Central Line–Associated Bloodstream Infection Prevention: Standardizing Practice Focused on Evidence-Based Guidelines

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Central venous access devices (CVADs) are integral to the treatment and provision of supportive care for many patients with cancer. Central venous catheters are the most frequent cause of healthcare-associated bloodstream infections. Healthcare-associated bloodstream infections can be prevented when evidence-based practices are followed consistently over time. Establishing nursing best practice with CVADs in the ambulatory setting presents additional challenges because of multiple providers, caregivers, and policies. This article identifies evidence-based practice strategies implemented at a comprehensive ambulatory cancer center to standardize best nursing practice for central lines.

At a Glance

• Central line care must reflect knowledge of risk factors associated with central line–associated bloodstream infection.
• Central line care must be guided by credible evidence-based standards that focus on central line–associated bloodstream infection prevention.
• Standardizing port access and dressing practice by implementing evidence-based policies are associated with measurable improvement in patient outcomes.

Central line–associated bloodstream infection (CLABSI) can cause significant avoidable morbidity and mortality (O’Grady et al., 2011). The Institute for Healthcare Improvement (IHI) introduced central line care bundles in 2001, which have demonstrated a 58% reduction in CLABSI as a result (Centers for Disease Control and Prevention [CDC], 2011a; Umscheid et al., 2011). These improvements have occurred in the intensive care unit and acute care setting; research suggests that millions of patients outside the intensive care and acute care settings are at risk of developing CLABSI (Chopra, Krein, Olmstead, Saadfar, & Saint, 2013). This shift is relevant to the ambulatory setting because multiple patient care teams and caregivers and the absence of comprehensive surveillance methods are substantial obstacles to CLABSI prevention. Minimal research exists on measures to prevent CLABSI in the ambulatory setting (Mollee et al., 2011; Tomlinson et al., 2011). Patients with cancer are at higher risk because of neutropenia, which has been identified by the IHI as a key risk factor for CLABSI. Neutropenia is a common side effect of cancer treatment, with most treatments being provided in the outpatient setting (Chopra et al., 2013; Loveday et al., 2011; Schiffer et al., 2013). Central line care must reflect knowledge of risk factors and be guided by credible evidence-based standards that focus on the goal of preventing CLABSI (Camp-Sorrell, 2011).

In 2011, the Dana-Farber Cancer Institute (DFCI), a National Cancer Institute–designated comprehensive cancer center, opened a cancer center with a centralized laboratory service unit for patient blood draws and venous access. The new unit was staffed by IV nurses and phlebotomists. An average of 300 patients per day were seen for blood draw and access by the IV team, and about 50% of those patients required port access. The opening of the laboratory service center integrated nursing staff with IV expertise from a variety of disease center units and institutions. Questions began to arise from staff about best practice as they observed and discussed individual practice. The practice variance was most evident in port access. Patients noticed this variance and were concerned that nurses did not follow the same routine. Patient interviews revealed dissatisfaction with the variance and expected consistency in the central line practices of the staff (Weingart, Hsieh, Lane, & Cleary, 2014).

Practices Associated With Prevention

The key advances from the science of CLABSI prevention focus on the following high-risk factors: heavy microbial colonization at the insertion site, heavy microbial colonization at the catheter hub, presence of neutropenia, and inadequate care of the central venous catheter after insertion (Chopra et al., 2013). The CDC (2011b) guideline bundle for postinsertion care of central lines emphasizes (a) compliance with hand hygiene requirements, (b) scrub of the access port or hub immediately prior to each use with...
TABLE 1. Focused Evidence-Based Guidelines for Practice Change

