Improving Registered Nurses' Knowledge of Evidence-Based Practice Guidelines to Decrease the Incidence of Central Line-Associated Bloodstream Infections: An Educational Intervention

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Abstract

Background: *The 2011 Centers for Disease Control and Prevention guidelines provide evidence-based recommendations for preventing central line-associated bloodstream infection (CLABSI). Educating and training health care personnel—incorporating bundled strategies for maximizing patient safety throughout the course of intravenous therapy—is the major area of interest. Despite a low number of reported CLABSIs—below national benchmarks—our large regional medical center has the goal of 0 CLABSI.*

Purpose: *The purpose of our project was to develop an educational intervention guided by the Healthcare and Technology Synergy Framework to improve registered nurses' (RNs) knowledge of evidence-based practice guidelines to decrease the incidence of CLABSI.*

Methodology: *A pretest/posttest format was used to evaluate an educational session on the nursing management of central lines (CLs). Participants in the study were RNs employed at a large regional medical center who worked 50% or more per week providing direct patient care in the hospital's intensive care units. An educational session on nursing management of CLs was presented. A 16-question survey (7 demographic and 9 knowledge questions) to assess RNs' knowledge of care and maintenance of CLs was used as the pretest and posttest.*

Conclusions: *RNs' knowledge of care and maintenance of CLs improved significantly after the intervention (pretest mean score = 4.6 and posttest mean score = 8.4;* $P = .0001$*).*

Implications for Practice: *An educational intervention can increase RNs' knowledge of care of CLs. As a result of this project, an annual evidence-based practice educational intervention was adopted for RNs at our large regional medical center.*

Keywords: *Healthcare and Technology Synergy Framework, evidence-based practice, Centers for Disease Control and Prevention CLABSI*

Introduction

Hospital-associated infections (HAIs) have been considered an unavoidable result of a hospital stay and account for a substantial portion of health care-acquired conditions.[1] The Environmental and Public Health Consulting Group[2] reported that with nearly 100 million procedures performed at hospitals each year, legal action arising from nosocomial infections is increasing nationwide. Immunocompromised patients, the elderly, and young children are usually more susceptible than others. These infections are transmitted through direct contact from the hospital staff, inadequately sterilized instruments, aerosol droplets from other ill patients, or even the food or water provided at hospitals.[2] HAIs, also referred to as nosocomial, hospital-acquired, or hospital-onset infections, are defined as infections not present and without evidence of incubation at the time of admission to a health care setting.[3] HAIs affect 5% of all hospitalized patients with 20%-30% of all HAIs occurring in intensive

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care units (ICUs).[1] The use of intravascular catheters are a major source of HAIs; therefore, the prevention of central line-associated bloodstream infections (CLABSIs) are of critical concern for nursing staff working in hospitals.[4] CLABSIs are deadly, costly, and preventable.[5] More than 5 million patients in the United States require central line (CL) placement each year. Unfortunately, infection remains the main complication of intravascular catheters in patients with chronic or critical conditions.[6] Statistics show that 500,000 catheter-related infections occur in the United States, which calculates to 1,370/d, 57/h, or almost 1/min.[7]

