (Refer to Appendix B)

8.0 Measurement of Temperature

- 8.1 Infants within the high risk groups and infants with a history of maternal group B streptococcus should have their temperatures recorded at least 4 hourly. Those with a history of prolonged rupture of membranes require more frequent observations. (Refer to the "Postnatal observations of babies born with prolonged rupture of membranes (PROM) meconium stained liquor (MSL) and infants of GBS positive mothers who have received IV antibiotics in labour"; register number 08074)

- 8.2 Intermittent temperature recording taken from the axilla is the most common way to monitor temperature. The temperature should be taken using the Sure temp plus digital thermometer (Welch Allyn). A single use sheath system is provided with the Sure temp; a single button switch on mode activates the equipment followed by a 'bleep' tone to alert the operator that the Sure temp is ready for use. After a period of between 2-3 minutes the system will bleep again to complete the procedure.
(Refer to Appendix E and the guideline for the 'Examination of the newborn infant'; register number 04225)
- 8.3 Sick and small infants should have their temperatures monitored continuously. Monitoring the temperature from both the core and the periphery (c-t-p) and comparing the two is particularly useful in these infants who have poor vasomotor control and are peripherally shut down. A wide c-p t (more than 2-3°C is abnormal and could possibly be caused by infection, patent ductus arteriosus (PDA), hypoalbuminaemia or cold stress.

9.0 Clinical Effects of Cold

- 9.1 Cold stress effects oxygenation by increasing pulmonary artery resistance and reducing surfactant production. Poor perfusion causes an increase in anaerobic metabolism causing worsening acidosis. Acidosis itself will increase artery pressure and decreasing the amount of flow through the lungs leading to further hypoxia.
(Refer to Appendix C)
- 9.2 Surfactant production decreases and its ability to act as a surface tension lowering agent is impaired if temperature drops below 35°C.
- 9.3 There is extra utilisation of glucose because of the increased metabolism which can lead to hypoglycaemia.
(Refer to the guideline for 'Treatment of neonatal hypoglycaemia in the high risk infant'; register number 12025)
- 9.4 Prolonged hypothermia with its resultant poor cardiac output and flow to the central nervous system also has an effect on the intestinal blood flow and may predispose to Necrotising enterocolitis.

10.0 Neonatal Cold Injury

- 10.1 This occurs after a period of extreme hypothermia below 32°C. The infant will appear bright red in colour due to the dissociation of haemoglobin at low temperatures.

- 10.2 The consequences of profound hypothermia are a cascade of acidosis, hypoxia, clotting disorders leading to pulmonary haemorrhage and shock with decreased cardiac output.

11.0 Treatment of an Infant with Hypothermia

- 11.1 There is no increase in mortality between infants re-warmed slowly or quickly.

- 11.2 Axilla temperature below 36.5°C but above 36°C

- Increase the number of blankets and clothing. It is especially important to cover the head;
- If the mother is able to provide skin to skin contact with the baby just in a nappy against the mother's skin with both of them covered with blankets;
- Ensure the baby has received a feed;
- Repeat the temperature in one hour to make sure the baseline temperature is improving;
- If warming the baby under the overhead heater do not cover with blanket.
- Nurse baby on a heated cot initially set to 37°C until its temperature is recorded within the normal range on two consecutive occasions;
- The cot temperature can then be reduced in 0.5°C increments ensuring that the baby is maintaining a normal temperature;
- When the cot temperature has been reduced to 35 °c and baby has maintained its temperature within normal range on two occasion's baby should be removed from the heated cot and placed in a normal cot;
- The heated cot should not be switched off and the baby nursed on it as this leads to further temperature loss by conduction.

- 11.3 Axilla Temperature below 36°C

- Admit to Neonatal Unit (NNU);
- Place in an incubator, in an intensive care cot (ICC) with an overhead heater or in a heated cot;
- Set the incubator as per the Hey chart;
(Refer to Appendix A)
- Hourly measurements of axilla temperature;
- If no improvements after one hour increase incubator temp or ICC temperature to add humidity to the incubator;
- Treat presenting conditions such as respiratory distress;
- Administer intravenous fluids if necessary or continue with enteral feeds depending on the blood sugar levels.

