Preventing hypothermia: a three-year comparative review in a tertiary neonatal unit

infant
PATIENT SAFETY
Working together

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Hypothermia is well recognised as a factor influencing newborn health and one of the major risk factors contributing to neonatal morbidity and mortality. Many studies, including EPICure1 and EPICure2,[1,2] have shown that the incidence of significant hypothermia is relative to the degree of prematurity.

Maintaining a thermoneutral environment is a fundamental aspect of neonatal care. A thermoneutral environment is one in which an infant at rest maintains a core temperature of 36.8-37.2°C, so that oxygen consumption and energy expenditure are minimal. A neutral thermal environment for infants is ideal for growth and development, even more so in preterm infants and babies with low birth weight. Exposure to 'cold stress' increases metabolic demands and oxygen consumption surges[3] in response to which infants undergo non-shivering thermogenesis, initiating a complex pathway to produce heat via oxidative phosphorylation of brown adipose tissue.[4] If not addressed promptly this process may lead to problems such as respiratory distress, hypoglycaemia, metabolic acidosis, hypotension and hypoxic tissue damage in the term and preterm infant. Measures to ensure a neutral thermal environment for infants and prevent heat loss include:

- maintaining a set room temperature
- using pre-warmed towels for resuscitation/stabilisation at birth
- immediate skin-to-skin contact with a parent and covering the baby with a warm towel/blanket
- the use of external mechanisms of heating (eg heated cots, radiant heaters, incubators)
- avoidance of precipitating factors that lead to heat loss in the form of convection, conduction, evaporation and radiation.

Nevertheless, maintaining a warm chain during various interventions, particularly in the first few hours after birth, can be challenging.

At Norfolk and Norwich University Hospital NHS Trust, it was noted that nearly 40% of infants admitted to the neonatal unit in the first quarter of 2013 were hypothermic (an admission temperature <36.5°C). This observation prompted the team's immediate attention and formation of a working group to formulate a multidisciplinary plan. In order to improve standards of care a sustained programme of awareness among medical, nursing and midwifery staff was instituted and modifications were made to aspects of working practice in areas that might affect an infant's temperature. The interventions comprised:

FIGURE 1 Rectal temperature measurement to determine the incidence of neonatal hypothermia.

1. Reinforcing the importance of maintaining normothermia in infants
2. An enhanced awareness initiative highlighting the risks associated with cold exposure in infants, particularly in the preterm population
3. Placing posters emphasising the importance of maintaining normothermia in strategic locations in the delivery suite and neonatal intensive care unit
4. Ensuring that wet towels are immediately replaced by dry ones and using pre-warmed towels on the resuscitation units
5. Installing a thermometer in every delivery room, recovery room and the obstetric theatres to help maintain a temperature ≥25°C
6. Measuring the infant's body temperature within the first hour of birth. The temperature was recorded via a rectal thermometer (**FIGURE 1**).

Room and theatre temperatures were documented at the time of labour and delivery. Careful attention was given to the maintenance of temperature during transportation of infants from the theatre to the delivery suite or the neonatal unit, which may perhaps be the weakest link in preserving the warm chain.

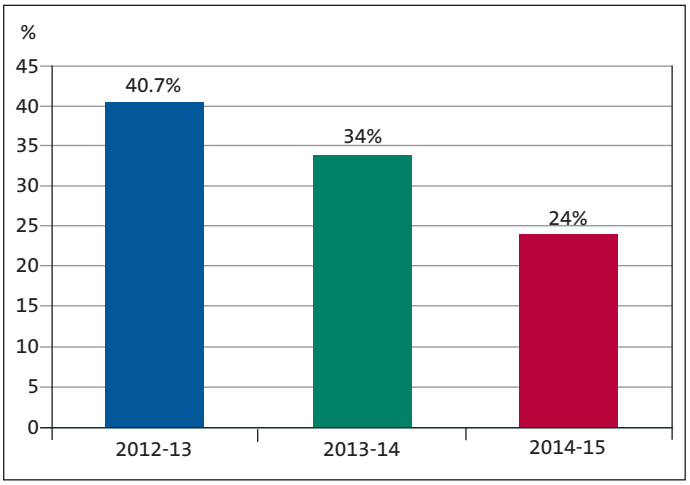

FIGURE 2 Percentage of admissions to the neonatal unit with a body temperature <36.5°C.