Preventive measures against CLABSI have been well documented in the literature. The prevention of CLABSI requires a comprehensive understanding of the major risk factors by which catheters get contaminated. Despite the possible key contributions of nurses in the prevention of nosocomial infections, the main challenge is to ensure implementation of and compliance with the evidence-based recommendations in daily nursing practice.[8] Risk factors for CLABSI can be intrinsic (ie, nonmodifiable characteristics such as age or underlying diseases or conditions) or extrinsic (ie, modifiable factors such as insertion circumstances, skill of the inserter, insertion site, skin antisepsis, catheter lumens, duration of catheter use, or use of barrier precautions).[9] Utilizing poor technique during central venous catheter insertion can cause pneumothorax, catheter occlusion, thrombosis, phlebitis, endocarditis, metastatic infection, and catheter-related infection.[10] The site at which a catheter is placed influences the subsequent risk for CLABSI and phlebitis.[6] Microbes from the hands of health care workers can play a role in pathogenesis by contaminating the catheter hub or a patient's skin during medication administration, manipulation of the catheter, or dressing changes.[11] Zingg et al[12] concluded that infection control efforts to improve the quality of hand hygiene and catheter care are critical essentials for reduction of CLABSI as well as other HAIs. Labeau et al[13] suggest that to optimize knowledge of CLABSIs educational curricula and continuing refresher education programs should include CLABSI-prevention guidelines. CLABSIs are recognized as a problem in ICUs.[13] Due to the initiatives such as the Food and Drug Administration's warning that positive displacement needleless connectors may increase the risk of CLABSI, the Institute for Health-care Improvement 100,000 Lives Campaign, The Pittsburg Regional Health Initiative, The Michigan Keystone Project, and the Joint Commission's 2012 National Patient Safety Goal requiring patients or their caregivers to be educated on the use of evidence-based practices coupled with the product aspect of the Healthcare and Technology Synergy Framework model (Figure 1) has had a positive effect on CLABSI rates.[8,5,14] In 2005 the Centers for Disease Control and Prevention (CDC) developed the National Healthcare Safety Network as an Internet-based surveillance system to collect patient safety data voluntarily reported by hospitals.[6] According to O'Grady et al,[6] the Agency for Healthcare Research and Quality and the CDC recommend the following quality measures for prevention of CLABSI:

1. Hand hygiene,
2. Maximal sterile barrier precautions,
3. Chlorhexidine skin antisepsis,
4. Appropriate insertion site selection, and
5. Prompt removal of unnecessary catheters.

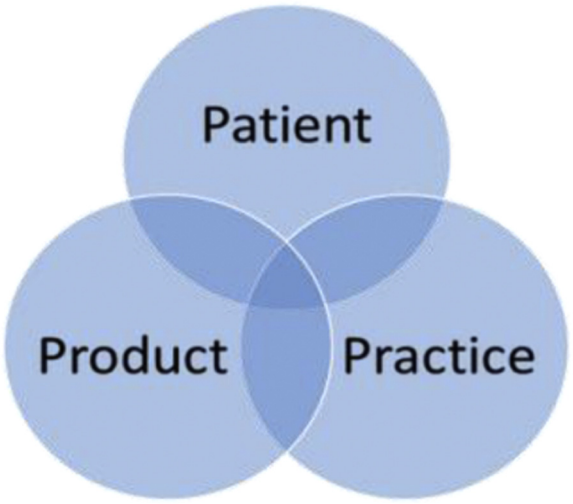

Figure 1. **Healthcare and Technology Synergy (HATS) framework.**

Since beginning these initiatives, the incidence of CLABSI in ICU patients in the United States have been reduced from an estimated 43,000 in 2001 to 18,000 in 2009 (58% reduction).[15] The CDC estimates that this reduction represents 3000-6000 lives saved and a cost saving of $414 million in 2009 alone. These results show that a coordinated, multi-institutional infection-control initiative can be an effective approach to reducing CLABSIs and 0 CLABSI rates are achievable.[16]

Nurses have responsibilities associated with the care and maintenance of the insertion site and external catheter surfaces, such as catheter stabilization and dressing management, and the internal catheter walls, such as septum disinfection, catheter flushing, and applying the appropriate clamping technique with disconnection.[17] Nursing knowledge of intravenous line connectors, occlusions, and proper flushing is necessary to avoid infection and decrease the risk of thrombus formation, which positively influence patient outcomes.[18]

Problem Statement

In 2011, Hospital Compare reported 18 CLABSIs in the ICU at a large regional medical center. This is a standardized infection ratio of 0.47 or a 54% reduction in infections. In 2012, 17 CLABSIs were reported with an standard infection ratio of 0.431 or 57% reduction. January 2013 through September 2013 the number of reported CLABSIs was 15.[19]

Despite clinical guidelines for appropriate care and management of central lines, ICU registered nurses (RNs) are not adhering to evidence-based practice guidelines. This is resulting in CLABSIs, increased health care costs, morbidity/mortality, and an increase in patient length of hospital stay.

Aims

1. Determine the knowledge of RNs working in critical care areas of factors contributing to CLABSI; and