

Using Stethoscope Hygiene Barriers to Reduce Central Catheter–Associated Bloodstream Infection Rates

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BACKGROUND Central line [catheter]–associated bloodstream infections (CLABSI) represent a significant mortality risk.

LOCAL PROBLEM Due to a significant increase in CLABSI rate, a new CLABSI prevention bundle strategy was evaluated to determine whether it changed the CLABSI rate.

METHODS A before and after quality improvement project was performed in an 18-bed intensive care unit from March 1, 2021, to March 1, 2025. A CLABSI prevention bundle was implemented; CLABSI rates were compared for 1 year before to 3 years after intervention implementation. Additionally, clinician satisfaction surveys were collected.

INTERVENTIONS The implemented bundle consisted of (1) replacement of disposable stethoscopes with touch-free, aseptic stethoscope diaphragm cover dispensers (DiskCover System, AseptiScope, Inc) in each intensive care unit room, and (2) requiring a chlorhexidine-impregnated dressing for all central catheters, with standardization and reeducation of bedside staff on central catheter dressing changes.

RESULTS Of 5226 intensive care unit patients, the mean CLABSI rate was 4.42 (95% CI, 2.93-5.91) infections per 1000 patient central catheter days during the year before implementation, which decreased to 0.70 (95% CI, –1.21 to 2.61) in the 3 years after implementation. Clinicians reported the new strategy was easy to use and superior to disposable stethoscopes.

CONCLUSION A CLABSI bundle that included touch-free, aseptic stethoscope hygiene barriers and chlorhexidine-impregnated dressings was highly effective at decreasing the CLABSI rate. (*Critical Care Nurse*. 2026;46[5]:61-66)

A central line [catheter]–associated bloodstream infection (CLABSI) is defined as a primary bloodstream infection (BSI) occurring in a patient with a central catheter placed during the 2 calendar days before BSI development and that is unrelated to an infection at another site.¹ Its incidence commonly ranges from 0.5 to 5 infections per 1000 central catheter days, depending on the setting and population being evaluated, and its consequences are dire.² In one 2024 meta-analysis of 16 studies, the odds ratio for CLABSI-associated acute mortality was 3.19 (95% CI, 2.44-4.16), and the hospitalization length of stay was increased by 16.14 days (95% CI, 9.27-23.01) compared with that of uninfected

controls.³ There are as many as 60 400 annual primary BSIs in US hospitals related to central venous catheters, at an estimated cost of \$48 000 each.⁴ This value suggests a total annual US cost of \$1.85 billion.⁵⁻⁷

It is clear that various factors contribute to CLABSI. One 2023 meta-analysis of 15 studies representing 32 198 patients reported 38 risk factors contributing to CLABSI rates.⁸ Addressing each of these contributors thus creates a scenario requiring the implementation of multiple methods, each targeted at different aspects of decreasing the CLABSI rate. To address this complexity, and con-

sistent with the

most recent (2024) guideline recommendations,

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CLABSI reduction interventions are most frequently constructed into a “bundle of strategies” format.⁹ These bundles commonly include bedside staff education regarding central catheter dressing changes, daily infection prevention rounds and catheter checks, alerts for blood culture orders, and prompt central catheter downgrades. Unfortunately, the impact of stethoscope hygiene as part of a bundle to address the CLABSI rate has been poorly described.

It is well documented that the stethoscope harbors a multitude of pathogens identical to those found on the hands.^{10,11} It is quite possible that hand pathogens carried on the stethoscope may contribute to patient contamination and ultimately result in a CLABSI. However, unlike cleaning the hands, the practice of cleaning the stethoscope with alcohol is an ineffective strategy for providing an aseptic patient contact.¹² Within the past 6 years, a touch-free dispenser that applies a single-use, aseptic diaphragm cover to the stethoscope (AseptiScope, Inc) has

become available.^{13,14} Although the disposable stethoscope hygiene barrier provides an aseptic point of contact, its impact when included as part of a CLABSI reduction bundle has not been previously evaluated.

