Maternity Newborn Thermoregulation

Guideline information

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Summary of document:
This guideline is informing best practice from the existing evidence on the management of normal range of temperature in the term and well neonates cared for on the postnatal and transitional care ward.

Scope: This guideline is to support all staff caring for term, healthy newborn babies
The guidance below uses the term 'woman' (pronouns she or her) to describe individuals whose sex assigned at birth was female, whether they identify as female, male or non-binary. It is important to acknowledge it is not only people who identify as women for whom it is necessary to access women's health and reproductive services. Therefore, this should include people who do not identify themselves as women but who are pregnant or have recently given birth. Obstetric and Midwifery services and delivery of care must therefore be appropriate, inclusive and sensitive to the needs of those individuals whose gender identity does not align with the sex that they were assigned at birth

To be read in conjunction with:
Thermoregulation in Neonates Guideline 1193 -open in new tab.

Patient information:
Patient Information Library

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Glossary of terms
Transwarmer Infant Mattress - A gel-filled, disposable thermal mattress designed to provide between 30 minutes and up to two hours of warming for safe management of hypothermia in infants.

Key points:
Term , healthy babies, Thermoregulation.

Contents

Scope
This guideline is to support all staff caring for term, healthy newborn babies .

Aim
The purpose of this guideline is to facilitate optimum thermal control in term babies, potentially reducing the need for admission to the neonatal unit due to hypothermia.

Objectives
The aim of this guideline will be met by the following objective:

- Staff supporting the prevention of hypothermia by providing an optimal neutral thermal environment immediately after and within the first few days of birth.

Introduction
This guideline is informing best practice from the existing evidence on the management of normal range of temperature in the term and well neonates cared for on the postnatal and transitional care ward. This guideline should be used alongside the Thermoregulation in Neonates Guideline 1193 if babies are preterm or in need of neonatal support.

The term hypothermia refers to low body temperature. Hypothermia is an important cause of morbidity and, occasionally, of mortality in the newborn. The effects of hyperthermia are less well-documented but equally important. The neonates' ability to maintain a normal body temperature may be impaired by environmental changes. Heat conservation is also impaired by the neonates' large surface area to weight ratio, in addition low birth weight babies have less subcutaneous fat and less brown fat which is a source of heat production by non-shivering thermogenesis. With continued cold stress the stores of brown fat become depleted resulting in hypoxia and hypoglycaemia. Hypothermia is linked to unnecessary admissions of term babies to neonatal units.

Newborn babies are unable to regulate their body temperature as effectively as older individuals and can only tolerate limited changes in environmental temperature. After birth the baby is then exposed to an atmospheric temperature (about 25°C)—significantly below intrauterine temperature (approximately 37°C) This 'colder' environment, in combination with the newborn's wet body, results in a heat-loss of between 0.1°C to 0.3°C per minute and of up to of 0.2°C to 1°C per minute (where there are no precautions taken regarding neonatal thermal protection after birth). Most heat is lost in the first minutes after birth, and this can result in falls in body temperature of 2-4°C or more.

The main principle of thermal management in the newborn is the prevention of hypothermia by providing an optimal neutral thermal environment immediately after and within the first few days of birth. With good management the incidence of severe adverse consequences is low.

Thermoregulation
Thermoregulation is the capacity to maintain equilibrium between heat production and heat loss in order to sustain body temperature within a normal range. Hypothermia and hyperthermia may have serious metabolic consequences for all newborns.

To minimise these effects, an environmental temperature at which the infant uses minimal rates of oxygen consumption and expends the least energy to maintain its temperature is needed.

WHO classifications of core body temperature for newborns:

- Normal core temperature of newborn infants should be maintained between 36.5 °C and 37.5 °C however consider adjustments if <36.7°C or > 37.3°C.
- Mild Hypothermia or Cold stress =36-36.4°C- cause for concern
- Moderate Hypothermia = 32-35.9ºC – danger, needs action to warm baby.
- Severe Hypothermia =<32ºC- outlook is grave, skilled care urgently required.

