COMMENTARY

# Improving the Central Line–Associated Bloodstream Infection Surveillance Definition: A Work in Progress

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(See the article by See et al, on pages 769–776.)

Surveillance of healthcare-associated infections (HAIs) historically has been performed at hospitals to define endemic rates, track longitudinal trends, and help detect outbreaks. These hospital-specific infection data are also essential for measuring the impact of improvement efforts aimed at preventing HAIs. Having a standardized surveillance definition for HAIs is necessary to allow benchmarking of an individual hospital's performance against others. For years, these reference data were provided by a defined group of hospitals that voluntarily submitted surveillance data to the Centers for Disease Control and Prevention's (CDC's) National Nosocomial Infection Surveillance (NNIS) system. The transition of NNIS system to the National Healthcare Safety Network (NHSN) and new state and federal requirements to report data to the NHSN have transformed the landscape of national HAI reporting. In an era of increasing public scrutiny, the NHSN has become a means to supply HAI data for public reporting.

The elusiveness of establishing ideal surveillance definitions has been noted for years. As stated by Frank Rhame in 1987, "Conversion of real world events into categorical data presents formidable difficulties."[1(p454)] Surveillance definitions have been repeatedly revised on the basis of accumulated experience, new knowledge, and shifting uses for data. While refining surveillance definitions is important to improve their accuracy, revisions to HAI surveillance definition modifications must be validated to ensure that the intended benefits of the new definitions are realized. Additionally, the potential downsides of definition changes must be recognized, including loss of longitudinal integrity of data and confusion due to changing criteria.

At times, competing needs have led to trade-offs pitting standardization and sensitivity against clinical accuracy and specificity. Historically, the NHSN has favored enhanced sensitivity over specificity, which was reasonable when surveillance was used primarily by hospitals for benchmarking, internal trending, and performance improvement. As an example of the standardization versus specificity trade-off, in 2012 the NHSN changed the surveillance definition of central line–associated bloodstream infections (CLABSIs) to disallow the use of susceptibility test results to determine the relatedness of 2 blood isolates of coagulase-negative staphylococci. This change was made because of differences in susceptibility testing practices across reporting hospitals. The result was an inclusion, as CLABSIs, of some blood isolates that were previously categorized as contaminants by prior surveillance definitions and by clinicians.

The new mucosal barrier injury laboratory-confirmed bloodstream infection (MBI-LCBI) definition was developed in response to growing concerns within and beyond the hospital epidemiology community that existing definitions for CLABSI misclassify bloodstream infections due to translocation of gut microbiota in at-risk immunocompromised patients and incorrectly associate them with a central line. Consequently, distinguishing MBI-LCBIs from CLABSIs should add specificity to the surveillance definition and allow a more accurate assessment of the quality of preventive care given to immunocompromised patients with central lines in place.[2] Separating MBI-LCBIs from CLABSIs should also increase confidence in interinstitutional comparisons of publicly reported CLABSI rates. Many clinicians and hospital epidemiologists have expressed concern that publicly reported data are subject to overt and subtle ascertainment bias,[3] and there are ongoing murmurings that some institutions have identified events included in the MBI-LCBI definition as secondary bloodstream infections and have excluded them from external reports.

The article by See et al[4] in this issue of the journal represents a field test of this definition change. This field test uncovered some practical limitations of the proposed MBI-LCBI definition, allowing modification before its integration into CLABSI surveillance. For example, the proposed MBI-LCBI definition included a criterion for a white blood cell count or absolute neutrophil count of less than 100/mm$^3$.

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During the field test, the investigators discovered that some laboratories do not quantify white blood cells to this level, and the final MBI-LCBI definition includes revised criteria that do not include low white blood cell quantitation.

This study identified other issues with the MBI-LCBI definition, some of which will pose challenges for infection preventionists responsible for data collection but that, nonetheless, remain as criteria in the MBI-LCBI modification. The MBI-LCBI definition includes provisions for using the volume of stool output and severity of graft-versus-host disease. These clinical details were documented in the medical record in just over half of the cases reviewed in the field test and will likely prove to be highly variable across reporting hospitals. The authors of the study acknowledge that the MBI-LCBI definition may need further revision. The validation study confirmed findings of other studies indicating that some of the organisms eligible for MBI-LCBI designation, including *Candida* species, are underrepresented among immunocompromised patients with CLABSIs compared with other patients with CLABSIs, suggesting that translocation is not the main route by which these organisms gain access to the bloodstream.[5]

We applaud the CDC for developing the MBI-LCBI definition, undertaking the field test, and revising the MBI-LCBI definition before implementation. In addition, we agree with See and colleagues that the MBI-LCBI definition needs additional study and likely further revision as additional data are generated on whether the data elements can be consistently captured and on which organisms should be included.

Despite the assumption that MBI-LCBIs are caused by translocation of gut organisms, these infections are still considered CLABSIs and are subject to public reporting. As MBI-LCBIs typically do not occur in critical care units (there were no MBI-LCBIs reported from any of the 38 adult critical care units in the study of See and colleagues), for most hospitals these infections do not significantly contribute to data currently reported to Hospital Compare. However, given that the majority of CLABSIs occur outside critical care units, the need to expand reporting outside ICUs is evident.[6] Optimization of the MBI-LCBI definition and exclusion of these infections from publicly reported CLABSI data are needed before national requirements for hospital-wide CLABSI reporting are implemented.

While the MBI-LCBI designation is a step forward, there are potential downsides to its adoption. Our knowledge of translocation events and the populations in which they occur is incomplete. While enteric organisms contribute to the pathogens isolated from the blood of patients with mucosal barrier injury, enterococci are also a leading cause of CLABSIs, so attribution of enterococcal bacteremia to translocation in immunosuppressed patients will underestimate the true rate of CLABSIs.[5,7] There also could be unintended clinical consequences of attribution of bloodstream infections, particularly *Candida* species, to gut translocation, including relapses of true catheter-related infections if infected catheters are not removed. There is evidence that adherence to catheter care bundles can reduce CLABSIs in patients with mucosal barrier injury.[8] Will the creation of a new category of HAI lessen clinicians' commitment to provide consistently excellent catheter care for these very vulnerable patients? We hope the opposite occurs, as excluding MBI-LCBIs from CLABSIs should help identify those infections truly amenable to improvement activities related to central line management. Finally, although meticulous catheter care may not prevent MBI-LCBIs, we should recognize that these events are still iatrogenic and a source of great morbidity. An additional focus could be to develop strategies to prevent bloodstream infections in patients with mucosal barrier injury. In this respect, the new MBI-LCBI designation represents a novel modification of the CLABSI surveillance definition, one that could drive future improvement efforts.

Challenges remain in the quest of making CLABSI surveillance accurate and reliable.[9-11] Given these challenges along with the uses of CLABSI surveillance data to compare the quality of care across hospitals and determine reimbursement, perhaps it is time to change our CLABSI surveillance paradigm. Should surveillance also include a measure of all hospital-acquired bloodstream infections? This strategy has been suggested as a countermeasure to help ensure accuracy of CLABSI surveillance and could potentially uncover other preventable bloodstream infections amenable to novel improvement efforts.[12] We hope that the NHSN continues to work to improve the specificity and reliability of the CLABSI surveillance definition and continues to conduct field tests for definition changes as in the excellent study of See and colleagues—and that it does so with the sense or urgency felt by its constituents in hospitals throughout the country.

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