INSURE to ensure rapid extubation after surfactant administration in preterm infants with Respiratory Distress Syndrome (RDS)

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Background: Reducing exposure to mechanical ventilation (MV) is an important strategy to decrease chronic lung disease (CLD). INSURE (Intubation-SURfactant-Extubation) is a treatment approach found to reduce the need for prolonged MV in preterm infants with RDS.

Aim: Our primary aim is to achieve >80% compliance with INSURE and reduce median time to first extubation from 20 hours to less than 12 hours in very low birth (VLBW) infants less than 30 week gestation in a period of one year by December 2015.

Setting: Level 3 academic neonatal intensive care unit with high-risk maternal-fetal medicine service, which has an annual admission of 80-90 VLBW infants/year.

Mechanisms: Ventilator-induced-lung-injury (VILI) is an important contributor to CLD. We hypothesized that we could reduce VILI by shortening the duration of mechanical ventilation by early extubation of those intubated for RDS via INSURE procedure.

Method: A multidisciplinary team working with NICQ Next collaborative on ‘minimizing lung injury’ obtained consensus among neonatal providers to implement an INSURE protocol, developed educational materials for staff education and disseminated information via e-mails and routine huddles. INSURE protocol was implemented in our unit in Feb 2015, initially piloting with larger infants and then expanding the protocol to preterm infants >26 week gestation.

Measures: The primary outcome measure is CLD rate, and the processes measures include compliance with INSURE in the eligible population, rate of success with INSURE (i.e. extubation within one hour), time to first extubation, and the number of ventilator days. The balancing measure is rate of failed extubations, defined as reintubation within 72 hours of extubation.

Results: Five of the seven eligible infants (71%) received INSURE since the implementation. Two infants were considered not appropriate candidates for rapid extubation by the attending. 80% of infants were extubated within one hour of intubation after INSURE, with the average time to extubation being 38 minutes. There has been reduction in time to first extubation and ventilator days since implementation of the INSURE protocol (Table 1, Fig 1).

Discussion: An INSURE protocol was implemented successfully in our unit for infants >26 week gestation. Though the number of infants who received INSURE thus far is small, the results for early extubation and reduction in ventilator days are encouraging. Important challenges during the process were reaching consensus on defining eligible patient population and method for INSURE such as immediate extubation after surfactant administration versus short period of MV. Decision to use premedication before intubation, brief period of MV until spontaneous breathing resumes and allowing exclusion of infants for INSURE based on attending’s clinical judgment helped to get buy-in from different stakeholders. In future, we will try to identify a subset of patients who potentially are not appropriate candidates for INSURE to reduce variation in practice and decrease extubation failures.
Table 1: Quarterly performance result

<table>
<thead>
<tr>
<th></th>
<th>Q1 2014</th>
<th>Q2 2014</th>
<th>Q3 2014</th>
<th>Q4 2014</th>
<th>Q1 2015</th>
<th>Q2 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Time to first extubation (hours)</td>
<td>13</td>
<td>24</td>
<td>160</td>
<td>10</td>
<td>44</td>
<td>1.5</td>
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<tr>
<td>Median Ventilator days</td>
<td>3</td>
<td>4.5</td>
<td>50</td>
<td>2</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Failed first extubations (%)</td>
<td>25%</td>
<td>17%</td>
<td>33%</td>
<td>44%</td>
<td>20%</td>
<td>17%</td>
</tr>
<tr>
<td>CLD (%)</td>
<td>15%</td>
<td>36%</td>
<td>50%</td>
<td>18%</td>
<td>12%</td>
<td>8%</td>
</tr>
</tbody>
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Fig 1. XmR chart for time to first extubation for VLBW infants < 30 week GA
(Each square represents an individual patient, and red color signifies a statistically significant trend or a special cause variation)