12.0 Therapeutic Hypothermia

- Recent research indicates that for infants who have received a hypoxic insult benefit from localised hypothermia;
- Regionally cooling is provided at Addenbrookes and Norfolk and Norwich hospitals (Refer to Appendix D);
- Referrals are made to the Acute Neonatal Transport Service (ANTs) and cooling must begin within the first 6 hours;
- Overhead heaters should not be used for infants with birth asphyxia who meet the criteria for cooling.
(Refer to Appendix B)

13.0 Documentation

- 13.1 Temperature following delivery must be recorded on the postnatal/neonatal health care records.
- 13.2 If nursed with a servo control on the ICC or in incubator, hourly skin measurements and 6 hourly axilla measurements should be documented in the neonate's hospital records.
- 13.3 While re-warming takes place on the postnatal ward, hourly skin measurements should be recorded on the postnatal/neonatal health care records and on the appropriate neonatal observation chart.
(Refer to Appendix E)
- 13.4 Date and time of the first temperature measurement and all treatment and advice given should be documented, signed and printed. (Refer to the "Maternity record keeping including documentation in handheld records"; register number 06036)

14.0 Infection Prevention

- 14.1 All staff should follow Trust guidelines on infection prevention by ensuring that they effectively 'decontaminate their hands' before and after undertaking any patient contact.
- 14.2 All staff should ensure that they follow Trust guidelines on infection prevention, when using thermometers.

15.0 Staff and Training

- 15.1 All relevant staff should be competent in the use of thermometers. They must be aware of timings for an accurate temperature.
- 15.2 All relevant staff should complete an equipment competency related to the use of the heated cot.
(Refer to Appendix E)
- 15.3 Staff undertaking this procedure must have had the appropriate training and their competence should be recorded on appraisal.
- 15.4 Staff should be aware of the dangers of hypothermia and how to prevent it.

16.0 Professional Midwifery Advocates

- 16.1 Professional Midwifery Advocates provide a mechanism of support and guidance to women and midwives. Professional Midwifery Advocates are experienced practising midwives who have undertaken further education in order to supervise midwifery services and to advise and support midwives and women in their care choices.

17.0 Audit and Monitoring

- 17.1 Audit of compliance with this guideline will be undertaken on an annual audit basis in accordance with the Clinical Audit Strategy and Policy and the Maternity annual audit work plan. The Women's and Children's Clinical Audit Group will identify a lead for the audit.
- 17.2 The findings of the audit will be reported to the Women's and Children's Directorate Governance meetings and an action plan with named leads and timescales will be developed to address any identified deficiencies. Performance against the action plan will be monitored by this group at subsequent meetings.
- 17.3 The audit will be reported to the monthly Women's and Children's Directorate Governance Meeting (DGM) and significant concerns relating to compliance will be entered on the local Risk Assurance Framework.
- 17.4 Key findings and learning points from the audit will be submitted to the Patient Safety Group within the integrated learning report.
- 17.5 Key findings and learning points will be disseminated to relevant staff.

18.0 Guideline Management

- 18.1 As an integral part of the knowledge, skills framework, staff are appraised annually to ensure competency in computer skills and the ability to access the current approved guidelines via the Trust's intranet site.
- 18.2 Quarterly memos are sent to line managers to disseminate to their staff the most currently approved guidelines available via the intranet and clinical guideline folders, located in each designated clinical area.

19.0 Communication

- 19.1 Approved guidelines are published monthly in the Trust's Focus Magazine that is sent via email to all staff.
- 19.3 Approved guidelines will be disseminated to appropriate staff quarterly via email.
- 19.4 Regular memos are posted on the guideline notice boards in each clinical area to notify staff of the latest revised guidelines and how to access guidelines via the intranet or clinical guideline folders.

20.0 References

East of England Thermoregulation; registration number NEO-ODN-2016-11

Cloherty J.P, Eichenwald E.C, Stark AR (2016) Cloherty and Stark's Manual of neonatal care. 8th edition. Philadelphia: Lippincott, Williams & Wilkins.

