



Brief Report

Central Line–Associated Bloodstream Infections and Advanced Practice Providers: Identifying Opportunities for Prevention Efforts

Shawna S. Mudd, Tammy Slater, Melanie Curless

A B S T R A C T

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Central venous catheters can be a vital part of patient care in the hospital setting but are at high risk of infection. Central line–associated bloodstream infections pose a high risk of morbidity, mortality, and increased hospital costs. The purpose of this project is to assess the practices and learning needs of advanced practice providers (nurse practitioners and physician assistants) in the provision of evidence-based care to patients with central venous catheters in the hospital setting. This can guide further educational initiatives for central line–associated bloodstream infection prevention.

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Central venous catheters (CVCs) can be a vital part of patient care by providing needed and reliable intravenous access. However, their placement and use come with a high risk of infection. Central line–associated bloodstream infections (CLABSIs) pose a significant threat to patients and hospitals in terms of morbidity, mortality, and hospital costs. CLABSIs are a predominant cause of preventable hospital-acquired infection.¹ This has become an increasing concern during the severe acute respiratory syndrome coronavirus 2 pandemic because widespread increases in CLABSI rates have been reported.^{2,3}

It is known that CLABSI rates are reduced when evidence-based practices are implemented into standard CVC insertion and maintenance routines, often referred to as *bundles*.¹ These include standardized practices recommended for hospital implementation and integration to decrease the risk of CLABSIs.⁴ The CVC insertion bundle addresses CVC site and line selection. This includes preferentially selecting a subclavian site rather than a femoral or jugular vein, selecting the type of line and the minimal number of ports or lumens for the patient's needs, properly preparing the skin with chlorhexidine gluconate (CHG), using maximal barrier precautions during line placement, and hand hygiene.⁴ The CVC maintenance bundle involves ongoing aspects of central line care, including standardized dressing change regimens, proper line access, and evaluating the continuing need for the line.^{5,6} This includes a daily discussion of the need for the line and making a plan for its removal, regular monitoring of the catheter site visually or by palpation, and daily CHG bathing treatments.⁷ Bundles are most effective when incorporated as a multidisciplinary approach in teams of health care providers.

Prevention programs have been initiated throughout the country to monitor compliance and identify best practices for

CLABSI prevention. Quality improvement efforts often focus on specific roles of responsibility, such as bedside clinicians and leadership. From this, targeted education is implemented based on the identified gaps.⁶ Multidisciplinary groups of providers are responsible for adhering to CLABSI guidelines, including central line insertion bundles and implementing best practices to decrease the risk of infection. However, there are inconsistencies and variations in experiential knowledge and practices among health care personnel.⁸

Although the bundle components involve aspects of care that overlap between types of providers, many are unique as it relates to their specific role in ordering, line placement, and/or site maintenance. When identifying learning needs, the focus in the literature is often on bedside registered nurses and physicians or physicians and advanced practice providers (APPs), who are often grouped together for the purposes of identifying educational needs.⁸ This may be appropriate depending on the setting. However, at our facility, physician trainees such as medical students, interns, and residents rotate through different services and units during training. In contrast, APPs (specifically nurse practitioners and physician assistants) are a consistent group within units and services. APPs are vital members of the multidisciplinary team and serve an important role in the prevention of CLABSIs.^{5,9} Additionally, APPs are both formal and informal champions for evidence-based CLABSI prevention practices. Yet, little is known regarding the specific practice of APPs and their educational needs related to CLABSI prevention.

The goal of this project was to assess the learning needs of APPs related to CLABSI prevention at a 1,059-bed academic medical facility in Baltimore, MD. This information will be used to guide educational initiatives and advance the work of a newly formed CLABSI provider champion group.

