

# Thermoregulation of Premature babies during Neonatal Transfer

## Background

- Prematurity is the leading cause of neonatal death worldwide
- National neonatal audit programme (NNAP), established in 2006, assesses the consistency and quality of the care provided for those needing specialist input and identifies areas of improvement, including thermal care.
- Inter-hospital transfer subjects neonates to hypothermia: an imperative risk factor for morbidity and mortality.
- Transepidermal water loss (TEWL), the biggest contributor to hypothermia in preterm neonates, increases with a lower gestation age and postnatal age.
- Neonates who are <26 weeks gestation, a temperature of <35°C is independently associated with their death.<sup>1</sup>

### Preterm Infant Heat Loss

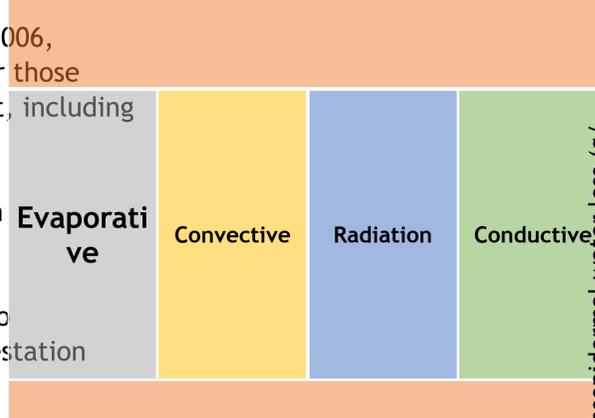
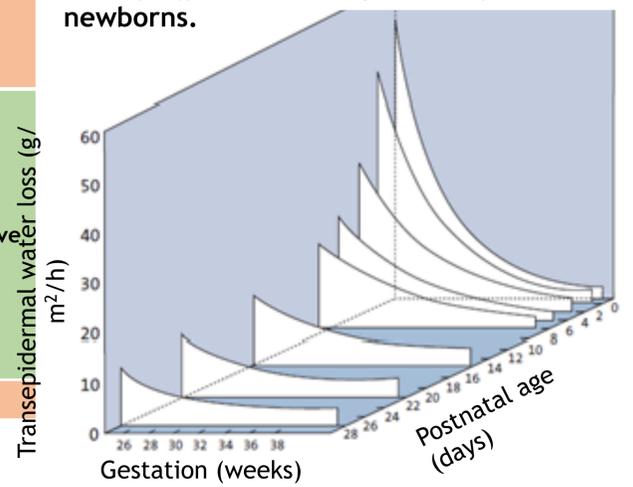


Figure 1: Methods of heat loss in Preterm Infants.

Figure 2: The relationship between TEWL and age (gestation and postnatal) of newborns.



## Aims

1. To assess the team's ability to establish and maintain normothermia (36.5-37.5°C) of babies during inter-hospital transfer.
2. To evaluate the use of additional warming intervention(s) for babies who were hypothermic during inter-hospital transfer.

## Methods

Retrospective study of preterm babies transferred by the London Neonatal Transfer Service (NTS)

### INCLUSION CRITERIA

1. Gestational age (weeks): 24<sup>+0</sup> - 28<sup>+6</sup>
2. Transferred in the first 14 days of life

TIME PERIOD  
September 2012-2013

### DATA COLLECTION

- Badger net database
- Transfer notes

Temperature recorded at 4 stages of transfer & categorised according to WHO criteria:

1. Referral
2. Stabilisation\*
3. Transfer\*
4. Receiving

\*Lowest temperature of series was used

The use of any recorded intervention was assessed

## Results

### PATIENT DEMOGRAPHICS

Babies transferred: 159; data missing for 21; final number analysed: 138

- Gestational age (weeks): 26 (25-27)\*
- Birth weight (grams): 830 (715-997)\*
- Transport age (days): 0.3 (0.2-4.2)\*

\*Median (25<sup>th</sup>-75<sup>th</sup> centiles)

## Results - Aim 1

Temperature (°C)	Referral	Stabilisation	Transfer	Receiving
>37.5	9% (13)	4% (6)	4% (5)	7% (10)
Normothermia (>36.5)	48% (66)	41% (57)	59% (82)	73% (101)
Mild Hypothermia (36-36.4)	13% (18)	20% (28)	23% (31)	12% (17)
Moderate Hypothermia (33-35.9)	24% (33)	23% (32)	10% (14)	5% (7)
No temperature Recorded	6% (8)	12% (15)		3% (3)