<table>
<thead>
<tr>
<th>Variable</th>
<th>Criteria</th>
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<tbody>
<tr>
<td>Hand hygiene</td>
<td>Hand hygiene must be performed by every person before any access by central venous access device.</td>
</tr>
<tr>
<td>Chlorhexidine skin antisepsis</td>
<td>Skin at the insertion site should be scrubbed with 2% chlorhexidine for 30 seconds and allowed to dry for at least 30 seconds.</td>
</tr>
<tr>
<td>Strict aseptic technique should be used throughout all central venous access device procedures</td>
<td>Key parts and connections must remain sterile. No evidence exists to show a difference in infection rates when using clean versus sterile gloves.</td>
</tr>
<tr>
<td>Access port or hub</td>
<td>Scrub the hub or access port immediately prior to each use with appropriate antiseptic.</td>
</tr>
<tr>
<td>Huber needle stabilization</td>
<td>All ports should be secured with a stabilization device. Stabilization decreases the risk of needle dislodgement, which increases risk of infection. Minimize entry into the venous access device system.</td>
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Note. Based on information from Alexander, 2011; Camp-Sorrell, 2011; Institute for Healthcare Improvement, 2012; O’Grady et al., 2011; Schiffer et al., 2013.

Assessment of Current State

The clinical specialist and nurse director conducted an assessment of the current state and found a wide variance in central line port access and dressing practices. Part of the controversy was that the current institutional policies provided for three types of port dressings: sterile, clean, and high risk. The clean technique was instituted at DFCI 10 years ago when the controversy of clean versus sterile was debated. The rationale was that short-term access did not require the sterile dressing. The inpatient oncology unit continued to require sterile technique. The third high-security dressing was applied to patients going home on continuous infusion of a highly irritant drug with a CADD® pump. The rationale that different types of port access were needed for outpatients versus inpatients was based on history and policy rather than on evidence. CLABSI rates are monitored by the infection control department and showed that, in the 10 years that DFCI used clean technique, no increase occurred in outpatient CLABSI rates.

Interviews with nurses revealed unique approaches and rationale for dressing practices. The desire to provide the best care for their patients was paramount, but no consensus existed on practice. Nurses expressed the need for a standard of practice based on evidence. The results of the assessment were presented to nursing practice committees. The CLABSI committee is a multidisciplinary, multi-institution membership, including infection control, that provided review and surveillance of CLABSI for outcome measures. Support to establish a standard of evidence-based practice for port access and dressing was attained. The committee reviewed and approved all practice change.

Methods

What is clear from the literature is that focus of central line procedures must be on aseptic technique and not the hierarchical paradigm that was used. Debate and variation surrounding aseptic technique in nursing has led to variability in technique in the absence of research (Aziz, 2009). The Aseptic Non Touch Technique (ANTT®) is a contemporary approach to aseptic practice rather than the conventional sterile, aseptic, and clean techniques (Rowley, Clare, Mac-queen, & Molynex, 2010). ANTT means that, when handling sterile equipment, the part of the equipment being used that comes into direct or indirect contact with a key site (port access site) is not touched or handled. Clarity on the definitions of dressing technique provided the foundation for practice change. The goal is to focus nurses’ attention on the principles and practices of aseptic technique that have been established to prevent CLABSI. In aseptic technique, one cause of infection exists: contamination of key parts or sites (Rowley et al., 2010).

Implementation

The team of clinical specialists from the Department of Clinical Education and Professional Development at DFCI developed and conducted mandatory 90-minute training sessions for all nursing staff. Flyers and posters depicted the correct technique and dressing procedure emphasizing zero CLABSI as the outcome goal. A pre- and post-test assessed individual knowledge of the key concepts. Didactic sessions reviewed professional guidelines and the new port access and dressing policy. Skill stations provided a step-by-step demonstration and return demonstration of the correct aseptic

Information needed for each audit sheet
- Month and year
- Auditor
- Unit

Information needed for each audit entry
- Date
- Staff initials
- RN
- Patient
- Presence of hand hygiene
- Use of gloves

Aseptic Non Touch Technique checklist
- Open supplies, maintaining sterility in presence of patient.
- Prepare equipment using aseptic technique.
- Cleanse site, scrubbing for 30 seconds.
- Allow area to dry for 30 seconds.
- Access port: Maintain non touch of site and insertion site of Huber needle.
- Apply dressing (Steri-Strips™, Tegaderm™, notched tape).