Polin R.A & Spitzer A. R. (2013) Fetal and Neonatal secrets. 3rd edition. Philadelphia: Elsevier.

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Kramer, K (2005) Heat loss prevention: a systematic review of occlusive skin wrap for premature neonates. Journal of perinatology : official journal of the California Perinatal Association; 25 (no. 12); 763-769

Wyllie, J et al (2015) European Resuscitation Council Guidelines for Resuscitation 2015: Section 7. Resuscitation and support of transition of babies at birth. Resuscitation 95: 249-263

McCall, E et al (2018) Interventions to prevent hypothermia at birth in preterm and/or low birth weight infants. Cochrane Database of Systematic Reviews. Issue 2. Art. No.: CD004210. DOI: 10.1002/14651858.CD004210.pub5

Conde-Agudelo, A et al (2016) Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. Cochrane Database of Systematic Reviews. Issue 8. Art. No.: CD002771. DOI: 10.1002/14651858.CD002771.pub4.

Duryea, E (2016) The impact of ambient operating room temperature on neonatal and maternal hypothermia and associated morbidities: a randomized controlled trial. American Journal of Obstetrics and Gynaecology. 214(4): 505

Jacobs, S E (2013) Cooling for newborns with hypoxic ischaemic encephalopathy. Cochrane Database of Systematic Reviews Issue 1. Art. No.: CD003311. DOI: 10.1002/14651858.CD003311.pub3.



