Letters to the Editor

Recommendations to replace peripheral venous catheters every 72–96 hours: is a single reference enough?

Madam,

The incidence of local or bloodstream infections (BSIs) associated with peripheral venous catheters (PVCs) is low (0.0–0.2% bacteremia); but there is considerable annual morbidity because of the frequency with which such catheters are used. The incidence of phlebitis (3–5%) and bacterial colonisation of catheters increases for catheters left in place >72 h.1,2 In 2001 the Centers for Disease Control (CDC) changed the recommendations for PVC site rotation from 48–72 to 72–96 h, based on a study showing that rates of phlebitis were similar in PVCs left in place for 72 and 96 h.1,3 Following the publication of the CDC guideline, the William S. Middleton Memorial Veterans Hospital (Madison VAH), a 100-bed acute care university hospital affiliated facility, extended the PVC (Becton Dickinson Insyte Autoguard Safety IV catheter) catheter rotation from 48–72 to 72–96 h in September 2001. The rates of PVC-associated primary BSI rose to 0.24, 0.10 and 0.17 per 1000 patient-days in 2002, 2003 and 2004 respectively. PVC-associated primary BSI rates before the policy change were 0.0, 0.0 and 0.08 per 1000 patient-days in 1999, 2000 and 2001 respectively. We undertook a retrospective case–control study of 161 patients (20 cases and 141 controls) with PVCs to determine risk factors for complications such as BSI and phlebitis following PVC insertion. Cases were patients admitted between 2002 and 2005 with PVCs that met the criteria of PVC complications (eight cases of BSI, six of local site infection, and six of phlebitis).

Controls were patients with PVCs but without PVC complications, selected randomly from patient admissions identified between May and June 2004 and between May and June 2005 (42 ICU patients and 99 medical/surgical patients). Data were collected on a standard form by a single investigator using CDC definitions for case detection.1 Descriptive statistics were performed, using χ² or Fisher’s exact test for categorical variables and Student’s t-test for continuous variables. Stepwise logistic regression was done. P < 0.05 was considered significant (SAS software, version 9.1, Cary, NC, USA).

A total of 161 patients with PVCs were included, of whom 20 had complications, including local site infection, phlebitis and BSI. Overall eight episodes of BSI and six episodes of phlebitis occurred. Six patients had local site infection. Table I summarises the study findings. By univariate analysis, factors associated with an increased risk of complications included: duration of implantation of catheter >72 h [odds ratio (OR): 208, 95% confidence interval (CI): 37–1169; P < 0.001], use of PVC for NaCl lock (4.69; 1.61–13.63; P < 0.001), multiple IVs (8.61; 3.12–23.78; P < 0.001), and IV push (10.30; 3.12–33.96; P < 0.001). Staff inserting PVCs did not differ between case and controls. By multivariate analysis, the duration of PVC >72 h remained significant for overall complications after adjusting for multiple IVs, IV push and NaCl lock.

For the subset of patients with BSI (N = 8), factors associated with increased risk of BSI included duration of implantation of catheter >72 h, NaCl lock, IV push and multiple IVs in univariate analysis. By multivariate analysis duration of implantation >72 h remained significant (OR: 324; 95% CI: 20.95–1,139; P < 0.001).

In December 2004, the infection control committee recommended changing the guideline for PVC site rotation from every 72–96 h to every 72 h; there was an associated reduction in PVC-related primary BSI during 2005 with overall infection rates of 0.04 per 1000 PVC-days (1/22,889) and 0 per 1000 PVC-days (0/21,765) in 2006.

We found that duration of PVC implantation of >72 h was associated with a significantly increased risk of BSI and overall

Table I

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cases (N = 20)</th>
<th>Controls (N = 141)</th>
<th>OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC-associated complications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of implantation &gt;72 h</td>
<td>15</td>
<td>2</td>
<td>208 (37–1169)</td>
<td>&lt;0.001</td>
<td>188 (23–1169)</td>
</tr>
<tr>
<td>Use of PVC for NaCl lock</td>
<td>15</td>
<td>55</td>
<td>4.69 (1.61–13.63)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Multiple PVCs</td>
<td>13</td>
<td>15</td>
<td>8.61 (3.12–23.78)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Use of PVC for IV push</td>
<td>7</td>
<td>7</td>
<td>10.30 (3.12–33.96)</td>
<td>&lt;0.001</td>
<td>25.62 (2.62–252.43)</td>
</tr>
<tr>
<td>IV contrast</td>
<td>2</td>
<td>0</td>
<td>1.1 (0.9–1.2)</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>IV drip</td>
<td>1</td>
<td>16</td>
<td>0.41 (0.05–3.28)</td>
<td>0.38</td>
<td></td>
</tr>
<tr>
<td>Insertion by RN</td>
<td>9</td>
<td>10</td>
<td>2.03 (0.77–5.35)</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>PVC-associated BSI*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insertion by RN</td>
<td>4</td>
<td>48</td>
<td>1.83 (0.43–7.65)</td>
<td>0.38</td>
<td></td>
</tr>
<tr>
<td>Duration &gt;72 h</td>
<td>7</td>
<td>2</td>
<td>486 (39.23–6,032.37)</td>
<td>&lt;0.001</td>
<td>324 (20.95–1,139), P &lt; 0.001</td>
</tr>
<tr>
<td>NaCl lock</td>
<td>7</td>
<td>55</td>
<td>10.94 (1.11–91.41)</td>
<td>&lt;0.01</td>
<td></td>
</tr>
<tr>
<td>Multiple IVs</td>
<td>6</td>
<td>25</td>
<td>13.92 (2.85–73.03)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>IV drip</td>
<td>1</td>
<td>16</td>
<td>1.11 (0.12–9.6)</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>IV push</td>
<td>4</td>
<td>7</td>
<td>19.14 (3.94–92.99)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
</tbody>
</table>

