Infection Control & Hospital Epidemiology (2023), **44**, 962–964
doi:10.1017/ice.2022.156

SHEA

Concise Communication

A survey study of the association between active utilization of National Healthcare Safety Network resources and central-line–associated bloodstream infection reporting

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Abstract

In this survey of 41 hospitals, 18 (72%) of 25 respondents reporting utilization of National Healthcare Safety Network resources demonstrated accurate central-line–associated bloodstream infection reporting compared to 6 (38%) of 16 without utilization (adjusted odds ratio, 5.37; 95% confidence interval, 1.16–24.8). Adherence to standard definitions is essential for consistent reporting across healthcare facilities.

(Received 30 March 2022; accepted 1 June 2022; electronically published 15 July 2022)

Central-line–associated bloodstream infections (CLABSIs) are associated with increased morbidity, mortality, and costs.[1] CLABSIs also influence hospital reimbursement through both the Centers for Medicare & Medicaid Services (CMS) Hospital Acquired Condition (HAC) Reduction Program and the CMS Value-Based Purchasing (VBP) Program. In an effort to standardize reporting, the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network (NHSN) updates annually the definitions and rules for reporting healthcare-associated infections (HAIs), including CLABSIs.[2] However, multiple validation studies suggest that incorrect reporting is prevalent, with 28%–52% of bacteremia episodes meeting the definition of CLABSI not being reported to the NHSN, primarily because of misinterpretation of the surveillance definitions.[3–7] Infection preventionist years of experience and attending an NHSN training session have been associated with accurate CLABSI reporting, though other specific strategies influencing CLABSI reporting have not been extensively studied.[8]

The goal of this survey was to assess whether active utilization of NHSN resources is associated with accurate CLABSI reporting. We hypothesized that active utilization of NHSN resources would increase the likelihood of accurate reporting. We also predicted that the resources allocated to infection control, academic medical center (AMC) classification, and alternative strategies for adjudicating difficult cases could potentially confound this association.

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PREVIOUS PRESENTATION. These data were previously presented as a poster at IDWeek 2018, October 3–6, 2018, in San Francisco, California.

Cite this article: Adams Barker CM, *et al.* (2023). A survey study of the association between active utilization of National Healthcare Safety Network resources and central-line–associated bloodstream infection reporting. *Infection Control & Hospital Epidemiology*, 44: 962–964, https://doi.org/10.1017/ice.2022.156

Methods

Study design and participants

This study was conducted through the Society for Healthcare Epidemiology of America (SHEA) Research Network, a consortium of >100 unique healthcare facilities collaborating on research projects. We created a questionnaire asking respondents to classify 3 vignettes as either a CLABSI reportable to NHSN, a secondary bloodstream infection (BSI), or an infection present on admission (POA) (Supplementary Material, Questionnaire). Also, a multiple-choice question assessed how respondents typically adjudicate difficult cases in which the answers were to (a) e-mail the NHSN, (b) bring the case to a committee, (c) ask the hospital epidemiologist or other physician, (d) use the NHSN manual, or (e) consult other IPs. Additionally, we collected demographic data about the respondent and their institution. The questionnaire was distributed to United States members of the SHEA Research Network in March 2018. This study was determined to be quality improvement only by the Dartmouth College Institutional Review Board.

Exposure, outcomes, and covariates

The primary exposure was active utilization of NHSN resources, and the primary outcome was correct reporting. We defined active utilization of NHSN resources as the selection of options "(a) e-mailed NHSN" and "(d) used NHSN manual," reasoning that these strategies are more predictive of reporting accuracy than others. We defined correct reporting as correctly classifying all 3 vignettes according to the NHSN standards. Respondent-specific covariates included the respondent's background (ie, nursing, laboratory, or other), having a masters of public health degree (MPH), and being a member of SHEA. Facility-specific covariates

included the number of IP FTEs, hospital epidemiologists, total hospital beds, number of intensive care units, and classification as an AMC. We defined infection preventionist full-time equivalents (FTEs) per 100 hospital beds (IP/bed) as a surrogate measure of resources dedicated by hospitals to infection control, dichotomized as ≤1 and >1.[9]

Statistical analysis

We examined the frequency of categorical variables and distribution of continuous variables by univariate analysis. By bivariate analysis, we determined the crude associations between the exposure and covariates. We compared medians of continuous variables using the Wilcoxon rank sum test and proportions of categorical variables using the Pearson χ^2 test or the Fisher exact test as appropriate. We used logistic regression to assess the crude association between the exposure and outcome, expressed as an odds ratio (OR). We assessed the following covariates as potential confounders, selected a priori based on a causal diagram: IP/bed, AMC classification, and alternative methods for adjudicating difficult cases (ie, bring the case to a committee, ask the hospital epidemiologist or other physician, and consult another infection preventionist). We then assessed each potential confounder individually using the change-in-estimate approach (ie, for a covariate to be a confounder, the adjusted OR and crude OR had to differ by >10%). We used Stata version 15.1 software (StataCorp, College Station, TX) for all statistical analyses.

Results

We received responses from 42 (44%) of 95 eligible healthcare facilities, though 1 respondent without demographic data was excluded from the analysis. As shown in Table 1, 25 responded "yes" to e-mailing NHSN and using the NHSN manual. Most respondents had a nursing (49%) or laboratory (22%) background. Few had an MPH degree (17%), and most were members of SHEA (85%). Those reporting active utilization of NHSN resources came from facilities with fewer IP/bed (0.86 vs 1.02) and academic medical centers (64% vs 34%) and were more likely to confer with an MD for case review (52% vs 25%). For other covariates, the groups were similar. Additionally, facility characteristics were similar between the 42 survey respondents and the 95 potential respondents (Supplementary Table 1 online).