*Hypothermia (≤ 36.5 °C) and hyperthermia (> 37.5 °C) should be avoided

Clinical signs of Temperature instability

Signs & Symptoms of Hypothermia

- Shallow breathing, apnoea and bradycardia
- Decreased activity and apparent lethargy
- Hypotonia with diminished reflexes
- Pale mottled skin – cool to touch, cold extremities
- Bright red face and extremities, be mindful that dark skinned new-born's may be more difficult to assess, use full clinical assessment.
- Weak suck, poor feeding, poor gastric emptying, abdominal distension

Signs & Symptoms of Hyperthermia (Pyrexia).

- Tachycardia, tachypnoea, apnoea
- Hypotension
- Warm extremities, flushing, perspiration
- Lethargy, hypotonia, poor feeding
- Central temperature lower that peripheral temperature.

Hyperthermia (>37.5ºC) is rare and is usually iatrogenic. It is important to identify that the condition is not caused by a fever.

Signs of hyperthermia due to fever.

- Pale, cool extremities
- Core temperature greater than peripheral temperature

Measuring the Temperature

An axilla temperature should be taken, with an electronic thermometer, within or soon after the first hour of birth.

The skin in the armpit is more prone to temperature fluctuations, especially in neonates, and therefore care must be taken to ensure that the armpit is **dry,** and that the thermometer is positioned as high as possible into the baby's armpit aligned with their spine before temperature is obtained.

If the temperature is less than 36.5ºC check the position of probe and ensure the arm and clothes/ bedding is dry.

Consider taking a temperature earlier if:

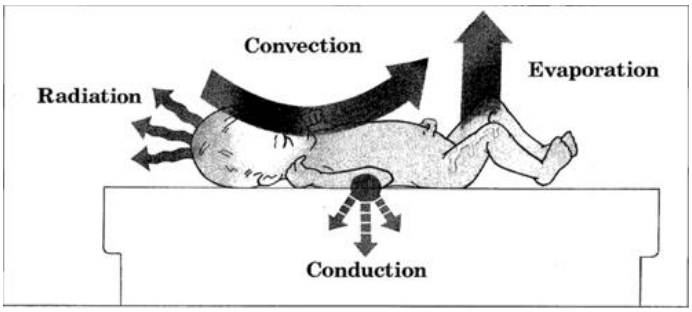
- there is a suspicion that the infant is becoming hypothermic,
- the infant was resuscitated at birth.

Methods of Heat Loss

It is important to understand the mechanisms of heat loss, to minimise their effect on the newborn. Infants lose heat through their skin and respiratory tract to the environment through evaporation, radiation, convection and conduction.

- Evaporation- Heat is lost when water evaporates from skin or breath.
- Convection- Heat is lost to currents of air.
- Radiation – Heat is lost via electro-magnetic waves from skin to surrounding surfaces. e.g. an infant placed near a cold wall will lose heat to that surface.
- Conduction – Heat is lost to surfaces with which the baby is in direct contact.

In adults 7- their dry heads the rest of the is larger in the total surface



10%of body heat is lost through if the heads are uncovered whilst body is covered. A neonate's head comparison to body ratio (20% of area).

Neutral Thermal Environment

Infants should be cared for in neutral thermal environment, a temperature range within which heat production is at the minimum needed to maintain normal body temperature (i.e. Core body temp between 36.5-37.5 degree Celsius) The ambient air temperature required to maintain a neutral thermal environment is dependent upon weight, gestational age, and postnatal age and each infant has his or her own individualized neutral thermal environmental temperature.

Thermoregulation at Birth

Prepare the birth environment

- Keep the environment in which the infant is looked after (e.g. birthing room or theatre) warm at 23–25 °C. If infant is ≤28 weeks' gestation, then temp should be ≥25 °C.
- Protect the infant from draughts. Ensure windows and doors are closed and air-conditioning appropriately programmed.
- Ensure electronic fans turned off
- Radiant heater, prewarmed if required.
- Towels and wool hat (+/- sterile plastic bag) available /warmed under heater

- Have a transwarmer available
- Pre-warm transport incubator to 35°C or 37°C if known preterm birth

Thermal Management at Birth

Immediate Care at Birth

Allow for optimal (delayed) cord clamping after minimum of one minute and up to five minutes after birth or when cord pulsation has ceased and becomes white, if appropriate.