Using chlorhexidine gluconate (CHG) as a hygiene adjunct, applied either for total body bathing¹⁵ or within central catheter caps,¹⁶ may aid in reducing the CLABSI rate. Although these CHG strategies reduce the CLABSI rate by as much as 50%, they do not eliminate CLABSI occurrence. Chlorhexidine gluconate technology has been applied to central catheter dressings, either as an impregnated disc dressing or as a gel dressing placed at the site of catheter entry, and may represent another CLABSI prevention bundle option.¹⁷⁻¹⁹

In 2020, due to the rising rate of CLABSI in our local intensive care unit (ICU), we explored the addition of 2 strategies to our existing CLABSI prevention bundle. Our purpose was to perform a quality improvement project determining the effects of incorporating stethoscope hygiene barriers and CHG dressing initiatives into our current CLABSI prevention measures.

Methods

This descriptive project used the PDSA (plan-do-study-act) strategy. It was performed in the southeastern United States at an 18-bed tertiary care ICU, which evaluated the CLABSI rate during the 48-month period from March 1, 2021, to March 1, 2025. Results and methodology are reported consistent with the SQUIRE (Standards for Quality Improvement Reporting Excellence) guidelines.²⁰ This project was performed because of identifying an increased rate of CLABSI noted as part of our standard quality improvement observation practice.

At the time this project was performed, our standard of care CLABSI prevention maintenance bundle consisted of constant aseptic care monitoring for ongoing central catheter management. This bundle included hand hygiene reminders and monitoring, disinfection (“scrub the hub” reminders) before central catheter access, daily review of central catheter necessity with prompt removal if judged as no longer needed, disposable stethoscopes in each isolation room and for each patient under isolation status, and weekly recording of all CLABSI. Following any CLABSI event, interprofessional meetings were held to evaluate the cause and address any necessary interventions going forward.

The team involved in this project consisted of 2 nurses, employed by the hospital’s department of infection

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prevention, who were responsible for tracking CLABSI rates throughout the hospital, interacting with and providing education to unit staff, implementing best practice strategies, reassessing the impact of interventions, and providing feedback to the ICU staff. As part of this strategy, we performed a before and after evaluation of the changes in the CLABSI rate occurring after the implementation of the addition of 2 interventions to the previously existing CLABSI bundle. The new interventions consisted of (1) removal of disposable stethoscopes and the installation of a touch-free, aseptic stethoscope diaphragm cover dispenser in each ICU room (DiskCover System, AseptiScope, Inc), and (2) the mandatory requirement of CHG-impregnated dressing for all central catheters, with standardization and reeducation of bedside staff on central catheter dressing changes (with the requirement of a return demonstration).

The CLABSI rates, defined as the number of infections per 1000 central catheter days, were measured and documented by the hospital's department of infection prevention, then presented monthly to the unit staff, consistent with the standards of the National Healthcare Safety Network criteria.²¹ To measure compliance with CHG-impregnated dressing usage, documentation from the electronic health record was audited for those patients identified as having had a CLABSI. Monthly compliance and CHG-impregnated dressing usage documentation rates were regularly communicated in chart format to the ICU leadership via email, during daily huddles, and at leadership meetings.

A user acceptance survey, evaluating opinions regarding the addition of the touch-free, aseptic stethoscope hygiene barrier to the CLABSI prevention bundle, was distributed to all physician, nursing, and respiratory medical ICU staff and was collected by the department of infection prevention to compile and evaluate responses. Other than routine institutional support to improve the standard of care, this project received no financial support for any aspect of its performance.

Overall, we did not control for missing data in this observational project. Data are presented descriptively, with comparisons presented as 95% confidence intervals. Finally, this quality improvement project was deemed exempt from institutional review board approval.

Results

We recorded monthly CLABSI rates from March 1, 2021, to March 1, 2025, evaluated over 48 one-month

periods. In total, 5226 patients were admitted to the ICU during this time. During the 12-month period before the new CLABSI bundle was implemented, from March 1, 2021, to March 1, 2022, there were 1189 ICU admissions, with a mean CLABSI rate of 4.42 (95% CI, 2.93-5.91) infections per 1000 patient central catheter days.

