Short Summary: Testing for C. difficile and Standardized Infection Ratios, National Healthcare Safety Network, 2019

Date: November 2019

Available from: https://www.cdc.gov/nhsn/datastat/index.html

Background:

Clostridioides difficile infection (CDI) is a common healthcare-associated infection (HAI) in the United States that causes approximately 70,000 hospital-onset infections per year. CDC's National Healthcare Safety Network (NHSN) is the nation's largest surveillance system for healthcare-associated conditions and captures nearly all of the facility-onset infections each year. Efforts to prevent hospital-onset CDI, spurred by rigorous surveillance and payment-based performance standards, have resulted in a 30% reduction since 2015 (2018 National and State Healthcare-Associated Infections Progress Report Available at: https://www.cdc.gov/hai/data/portal/progress-report.html).

NHSN is committed to minimizing the burden of reporting for healthcare facilities performing surveillance for HAIs. To that end, since 2009, NHSN's CDI laboratory identified (LabID) event surveillance definition has used a positive diagnostic test result as the sole case-criterion. Testing for *C. difficile* typically relies on nonculture-based techniques of enzyme immunoassays (EIAs) and nucleic acid amplification tests (NAATs) for toxigenic *C. difficile*, used either alone or in combination with one another. These tests vary in sensitivities, specificities, and clinical implications depending on test type and manufacturer. For this reason, NHSN's risk-adjusted standardized infection ratio (SIR) for CDI takes into account the test type in use as reported by each facility. Nevertheless, representatives from some facilities have expressed concern that their choice of test type is driving their performance more than their actual burden of infection. In addition, some facilities deploy a multi-step testing algorithm that uses more than one test type. Starting in January 2018, NHSN adjusted its CDI surveillance protocol by stipulating that when facilities use a multi-step testing algorithm on the same stool specimen, the result of the last test performed, as documented in the medical record, determines whether facilities' CDI rates are adjusted by toxin EIA or by NAAT.

Aim:

To investigate whether reporting using the NAAT test type tends to inflate the SIR, we analyzed CDI LabID data that acute care hospitals submitted to NHSN with event dates between July 1, 2017 and June 30, 2018 and reported to NHSN by December 31, 2018.

Methods:

Acute-care hospitals reported their method of testing for CDI for each quarter. We selected hospital-quarters for which CDI test type was reported as "NAAT" (includes NAAT, GDH+NAAT and GDH+EIA followed by NAAT for discrepant results) and "EIA" (for toxin) (includes EIA and GDH+EIA). The method of NAAT+EIA was not included in this analysis because an update to the NHSN CDI surveillance protocol for January 2018 changed categorization of NAAT+EIA from being NAAT to being EIA. Hospital-onset CDI SIRs were calculated for facility-wide inpatient locations in

accordance with methods specified in the NHSN SIR Guide.[2]

We performed two analyses. (1) Among acute-care hospitals that did not change their reported CDI test type during the study time period, we compared the distribution of SIRs by NAAT vs EIA. (2) Among acute-care hospitals that changed their reported testing methods during the study time period and had 2 consecutive quarters of data for each of EIA and NAAT, we categorized them as having a pattern of EIA-to-NAAT or of NAAT-to-EIA and compared the distribution of SIRs for both patterns. The pooled SIRs for EIA and NAAT were calculated and a paired t-test was used to evaluate the difference of SIR between EIA and NAAT for each pattern.

Results:

Most hospitals (3242) did not switch test types and had SIR values calculated: 2444 (85%) used NAAT and 428 (15%) used EIA (Table 1 and Figure 1). After adjusting for test type, the distributions of the SIRs for acute-care hospitals using NAAT and acute-care hospitals using EIA were highly overlapping and covered the range of SIR values. (Figure 1).

Among acute-care hospitals with a switch-pattern of 2 consecutive quarters of data for each of EIA and NAAT, 42 had the pattern EIA-to-NAAT and 26 had the pattern NAAT-to-EIA. Shown in scatter-plots (Figure 2), the results of switching indicate that acute-care hospitals were equally likely to have an increase or decrease in their CDI SIR based on a change in testing method. Some acute-care hospitals had higher SIRs when using NAAT, and some had higher SIRs when using EIA (Figure 2). The mean SIR difference for hospitals switching from EIA to NAAT was not significant: 0.048 (95% CI -0.189 to 0.284, P=0.688). The mean SIR difference for hospitals switching from NAAT to EIA was also not significant: 0.162 (95% CI -0.048 to 0.371, P=0.124).