OR, odds ratio; CI, confidence interval; PVC, peripheral intravenous catheter; IV, intravenous; RN, registered nurse.
* Cases of phlebitis (N = 6) and local site infection (N = 6) were excluded from this analysis.
complications in our patient population. A single study undertaken in a university hospital with a dedicated IV therapy team formed the basis for the CDC’s recommendations to extend the duration of PVC implantation to 96 from 72 h. Use of an IV therapy team has been shown to lead to reduced rates of overall complications, including phlebitis and BSI. It is possible that the results of that study are not readily generalizable to other populations, such as our elderly veteran patient population. The most recent 2006 standards from the Infusion Nurses Society continue to recommend PVC site rotation every 48–72 h.

Our study design had several limitations. Patients were not randomised to receive peripheral intravenous catheters for less than or more than 72 h and confounding by indication is a possibility. Whereas we controlled for some factors, we did not collect data on patient-related factors. Our sample size was small, especially with regard to BSI. Nevertheless, we believe that our study provides the basis for suggesting ongoing research to re-examine and further explore the optimal timing of replacement of a PVC to minimise the risk of complications, especially in the veteran population.

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Conflict of interest statement

None declared.

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3. Lai KK. Safety of prolonging peripheral cannula and i.v. tubing use from 72 hours to 96 hours. Am J Infect Control 1998;26:66–70.

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Peripheral-venous-catheter-related Staphylococcus aureus bacteraemia: a multi-factorial approach to reducing incidence

Madam,

Boyd et al. recently reported a significant improvement in the management of peripheral venous catheters (PVCs) using a care bundle approach. Included in this improvement were the introduction of new PVC dressings and the promotion of new PVC care plans. We report similar and additional interventions undertaken to reduce the incidence of PVC-related Staphylococcus aureus bacteraemia in our hospital. Connolly Hospital Blanchardstown (CHB) is a 350-bed general hospital in Dublin, Ireland. In Ireland, as in other countries, central venous catheters account for many S. aureus bacteraemias (26%), and PVCs account for 4–6% of S. aureus bacteraemias.

Since July 2008, the Infection Prevention and Control Team (IPCT) at CHB have been undertaking root cause analysis (RCA) on all meticillin-resistant S. aureus bacteraemias in an attempt to identify risk factors contributing to the infection. This analysis was extended to all hospital-acquired S. aureus bacteraemias in 2009. During the 12-month period from September 2009 to August 2010, there were 21 [0.19/1000 occupied bed-days (OBD)] episodes of S. aureus bacteraemia, 18 of which were hospital acquired. Of these 18 hospital-acquired cases, 10 (0.09/1000 OBD) were due to an infected PVC. Of these 10 PVC-related bacteraemias, seven (70%) occurred within 96 h of PVC insertion in the Emergency Department. Three PVC-related S. aureus bacteraemias followed PVC insertion/change on a ward. Other key features of the RCA report in these patients included two patients in whom the PVC was in situ for more than 72 h, and two patients who had more than one PVC in situ without a medical indication. During this period, efforts to reduce the incidence of PVC-related bacteraemia by the IPCT at CHB included: circulation of the findings of each RCA to relevant medical personnel and nurse managers; sending a memorandum to medical personnel about the need for aseptic insertion of PVCs; and appropriate care and documentation of PVCs. Training on PVC insertion was also arranged for all new doctors as part of their induction training. During this period, the IPCT also advocated the introduction of a PVC care bundle and a review of the entire PVC insertion process.

From September 2010, grand round presentations and education sessions for medical and nursing staff occurred throughout the hospital, and a PVC care bundle was introduced on a phased basis. Wards completing the PVC care bundle have increased during subsequent months, and all acute wards are now involved. The PVC care bundle is adapted from the Irish guidelines on prevention of intravascular-catheter-related infection in Ireland. It addresses issues relating to whether the PVC is still in use, the presence of any inflammation at the PVC site, whether the dressing is intact, whether the PVC is in situ <72 h, and whether hand hygiene was performed before and after all PVC procedures. The care bundle was completed by designated ward staff on a weekly basis. Feedback and percentage compliance with all aspects of the care bundle were


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