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Effect of a Multidisciplinary Team Approach to Eradicate Central Line Associated Blood-Stream Infections (CLABSI)

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Comments

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Effect of a Multidisciplinary Team Approach to Eradicate Central Line Associated Blood-Streptococcal Infections (CLABSI)

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Abstract # 583

Introduction: CLABSI remains a significant problem in the intensive care unit. Hypothesis: A multidisciplinary approach for the insertion and care of central venous lines will prevent central line associated bloodstream infections (CLABSI). Methods: A Critical Care Operations Committee was formed to transition care in eight intensive care units (ICUs) on academic medical center in 2004. The goal was to reduce CLABSI. Using evidence-based medicine, a clinical practice guideline was developed that incorporated the use of maximum barrier precautions, chlorhexidine skin preparation, and other best practice recommendations. A multidisciplinary team was formed by the hospital epidemiologist and ICU directors, led by the hospital epidemiologist. Patients were included during intervention (Table 1) that were incorporated into the outcome over time included an education program (that also emphasized hand hygiene), use of a dedicated catheter that has all of the necessary elements while reducing maximum barrier precautions, pre-procedural time out, use of a check list during catheter insertion, empowering the bedside nurse to stop the procedure if the elements in the checklist were not followed, incorporation of chlorhexidine solutions for skin preparation and chlorhexidine sponges for catheter dressings, tracking of high risk catheters (i.e. those were inserted during emergent or in the femoral vein), treating a CLABSI as a critical event and holding a root cause analysis after each one to discuss the cause, use of the subclavian vein as the preferred site of catheter insertion, documentation of the catheter insertion with a standardized procedure note, and daily assessment as to the need of the central venous catheter.

Results: We were challenged by infection control practitioners and were put into a database that was managed by the eRIC data coordinator. Definitions of CLABSI were those published by the Centers for Disease Control and Prevention (CDC). A panel of physicians that was led by the hospital epidemiologist adjudicated cases of suspected CLABSI. Data were presented to the CCOG on a quarterly basis and to the individual ICUs on monthly basis by means of an electronic newsletter. In addition, the data could be viewed on the CCOG intranet website.

The number of catheterizations was modeled using general linear models with first and second order slopes fit for each type of catheter type to detect linear trends and change points. The number of blood culture infections were evaluated with a Poisson test. The trend in catheter blood infection rates was modeled with Poisson regression. The distributional assumptions of methods used were evaluated using the Kolmogorov-Smirnov goodness of fit test for normality and by visual inspection of frequency histograms. Analyses of data from models fit to the appropriate design. Poisson regression was performed using LogProc. Linear models were fit using the Mixed procedure (SAS).

From 2004 to 2011 the rate of CLABSI declined significantly from 5.86 to 0.6 infections per 1000 catheter days (p<0.0001). There were no reports of multidrug resistant organisms (MDROs) in CLABSI (p<0.0001) (Figure 1). The number of catheterizations differed significantly by type, with approximately eight times as many CVCs being performed than PICCs. From 2009 to 2010 catheter usage significantly increased whereas from 2010 to 2011 it dropped significantly (p<0.0015). However, the number of PICCs did not significantly change in frequency over time (Figure 2). Table 3 shows the longest CLABSI-free time and APACHE III scores for individual units. Microbiology data are presented in Table 4.

Discussion

Similar to other published reports, the primary finding of our study is that a multidisciplinary approach to the insertion and care of central venous catheters reduces the incidence of infections in rates of CLABSI. However, our study is different in several important ways from previous investigations. Other investigations included a single ICU that did not use antibiotic catheters4,5 or used suture plus chlorhexidine6. We included all eight ICUs (community hospitals versus tertiary medical centers). In addition to the annual implementation of the Promoting the Elimination of Unnecessary ICUs (PENICU) checklist of chlorhexidine sponges and antibiotic impregnated catheters. The time period in our study is also the longest for studies of this type. Our data suggest that the CLABSI rates in the medical center is currently at the lowest of the APACHE III scores. The lower APACHE III score likely reflects the fact that patients are also admitted to this unit, which would “dilute” the acuity of the patient population. Since the protocol as to how we care for these catheters does not change from unit to unit, it is surprising that the rates are as high as they are in the neuro-trauma unit and the Medical 2 ICU particularly since similar units have a much lower rate. We do not have ready explanation for this finding.

