

Central Line–Associated Bloodstream Infections: Evidence for Practice

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Infections in home care cannot be tolerated. McGoldrick (2009) has called for zero tolerance where infections are involved. Infections in home care are complicated by the compromised condition of the patient and the degree of care that is administered by family caregivers. All infections that occur 48 hours after a patient is admitted to home care or hospice need to be investigated in a manner that will identify the cause and foster measures to prevent such infections in the future (McGoldrick, 2009).

One particular set of infections, central line–associated bloodstream infections in acute care settings, contributes to 12% to 25% mortality and on average costs \$25,000 per infection (Posa, Harrison, & Vollman, 2006). Central line–associated infections are becoming more of a problem in home care as a number of patients are discharged from acute care with indwelling catheters.

Standards of Practice/Guidelines

Several evidence-based Standards of Practice exist for the care of infusion devices across all health care settings. The Infusion Nurses Society's (2006) Standards of Practice are evidence based and define the scope of practice and educational requirements for nurses practicing infusion therapy.

All home care agencies that are accredited by the Joint Commission have been challenged in 2009 to focus on central line infections. The 2009 National Patient Safety Goals require that the agencies implement evidence-based best practices to prevent central line–associated bloodstream infections (Gorski, 2009). The elements of performance that are addressed include staff education, disinfection protocol, and surveillance and monitoring activities (McGoldrick, 2009).

The Centers for Disease Control and Prevention's (CDC) Healthcare Infection Control Practices Advisory Committee released their *Guidelines for the Prevention of Intravascular Catheter-Related Infections* in 2002. These guidelines focus on acute care but much is applicable to home care. These “guidelines were developed for healthcare practitioners who insert catheters and for persons who are responsible for

surveillance and control of infections in hospital, outpatient, and home health-care settings” (CDC, 2000, p. 3).

Strategies for preventing catheter-related infections include the following (CDC, 2002):

- Continuing education that enables clinicians to provide and monitor care
- Line placement because jugular and femoral lines had more infections
- Good hand washing
- Aseptic technique
- Cleansing the insertion site with povidone iodine
- Catheter site dressing regimen
- Consideration of antimicrobial catheters for certain populations
- Povidone iodine ointment at the insertion site

The Society for Healthcare Epidemiology of America and Infectious Diseases Society of America published evidence-based guidelines, *Compendium of Strategies to Prevent Healthcare-Associated Infections*, in 2008. Marschall et al. (2008) highlighted practical recommendations based on these guidelines. These practical recommendations focused on prevention, monitoring, and reporting of infections. Specific steps are outlined for what should be done before, during, and after the insertion of central lines. Accountabilities are outlined from the chief executive officer to the bedside staff and lab personnel in an attempt to make the total environment focused on the prevention and reporting of such infections.

Reporting of data regarding central line infections are addressed from an internal reporting perspective to support quality improvement efforts and external reporting perspective to further aggregate public health information. Internal data should include compliance with insertion guidelines,

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documentation of daily assessment, cleaning of catheter hubs and ports before access, and avoidance of the femoral vein site. Recommendations for public reporting have been provided by the Healthcare Infection Control Practices Advisory Committee (CDC, 2009) and the National Quality Forum (2009).

The Institute for Healthcare Improvement (2006) has published guidelines based on the CDC's guidelines. At their Web site several "Improvement Reports" are published that address how different health care settings used the guidelines. For example, one report from Virginia Mason Medical Center (Westley, Sherman, & Busted, 2005) outlines the application of the guidelines and the results. The practice changes included the use of evidence as a basis for care and making all needed supplies, especially sterile barriers, available on a cart, and the results were the use of fewer lines and decrease in number of catheter days.

Pediatrics

McCaskey's (2009) case study about a newborn with gastrochisis who was discharged with a long-term central venous catheter demonstrated the fact that line infections could be decreased with strict line protocols and education of all involved in the care of the line. Individualized education for the family caregivers requires cooperative efforts of the inpatient staff and the home care staff and a thorough assessment of the home environment. It is essential that time be allotted for the family caregiver to practice while the patient is still in acute care so that questions can be answered and problems can be addressed in technique prior to discharge.

Statewide Collaborative

A team of multidisciplinary representatives from intensive care units (ICUs) from a health system in Michigan developed a comprehensive program to eliminate central line-associated bloodstream infections in ICUs (Posa et al., 2006). Based on the CDC (2002) guideline, four risk factors that increase the likelihood of such infection were focused on: colonization of the insertion site, moisture under the dressing, time of catheter maintenance, and technique used to insert and care for the catheter.

Based on evidence from other national collaborative efforts several actions were identified as being significantly related to the occurrence of catheter-related infections. These actions are proper hand washing, use of sterile barriers while inserting the catheter, use of chlorhexidine for cleansing the skin before insertion, avoiding femoral lines, and removing unnecessary lines (Berenholtz, Pronovost, & Lipsett, 2004).

The evidence-based program was in place for 2 years when the article was published, and the decrease in the number of line-associated infections had been maintained (Posa et al., 2006). Findings from this program included the fact that 50% of the infections were in lines inserted in one

ICU. Contributing factors in that ICU were identified and corrected, accounting for a decrease in infections. Another factor that was identified in the assessment of infections in this program was that all infections occurred in patient s with a Slick catheter that was placed into an existing introducer by a nurse. On further investigation it was found that nurses were not using sterile barriers during the placement of the Slick catheter. Once nurses were educated to use the sterile barriers, infection rates significantly decreased. Prior to the implementation of the program infections were at the rate of 7.6 per 1,000 catheter days. Following the implementation of the program and the follow-up of all infections that rate decreased to 2.24 per 1,000 catheter days (Posa et al., 2006).

The program has continued with staff education, a line cart with the appropriate supplies, a line insertion checklist, and the empowering of the nurses to be able to stop the line insertion procedure if the guidelines are not being followed (Posa et al., 2006).

Outcomes in Home Care

Gorski (2004) describes 7 years of central venous access device data collected in one large urban home care agency. Data from patients with central lines from 1996 to 2002 were analyzed. Infection and occlusion rates were tracked. The only potential risk factor that was statistically correlated with central venous access device infections in this agency was the administration of total parenteral nutrition.

Education

Roslien and Alcock's (2009) study was based on the assumption that an educational intervention focused on peripherally inserted central catheters would increase the nursing staff's knowledge, confidence, and psychomotor skills. Eleven registered nurses attended the class. Pre- and posttests showed a significant increase in knowledge and confidence that lasted for 3 months after the educational intervention. The psychomotor skills increased significantly after the educational intervention. Obviously, this is a limited study with only 11 subjects, but the results are encouraging and should be continued to be tested.

Summary

Best practices to prevent central line-associated infections in home care environments are limited by the lack of research. More research is needed in home care and hospice addressing the incidence, patient risk factors, and effective interventions to prevent central line infections (Gorski, 2009). What can be done in the meantime is to adopt the evidence from the Standards of Practice from the CDC and the Society for Healthcare Epidemiology of America and Infectious Diseases

Society of America. Although the standards were developed from data in acute care, many of the factors that increase the incidence of infections can be generalized to home care and hospice. It is a beginning, and it is evidence based.

Declaration of Conflicting Interests

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Bio

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