Infection Control & Hospital Epidemiology (2023), **44**, 1697–1703
doi:10.1017/ice.2023.11

SHEA

Research Brief

Central-line–associated bloodstream infections secondary to anaerobes: Time for a definition change?

Jessica L. Seidelman MD, MPH[1,2], Ibukunoluwa C. Kalu MD[1,3], Sarah S. Lewis MD, MPH[1,2], Deverick J. Anderson MD, MPH, FIDSA[1,2] and Becky A. Smith MD, FIDSA[1,2]

[1]Duke Center for Antimicrobial Stewardship and Infection Prevention, Durham, North Carolina, [2]Division of Infectious Diseases, Duke University Medical Center, Durham, North Carolina and [3]Division of Pediatric Infectious Diseases, Duke University Medical Center, Durham, North Carolina

Primary central-line–associated bloodstream infection (CLABSI) pathogenesis occurs via 1 of 2 mechanisms: bacteria on the skin migrate along the external surface of the catheter from the catheter exit site toward the intravascular space or bacteria are directly inoculated by contamination of the hub. In contrast, anaerobic bacteria, which commonly colonize mucous membranes of the mouth, gastrointestinal tract, and genital tract, lack detoxifying enzymes to break down oxygen-reduction products and cannot survive in the presence of oxygen. The National Health Safety Network (NHSN) established the mucosal barrier injury–laboratory confirmed bloodstream infection (MBI-LCBI) definition in 2013 to acknowledge that some patients have BSIs due to mucosal barrier translocation.[1] Based on current National Healthcare Safety Network (NHSN) definitions, mucosal barrier translocation of anaerobic bacteria in the MBI-LCBI definition only applies to immunocompromised patients.[2] A nonimmunocompromised patient with a central catheter and a blood culture growing an anaerobic organism can still meet the CLABSI criteria despite both primary mechanisms of CLABSI requiring bacterial exposure to atmospheric oxygen. Here, we have described the epidemiology of anaerobic CLABSI, and we evaluated the impact of modifying the MBI-LCBI definition to include CLABSI caused by obligate anaerobic bacteria in nonimmunocompromised patients with central catheters.

Methods

We performed a retrospective analysis of 54 hospitals in the southeastern United States from January 2015 to December 2021 using the Duke Infection Control Outreach Network (DICON) database and the Duke University Hospital Infection Control database. Most of these hospitals were community hospitals in North Carolina, South Carolina, Georgia, Virginia, and Florida. The median inpatient bed size was 142 (range, 6–611). We also included Duke University Hospital, which is an academic, quaternary-care medical center with 978 inpatient beds. We calculated the proportion of CLABSIs attributed to obligate anaerobes.

Author for correspondence: Jessica L. Seidelman, E-mail: jessica.seidelman@duke.edu

PREVIOUS PRESENTATION. Preliminary data for this manuscript were presented in an oral presentation at the Society for Healthcare Epidemiology of America 2022 Spring conference on April 13, 2022, in Colorado Springs, Colorado.

Cite this article: Seidelman JL, *et al.* (2023). Central-line–associated bloodstream infections secondary to anaerobes: Time for a definition change?. *Infection Control & Hospital Epidemiology*, 44: 1697–1698, https://doi.org/10.1017/ice.2023.11

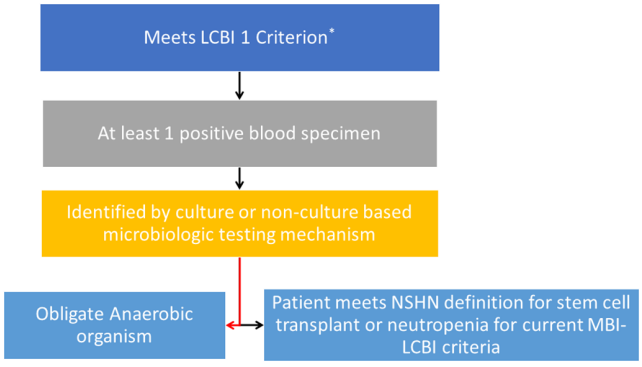

Fig. 1. Suggested new algorithm to determine whether a bloodstream event meets mucosal barrier injury–associated, laboratory-confirmed bloodstream infection criteria. *LCBI 1 criterion is defined as a recognized bacterial or fungal pathogen, not included on the NHSN common commensal list identified, from 1 or more blood specimens obtained by a culture or identified to the genus or species level by non–culture-based microbiologic testing.

We then performed additional chart review on a subset of anaerobic CLABSI cases from 3 hospitals for which we had access to the electronic medical record (EMR), and we categorized the reasons why primary site-specific infection criteria or MBI-LCBI criteria could not be fulfilled. We then applied a modified definition for MBI-LCBI (Fig. 1) that included all patients who met MBI-LBCI criteria in addition to patients who met LCBI criteria with an obligate anaerobic organism.

Results

Among 2,432 CLABSIs captured over the 7-year study period, 60 (2.5%) were due to obligate anaerobic organisms. Of the anaerobic CLABSIs, 8 (13.3%) were polymicrobial with aerobic or facultative bacteria and 1 (1.7%) was polymicrobial with another anaerobic pathogen. Also, 30 anaerobic CLABSIs (50%) occurred in 1 quaternary-care, academic, medical-center hospital. The most prevalent organisms associated with the anaerobic CLABSI included *Bacteroides* spp (34%), *Clostridium* spp (23%), and *Lactobacillus* spp (17%) (Supplementary Fig. 1 online). The median age of the patients was 58 years and 42% of the patients were women. The median time from central-line insertion to positive culture was 14 days.