As shown in Table 2, a greater proportion of respondents that actively utilized NHSN resources answered all vignettes correctly (18 of 25, 72%) compared to those who did not (6 of 16, 38%), with an unadjusted OR of 4.29 (95% confidence interval [CI], 1.13–016.3). Only 2 of the covariates—IP/bed and AMC classification—modified the OR by >10%; adjusting for these gave an OR of 5.37 (95% CI, 1.16–24.8).

Table 1. Baseline Characteristics by Active Utilization of NHSN Resources

Characteristic	Used NHSN Manual and E-mailed NHSN: Yes (N = 25), No. (%)	Used NHSN Manual and E-mailed NHSN: No (N = 16), No. (%)	*P* Value[a]
Respondent characteristics			
Background			.87
Nurse	13 (52)	7 (44)	
Laboratory	5 (20)	4 (25)	
Other (eg, MD, PhD)	7 (28)	5 (31)	
MPH	7 (28)	0 (0)	.03
Member of SHEA	22 (88)	13 (81)	.66
Facility characteristics			
IPs[b]	5.0 (3.0)	6.0 (6.0)	.38
Hospital epidemiologists[b]	1.1 (1.0)	1.0 (1.0)	.59
Hospital beds[b]	450 (500)	600 (650)	.98
ICUs[b]	5 (5)	5 (6)	.86
IP per 100 beds[b]	0.86 (0.44)	1.02 (0.45)	.11
≤ 1 IP per 100 beds	9 (36)	8 (50)	.37
Academic medical center	16 (64)	6 (38)	.10
Strategies for HAI review			
Attend NHSN workshop	12 (48)	8 (50)	1.00
Confer with committee	7 (28)	3 (19)	0.71
Confer with MD	13 (52)	4 (25)	0.09
Confer with another IP	4 (16)	2 (13)	1.00

Note. NHSN, National Healthcare Safety Network; IP, infection preventionist; MPH, master of public health degree; SHEA, Society for Healthcare Epidemiology of America; ICU, intensive care unit; HAI, healthcare-associated infection.
[a]Pearson χ^2 test or Fisher exact test was used for categorical variables. The Wilcoxon rank-sum test was used for continuous variables.
[b]Median (interquartile range) for continuous variables.

Table 2. Active Utilization of NHSN Resources is Associated With Accurate CLABSI Reporting

Used NHSN Manual and E-mailed NHSN	Correct Reporting, No. (%)[a]	OR (95% CI)	aOR (95% CI)
Yes	18 (72)	4.29 (1.13–16.3)	5.37 (1.16–24.8)
No	6 (38)	Reference	Reference

Note. NHSN, National Healthcare Safety Network; CLABSI, central-line bloodstream infection; OR, odds ratio; CI, confidence interval; aOR, odds ratio adjusted for infection preventionist-to-bed ratio and academic medical center classification.
[a]All vignettes answered correctly.

Discussion

This research is, to our knowledge, the first study showing that active utilization of NHSN resources is associated with accurate CLABSI reporting, even when adjusting for IP/bed and AMC classification. This finding is unsurprising given that the NHSN definitions are stringent and do not always correlate with clinical judgement. The IP/bed ratios modified the OR to a greater degree than AMC data, though not in the expected direction (ie, toward the null). A potential explanation is that unfavorable IP/bed ratios are more common in centers seeing a higher volume and complexity of HAIs, requiring frequent use of NHSN resources. However, individual respondents from these centers might have had poorer performance on this questionnaire because they are more accustomed to working collaboratively on difficult cases.

The strengths of this study include that it was a real-time knowledge assessment while collecting covariates providing uncommon insight into the strategies underlying CLABSI reporting, from a variety of respondents and institutions. This study also had several

https://doi.org/10.1017/ice.2022.156 Published online by Cambridge University Press

limitations. The sample size was relatively small and the response rate was low, which could have resulted in a selection bias, although facility characteristics were similar between respondents to the survey and all potential respondents to whom the survey was sent. Although residual confounding may have been present, additional respondents to this survey from the SHEA Research Network would likely have been more similar (eg, most were from larger acute-care hospitals, academic medical centers and/or teaching hospitals, and members of SHEA), reducing the risk of residual confounding. Also, we assumed that respondents who completed the questionnaire were represented their institution's surveillance practices. This study preceded the current COVID-19 pandemic, which has likely had profound effects on both infection control and prevention and NHSN reporting.

Infection prevention practitioners should use NHSN resources in addition to other tools to assist with accurate reporting of CLABSI events. Because the NHSN continually reassesses its HAI surveillance definitions, an open line of communication with infection preventionists, hospital epidemiologists, and others on the frontlines of infection control will be essential to making HAI surveillance fair and relevant to our patients and healthcare providers.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/ice.2022.156

Acknowledgments.

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

Conflicts of interest. C.M.A.B. has received support from the New England Chapter of the Association for Professionals in Infection Control and Epidemiology (APIC) for meeting attendance and travel as a member of their Board of Directors. M.S.C. has received support from SHEA for meeting attendance and travel as a member of their Conference Planning Committee, and consulting fees from UpToDate. All other authors report no financial support.

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