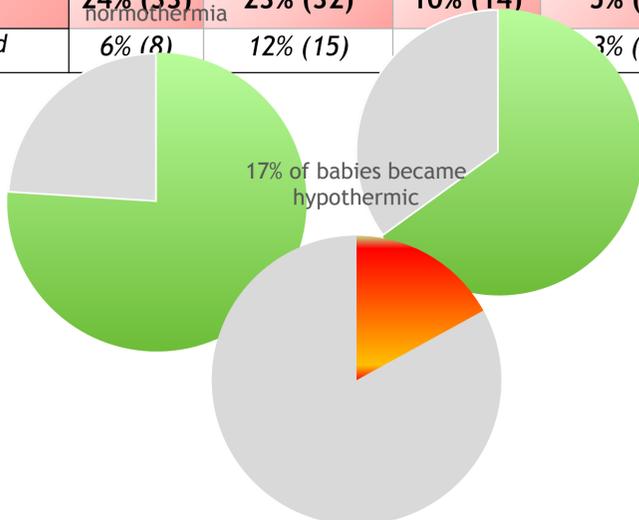
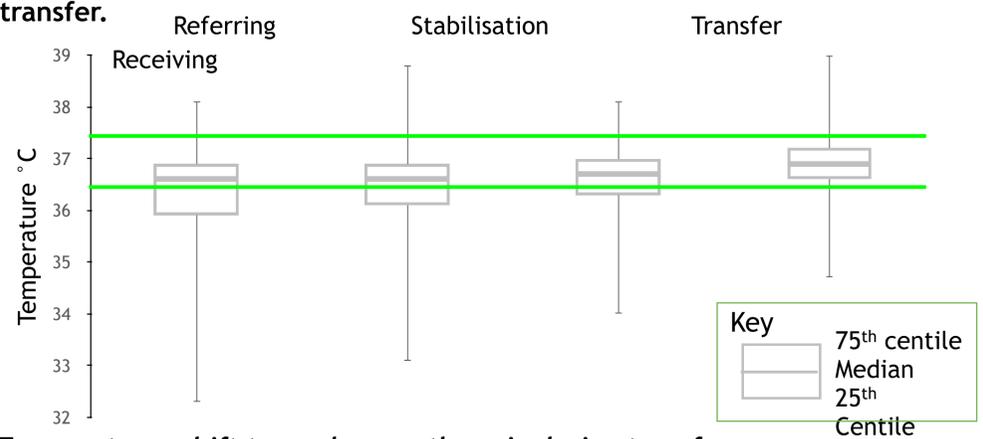


Figure 3: % of babies at different temperature ranges throughout transfer. (above)

Figure 4: Individual temperature profiles of babies transferred by the London NTS. (right)

## Results - Aim 1 continued

Figure 5: Temperature ranges during 4 stages of transfer.



### Temperatures shift toward normothermic during transfer:

- Rates of normothermia increased from 48% to 73% from the referral to receiving unit.
- 65% of initially hypothermic babies established normothermia.
- The 25<sup>th</sup> and 75<sup>th</sup> centile encompassed all normothermic babies at receiving unit.

### Normothermia isn't always achievable during transfer:

- 17% of babies were hypothermic at the receiving unit.
- Potential interventions, difficult transition and movement of baby from one environment to another can all subject the baby to heat loss.

## Results - Aim 2

Figure 6: Use of intervention for hypothermic babies during transfer.

Category	No. of babies	Plastic	Transwarmer	Both	No intervention
Mild Hypothermia	28	4% (1)	32% (9)	7% (2)	57% (16)
Moderate Hypothermia	32	6% (2)	28% (9)	34% (11)	31% (10)

### Appropriate warming methods are not being used consistently:

- Only 34% of those moderately hypothermic had both a plastic cover and a transwarmer.

## Summary and Future Work

- Future study will be conducted to compare the efficacy of the Tecotherm Neo in addition to standard thermoregulation care vs. standard care alone.
- The Tecotherm Neo is a servo controlled thermoregulation mattress that allows for continuous monitoring and controlled heat or cold therapy via continuous flow an alcohol base fluid.

### References:

Preterm Birth, World Health Organisation. November 2013, UK, accessed 2<sup>nd</sup> May 2014. www.who.int/mediacentre/factsheets/fs363/en/  
 Figure 2: Hammarlund K, Sedin G, Stromberg B. Transepidermal water loss in newborn infants VII. Relation to postnatal age in very preterm and full-term appropriate for gestational age infants. Acta Paediatrica Scand 1982; 71: 369-374.  
 Organisation WH. Thermal Protection of the Newborn: A practical guide. Geneva: Switzerland, 1993.  
 Costeloe K, Hennessy E, Gibson AT, Marlow N, Wilkinson AR. The Epicure study: outcomes to discharge from hospital for infants born at the threshold of viability. Paediatrics 2000; 29: 623-649