- Dry the infant thoroughly, including head, with absorbent towels to reduce evaporative heat loss and remove wet towel, replacing with dry towel.
- If birth room not a neutral thermal environment, then apply well-fitting hat. If hat, then become wet/damp then ensure it is replaced with a dry hat.
- If no resuscitation is required place the infant skin to skin contact with mum and cover exposed skin with warm towel.
- Initiate breast feeding/ artificial feeding.
- Ensure continued normothermia, maintain warm environment.
- Record temperature within first hour post-birth.
- Place the thermometer probe as high as possible can into baby's armpit aligned with their spine.
- Repeat temperature at 2 hours after birth.

Skin to Skin

Ensure mother is aware of the advantages of skin to skin for thermoregulation.

- After drying, place on the mother's chest and cover baby and mother with pre-warmed blankets/towels – this will help reduce conductive heat loss.
- If room temperature not 23-25 degrees Celsius) cover head with a hat.
- During skin to skin, regularly monitor head position (airway), breathing colour, and tone.
- If mother is unable to undertake skin to skin safely (due to pain, invasive procedures or drowsiness) skin to skin may be undertaken by the other parent or support person if this is agreed. The above steps and checks should still be performed

If not to be nursed skin-to-skin (through parental choice or clinical condition of the mother) but is to remain with their mother, the infant should be dressed in pre-warmed clothes and then wrapped in blankets.

Care in Theatre

Temperature in the operating theatres are ambient, between 20 and 23^0C, which is less than the World health organisation (WHO) recommended 25-28^0C and there can increase the risk of neonatal hypothermia and also maternal hypothermia.

- Consider pre-warming towels e.g. On the resuscitative under the radiant heater source
- Dry baby thoroughly, ensure wrapped in a dry towel.

- Use well-fitting hat or ensure head if covered with towel when wrapped. If baby has significant hair be aware that more likely to cool quicker.)
- For skin to skin due to the positioning of mother on the theatre couch positioning of baby for optimal contact and heat is not always achievable. If the mother is in agreement partners can have skin to skin with the baby.
- Temperature must be taken within the first hour of birth and repeated at 2 hours.

Term baby requiring resuscitation

If the infant needs support with transition or when resuscitation is required, place the infant on a warm surface using a preheated radiant warmer

- Place resuscitation table away from doors or draughts
- Ensure radiant overhead heater is on pre-warm
- Dry the baby with pre-warmed towels.
- Remove wet towel and replace with clean dry towel
- Put on hat.
- Baby should be on a non-conductive surface such as a mattress or dry towel under a radiant warmer.
- Record temperature within first hour and then repeat 2 hours post-birth.

Handling and Weighing

- Term infants should be weighed in clean scales which are lined with a warmed towel or dry paper towel.
- Weighing should be completed after skin to skin.
- Always warm hands before touching the infant
- If an examination is made ensure that the stethoscope is warmed by your hands before applying it to the infant's chest.

Ongoing Care

- Whilst an inpatient well term babies not requiring monitoring by NEWTT2, an axilla temperature should be recorded daily preferably in the morning.
- If temperature below 36.5°Cimplement thermal control measures (see Appendix 1.)
- Position cots away from outside walls and draughts.

Temperature on Transfer of Care

When care of baby is transferred e.g. labour ward to the postnatal ward it is the responsibility of the transferring midwife to check the baby ID bands, security "X" tags are correct and attached and check baby's temperature.

The receiving midwife will then take responsibility If intervention thermal control measures are required.

In the community if the baby appears well, is handling and feeding well the midwife would not necessarily perform a temperature. If there are any concerns a temperature is be performed as part of the full clinical assessment.

Late Pre-term babies on Postnatal and Transitional Care Ward

Babies being cared for in the postnatal Transitional Care ward who are less than 37 completed weeks gestation. These babies are at a greater risk of becoming hypothermic.

- For the first 48 hours these babies should have their temperature checked 4 hourly and then twice daily for the next 48 hours. Document observations on the NEWTT2 chart.
- If temperature remains low despite measures being taken to increase baby's temperature, then baby should be reviewed by medical staff.
- Dress and wrap baby appropriately for environmental conditions.

