Clinical Comparative Evaluation of Split Septum and Zero Fluid Displacement Connectors on Central Venous Catheter Occlusion

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Objective

Describe differences in two intravenous (IV) connector products by comparing frequency of central venous catheter (CVC) intraluminal thrombus occlusion in patients from both inpatient and outpatient cancer clinical settings.

Introduction

Significance:
Venous access and IV connector caps are a necessary part of cancer patient treatment. Occlusion, a significant complication of vascular access catheters and connectors, not only delays testing and treatment, but also contributes to a build up of intraluminal biofilm, which may lead to bloodstream infections.

Problem:
With multiple connectors on the market, which one(s) offer(s) the best protection against occlusion? This study compared one simple split septum negative pressure connector (Q-Syte™) and one zero fluid displacement connector (InVision Plus®) in both inpatient and outpatient cancer clinical settings.

Framework:
Occlusion is based on physiological mechanisms of fibrin formation which are based, in part, on fluid flow physics, dead space and the body’s reaction to a foreign substance and/or object.

Methodology

This project retrospectively assessed the CVC occlusion rates over 3 months with the Q-Syte™ style IV connector and prospectively over 4 months with the InVision Plus® one.

Sample sizes were:
- Q-Syte™ 3,984 connectors and 92 connector days
- InVision Plus® 6,024 connectors and 121 connector days

ICUs, pediatric outpatient and inpatient departments of a major cancer hospital in the South were used for this investigation. Incidences of occlusion for both the inpatient and outpatient areas were collected by the Infusion Therapy Team. There were no changes in methods, design, or covariates except for changing the type of IV connector used in patient care.

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Results

<table>
<thead>
<tr>
<th>Setting</th>
<th>ICU</th>
<th>Peds Inpatient</th>
<th>Peds Outpatient</th>
</tr>
</thead>
<tbody>
<tr>
<td>BD Q-Syte: 3,984 connectors and 92 connector days</td>
<td>Total Occlusions: 46</td>
<td>25</td>
<td>14</td>
</tr>
<tr>
<td># of Connectors: (3,204)</td>
<td>101.62</td>
<td>26.22</td>
<td></td>
</tr>
<tr>
<td>Occlusion Rates:</td>
<td>14.35</td>
<td>26.22</td>
<td></td>
</tr>
<tr>
<td>RyMed InVision: 6,024 connectors and 121 connector days</td>
<td>Total Occlusions: 49</td>
<td>18</td>
<td>3</td>
</tr>
<tr>
<td># of Connectors: (4,272)</td>
<td>54.87</td>
<td>2.106</td>
<td></td>
</tr>
<tr>
<td>Occlusion Rates:</td>
<td>11.47</td>
<td>2.106</td>
<td></td>
</tr>
</tbody>
</table>

Occlusion Reduction: 20% 46% 93%

Conclusions

1. Reductions were observed in occlusion rates with the InVision Plus® connector versus the Q-Syte™ connector per 1000 connector day rate. The ICU occlusion rate per 1000 connector days dropped from 14.35 to 11.467, a 20% reduction. The Pediatric inpatient unit rate dropped from 101.62 to 54.87, a 46% reduction. The Pediatric outpatient clinic saw a major reduction from 26.22 to 2.106, a decrease of 93%.

2. In total, all areas averaged a 73% reduction in the occlusion rates. Furthermore, significant decreases were found in both the Pediatric Inpatient department (p = 0.028) and in the Pediatric Outpatient department (p = 0.028).

3. The RyMed InVision Plus® was found to be the superior IV connector for intraluminal protection from occlusion in cancer patients in this study.

4. Infection control specialists, oncology and infusion therapy nurses, as well as physicians should use evidence-based research results to evaluate the best IV connectors for their patients.

5. Clinicians should require manufacturers to conduct comparative evaluative in vitro studies that are unbiased, independent, IRB approved, and use blood. Use of best products to reduce and/or eliminate occlusions will negate treatment delays, add time to nursing and physician care, decrease cost, decrease morbidity and mortality, and increase quality of life for patient’s and their family.

References