FIGURE 1. Audit Tool for Venous Access Port Dressing Using Aseptic Non Touch Technique

an appropriate antiseptic, (c) accessing catheters only with sterile devices, (d) replacing wet or soiled dressings, and (e) performing dressing changes under aseptic technique using clean or sterile gloves (O’Grady et al., 2011). The literature and guidelines are in consensus that maintaining aseptic technique for care of port access devices is essential for preventing CLABSIs (Alexander, 2011; Camp-Sorrell, 2011; O’Grady et al., 2011) (see Table 1).
technique, emphasizing key parts and
key connections that were critical to pre-
venting CLABSI. They were identified as
critical connections. A scrub-the-hub
station included use of an ultraviolet light
and marker that demonstrated whether
the nurse had sufficiently cleaned the
hub. Question-and-answer sessions
were provided to encourage dialogue on prac-
tice evidence and culture. The sterile
gloves and kits were the biggest stum-
bling block. Nurses had strong opinions
on practice, and the interactive exchange
provided a forum to introduce evidence-
based standards and guidelines that are
shown to prevent CLABSI.

After the program began in June 2012,
it was clear that misinterpretations of
the key elements of the new technique
occurred. Aseptic fields were omitted
in some cases because nurses were opening
sterile items and placing them on non-
sterile fields, such as a disposable pad.
The 30-second scrub was not timed, and
patients noted that some nurses cleaned
the site longer than others (Weingart et
al., 2014). When nurses were questioned,
they would state that they only use clean
technique. Other nurses continued to use
sterile gloves because they did not be-
lieve clean gloves were as safe. The ANTT
concept was not uniformly accepted,
and, therefore, the goal of standardiza-
tion was not achieved.

The IV team nurse director and charge
nurse and the clinical specialist devel-
oped an audit tool to monitor practice
and reinforce the evidence (see Figure
1). The emphasis of asepsis and critical
connections while performing the ac-
cess provided clarity on the importance
of not contaminating key parts and sites.
The auditor timed the nurse skin prep
with chlorhexidine scrub and dry and
reinforced the evidence that removing
microorganisms at the insertion site is a
key to CLABSI prevention.

Audits were conducted monthly with
peer-to-peer audits replacing clinical
nurse specialist audits, which provided
the necessary peer support for the prac-
tice. Peers can be very influential, and
informal leaders may weigh in even
stronger than formal leaders in practice
change (Melnyk & Fineout-Overholt,
2011). The audits were instrumental in
nurse compliance with the evidence-
based interventions and the recommend-
ed standards. The CDC reported that
well-organized programs that educate,
monitor, and evaluate care are critical
to success; declining infection rates follow
standardization of aseptic care; and IV
teams have shown unequivocal effective-
ness in reducing incidence of CLABSI
(O’Grady et al., 2011).

Results

Consistent nursing practice for cen-
tral line port access was achieved with
audits demonstrating 100% compliance
with the critical components known to
prevent CLABSI by six months postint-
ervention. This compliance has been
sustained, and monitoring continues
monthly. The most important outcome
was a sustained decline in CLABSI rates.
The CLABSI rate is measured per 1,000
line accesses in the outpatient setting.
Rates prior to the intervention in quarter
3 of 2012 were 1.39 and measured at 0.88
in quarter 2 of 2013 (see Figure 2). These
trends continued to be sustained through
2015. Expansion of education about criti-
cal components of best practice with
port access led to development of online
videos, teaching sheets, and skill demon-
stration in orientation.

Conclusion

Standardizing port access and dressing
practice by implementing evidence-based
policies are associated with measurable
improvement in patient outcomes. Pa-
tients want consistency in nursing prac-
tice (Weingart et al., 2014). A multfac-
eted approach is required to ensure that
clinical guidelines are adopted into nurs-
ing practice at the point of care. Nursing
culture and peer influence are aspects
that must be considered in achieving
practice change. Education that provides
the rationale for change and opportunity
for skill demonstration are critical ele-
ments to understanding and acceptance.
Practice audits involving peer review to
monitor change improve compliance and
sustain the practice change. The goal for
standardization and adherence to guide-
lines is to achieve zero CLABSI.

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