A retrospective audit was conducted using data from all infants admitted to the unit (excluding those admitted for therapeutic hypothermia). The data used came from the neonatal database, BadgerNet, in three consecutive one-year periods, starting from 1 April 2012 to 31 March 2013, through to 31 March 2015. The aim was to determine the incidence of neonatal hypothermia (defined as a rectal temperature <36.5°C) at the time of admission to the neonatal unit, prior to and after the institution of the sustained programme of awareness and room temperature modifications. A sub-analysis was performed that looked at various gestational groups and the severity of hypothermia.

Main findings

Following implementation of the above measures in the year 2013-14, the number of infants admitted to the unit with hypothermia fell from 40.7% to 34% in comparison to 2012. There was a further reduction in the incidence of hypothermia in 2014-15 (down to 24%, **FIGURE 2**).

Within the gestational groups there was an overall reduction in the incidence of hypothermia, most significantly in the infants of <29 weeks' gestation (from 8% in 2013 to 5% in 2015, **TABLE 1**). The vast majority of the infants across the three-year period had mild hypothermia with a temperature >36.0°C (**FIGURE 3**).

The audit demonstrates a reduction in the incidence of hypothermia over a three-year period; however, even though significant improvements were seen, nearly 25% of infants were nonetheless hypothermic on admission to the unit.

It is interesting to note that a high percentage of infants fall into the mild hypothermia category – a recorded temperature between 36.0°C and 36.5°C. Studies have shown that term infants with no other associated risk factors or illnesses who fall within this temperature range may be subjected to unnecessary medical intervention or treatment.[5]

Gestational age	2012-2013 n = 399 (%)	2013-2014 n = 391 (%)	2014-2015 n = 306 (%)
<29 weeks	31 (8)	29 (7.5)	16 (5)
29-33+6 weeks	55 (14)	56 (14)	40 (13)
34-36+6 weeks	134 (33)	135 (34.5)	94 (31)
>37 weeks	179 (45)	171 (44)	156 (51)

TABLE 1 Breakdown by gestational age of infants with hypothermia admitted to the unit.

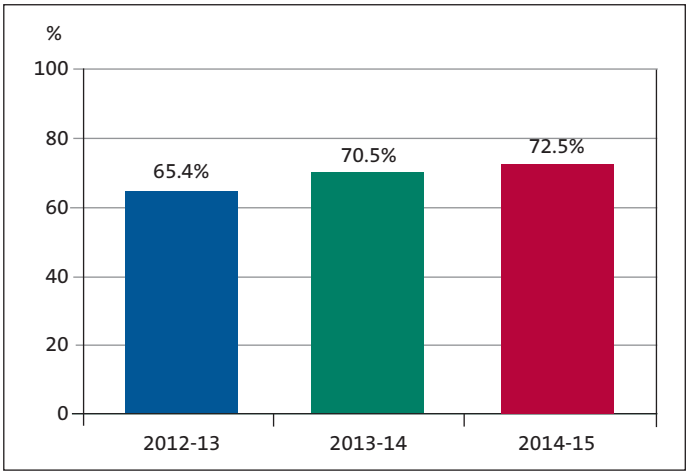

FIGURE 3 The percentage of hypothermic admissions (<36.5°C) with a body temperature between 36.0°C and 36.5°C.

Conclusions

Achieving normothermia and maintaining a warm chain, facilitated by health professionals and immediate care staff at the time of birth, can prevent hypothermia-associated morbidity and mortality risk. Sustaining an action plan and maintaining awareness needs consistent commitment and regular input from team leaders. Strategies need to be aimed at achieving these goals with key involvement from all stakeholders.

References

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