The described changes to the CLABSI bundle were instituted on March 1, 2022. A single-use, touch-free, aseptic stethoscope diaphragm cover dispenser was placed in each ICU room, and the standardized CHG-impregnated dressing kit was implemented. Subsequently, during the 36-month period from March 1, 2022, to March 1, 2025, there was a total of 4037 ICU admissions with a mean CLABSI rate of 0.70 (95% CI, -1.21 to 2.61) infections per 1000 patient central catheter days. This value represents an absolute decrease of 3.72 infections per 1000 patient central catheter days, constituting a relative 84% decrease after the implementation of the new CLABSI bundle (Figure 1). Each case represented a single patient. If multiple infections occurred in an individual patient, they were counted as 1 infection for the analysis.

Overall, although touch-free stethoscope diaphragm cover dispensers were placed into each of the 18 ICU rooms, compliance with stethoscope hygiene was not determined, as stethoscope use was not constantly supervised; however, the dispensers (which each have a cassette holding 420 diaphragm covers) required regular cassette replacement after installation, indicating their regular use. Furthermore, after the CLABSI bundle implementation changes, all central catheters were changed using the same kit and CHG-impregnated dressing, such that compliance for this strategy of the CLABSI bundle was more than 95%, as noted in daily rounding and chart review.

Finally, 45 user acceptance surveys were distributed and 28 (62%) were returned. They were completed by 18 (64%) nurses, 7 (25%) physicians, and 3 (11%) respiratory therapists. Overall, all answers to the survey's questions were positive (Figure 2). All users (100%) reported that the barrier was easy to use, created less medical waste, and was easy to attach and remove. Most (81%) preferred the barrier to the disposable stethoscope, 81% reported that they cleaned their stethoscope between each patient, and 81% stated that the barrier provided confidence that they were not spreading germs between patients. Last, 96% of survey respondents felt they were more likely to be compliant with isolation guidelines, and 96% felt the stethoscope

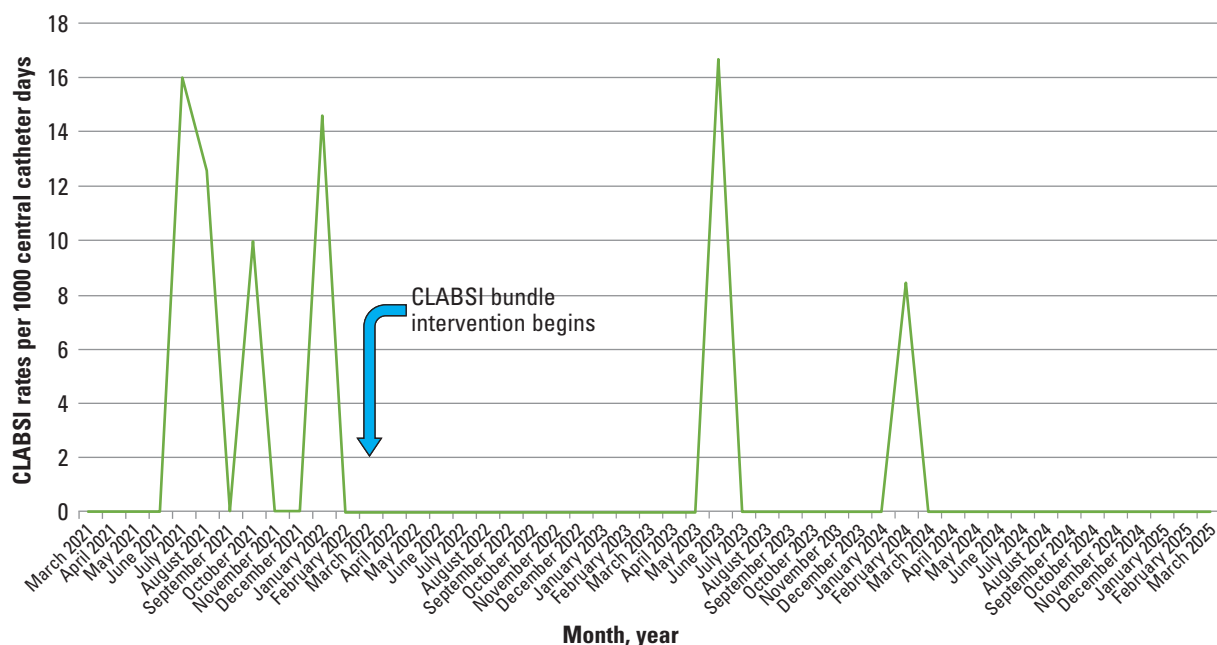


Figure 1 Central line [catheter]–associated bloodstream infection (CLABSI) rates by month.