Additional chart review of 30 patients (50%) revealed that 25 (83%) died during the same hospital admission. Among these 30 patients, 20 (65%) had a significant immunosuppressing condition at the time of the positive blood culture: 8 (26%) had a hematologic malignancy, 5 (16%) had a solid-organ transplant, 4 (13%) had a bone-marrow transplant, and 3 (10%) had a solid-organ malignancy on chemotherapy. All but 2 cases of the 30 reviewed were treated with antibiotics for these infections.

Moreover, chart review of the 30 anaerobic CLABSI cases (50%) revealed that 25 patients (81%) most likely had secondary bloodstream infections related to gastrointestinal or genitourinary sources based on retrospective chart review. However, primary site-specific infection criteria could not be fulfilled because 15 cases (48%) did not have imaging within the infection window period and 10 (32%) of these cases lacked documentation of the required signs or symptoms. MBI-LCBI criteria could not be fulfilled for 2 patients for whom organisms were not included on the MBI organism list, 4 bone-marrow transplant recipients without graft versus host disease or diarrhea documented, and 25 patients without neutropenia within the 7-day period who otherwise met current MBI-LCBI criteria. Also, 6 (19%) of anaerobic CLABSI cases did not have a clear etiology. All anaerobic CLABSIs would have been reclassified as MBI-LCBIs if the proposed modification to the current definition had been used.

Discussion

We evaluated the relative proportion of CLABSI due to obligate anaerobic organisms and the impact of modifying the MBI-LCBI definition. Although anaerobic CLABSI represent a small proportion of the overall infections, they may disproportionately affect academic medical centers caring for complex patient populations. Specifically, we identified 50% of the anaerobic CLABSIs in 1 academic hospital, with the other 50% spread among the other 53 community hospitals. Based on chart review of these cases, we hypothesized that most of these events represent translocation from the gastrointestinal or genitourinary tract.

The CDC introduced a new MBI-LCBI surveillance definition in 2013 to prevent misclassification of bloodstream infections caused by oral and/ or intestinal microbiota in cancer patients and to improve the comparability of CLABSI rates at cancer and noncancer centers. Reevaluating whether CLABSI should be attributed to obligate anaerobic bacteria presents another opportunity to improve the specificity of the NHSN CLABSI definition and provide more accurate benchmark data.

If the NHSN were to introduce an additional branch point for obligate anaerobic pathogens prior to determining whether a patient meets the neutropenia definition or received a stem-cell transplant as proposed in our modified algorithm, then anaerobic CLABSI could be better classified as MBI-LCBI.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/ice.2023.11.

Acknowledgments.

Financial support. No financial support was provided relevant to this article.

Conflicts of interest. All authors report no conflicts of interest relevant to this article.

References

1. National Healthcare Safety Network. NHSN version 7.1 (February 2013) release notes. Centers for Disease Control and Prevention website. https://www.cdc.gov/nhsn/pdfs/commup/Release-Notes-v7-1.pdf. Published February 2013. Accessed November 21, 2022.
2. Bloodstream infection event (central-line–associated bloodstream infection and non–central-line–associated bloodstream infection). Centers for Disease Control and Prevention website. https://www.cdc.gov/nhsn/pdfs/pscmanual/4psc_clabscurrent.pdf. Published January 2022. Accessed November 21, 2022.

Incidence and outcomes of hospital-associated coronavirus disease 2019 (COVID-19) before and after emergence of the severe acute respiratory coronavirus virus 2 (SARS-CoV-2) omicron variant

Victoria R. Williams MPH[1], Charlie Tan MD[1,2], Robert Kozak PhD[3] and Jerome A. Leis MD, MSc[1,2]

[1]Infection Prevention and Control, Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada, [2]Division of Infectious Diseases, Department of Medicine, University of Toronto, Ontario, Canada and [3]Shared Hospital Laboratory, Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada

The severe acute respiratory coronavirus virus 2 (SARS-CoV-2) o (omicron) variant has been associated with broader community transmission compared to earlier variants but lower mortality.[1,2] We sought to determine whether similar trends apply to hospital-associated coronavirus disease 2019 (HA–COVID-19) cases.

We conducted a prospective quality improvement study assessing the risk and outcomes of HA–COVID-19 before and after the emergence of the SARS-CoV-2 o (omicron) variant. From November 1, 2020, to December 14, 2022, all patients admitted to our healthcare facility were tested for SARS-CoV-2 on admission using a reverse-transcriptase polymerase chain reaction (RT-PCR) assay.[3] Retesting occurred in response to development of new symptoms, after exposure to a SARS-CoV-2–positive

Author for correspondence: Jerome A. Leis, E-mail: jerome.leis@sunnybrook.ca

Cite this article: Williams VR, *et al.* (2023). Incidence and outcomes of hospital-associated coronavirus disease 2019 (COVID-19) before and after emergence of the severe acute respiratory coronavirus virus 2 (SARS-CoV-2) omicron variant. *Infection Control & Hospital Epidemiology*, 44: 1698–1700, https://doi.org/10.1017/ice.2023.29