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TITLE: IDLE CENTRAL VENOUS CATHETERS DAYS POSE INFECTION RISK FOR PATIENTS AFTER DISCHARGE FROM INTENSIVE CARE

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Key words: central venous catheters, evidence-based practice, catheter-related infections

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TITLE: IDLE CENTRAL VENOUS CATHETERS DAYS POSE INFECTION RISK FOR PATIENTS AFTER DISCHARGE FROM INTENSIVE CARE
ABSTRACT

This prospective observational study measured idle central venous catheter (CVC) days (no medical indication), and ward clinicians’ adherence to evidence-based practices for preventing short-term central line-associated blood stream infections (CLABSI). In 340 patients discharged from ICU over one year, 208 of 794 CVC days (26.2%) were idle. Interventions to prevent CLABSI were poorly implemented. Ward clinicians need education regarding risk management strategies to prevent CLABSI, and clear accountability processes for prompt catheter removal are recommended.
Central venous catheters (CVCs) are vital for assessing and managing critically ill patients in the intensive care unit (ICU). The use of CVCs comes with inherent risks, most notably central line-associated blood stream infections (CLABSIs) which are associated with increased morbidity, mortality and healthcare costs (1). Implementing practices to reduce CLABSIs have mostly been confined to ICUs, placing patients discharged from ICU to wards with a CVC most vulnerable to developing CLABSIs. Recent data from USA showed 20.1 million CVC-days and 23,000 CLABSIs occurred on non-ICU wards in 2009 (2).

Guidelines (3) strongly recommend prompt removal of CVCs (category 1A) because the risk of developing CLABSIs increases with each day of prolonged use (4). Idle CVC days represent continued use of CVCs without justification by medical indications. Investigating the number of idle CVC days, and use of post-insertion interventions known to prevent CLABSIs (3) will scope the problem and enable specifically targeted interventions to implement evidence-based practices. Thus the aims of this study were to quantify idle CVC days in patients discharged from ICU to general wards, and describe the use of evidence-based post-insertion nursing interventions to reduce CLABSIs.

Method

Following hospital ethics approval, a prospective observational design was used to quantify the number of idle CVC days and use of evidence-based interventions known to prevent CLABSIs. The setting was a 460-bed (36-bed ICU) quaternary hospital. All patients discharged from ICU with an uncuffed CVC (cardiopulmonary catheter sheath or multi-lumen catheter) for short-term
therapy or monitoring were included. Cuffed, implanted or tunnelled CVCs for long-term therapy, such as chemotherapy, were excluded. Outreach ICU nurses conducted daily assessments until CVC removal as part of their usual role from Oct 2009 to Oct 2010. Idle CVC days was defined as the lack of documented or observable medical indications for a CVC (Table 1). Evidence-based post-insertion nursing management practices included the following: use of an occlusive dressing, use of a biopatch, anchored lines, particulate matter absent in the lumens and connectors, CVC line change due date documented, and a process to maintain patency of lumens (infusion or prescribed flush) (3).

Results and Discussion
Of 1650 patients discharged from ICU to wards, 340 (21%) had a short-term CVC. Median duration of ward-based CVC use was 2.34 days (IQR 1-3; range 1-15). A total of 794 daily assessments were conducted by outreach ICU nurses. Of a total 794 CVC days, 208 (26.2%) were idle; that is, there was no medical indication for continued use. Of 434 multilumen CVC days, there was no indication for use in 58 (13.4%) instances; and for 345 cardiopulmonary sheaths days, 151 (43.8%) lacked an indication (missing data, n=15). Fifty percent of patients recorded at least 1 idle CVC day; 25% had at least 2 idle CVC days (range 1-4 days).

Evidence-based post-insertion interventions were poorly adhered to, particularly ensuring an intact occlusive dressing (see Table 2). Overall, about a quarter of CVC assessments revealed a lack of adherence to practices known to prevent CLABSI. Formal documentation of CLABSI
prevention practices was poorly performed with only 43% (n=339) of patients having the hospital-specific form for documenting care included in their records.

Delayed removal of CVCs and lack of adherence to post-insertion interventions placed patients discharged from ICU to acute medical/surgical wards at high risk of CLABSIs. All these practices indicate poor knowledge of CLABSI risks to patients or inadequate translation of evidence-based practices for CVC management. Such low adherence to interventions known to reduce infection risks for indwelling CVCs was concerning. Essential sterile dressing techniques were poorly adhered to in this study, along with more advanced practices known to reduce CLABSIs.