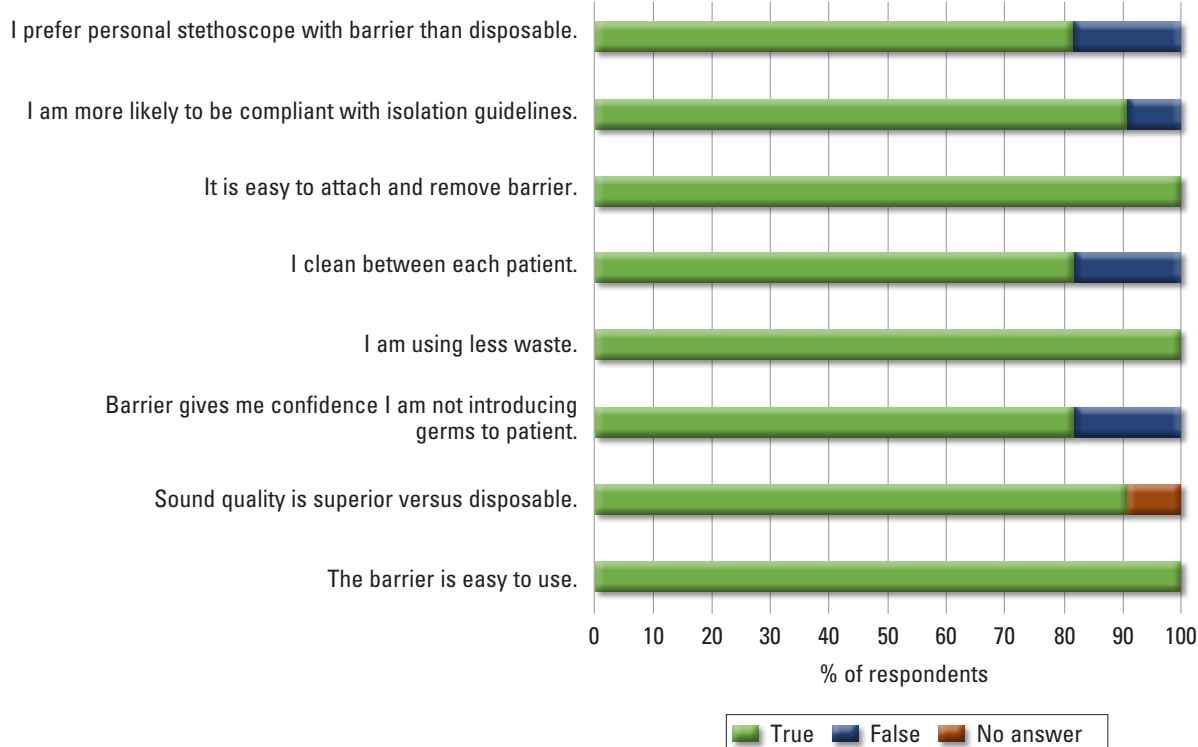


Figure 2 Survey results based on implementing aseptic stethoscope hygiene barriers.

sound quality with the barrier was superior to that of the disposable stethoscope.

Discussion

A marked decrease in the CLABSI rate occurred with the implementation of single-use, touch-free, aseptic stethoscope diaphragm covers and the addition of a CHG-impregnated dressing kit to the previous standard of care CLABSI prevention bundle. Our finding of an 84% decrease in CLABSI events is important because, if duplicated nationally, this finding could represent a decrease of up to 50 736 annual CLABSI events in the United States, corresponding to \$1.5 billion in cost savings.

Our strategy of implementing CHG-impregnated dressings and single-use, touch-free stethoscope hygiene barriers represents relatively low-cost and low-intensity interventions that require minimal staff education and limited workflow alterations. If included in institutional policy and procedures, these low-intensity interventions are likely to lead to increased adoption, rather than resistance to implementation, by clinical workforce staff. The ease of adopting the 2 interventions documented in our project are mirrored by (1) the results of the staff survey that reported general approval of the single-use, touch-free stethoscope diaphragm covers and (2) more than 95% compliance with CHG-impregnated dressing use, as noted in daily rounding and chart review. The consideration of “ease of use” represents an important aspect of compliance when considering the effect of the CLABSI infection bundle. In other studies, noncompliance with various parts of a CLABSI prevention bundle directly related to a higher rate of CLABSIs.²²