Appendix A

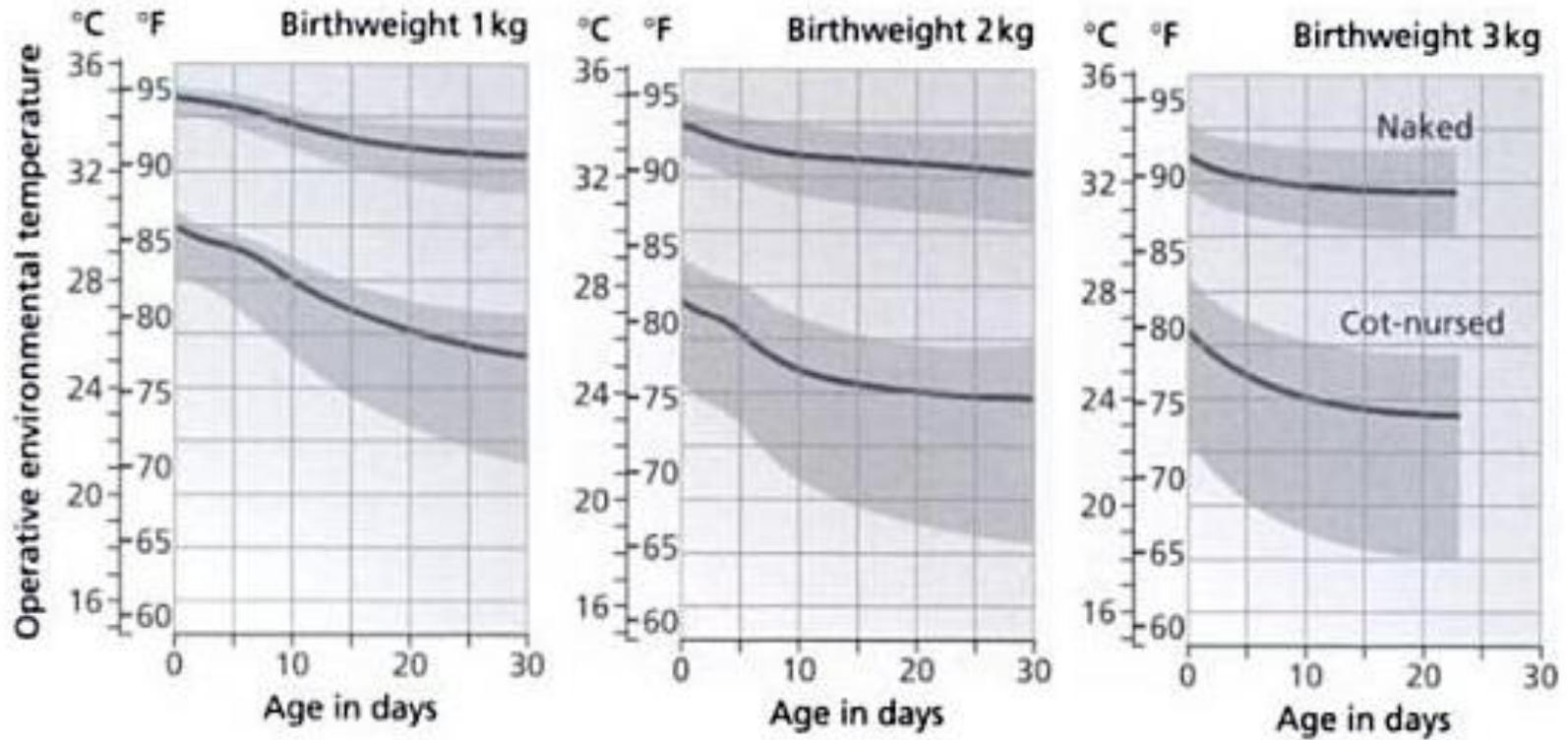
