Reduction of Central-Line Associated Bloodstream Infection Rates: Impact of Minimizing Blood Cultures from Central Lines

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Abstract

Background
CLABSI surveillance at our institution indicated that a significant proportion of CLABSI had a positive blood culture drawn from central line (CL-BC) with corresponding negative BC done by venipuncture (VP-BC), suggesting possible CL contamination. The contribution of minimizing CL-BC on CLABSI rates is unknown. This study evaluates the impact on CLABSI rates of reducing CL-BC in addition to standard CLABSI reduction strategies in adult intensive care units (ICUs).

Methods
The study was done from 1-1-2015 to 8-31-2017 in adult ICUs at a Detroit teaching hospital with 164 ICU beds. Education initiatives to minimize CL-BC were implemented in the ICU. Internal metrics VP-BC ratio (No. VP-BC/total BC done in patients with CL) and CL-BC ratio (No. CL-BC/total BC done in patients with CL) were used to monitor effectiveness. Compliance audits of CL maintenance were done i.e. CL dressing intact, proper use of chlorhexidine dressing, site without redness or drainage. Monthly unit-specific CLABSI rates, CL utilization ratios, and VP-BC and CL-BC ratios were provided as feedback to the ICUs. CLABSI rates and number of contaminated BC were monitored. Trends of the various metrics were analyzed using Kendall Tau's correlation for continuous variables. The relationship between CLABSI rate, VP-BC ratios and CL utilization ratios were examined using Spearman's correlation coefficient. Statistical significance was set at p<0.05.

Results
In the ICU, during the study period there were 148,762 patient-days and 8,2153 CL days. Trends over time of the metrics utilized are shown (Table 1 and Figure 1). There was significant improvement noted in CLABSI rates, CL utilization and VP-BC rates. There was a significant inverse correlation between the CLABSI rates with VP-BC -0.395 (p value=0.025) compared to correlation with CL utilization rate -0.278 (p value=0.123). The number of contaminated blood cultures were 29, 3, and 0 in 2015, 2016 and 2017 respectively.

Conclusions
Minimizing BC obtained from CL can significantly contribute to reduction in CLABSI rates when used in combination with standard best care practices for CL insertion and maintenance.

Introduction
• CLABSI surveillance at our institution indicated that a significant proportion of CLABSI had a positive blood culture drawn from central line (CL-BC) with corresponding negative BC done by venipuncture (VP-BC), suggesting possible CL contamination.
• The contribution of minimizing CL-BC on CLABSI rates is unknown.
• This study evaluates the impact on CLABSI rates of reducing CL-BC in addition to standard CLABSI reduction strategies in adult intensive care units (ICUs).

Results
• In the ICU, during the study period there were 148,762 patient-days and 8,2153 CL days.
• Trends over time of the metrics utilized are shown (Table 1 and Figure 1).
• There was significant improvement noted in CLABSI rates, CL utilization ratio and VP-BC ratio.

Results (contd.)
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• The number of contaminated blood cultures were 29, 3, and 0 in 2015, 2016 and 2017 respectively.

Table 1: Correlation of CLABSI Rates, CL-UR, VP-BC Ratio and CL-Care Bundle Compliance

<table>
<thead>
<tr>
<th>Variable</th>
<th>Correlation with time</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLABSI rate</td>
<td>-0.260</td>
<td>0.036</td>
</tr>
<tr>
<td>CL utilization ratio</td>
<td>-0.520</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>VP-BC ratio</td>
<td>0.806</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CL care bundle compliance</td>
<td>-0.048</td>
<td>0.805</td>
</tr>
</tbody>
</table>

Definitions
• CLABSI rate: #CLABSI/#CL days x 1000
• Central Line utilization ratio (CL-UR): #CL days/#Patient days
• VP-BC Ratio: # VP-BC/total BC in patients with CL
• CL-BC Ratio: # CL-BC/total BC in patients with CL
• Contaminated BC: Single positive BC for common commensals
• CLABSI rates and number of contaminated BC were monitored.
• Trends of the various metrics were analyzed using Kendall Tau's correlation for continuous variables. The relationship between CLABSI rate, VP-BC ratios and CL utilization ratios were examined using Spearman's correlation coefficient. Statistical significance was set at p<0.05.