Few studies have explored the prevalence of idle CVC days or unjustified ongoing use of CVCs. A smaller retrospective study conducted over a 9-day period in three wards reported at least one idle day for 63% of ward-based patients (n=89) (5) and a much earlier study also showed ward-based patients are at high risk of prolonged CVC use and thus CLABSIs (6). Previous studies showed the risk of infection in ward patients by peripheral IV lines (8,9). Currently, the increasing complexity of patients and prompt discharges from ICU to enhance patient flow suggest an increasing rate of CVC use over peripheral IVs for ward-based patients. While the recent emphasis on preventing infections during CVC insertion is essential (7), current contexts of care suggest equal importance is warranted for implementing post-insertion nursing interventions known to prevent CLABSIs. This is the first study to scope and audit this issue in the current era. We argue the use of antimicrobial CVCs does not negate the need for post-insertion nursing interventions and timely removal decisions. All known evidence-based practices to reduce
infection risks should be implemented, particularly in an era when there is an increasing awareness of clinical deterioration due to sepsis of varying causes (10).

That half of all patients with CVCs had at least 1 idle CVC day warrants immediate change in ward-round practices and documentation to prevent patient harm. A model whereby daily review and removal of the CVC resides with the medical unit (often ICU) that inserted the catheter could be uniformly instituted to reduce uncertainty surrounding accountability for decision making regarding the CVC. Alternatively, a doctor dedicated to managing CVC insertion, removal and replacement of lines across the hospital could be considered. Targeted practices such as having an outreach ICU nurse review and discuss the use of post-insertion interventions with ward nurses may improve knowledge of, and adherence to these essential CLABSI prevention strategies. Indeed, based on ICU data elsewhere, between 2001 to 2009, such prevention strategies decreased CLABSIs by 58% (2). The use of a daily checklist to review post-insertion interventions and indications for continued use may prevent CLABSIs similar to the groundbreaking use of Provonost’s checklist (7) for CVC insertion. Revising the hospital-specific CVC form to a checklist may improve adherence to, and documentation of, CLABSI preventing strategies and prompt removal.

The strengths of our study include prospective data collection and comprehensive follow-up. However we recognize the limitations of reporting historically distant data and our results may not reflect current practices within the hospital. Indeed, guided by outreach ICU nurses, CVC nursing practices have improved but are not perfect. Of note, despite daily assessments for an entire year, our data did not show greater use of CLABSI prevention practices as the year
progressed. This may be explained by the accepted presence of, and questioning about practices by, Outreach ICU nurses; rostering ward nurses over three shifts daily which reduces daily exposure of individuals (~1200 exposed to this study) to the Outreach ICU nurses; and staff turnover in the hospital over the full year. Funding limitations precluded measuring CLABI rates in this study. We recommend further studies measure CLABSI rates in ward patients following interventions to address practice concerns identified in this study.

This innovative study has been the first to have a prospective longitudinal approach for one year across a hospital to quantify idle CVC days and use of post-insertion interventions. Understanding these patterns of CVC care will allow targeted interventions to reduce CLABSI in ward patients and subsequently enable measuring the effectiveness of such.

Conclusion

Ward-based patients are at high risk of developing CLABSI due to low use of post-line insertion interventions and days of unjustified use of CVCs. Given most of these short-term CVCs were inserted in ICU, accountability for ongoing CVC care needs to be maintained or clearly transferred to another entity equally skilled and knowledgeable about CLABSI prevention strategies.
REFERENCES


Table 1 Criteria for Continued Central Venous Catheter Use

<table>
<thead>
<tr>
<th>Criteria</th>
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<tbody>
<tr>
<td>IV antibiotics (type not differentiated)</td>
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<tr>
<td>Poor peripheral access (clinical examination, discussion with attending nurses/doctors)</td>
</tr>
<tr>
<td>Haemodynamic monitoring</td>
</tr>
<tr>
<td>Administration of total parental nutrition (TPN), vasoactives or immunosuppressants</td>
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</table>

Table 2 Frequency of adherence to evidence-based practices to reduce CLABSI risk

<table>
<thead>
<tr>
<th>Evidence-based practice</th>
<th>Adherence (n; %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biopatch present</td>
<td>596; 75%</td>
</tr>
<tr>
<td>Occlusive dressing</td>
<td>653; 71%</td>
</tr>
<tr>
<td>Intact occlusive dressing (n=653)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>**;73%</td>
</tr>
<tr>
<td></td>
<td>**;68%</td>
</tr>
<tr>
<td>IV lines anchored</td>
<td>379; 48%</td>
</tr>
<tr>
<td>Line change due documented</td>
<td>17; 2%</td>
</tr>
</tbody>
</table>

Note: CLABSI = central line-associated blood stream infection