Thermal Control Measures

Interventional thermal control (see appendix 1)

Implement Thermal Control Measures if temperature <36.5

- Dress baby appropriately. If baby's temperature <36.5°C consider adding hat, cardigan and add more blankets. Consider whether appropriate to check blood sugar to rule out hypoglycaemia.
- Skin-to-skin may also be used to increase the baby's temperature as long as it is in a warm room and the baby is not exposed.
- Make sure cot away from drafts
- Recheck temperature in 1 hour
- If temperature <36.5^{0}C despite interventions will require medical review.

Transwarmers.

If a baby has a significantly low temperature, in the ward setting, during transfer from community or in the community a Transwarmer can be used to increase temperature quickly.

- Babies must be placed on the woven side of the Transwarmer, and their skin checked regularly.
- Do not leave babies on a Transwarmer longer than 30 minutes as it will no longer be warm.
- Doctors should be informed of any unstable temperature.

Heated Mattress

If a baby nursed in a cot becomes cold a heated mattress can be used. It can also be used to help transition from an incubator to a cot.

- Ensure the mattress is the correct way up in the cot and is plugged in and turned on
- Monitor the temperature of the baby every 4 hours.
- Set the temperature of the heated mattress to 37 °C
- Ensure the baby has no hat or cardigan on, is not swaddled and only has x1 blanket in place in order for the heat of the mattress to reach the baby

- When the temperature of the baby is 37 °C or just above the heated mattress may be turned down by 0.5 °C.
- If the temperature of the baby is higher than 37.4°C then the heated mattress may be turned down by 1°C.
- Monitor and assess whether the temperature of the heated cot may be turned down depending on the temperature of the baby.
- Once the baby has a stable temperature on the heated mattress at 32°C, then the baby can be returned to a normal cot.

For care of neonates that require thermoregulation and care on SCBU, including care in incubator, refer to 1193 Thermoregulation in Neonates (Opens in a new tab)

Management of hypothermia in the community setting

Refer the baby for admission to hospital if:

- Temperature falls below 36. 0ºC, refer for admission to hospital
- Signs of infection are present, these include:
  - Rapid breathing (>60/min) or grunting
  - Poor tone
  - Lethargy o Duskiness
  - No/very poor feeding within past 4 hours
- If there is no significant improvement in a baby who has a temperature of 36.0- 36.4 ºC despite restorative measure. (see below and see appendix 1)

If the temperature is 36.0-36.4 ºC and the baby has no sign of infection:

- Aim to raise the room temperature to at least 25ºC (slightly too warm for adults)
- Skin-to-skin contact in a warm room
- Replace cold clothes with warm clothes and hat
- Review environment
- Ensure baby's cot is off the floor
- Is there a draught?
- What are the parents' understanding of warm environment (consider whether advice about reducing the risk of cot death may have been misinterpreted?)
- Continue feeding the baby to provide calories and fluid
- If the baby is too weak to feed admission to hospital should be arranged
- Assess baseline observations
- Continue re-warming for up to 1 hour and then recheck temperature to determine whether temperature recovered to within normal values.
- If transfer is required use Transwarm mattress if available.

Review the history for risk factors for hypothermia

If there is no significant improvement within one hour despite thermal control measures, refer for admission to hospital and arrange suitable transport (mode is dependent of clinical condition of baby).

Documentation

- All temperatures following birth, at 1 hour and two hours, and at time of transfer must be documented in the maternal notes in appropriate place.
- If babies identified as at risk of hypo- or hyperthermia, a plan for monitoring should be documented in the health care record and communicated to relevant health care professionals. NEWTTS2 chart to be used as appropriate.
- In babies requiring treatment for hypo- or hyperthermia, all actions taken, response and where appropriate further plan of care should be documented in the health care record.
- Any discussion with the parents relating to the baby's condition should also be clearly documented.

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Optimal timing of cord clamping for the prevention of iron deficiency anaemia in infants

Appendix 1. Newborn Restorative Thermal Control Measures