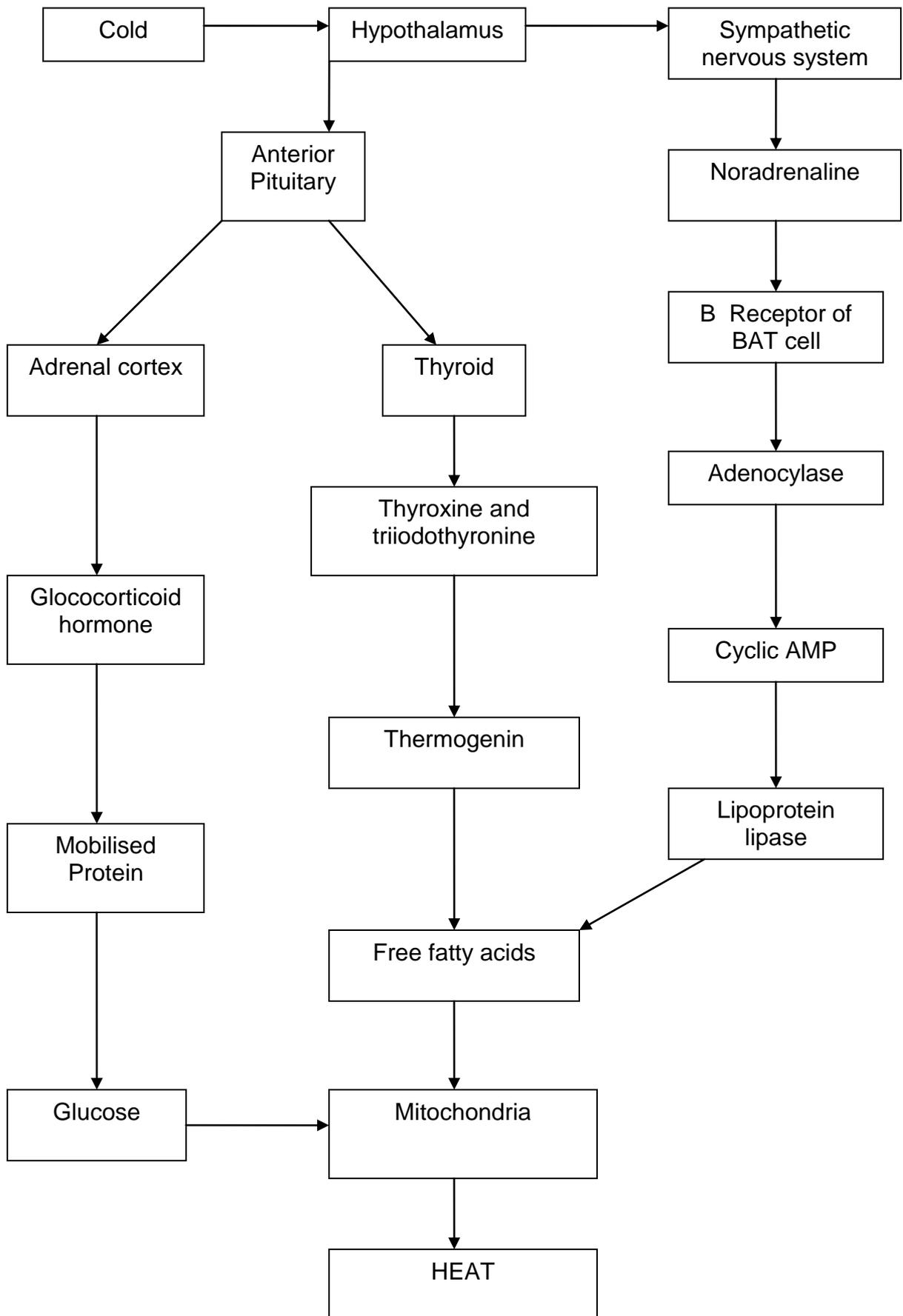
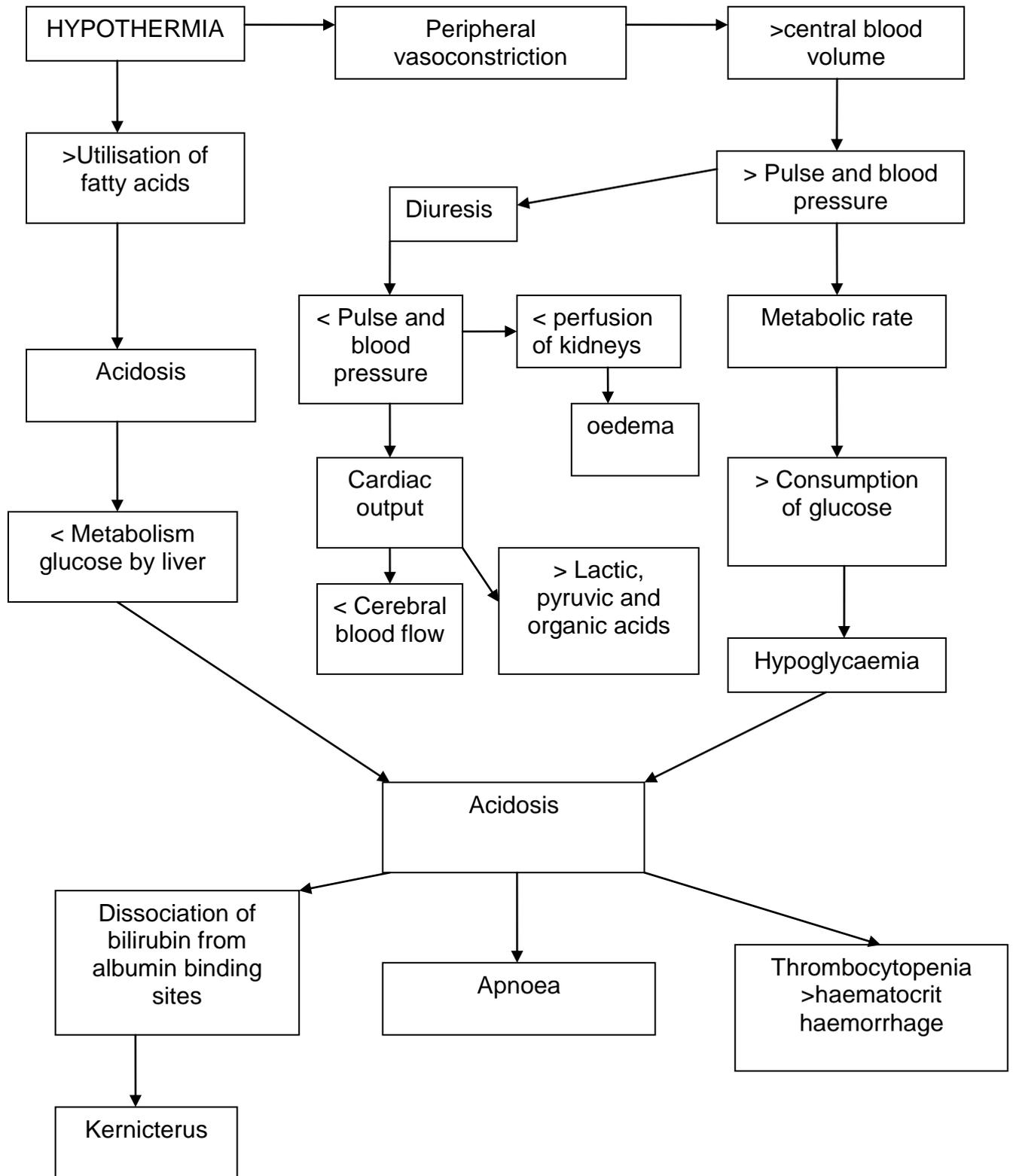