Take-Away Points:

These analyses of CDI data reported by thousands of acute-care hospitals to NHSN indicate that using the NAAT did not statistically inflate the SIR versus using EIA. While any individual acute-care hospital may have improved their SIR (or worsened it) by switching to EIA, acute-care hospitals switching to EIA did not preferentially improve their performance based on changing test type alone.

Tables and Figures:

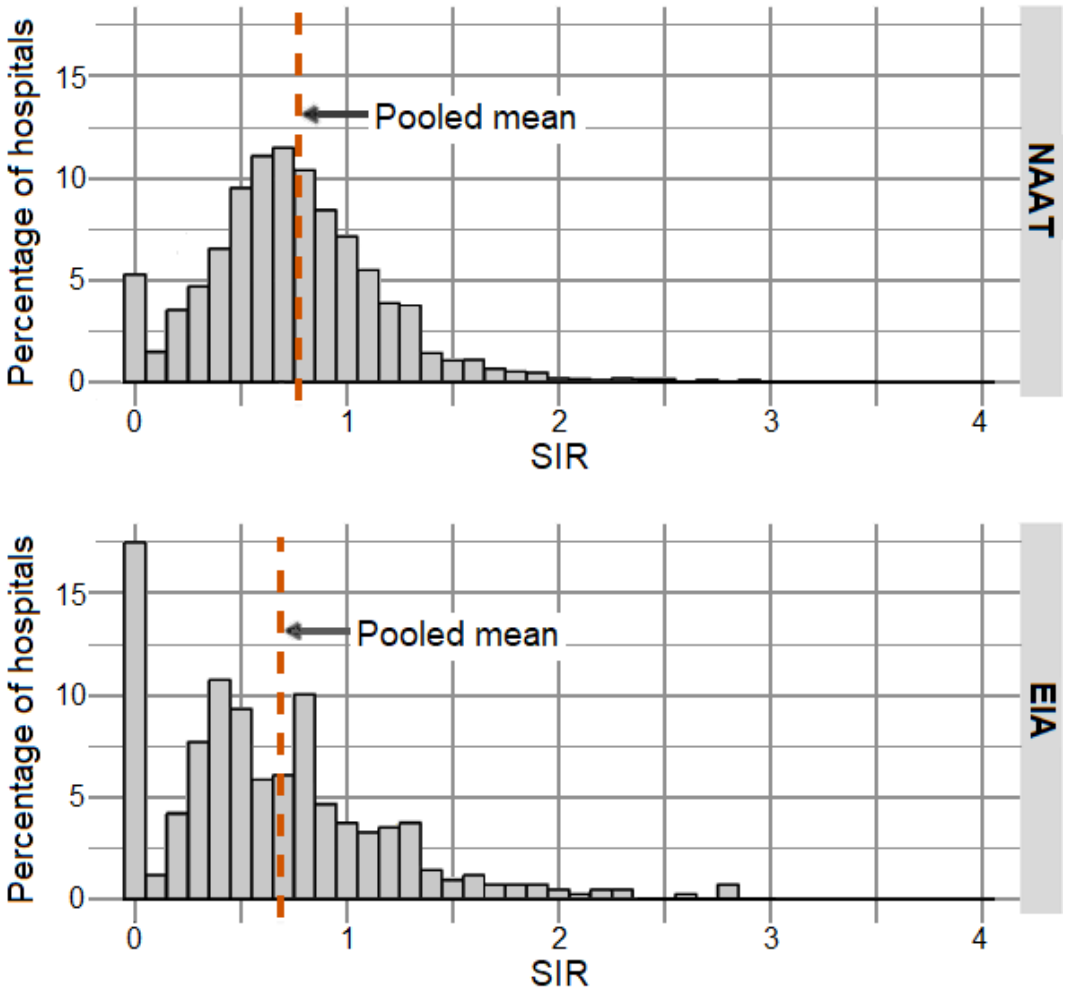
Table 1. Hospital-onset incidence rates and SIRs for hospitals that did not switch CDI test-type between EIA and NAAT during 2017Q3 to 2018Q2

Measures	CDI Test Type	No. of Hospitals[a]	Pooled Mean	10%[b]	25%[b]	50%[b]	75%[b]	90%[b]
Incidence Rates (Per 1,000 patient days)	EIA	600 (428)	0.312	0.000	0.101	0.213	0.378	0.579
	NAAT	2642 (2444)	0.570	0.137	0.302	0.485	0.673	0.891
SIR	EIA	600 (428)	0.692	0.000	0.280	0.542	0.896	1.317
	NAAT	2642 (2444)	0.773	0.242	0.489	0.720	0.979	1.266

a Numbers in parentheses represent the number of hospitals that had predicted values >=1 for 2017Q3 to 2018Q2.

b Percentile distributions shown for hospitals that had predicted values >=1 for 2017Q3 to 2018Q2.

