Reduction in Ventriculostomy-Associated Infections Following Implementation of Novel Guidelines for External Ventricular Drain Placement and Cerebrospinal Fluid Sampling at UPMC Presbyterian Hospital

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Poster: 41349
• Disclosures: none
Introduction

• Use of EVDs common in neurovascular patients
• EVDs have associated risks
  • Ventriculostomy-Associated Infections (VAIs)
• VAIs associated with poor neuro outcome, ↑hospital stay, ↑costs
• Literature sites rate of VAI 5.6-23.2%
• Prior to this quality initiative, no standardized protocols existed for CSF sampling and EVD placement
• Daily CSF sampling was norm
• From 2014-2015 VAI rate at Presby 9.2%
• Periprocedure antibiotics were only used in 66% of EVD placements
• CSF sampling not associated with early identification/treatment of VAI
Methods

• Standardized protocols for EVDs and CSF sampling were implemented
• EVD protocol emphasized use of periprocedure antibiotics in all cases
• CSF sampling protocol minimized CSF draws to either biweekly or no routine sampling
• Retrospective review of neurovascular patients requiring EVD for hydrocephalus secondary to subarachnoid hemorrhage, intraventricular hemorrhage, and/or tumor in 2014-2015 was completed
• Protocol was initiated in 2016 with new patients followed prospectively
• VAI was defined as positive CSF culture plus one or more of the following:
  • (1) fever to >101.5F
  • (2) CSF glucose either <50mg/dL or <50% serum glucose level drawn within 24h of CSF
• Pearson chi-square was used to compare categorical variables
## Results

**Table 1. Comparison Pre- and Post-Implementation**

<table>
<thead>
<tr>
<th>Year</th>
<th>2014-2015</th>
<th>2016-2017</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>65</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td># infections</td>
<td>6</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Total EVD days</td>
<td>631</td>
<td>722</td>
<td>0.962</td>
</tr>
<tr>
<td>EVD days per patient</td>
<td>9.71</td>
<td>9.63</td>
<td>0.764</td>
</tr>
<tr>
<td>Infection rate normalized per 1000 EVD days</td>
<td>9.5%</td>
<td>4.1%</td>
<td>0.048</td>
</tr>
<tr>
<td>Total hospital days</td>
<td>1125</td>
<td>1115</td>
<td>0.384</td>
</tr>
<tr>
<td>Hospital days per patient</td>
<td>17.31</td>
<td>14.87</td>
<td>0.494</td>
</tr>
<tr>
<td>% Received periop abx</td>
<td>66.2 %</td>
<td>82.7 %</td>
<td>0.024</td>
</tr>
<tr>
<td>Infections that did not receive periop abx</td>
<td>5/6 (83%)</td>
<td>3/3 (100%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total CSF draws</td>
<td>640</td>
<td>187</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CSF draws normalized per 1000 EVD days</td>
<td>1014.26</td>
<td>259.00</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Figure 1. Kaplan-Meier Curves showing similar number of EVD days between pre- and post-protocol groups. EVD days at which infections were identified in each group are highlighted.
Discussion

• Protocol emphasizing use of perioperative antibiotics and reduction in CSF sampling resulted in significantly decreased infection rate in neurovascular patients
• Lack of perioperative antibiotic use was strongly associated with VAI
• Trend toward infections occurring after EVD had been in place longer after protocol implementation
• No harmful effects of reduced CSF sampling were identified
  • Clinical concern for VAI preceded positive CSF in all cases before and after protocol
Summary Points

• EVDs are commonplace in neurovascular patients but may be complicated by devastating VAIs

• VAI rate at UPMC Presbyterian Hospital was reduced from 9.5% to 4.1% with novel protocols emphasizing use of periprocedural antibiotics and reduction in CSF sampling

• Future studies seek to evaluate benefit of antibiotic-coated catheters and complete cost savings analyses