Fig. 9.1 The thermoneutral temperature range for three birthweight groups of healthy babies. The upper graph represents infants nursed naked and the lower is for clothed babies. (Hey 1971; reproduced with permission from Churchill Livingstone.)





Referral of a baby for cooling treatment

Appendix D

Treatment criteria

Criteria A - Infant > 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 <7.0)
- Base Deficit >16 mmol/l in umbilical cord and/or blood sample (arterial, venous or capillary within 60 minutes of birth)

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

Criteria B - Seizures or moderate to severe encephalopathy, consisting of:

- 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)

Infants who meet criteria A and B may be considered for treatment with cooling. Babies not fulfilling all criteria may still be discussed with cooling centre.

Passive cooling should not be commenced until a cooling bed has been confirmed.

(From TOBY Cooling Register Clinicians Handbook)

Appendix E

MEDICAL DEVICE / EQUIPMENT COMPETENCY SELF ASSESSMENT STATEMENT

Equipment name:	Kanmed Baby Warmer		
Competency Statement Number	CS	Staff groups:	
Training level:	High <input type="checkbox"/> Manufacturer / supply company	Medium <input type="checkbox"/> DCCT / Superuser	Low <input type="checkbox"/> Cascade training by colleague

High Risk Device STOP. Do not use this item unless you are competent to do so



Self assessment of competency should be measured against the following statements. These statements are designed to indicate competence to use this device. Responsibility for the use remains with the user, so if you are in any doubt regarding your competence to use the device, you should seek education to bring about improvement. Various methods include self-directed learning; coaching & formal training may be initiated. (Consider local resources, product operating manual & discussion with colleagues / manager). Questions to ask yourself: Are you safe using this equipment? Do you know how to:		Assessment
1	Turn the bed on and off	Yes/No
2	Identify when there is the required amount of water in the bed	Yes/No
3	Top up the water to the right level with the correct water	Yes/No
4	Change the temperature of the bed as required	Yes/No
5	What observations are required while using the bed	Yes/No
6	Identify when the bed is not functioning correctly and inform the correct department for repair	Yes/No
7	Clean the bed and store so that the bed is warm when required	Yes/No

You must be able to answer **yes** to all questions **and**, where appropriate, be aware of how to decontaminate the equipment between uses, in order to consider yourself competent. If you are competent, you should date and sign your **Diagnostic & Therapeutic Equipment Competency Record** for this equipment. If you are not competent, please identify this on your record, signing and dating the record appropriately, and discuss with your manager how and when your training needs will be met.

Your line manager should retain your **Diagnostic & Therapeutic Equipment Competency Record**. Self - assessment is undertaken on a one-off basis but will be reviewed annually at appraisal.

Appendix F: Preliminary Equality Analysis

This assessment relates to: Prevention and Management of Neonatal Hypothermia (09128)

A change in a service to patients		A change to an existing policy	X	A change to the way staff work	
A new policy		Something else (please give details)			
Questions		Answers			
1. What are you proposing to change?		Full Review			
2. Why are you making this change? (What will the change achieve?)		3 year review			
3. Who benefits from this change and how?		Patients and clinicians			
4. Is anyone likely to suffer any negative impact as a result of this change? If no , please record reasons here and sign and date this assessment. If yes , please complete a full EIA.		No			
5. a) Will you be undertaking any consultation as part of this change? b) If so, with whom?		Refer to pages 1 and 2			

Preliminary analysis completed by:

Name	Sharon Pilgrim	Job Title	Advanced Neonatal Nurse Practitioner	Date	February 2019
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