Figure 1. Histograms SIRs by CDI test type for acute care hospitals (ACHs) that did not switch test type, 2017Q3-2018Q2



NAAT (N-244)

Pooled mean=0.773

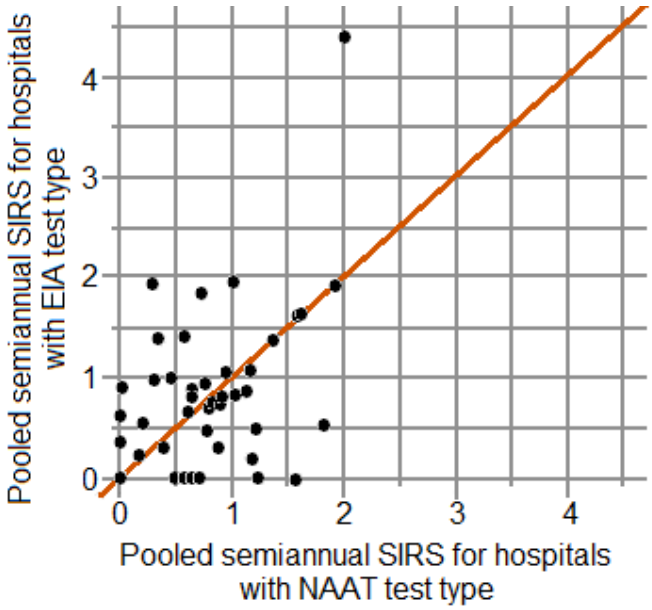
2 hospitals with SIR > 4, not showing in the graph

EIA (N=428)

Pooled mean=0.692

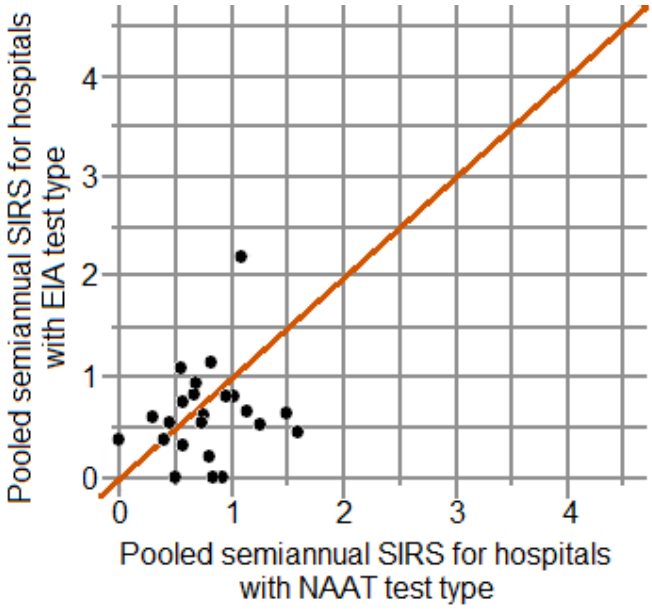
1 hospital with SIR >4, not showingin the graph

Figure 2. Scatter plots of pooled semiannual SIRs for NAAT and EIA for hospitals with switch pattern of EIA-to-NAAT and NAAT-to-EIA, 2017Q3-2018Q2



EIA_EIA_NAAT_NAAT

N=42



NAAT_NAAT_EIA_EIA

N=26

References:

1. Antibiotic Resistance Threats in the United States, 2013 [PDF - 114 pages]. Available at https://www.cdc.gov/drugresistance/pdf/ar-threats-2013-508.pdf , 2019.
2. The NHSN Standardarized Infection Ratio (SIR) [PDF - 49 pages]. Available at https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/nhsn-sir-guide.pdf. Accessed April 23, 2019.
3. Multidrug-Resistant Organism & Clostridioides difficile Infection (MDRO/CDI) Module [PDF - 53 pages]. Available at https://www.cdc.gov/nhsn/pdfs/pscmanual/12pscmdro_cdadcurrent.pdf. Accessed April 24, 2019.