Our CVC utilization rate peaked in 2010 and decreased in 2011. This observation is most likely the result of better adherence to catheter removal when indicated and to an increasing reliance on PICCs.

In conclusion, use of a multidisciplinary approach to catheter care resulted in over an 89% decrease in CLABSI over a 7-year period.

References

2. Sheiner A, Veber JD, Zaloga GP, et al. Use of maximum barrier precautions4,5 and check lists6 are some of the behavioral changes that have resulted in reductions in CLABSI. Technological advances include aqueous or alcoholic chlorhexidine solutions for skin preparation 8, 9, chlorhexidine patches for catheter site care7 and antibiotic or impregnated catheters7. Although these aforementioned studies showed significant reductions in CLABSI, the rates remain relatively high in this study. We describe our approach toward reducing CLABSI rates in the intensive care units at UMass Memorial Medical Center, Worcester, MA.

Introduction

Central venous catheters are essential for the care of the critically ill patient. However, serious complications can occur with their use. One such complication is central line associated bloodstream infection (CLABSI). Although the attributable mortality and care of central line infection is likely not affected, the economic costs and morbidity can be substantial.

In 2000, the estimated number of CLABSI in intensive care units (ICUs) in the United States per year was 80,000. Since then, both behavior and technological interventions have resulted in reductions in CLABSI rates. For example, an estimated 25,000 fewer CLABSI occurred in 2009 in US ICUs than occurred in 20017. Hand hygiene, education programs8,9 and use of maximum barrier precautions4,5 and check lists6 are some of the behavioral changes that have resulted in reductions in CLABSI. Technological advances include aqueous or alcoholic chlorhexidine solutions for skin preparation 8, 9, chlorhexidine patches for catheter site care7 and antibiotic or impregnated catheters7. Although these aforementioned studies showed significant reductions in CLABSI, the rates remain relatively high in this study. We describe our approach toward reducing CLABSI rates in the intensive care units at UMass Memorial Medical Center, Worcester, MA.

Methods

In 2004, a critical care operations committee (CCCO) was formed at UMass Memorial Medical Center with the intent on providing standardized care to our critically ill patients by developing clinical practice guidelines based on the best published medical evidence10. This committee is multidisciplinary and includes physicians, nurses, physical and occupational therapists, hospital administrators and patient representatives. One of the earliest developed committees was focused on reducing the rate of CLABSI. Interventions (Table 1) that were incorporated into the outcome over time included an education program (that also emphasized hand hygiene), use of a dedicated catheter that has all of the necessary elements while reducing maximum barrier precautions, pre-procedural time out, use of a check list during catheter insertion, empowering the bedside nurse to stop the procedure if the elements in the checklist were not followed, incorporation of chlorhexidine solutions for skin preparation and chlorhexidine sponges for catheter dressings, tracking of high risk catheters (i.e. those were inserted during emergent or in the femoral vein), treating a CLABSI as a critical event and holding a root cause analysis after each one to discuss the cause, use of the subclavian vein as the preferred site of catheter insertion, documentation of the catheter insertion with a standardized procedure note, and daily assessment as to the need of the central venous catheter.

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Tables 1-4:

References

2. Sheiner A, Veber JD, Zaloga GP, et al. Use of maximum barrier precautions4,5 and check lists6 are some of the behavioral changes that have resulted in reductions in CLABSI. Technological advances include aqueous or alcoholic chlorhexidine solutions for skin preparation 8, 9, chlorhexidine patches for catheter site care7 and antibiotic or impregnated catheters7. Although these aforementioned studies showed significant reductions in CLABSI, the rates remain relatively high in this study. We describe our approach toward reducing CLABSI rates in the intensive care units at UMass Memorial Medical Center, Worcester, MA.