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

J. Matthias Walz  
*University of Massachusetts Medical School*

Richard T. Ellison III  
*University of Massachusetts Medical School*

Helen Flaherty  
*University of Massachusetts Medical School*

*See next page for additional authors*

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Comments

Poster presentation at the Society of Critical Care Medicine's 41st Critical Care Conference in Houston, Texas, February 4-8, 2012.
From 2004 to 2011 the rate of CLABSI declined significantly from 5.86 to 0.6 infections per 1000 catheter days (p<0.0001) (Figure 1).

The number of catheterizations differed significantly by type, with approximately eight times as many CVCs being performed than PICCs (p<0.0001). From 2008 to 2009 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 multimodal approach to the insertion and care of central venous catheters has resulted in reduced CLABSI rates. However, our study is different in several important ways from previous investigations. Other investigations included a single ICU that did not use antiseptic catheters* or used a single antiseptic agent in the absence of clinical microbiology and pharmacy support. 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.

Results

In 2009, the estimated number of CLABSI in intensive care units (ICU) in the United States per year was 80,000. Since that time, both behavioral and technological interventions have resulted in reduced CLABSI rates. For example, an estimated 25,000 fewer CLABSI occurred in 2009 in US ICUs than occurred in 2001. Hand hygiene, education programs and use of maximum barrier precautions* and check lists are some of the behavioral changes that have resulted in reductions in CLABSI. Technological advances include aseptic or antibiotic chlorhexidine solutions for skin preparation and chlorhexidine patches for catheter site care* and antibiotic impregnated catheters*. Although these aforementioned studies showed significant reductions in CLABSI, the rates remain relatively high in our study. In this way we describe our approach toward reducing CLABSI rates in the intensive care units at UMass Memorial Medical Center, Worcester, MA.

In 2004, a critical care operations committee (CCOC) was formed at the UMass Memorial Medical Center with the intent of providing standardized care to our critically ill patients by developing clinical practice guidelines based on the best published medical evidence*. This committee is multidisciplinary and includes physicians, nurses, pharmacists, physical and occupational therapists, administrators and patient representatives. One of the earliest developed committees with a focus on reducing the rate of CLABSI interventions (Table 1) that were incorporated into the initiative over time included an education program (that also emphasized hand hygiene), use of a dedicated catheter that has all of the necessary elements required for optimal 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 checklist was 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 emergencies or in the femoral vein), treating a CLABSI as a critical event and holding a root cause analysis after each one to discern 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.

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. Because the catheterization infection rates were evaluated with a Poisson test. The trend in catheter blood infection rates was modeled using Poisson regression.

The distributional assumptions of methods used were evaluated using the Kolmogorov-Smirnov goodness of fit test and by visual inspection of frequency histograms, normality graphs and performance indicators of models fit to the appropriate design. Poisson regression was performed using LogPact. Linear models were fit using the Mixed procedure (SAS).