The stethoscope diaphragm has pathogens identical in quantity and diversity to that of the practitioner’s hands.^{10,11} However, unlike the practitioner’s hands, for which alcohol rubs can significantly decrease the quantity of pathogens, the stethoscope diaphragm is inherently difficult to effectively clean. Furthermore, although multiple publications have reported that medical staff rarely clean their stethoscope diaphragm (thus potentially providing a source for patient pathogen exposure), even when the diaphragm is scrubbed for a full 60 seconds with an alcohol swab, pathogens may persist.¹² Ultimately, providing an aseptic cover for a stethoscope diaphragm eliminates another source of potential CLABSI pathogens.

Importantly, the use of CHG-impregnated central catheter dressings has been associated with a decreased

rate, although not elimination, of CLABSIs in several studies.¹⁷⁻¹⁹ By providing an antiseptic agent at the point of contact with the central catheter, it is believed that fewer pathogens would have access to the central catheter at the point of entry into the bloodstream. This approach suggests another mechanistic explanation of our findings: that the combination of stethoscope and central catheter hygiene is superior to either as a solo implementation. Ultimately, our intervention combined 2 new strategies to decrease the CLABSI rate. By preventing pathogen exposure from the stethoscope diaphragm, in combination with an aseptic hygiene barrier in the form of a CHG-impregnated dressing at the site of the central catheter entry, we leveraged the potential effect of both strategies. However, as these interventions were done simultaneously, we cannot determine if either single intervention had a dominant effect on the CLABSI rate; thus, our findings are limited to the combination of the procedures.

Ultimately, this observational project has several important strengths. First, as the data were collected for more than 4 years, the data suggest that the findings are robust and may be generalizable to other ICUs. Second, these interventions were the only process changes to occur during this period, further supporting our findings. Third, by combining an intervention known to decrease rates of, but not eliminate, CLABSIs (ie, CHG dressings) with a new strategy (aseptic stethoscope hygiene barriers), the effect of the new strategy can be

considered the result of an additional

Providing an aseptic cover for a stethoscope diaphragm eliminates another source of potential CLABSI pathogens.

improvement that occurred with the combination of CHG dressings and aseptic stethoscope hygiene barriers.

Our project has several limitations. First, this was an unblinded observational project, with data reported from a single ICU. Thus, the impact of our intervention, when applied in different environments, may be unclear and will require future investigation in different medical care locations to provide greater generalizability. Second, the CLABSI reporting infrastructure in our dataset was temporally variable such that the time periods between the observations were not even. Thus, we cannot determine the potential impact of increased CLABSI reporting. Third, although we must consider that the Hawthorne effect²³ (when individuals modify their behavior while being observed) may have contributed to our initial

postimplementation results as a function of increased hygiene rates, its well-documented transient nature would likely be mitigated over the course of our 3-year follow-up period.

Conclusions

Implementation of stethoscope hygiene by using a touch-free, aseptic diaphragm cover dispenser coupled with the application of CHG-impregnated central catheter dressings was associated with an immediate, marked, and persistent decrease in the CLABSI rate to zero for periods exceeding 1 year. As CLABSIs are associated with increased mortality, this finding has the potential to provide significant value for the delivery of care in environments currently using central catheters. Because our interventions demonstrated very low CLABSI rates consistently over a 4-year period, require minimal changes to the existing workflow, and have a low environmental impact and limited costs, they are likely to be sustainable. Further prospective study is warranted to identify additional environments and applications beyond the ICU where the use of stethoscope hygiene and CHG-impregnated dressings are likely to be of significant value. These environments and applications may include oncology, transplant, and infectious control management. **CCN**

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Financial Disclosures

W. Frank Peacock has stock and ownership interests in AseptiScope, Inc.

See also

To learn more about reducing central line [catheter]-associated bloodstream infections, read “Beyond the Bundle: Decreasing Central Catheter–Associated Bloodstream Infections” by Barwick and Jendzio in *AACN Advanced Critical Care*, 2025;36(3):278-288. <https://doi.org/10.4037/aacnacc2025395>. Available at www.aacnconline.org.

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