Decrease in the incidence of Intraventricular hemorrhage (IVH) after the introduction of an IVH prevention bundle in the NICU

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Susan Bedwell has documented that she has no relevant financial relationships to disclose or COIs to resolve.
Intraventricular Hemorrhage

- Severe IVH is considered a major determinant for poor neurodevelopmental outcomes.
- Occurs in ~26% of all VLBW $\leq$ 1250 grams.
- VLBW most vulnerable due to richly vascular and gelatinous structure of germinal matrix.
- 50% of bleeds occur in 1st 24 hours of life.
Would the introduction of an evidence-based IVH prevention bundle decrease the incidence of intraventricular hemorrhage in the NICU?
Background

Bundle developed from:

• VON NICQ2000 paper on reduction of IVH
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- Evidence-based research
  - Causes of fluctuations in blood pressure and cerebral circulation.
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  - Effects of infusions on cerebral circulation.
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  - Effects of infusions on cerebral circulation.
IVH Bundle

• Head midline X 72 hours
• Avoid head down position
• HOB at 15°
• Avoid rapid flushes
• Maintain neutral thermal regulation
• Designed as a quality improvement project with IRB approval.

• Bundle introduced January 2008 with continued education and reinforcement

• Data collected on all infants < 32 weeks gestation born between 2007 and 2009 who survived to the first ultrasound.

• Head ultrasounds were completed between day of life 3-7. Grading of IVH was determined by a pediatric radiologist.

• Severe IVH (Grade III and IV) were included for analysis.
• No significant difference between gestational age, gender or weight from 2007-2009.

• No significant difference in # of days on ventilator or use of vasopressors.

• Analysis excluded infants receiving Indocin within the first 72 hours of life.
# Results

## GA and Weights

<table>
<thead>
<tr>
<th>GA (in weeks)</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 27</td>
<td>100</td>
<td>77</td>
<td>78</td>
</tr>
<tr>
<td>27-28</td>
<td>55</td>
<td>65</td>
<td>51</td>
</tr>
<tr>
<td>29-30</td>
<td>91</td>
<td>68</td>
<td>77</td>
</tr>
<tr>
<td>31-32</td>
<td>126</td>
<td>119</td>
<td>137</td>
</tr>
<tr>
<td>Birth Weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;750g</td>
<td>60</td>
<td>45</td>
<td>50</td>
</tr>
<tr>
<td>751-1000</td>
<td>61</td>
<td>69</td>
<td>51</td>
</tr>
<tr>
<td>1001-1500</td>
<td>139</td>
<td>106</td>
<td>133</td>
</tr>
<tr>
<td>&gt;1500g</td>
<td>112</td>
<td>109</td>
<td>109</td>
</tr>
<tr>
<td>Overall Mortality Rate</td>
<td>24.9%</td>
<td>21.78%</td>
<td>18.3%</td>
</tr>
</tbody>
</table>
The incidence of severe IVH decreased from 2007 to 2009. The association between IVH and year is significant at .0022. Using the Cochran Armitage Trend Test and Lack Fit test we see a significant downward linear trend in incidence of severe IVH over time (p=.0005).
Results

Incidence of Severe IVH

- 2007: n=343, Percentage of IVH = n=36
- 2008: n=291, Percentage of IVH = n=18
- 2009: n=287, Percentage of IVH = n=10
Results

Number of Infants with Severe IVH by Gestational Age:
- 2007
- 2008
- 2009
The incidence of severe IVH decreased from 2007 to 2009. The association between IVH and year is significant at .0085. Using the Cochran Armitage Trend Test and Lack Fit test we see a significant downward linear trend in incidence of severe IVH over time (p=.0035).

<table>
<thead>
<tr>
<th>Severe IVH</th>
<th>2007 (n=372)</th>
<th>2008 (n=329)</th>
<th>2009 (n=343)</th>
<th>Chi-square p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidence</td>
<td>44 (11.83%)</td>
<td>23 (6.99%)</td>
<td>20 (5.83%)</td>
<td>.0085</td>
</tr>
</tbody>
</table>
Considerations

• Not randomized or controlled

• Unable to determine individual effect of interventions

• 85-95% compliance with protocol
An IVH bundle intervention may be a useful preventive strategy to reduce severe IVH and its associated morbidities.

Prospective studies are needed to confirm this preliminary result.
Thanks to the interdisciplinary team: physicians, nursing staff and nurse practitioners of OU Medical Center, The Children’s Hospital for successful implementation of the IVH bundle.
Questions?

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