Preterm Infant Heat Loss

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 needing specialist input and identifies areas of improvement in 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.  

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): 24⁰ - 28⁴ September 2012-2013
2. Transferred in the first 14 days of life

DATA COLLECTION
• Badger net database
• Transfer notes

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 (25th-75th centiles)

Results - Aim 1 continued

<table>
<thead>
<tr>
<th>Temperature °C</th>
<th>Plastic Cover (n)</th>
<th>Transwarmer (n)</th>
<th>Both (n)</th>
<th>No Intervention (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;37.5</td>
<td>9% (13)</td>
<td>4% (6)</td>
<td>4% (5)</td>
<td>7% (10)</td>
</tr>
<tr>
<td>Normothermia (36.5)</td>
<td>48% (66)</td>
<td>41% (57)</td>
<td>59% (82)</td>
<td>73% (101)</td>
</tr>
<tr>
<td>Mild Hypothermia (36-36.4)</td>
<td>13% (18)</td>
<td>20% (28)</td>
<td>23% (31)</td>
<td>12% (17)</td>
</tr>
<tr>
<td>Moderate Hypothermia (35.5-35.4)</td>
<td>24% (33)</td>
<td>23% (32)</td>
<td>10% (14)</td>
<td>5% (7)</td>
</tr>
<tr>
<td>No temperature Recorded</td>
<td>6% (8)</td>
<td>12% (15)</td>
<td>9% (13)</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: Methods of heat loss in Preterm Infants.

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

Table 1: Temperature ranges during 4 stages of transfer.

<table>
<thead>
<tr>
<th>Temperature °C</th>
<th>Receiving</th>
<th>Stabilisation</th>
<th>Transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;37.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normothermia (36.5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild Hypothermia (36-36.4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate Hypothermia (35.5-35.4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No temperature Recorded</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Temperatures shift toward normothermia during transfer:
• Rates of normothermia increased from 48% to 73% from the referral to receiving unit.
• 65% of initially hypothermic babies established normothermia.
• The 25th and 75th 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.

Table 2: Appropriateness of warming methods.

<table>
<thead>
<tr>
<th>Hypothermia</th>
<th>No. of Babies</th>
<th>Plastic Cover (n)</th>
<th>Transwarmer (n)</th>
<th>Both (n)</th>
<th>No Intervention (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild Hypothermia</td>
<td>28</td>
<td>4% (1)</td>
<td>32% (9)</td>
<td>7% (2)</td>
<td>57% (16)</td>
</tr>
<tr>
<td>Moderate Hypothermia</td>
<td>32</td>
<td>6% (2)</td>
<td>28% (9)</td>
<td>34% (11)</td>
<td>31% (10)</td>
</tr>
</tbody>
</table>

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 Tectotherm Neo in addition to standard thermoregulation care vs. standard care alone.
• The Tectotherm 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: