






Letter to the Editor

Outbreak of central-line–associated bloodstream infections (CLABSIs) amid the coronavirus disease 2019 (COVID-19) pandemic associated with changes in central-line dressing care accompanying changes in nursing education, nursing documentation, and dressing supply kits

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To the Editor—Central-line–associated bloodstream infections (CLABSIs) result in roughly 28,000 preventable deaths each year at an average cost of \$45,814 per infection.¹ Central-line bundles have been shown to achieve zero CLABSIs.² The Centers for Disease Control and Prevention (CDC) guidelines recommend dressings impregnated with chlorhexidine gluconate (CHG) for patients aged ≥ 18 years to protect the site of insertion due to their effectiveness in preventing CLABSI.^{3,4}

Our hospital reported no cases of CLABSI for 18 months between April 2019 and November 2020. However, from November 2020 to March 2021, we encountered at least 1 CLABSI each month for a total of 7 CLABSIs in this 5-month period. This report describes our investigation into the outbreak and its principal findings, which were largely related to changes in the use of CHG-impregnated dressings.

Methods

Infection preventionists at the Veterans Health Administration Nebraska-Western Iowa Health Care System Omaha Veterans Affairs Medical Center used the National Healthcare Safety Network (NHSN) CLABSI definition to conduct a retrospective chart review of patients with CLABSI amid the COVID-19 pandemic. They also interviewed relevant hospital staff. The data

collected from the investigation included the line insertion date, date of bacteremia detection, species and susceptibility of organism, location of the patient, healthcare provider who had inserted the central line, and the physician and nursing staff responsible for the patient.

Results

The first case of CLABSI in the outbreak (Table 1) was detected in November 2020. Prior to that, no CLABSI had occurred since April 2019.

The cases of CLABSI were associated with different microorganisms. Although 3 patients had COVID-19, none had been placed in the prone position. In February 2021, a nurse performing central-line dressing care noted that a CHG disc was not present at the insertion site. Further investigation revealed deviations in nursing training, documentation, and standard practices in central-line dressing care. The semiannual in-person nursing competency training sessions, which had included central-line dressing care, had continued through October 2019, but subsequently had been paused because of social-distancing concerns. The hospital had streamlined inpatient nursing documentation in March 2020 in anticipation of a new electronic health record and to reduce workload due to COVID-19 demands. Specifically, the streamlined documentation was less explicit regarding central-line care. Before November 2020, CHG-impregnated discs were included in central-line kits. Subsequently, new kits without these discs were used.

A weekly audit of dressing care began in March 2021. Among the changes made then was the reintroduction of CHG-impregnated discs in the central-line kits. No CLABSIs were identified in April 2021 nor the subsequent 7 months.

Notably, the number of patients hospitalized in the Omaha area with COVID-19 during this 5-month period peaked at 450 patients in November 2020 and decreased to ~ 75 patients in March 2021. At times nursing staff were deployed to inpatient

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Table 1. Listing of Cases of Central-Line-Associated Bloodstream Infections

Date of Positive Culture	Organism	Resistance	Susceptibility	SARS-CoV-2
11/12/20	<i>Bacteroides fragilis</i>			Negative
11/24/20	<i>Escherichia coli</i>	Ampicillin, ampicillin-sulbactam	Cefazolin, cefepime, ceftriaxone, ciprofloxacin, gentamicin, piperacillin-tazobactam, trimethoprim-sulfamethoxazole (TMP-SMX)	Positive (11/13/20)
	<i>Staphylococcus aureus</i>	Azithromycin, oxacillin, penicillin	Clindamycin, gentamicin, levofloxacin, linezolid, tetracycline, TMP-SMX, vancomycin	
	Coagulase-negative <i>Staphylococcus</i>			
12/22/20	<i>Klebsiella aerogenes</i>	Ampicillin, ampicillin sulbactam, cefazolin, piperacillin tazobactam	Cefepime, ciprofloxacin, gentamicin, TMP-SMX, ceftriaxone ^a	Positive (11/27/20)
1/9/21	<i>Enterococcus faecalis</i>		Linezolid, penicillin, vancomycin, gentamicin, streptomycin	Negative
1/28/21	<i>E. faecalis</i>	Gentamicin	Linezolid, penicillin, vancomycin, streptomycin	Positive (12/17/20)
	<i>Klebsiella oxytoca</i>	Ampicillin	Ampicillin-sulbactam, cefazolin, cefepime, ceftriaxone, ciprofloxacin, gentamicin, piperacillin-tazobactam, TMP-SMX	
2/19/21	<i>E. coli</i>	Ampicillin, ampicillin-sulbactam, TMP-SMX	Cefazolin, cefepime, ceftriaxone, ciprofloxacin, gentamicin, piperacillin-tazobactam	Negative
3/5/21	<i>E. coli</i> (3/5/21)	Ampicillin, ampicillin-sulbactam, cefazolin, ciprofloxacin, TMP-SMX	Cefepime, gentamicin, piperacillin-tazobactam, ceftriaxone ^a	Negative
	<i>B. fragilis</i> (3/3/21)			

Note. TMP-SMX, trimethoprim-sulfamethoxazole.

^aIndicates intermediate susceptibility.

units with which they were unfamiliar, but patient:nurse staffing ratios did not change.

Discussion

Multiple factors might have contributed to an outbreak of CLABSIs in a hospital that had experienced none in the 18 months before November 2020. These factors include the introduction of central-line insertion kits that omitted CHG-impregnated discs; the presence of these discs was meant to act as a reminder for their use in central-line care.⁵

Several randomized controlled trials have provided evidence that CHG dressings reduce the risk of central-line infection.⁴ The omission of CHG conceivably may have contributed to the outbreak, especially given that the reintroduction of CHG in central-line kits in March 2021 was temporally associated with the cessation of CLABSIs.

Also, changes in health record documentation practice may have had unintended consequences of omitting components that serve to remind nurses of elements of central-line care. Because of the desire to minimize face-to-face contact, competency training which had been held in a large open room with multiple stations had been omitted, possibly at the cost of losing reinforcement of nursing skills. The first cases of the outbreak occurred at a peak of COVID-19 hospitalizations in Omaha. However, the hypothesis that the increased workload due to COVID-19 triggered the outbreak is not supported by its persistence into March 2021, at which point the number of COVID-19 patients hospitalized in Omaha was greatly reduced.

One hospital system has reported an increase in CLABSI rates >50% associated with the pandemic.⁶ Others have noted

that prone positioning of COVID-19 patients interfered with regular inspections and ready access to central-line sites, compromising their care and increasing the frequency of CLABSI.⁷ However, none of the patients had been placed in the prone position. Other hospitals reported an increase in CLABSIs secondary to changes in infection prevention protocol among nurses to reduce the frequency of contact with patients and to combat the shortage of PPE and supplies during the COVID-19 pandemic.⁸

In contrast to our experience, some hospitals reported that the rate of CLABSI and other healthcare-associated infections decreased significantly due to stricter precautions put in place due to COVID-19.⁹

The Swiss cheese model of error prevention hypothesizes that undesirable events occur when multiple measures intended to prevent errors are simultaneously compromised.¹⁰ In the face of COVID-19, this outbreak developed at a time that at least 3 separate barriers were compromised, which may be consistent with the Swiss cheese model.

Our conclusions have limitations. First, we do not know whether CHG discs were absent in all the CLABSI patients. However, we suspect that was the case. Several factors may have led to less use of discs during the outbreak, and efforts to reinforce the importance of discs were associated with termination of the outbreak. Second, changes in nursing staff deployment might explain the occurrence of the outbreak. Nonetheless, even though the number of patients hospitalized in Omaha with COVID-19 during the outbreak period decreased, the outbreak persisted for five months.

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References

1. Zimlichman E, Henderson D, Tamir O, *et al.* Healthcare-associated infections: a meta-analysis of costs and financial impact on the US healthcare system. *JAMA Intern Med* 2013;173:2039–2046.
2. Gupta P, Thomas M, Patel A, *et al.* Bundle approach used to achieve zero central-line-associated bloodstream infections in an adult coronary intensive care unit. *BMJ Open Qual* 2021;10:e001200.
3. Talbot III TR, Stone EC, Irwin K, Overholt AD, Dasti M, Kallen A. Updated recommendations on the use of chlorhexidine-impregnated dressings for prevention of intravascular catheter-related infections, 2017. Centers for Disease Control and Prevention website. www.cdc.gov/infectioncontrol/guidelines/bsi/c-i-dressings/index.html. Published 2017. Accessed July 21, 2021.
4. Timsit JF, Schwebel C, Bouadma L, *et al.* Chlorhexidine-impregnated sponges and less frequent dressing changes for prevention of catheter-related infections in critically ill adults: a randomized controlled trial. *JAMA* 2009;301:1231–1241.
5. Drews FA, Bakdash JZ, Gleed JR. Improving central-line maintenance to reduce central-line-associated bloodstream infections. *Am J Infect Control* 2017;45:1224–1230.
6. Fakhri MG, Bufalino A, Sturm L, *et al.* Coronavirus disease 2019 (COVID-19) pandemic, central-line-associated bloodstream infection (CLABSI), and catheter-associated urinary tract infection (CAUTI): the urgent need to refocus on hardwiring prevention efforts. *Infect Control Hosp Epidemiol* 2022;43:26–31.
7. Stifter J, Sermersheim E, Ellsworth M, *et al.* COVID-19 and nurse-sensitive indicators: using performance improvement teams to address quality indicators during a pandemic. *J Nurs Care Qual* 2021;36:1–6.
8. Patel PR, Weiner-Lastinger LM, Dudeck MA, *et al.* Impact of COVID-19 pandemic on central line-associated bloodstream infections during the early months of 2020, National Healthcare Safety Network. *Infect Control Hosp Epidemiol* 2021. doi: 10.1017/ice.2021.108.
9. Heidempergher M, Sabiu G, Orani MA, Tripepi G, Gallieni M. Targeting COVID-19 prevention in hemodialysis facilities is associated with a drastic reduction in central venous catheter-related infections. *J Nephrol* 2021;34:345–353.
10. Reason J. Human error: models and management. *BMJ* 2000;320:768–770.