**A Proactive Risk Assessment by Utilizing Healthcare Failure Mode and Effect Analysis (HFMEA) for Safe Implementation for Peripheral Nerve Catheters in Pediatric Patients**

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**The Healthcare FMEA Process**

JCAHO Standard LD.5.2 requires facilities to select at least one high-risk process for proactive risk assessment each year. HFMEA has been designed by the VA National Center for Patient Safety (NCPS) specifically for healthcare. HFMEA streamlines the hazard analysis steps found in the traditional Failure Modes and Effects Analysis (FMEA) process by combining the detectability and criticality steps of the traditional FMEA in an algorithm presented as a Decision Tree. It also replaces calculation of the risk priority number (RPN) with a hazard score that is read directly from the Hazard Matrix Table. This table was developed by NCPS specifically for this purpose.

**Step 1 Define the HFMEA Topic**

In 2011 Nationwide Children’s Hospital began using Continuous Peripheral Nerve Catheters in order to provide localized anesthetic to patients undergoing select orthopedic and abdominal surgeries. While Peripheral Nerve Catheters provide a significant improvement in the quality of care our patients receive, introducing this new technology and process within our hospital presents an inherent risk. In order to assure that our patients received the safest care, we assembled a multi-disciplinary team to complete a proactive risk assessment by utilizing Healthcare Failure Mode and Effect Analysis (HFMEA). HFMEA was designed by the VA National Center for Patient Safety to identify potential failure modes within systems, and to study the consequences the failure modes have on patients.

**Step 3 Graphically Describe the Process**

In conducting this process, the team graphically described the process using process flow maps. Using the process flow map, the team then identified potential failure modes related to each process step.

<table>
<thead>
<tr>
<th>Process Step</th>
<th>Action Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decide where to place the pain pump</td>
<td>Connect Pain Pump to the pump</td>
</tr>
<tr>
<td>Place Pain Pump</td>
<td>Place Catheter Functional Prep &amp; Dispense Pain Pump</td>
</tr>
<tr>
<td>Attach Pain Pump to the pump</td>
<td>Use Pain Pump Pain Pump and Catheter using Ultrasound</td>
</tr>
<tr>
<td>Use Pain Pump</td>
<td>Use Pain Pump for the patient</td>
</tr>
<tr>
<td>Remove Catheter</td>
<td>Remove Catheter</td>
</tr>
</tbody>
</table>

**Step 4 Conduct a Hazard Analysis**

In conducting this process, the team graphically described the process using process flow maps. Using the process flow map, the team then identified potential failure modes related to each process step. Each failure mode was then evaluated for the likelihood of occurrence, severity and our ability to intercept the failure. Utilizing a score generated by the product of the aforementioned evaluation criteria (severity, probability and ability to intercept) an overall hazard score was developed.

The highest scoring failure modes were then assigned specific risk reduction methods.

**Step 5 Actions and Outcomes Measures**

The result of this process identified and evaluated 96 failure modes and therefore 19 specific interventions were developed and deployed.

**Interventions**

- New tubing labels
- EPIC order set
- EPIC hard stops
- RN education
- Surgeon education
- Video for families
- 5P handoff enhancements
- Change to pharmacy code kit

The first PNC was placed on November 1, 2011. For the first 6 months 7 patients received catheters with a total of 9 catheters placed. No significant events were associated with continuous PNC infusions. We are now placing 5-10 catheters per month.

The HFMEA process gave us confidence that new pain management techniques and their related processes can be safely and effectively implemented in order to provide the safest and highest quality care to our patients.