Methods

The survey was developed by CLABSI experts within the hospital epidemiology and infection control team using a Delphi method. The survey drew from items present as part of the institution's evidence-based CVC insertion and maintenance bundles to prevent CLABSIs. To assess face validity, the survey was piloted with APPs and infection preventionists for clarity and relevance to evidence-based and hospital-specific practices. Feedback was informal. The project was acknowledged by the Johns Hopkins Medicine Institutional Review Board as not human subjects research under the Department of Health and Human Services or Federal Drug Administration regulations. Nurse practitioners and physician assistants working at a single, large metropolitan academic medical center were emailed via a hospital distribution list with a link to the Qualtrics survey. Respondents were asked to respond to a number of factors related to CVC insertion, maintenance, and daily practice. In addition, the participants were asked to identify barriers to evidence-based CLABSI prevention practices. The surveys were distributed to approximately 220 inpatient and specialty service APPs caring for both adult and pediatric patients. The study team was blinded to any linking of respondents to survey results.

Results

Forty APPs completed the survey, which was approximately an 18% response rate. Demographic information was not collected to maintain anonymity. Most APPs (85%) who responded do not insert CVCs. Those who do insert CVCs ($n = 6$) were asked to report elements of the CVC insertion bundle, which includes maximum barrier precautions and optimal site selection. Respondents reported that they use a central line insertion kit that includes sterile gowns, masks, full-body drapes, and so on 100% of the time and feel "knowledgeable" to "very knowledgeable" in selecting the most appropriate CVC to minimize CLABSI risk.

Items related to the CVC maintenance bundle were addressed, which included a daily review of the necessity for the line, transitioning medications to peripheral or oral routes of administration, the use of standardized tools in addressing aspects of the line, methods of identification of duration of line placement, assessment of the CVC site, and daily CHG bathing treatments. Although most respondents reported that they do not insert CVCs, most respondents (87.5%) manage/treat patients with CVCs, with 40% reporting that they manage/treat patients with CVCs every shift. Only 12.5% reported never managing/treating patients with CVCs.

Daily review of the need for the line is a key component of the maintenance bundle. When respondents who manage/treat patients with CVCs were asked to consider a typical clinical day, the need for the CVC is "sometimes" considered/discussed 56% ($n = 19$) of the time and "always" considered/discussed 44% ($n = 15$) of the time for each patient who has one in place.

Respondents were asked to identify what techniques are most often used for the discussion of line necessity during rounds. Examples given include kamishibai cards (also known as K-cards), an algorithm, a tool, or other methods that could be identified in free-text responses. Sixteen responses were received. Most reported (75%) that the discussion of line necessity came about through verbal discussions, during sections of the patient presentations, or when reviewing/planning daily care. No specific tool was reported. Four (25%) reported using K-cards, a rounding tool, or a unit-based harm prevention tool.

APPs reported using a variety of processes to determine how long their patients' CVCs are in place. For the respondents who

Table

"If There Was One Thing That You as an Advanced Practice Provider Could Do to Prevent the Next Central Line–Associated Bloodstream Infection, What Would It Be?"

Narrative Comments	Number of Responses (N = 15)
I provide redirection and education when I see inappropriate central line practices by bedside staff.	1
Remove lines as early as possible/line removal.	3
Frequent review and discussion	1
Insist on earlier central line removal timing or put a tool in place to prompt RNs and team as a reminder to consider removal.	1
Work with nurses to ensure bundle compliance and help with any questions/issues; partner with nursing to reduce risk.	1
Personally examine CVLs during assessment; closely examine each patient's central line dressing every 4 hours.	2
Partnering with nursing to reduce risk	1
Alternatives to central lines	1
Regularly assess need for a central line.	1
Closely examine each patient's central line dressing every 4 hours.	1
Identify central line that could be d/c.	1
Limit times the line is accessed in a day.	1

CVLs = central venous lines; d/c = discontinued; RNs = registered nurses.

manage/treat patients with CVCs, a majority (76%) use chart review. Others reported using a rounding tool (9%) or announcements during multidisciplinary patient care rounds (9%). None reported using a huddle board. Respondents were able to enter free-text responses, reporting that discussion of the line duration occurred during provider team handoff (3%) or by a combination of methods (3%).

