Improving the Stabilisation of Premature Babies

- Encouraging Routine Use of Non-Invasive Respiratory Support -

Sarah Lodge¹, Donna Winderbank-Scott², Nitin Reddy³, Anushma Sharma⁴, Alok Sharma²

¹Paediatric ST5, Neonatal Consultant, ²Neonatal Clinical Fellow, ³Neonatal GRID Research Fellow
University Hospital Southampton NHS Foundation Trust

1. Background & Aim

Evidence is increasing that even extremely premature babies can be managed with non-invasive respiratory support (e.g. CPAP) at delivery instead of routine intubation based on gestation. This avoids complications from mechanical ventilation and improves long-term respiratory outcomes. Clinical practice in our unit was noted to be variable and we were an outlier for delivery room CPAP in the 2016 VON (Vermont Oxford Network) report.

Our QI project aims to improve the stabilisation of premature infants (<35 weeks gestation) at delivery, by providing respiratory support along a standardised pathway based on individualised assessment (instead of gestational age stratification), preserving invasive ventilation solely for babies who require it.

SETTING

A 36-cot Level 3 Tertiary Neonatal Unit with approximately 15-20 admissions at <35 weeks gestation per month.

2. Drivers of Change

Q: How can we improve the stabilisation of preterm infants with respiratory support? A: By providing respiratory support using a standardised pathway which avoids routine intubation

BALANCING MEASURES

1. Rate of pneumothorax in preterm babies receiving CPAP
2. Surveillance of admission temperatures

3. Method & PDSA Cycles

Change ideas were incorporated into three PDSA (Plan, Do, Study, Act) cycles over a six month period:

PDSA Cycle 1 (October 2017)

P Simulation scenarios were created to test and practice making decisions, following a standardised flowchart.
D These were run in a simulation suite (to focus on decision making without distraction) and involved all members of the multidisciplinary team.
S Written feedback was analysed, which showed the identified important issues with CPAP technique (maintaining uninterrupted PEEP), and reinforced the idea that you do not have to routinely intubate extreme preterm babies.
A We created more complex scenarios, to address environmental and human factors in addition to clinical decision making.

PDSA Cycle 2 (November 2017)

P We planned scenarios focusing on transporting babies from the delivery suite to the unit using CPAP, to improve familiarisation and assess environmental factors on the process.
D Simulations were undertaken in the delivery suite, and using the transport incubator in situ.
S We successfully reduced anxiety towards this new approach by increasing confidence in delivering effective PEEP and in using the equipment. We also discovered that the tubing was too short to provide CPAP to babies on the resuscitator from the ventilator incubator in the confined environment in delivery rooms.
A Longer CPAP tubing was sourced and a mannequin display was created on the unit to demonstrate the new equipment and provide an interactive reference.

PDSA Cycle 3 (December 2017)

P We attached standardised respiratory management flowcharts to resuscitaires (for reference) & advertised the change on the unit.
D Staff were encouraged to follow the new approach and feedback any issues.
S Retrospective data was collected from medical notes over 6 months, prior to and including the PDSA 1-3 cycle period. The percentage of preterm babies receiving primary CPAP at delivery did not increase in our data, although documentation around the reasoning behind decisions to intubate did improve and VON data does show a positive drift in practice.
A Case based discussions were offered to trainees to discuss their experiences in order to collect ongoing feedback and improve further PDSA cycles.

4. Results

Demographic Data and Complication Rate

<table>
<thead>
<tr>
<th>Month</th>
<th>Total admissions</th>
<th>No. of babies requiring respiratory support</th>
<th>Average gestation in weeks</th>
<th>No. of babies with pneumothoraces</th>
<th>No. of babies with metaphyseal fractures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct</td>
<td>16</td>
<td>12</td>
<td>29.3</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Nov</td>
<td>18</td>
<td>15</td>
<td>31.6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dec</td>
<td>17</td>
<td>11</td>
<td>30.2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Jan</td>
<td>19</td>
<td>18</td>
<td>31.6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Feb</td>
<td>11</td>
<td>13</td>
<td>29.2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Mar</td>
<td>15</td>
<td>12</td>
<td>30.4</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

*Pneumothorax was in baby intubated immediately in delivery suite, did not receive CPAP at any point

LONGITUDINAL VIEW

The data for PDSA cycles 1-3 is shown below. This was collected by retrospective review of case notes and the Badgemore database.

Run Chart of Mode of Respiratory Support at Delivery

1. Ventilated Immediately 2. Primary CPAP Attempted 3. Failed Primary CPAP

Respiratory Management at Delivery of VLBW Infants

SNAP-SHOT VIEW

The international VON (Vermont Oxford Network) data for 2016 showed we were an outlier for CPAP use in the delivery suite when compared to other units, despite the introduction of a new guideline. By the end of 2017 there is a significant shift in practice, with increasing use of CPAP from 13.4% to 36.4% in Very Low Birth Weight (VLBW) infants.

5. Discussion & Conclusions

REFLECTION

The 6 month data did not show an improvement in the use of non-invasive respiratory support. However the numbers were small and we observed better documentation of decision making, indicating clinicians were becoming more selective about intubation in the delivery room. Initial improvement work had also commenced prior to the data collection period, so some improvement may have already occurred - as shown by the VON data.

BALANCING MEASURES

The balancing measures were unaffected by the changes we implemented. There was no increase in pneumothoraces and no negative impact on admission temperatures, despite taking longer to stabilise babies in the delivery room.

SUCCESSES

Simulation in situ identified important equipment challenges, resulting in the provision of longer tubing to enable CPAP delivery when the transport incubator cannot be positioned close to the resuscitare. This was essential to avoid multiple breaks in the delivery of PEEP which would reduce it’s effectiveness. We had very positive feedback from simulation participants, and more interest was generated from the mannequin display than from posters.

NEXT STEPS

A possibility for the lack of change seen in the 6 month data is that the PDSA simulation cycles did not involve Neonatal Consultants (who tend to lead stabilisation at delivery for the most premature babies). Educational videos may be an alternative approach. These can be used to train larger groups, can be accessed when convenient and do not have the same perceived “reputational risk” as simulation can have - so may be more acceptable to senior staff. We have now created several video resources and will use these to form the basis of our next PDSA cycle (4).