Fifty-five percent (55%) reported that on a typical clinical day, there is "always" discussion of transitioning medications/fluids from central to peripheral or oral routes for each patient with a CVC, 42% report that this "sometimes" occurs, and 3% report this "never" occurs. APPs responded that they are "always" the ones who initiate the conversations around CVC necessity and transitioning fluids or medications if not initiated by another team member 38% of the time and do so "sometimes" 63% of the time. Direct examination of the CVC dressing by the APP or a member of the team reportedly occurs "always" 48% of the time on a typical clinical day, "sometimes" 42% of the time, and "never" 9% of the time.

An order for daily CHG bathing treatments is required for patients with CVCs (exceptions include contraindications such as age/weight restrictions or allergy). Although part of standard order sets when CVCs are placed, they may not always be ordered if a CVC is present on admission. Respondents were asked how often they confirmed that CHG treatments are ordered for their patients with CVCs. Thirty-three percent (33%) indicated that they "never" confirm that CHG has been ordered, 39% reported "sometimes," and 27% reported that they "always" confirm this.

When APPs who manage/treat patients with CVCs were asked how comfortable they feel discussing the importance of CHG bathing treatments with their patients, most feel "extremely comfortable" (42%) or "somewhat comfortable" (30%) in having these discussions. Fifteen percent (15%) feel "somewhat uncomfortable," and 12% feel "extremely uncomfortable" in discussing the importance of CHG bathing treatments with their patients.

APPs were asked "If there was one thing that you as an APP could do to prevent the next CLABSI, what would it be?" Fifteen respondents provided narrative comments. The comments were primarily around the theme of CVC maintenance, particularly line removal, and are reported in the Table. Additionally, there was a theme of partnering with registered nurses to reduce risk.

Discussion

The results of this survey demonstrate that although most APPs do not insert CVCs, they are involved in all aspects of CVC maintenance. Improving adherence to CVC maintenance best practices (bundles) such as strategies to reduce the line duration, incorporating the daily discussion of the need for the CVC, and actively transitioning medications/fluids to peripheral or oral routes are components for further quality/process improvements. Diverse tools and methods have been used to embed these evidence-based protocols into daily practice.^{10–12} This could include the use of standardized methods or tools to ensure consistency, compliance, and standardization of best practices into daily patient care. The development and engagement of APP CLABSI champions may be beneficial for targeted education and dissemination of best practices among interdisciplinary health care teams. Engaging frontline staff in these processes has been shown to be a highly effective method in reducing CLABSIs.¹⁰

An area for process improvement focuses on ordering CHG bathing treatments as an integral part of CLABSI prevention. Patient barriers can exist in the implementation of CHG bathing treatments. This includes a variety of factors such as a lack of understanding of the role of CHG bathing in CLABSI prevention, a lack of a perceived threat of a CLABSI, a lack of understanding of its use, how to perform it if done independently, and a general dislike of some of the common side effects of CHG bathing treatments (eg, unpleasant odor or sticky residue left on skin). These can result in patient refusal of treatments.^{13–16} However, these are surmountable barriers that can often be overcome with patient education.¹⁵ Increasing knowledge and comfort in discussing the benefits and potential side effects of CHG bathing treatments with patients/families may be beneficial.

As consistent members of care teams, APPs are an ideal group to improve CLABSI prevention efforts and further implementation of best practices within hospital teams. Further exploration into educational strategies, methods of engagement, and sustainability of evidence-based prevention practices are targets for further improvement efforts.

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Shawna S. Mudd, DNP, CPNP-AC, PPCNP-BC, CNE, is an associate professor at Johns Hopkins School of Nursing in Baltimore, MD, and can be contacted at smudd1@jhu.edu. Tammy Slater, DNP, ACNP-BC, is an assistant professor at Johns Hopkins School of Nursing, Melanie Curless, MSPH, RN, CIC, is the associate director of operations at Hospital Epidemiology and Infection Control, Johns Hopkins Hospital in Baltimore, MD, and an associate faculty member at Department of Healthcare Policy and Management, Johns Hopkins Bloomberg School of Medicine in Baltimore, MD.

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