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Methicillin-Resistant *Staphylococcus aureus* Bloodstream Infection Surveillance: National Healthcare Safety Network's Laboratory-Identified Event Reporting versus Traditional Laboratory-Confirmed Bloodstream Infection Surveillance

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Abstract

Hospitals must report cases of methicillin-resistant *Staphylococcus aureus* bloodstream infection (BSI) using a new laboratory-identified (LabID) event reporting module. BSI rates obtained using LabID differ from rates of BSI obtained from traditional surveillance (concordance of healthcare facility–onset cases, 61%–76%) because definitions used to report LabID events are inconsistent with traditional BSI definitions.

The Centers for Medicare and Medicaid Services requires acute care hospitals to report all cases of bloodstream infection (BSI) due to methicillin-resistant *Staphylococcus aureus* (MRSA) to the National Healthcare Safety Network (NHSN). As of January 1, 2013, surveillance for these infections requires the use of a new protocol called laboratory-identified (LabID) event reporting.¹ This protocol categorizes LabID cases of MRSA BSI into 2 groups: community onset or healthcare facility onset. Distinction between the 2 categories is based exclusively on the relationship between the date of the first positive blood culture and the date of admission.^{2,3} This new surveillance system with definitions for LabID events replaced traditional surveillance reporting of cases of BSI due to MRSA that relied on different definitions to characterize laboratory-confirmed bloodstream infections (LCBIs).⁴ Traditional surveillance also distinguished community-onset from healthcare facility–onset cases by comparing relative dates of admission and positive blood cultures;

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however, traditional surveillance additionally required determination of whether a BSI was a primary or secondary infection and the date of the most recent hospital discharge.

The purpose of this study is to compare surveillance data collected using both LabID and traditional surveillance methods for reporting rates of BSI due to MRSA in a network of community hospitals and determine how use of these definitions changes the relative rates of these BSIs at individual hospitals.

METHODS

We performed a comparative study of prospectively collected MRSA BSI data from 32 community hospitals within the Duke Infection Control Outreach Network⁵ that used the 2 preceding surveillance protocols from January 2013 through June 2013. All blood cultures positive for MRSA during the study period were evaluated using both LabID and traditional surveillance definitions. The date of admission and dates of all blood cultures positive for MRSA were available for each case. Duplicate cultures were excluded if the same patient had a prior positive culture within the preceding 14 days. Infection preventionists also assessed BSIs as either primary infections or secondary BSIs due to infection with the same pathogen at a separate site, and they recorded the date of the most recent hospital discharge.

We used the NHSN facility-wide inpatient (FacWideIN) protocol for determining the presence of LabID events at each hospital.² The admission date was defined as day 1 of admission. A blood culture positive for MRSA collected on days 1–3 of admission was defined as a community-onset LabID event. A positive blood culture for MRSA occurring on day 4 of hospitalization or later was defined as a healthcare facility–onset LabID event.

For laboratory-confirmed BSI surveillance, secondary MRSA BSIs as determined using traditional surveillance methods were excluded from our analysis. Of the remaining cases, patients with positive blood cultures on day 1 or day 2 of admission were defined as community-onset cases; however, patients with positive blood cultures on day 1 or day 2 who were readmitted within 1 day of a prior discharge were considered to have healthcare facility–onset cases of BSI, as were all patients with positive blood cultures for MRSA that were collected from day 3 of hospitalization or later.

RESULTS

We identified 315 nonduplicate blood cultures positive for MRSA during 709,035 patient-days of surveillance at the 32 study hospitals during the 6-month study period. Of these, 284 (90%) were categorized as community-onset LabID events; the remaining 31 cases (10%) were categorized as healthcare facility–onset LabID events. One hundred and twenty-one patients (38%) with positive blood cultures for MRSA were defined as having secondary BSIs, which were excluded by traditional surveillance; 169 (87%) of the remaining 194 positive cultures were classified as community-onset cases by traditional surveillance, and 25 (13%) were classified as healthcare facility–onset cases (Figure 1).

The incidence rate of community-onset LabID MRSA BSI was 40.1/100,000 patient-days compared with a rate of 23.8/100,000 patient-days for traditional cases (incidence rate ratio

[IRR], 1.7 [95% confidence interval (CI), 1.4–2.0]; $P < .0001$). The rate of healthcare facility–onset LabID events was 4.4/100,000 patient-days compared with a traditional surveillance rate of 3.5/100,000 patient-days (IRR, 1.2 [95% CI, 0.7–2.1]; $P = .4$). A total of 18 discordant healthcare facility–onset cases were identified (Table 1).

We compared the incidence rate of healthcare facility–onset MRSA LabID BSI to the rate of healthcare facility–onset traditional BSI at each of the 32 hospitals in this cohort. Fifteen (47%) of the 32 hospitals had no healthcare facility–onset cases by either surveillance method; however, 12 (71%) of 17 hospitals reporting at least 1 healthcare facility–onset case had different rates of LabID and traditional healthcare facility–onset cases. Eight hospitals experienced a higher rate with LabID compared with traditional surveillance (largest rate difference, 24.4 cases/100,000 patient-days), and 4 had lower rates (largest rate difference, 14.8 cases/100,000 patient-days).

DISCUSSION

LabID definitions differ from traditional definitions, resulting in important discrepancies in the number and percentage of BSIs given by the different surveillance methodologies for MRSA BSI at community hospitals. These differences have significant implications for understanding the epidemiology of healthcare-associated MRSA and the success of infection prevention efforts.

LabID's inclusion of secondary BSIs is the most important protocol change and will lead to inclusion of some non-preventable BSIs. In our experience, however, the distinction between primary and secondary MRSA BSI is not always clear or indicative of the potential preventability of an invasive MRSA infection. For example, 19 (16%) of the 121 cases in our network deemed to be secondary BSIs by NHSN surveillance definitions were recorded as primary MRSA urinary infections; however, given the frequent occurrence of positive urine cultures for MRSA in the setting of primary BSI and hematogenous spread,⁶ these and other MRSA BSIs labeled as secondary but still captured by LabID may in fact be preventable and important to analyze.

The second most important difference is the time point at which cases are considered healthcare facility onset. By labeling cultures positive on day 3 of admission as community onset, LabID likely misses some preventable cases that traditional surveillance designates as healthcare facility onset. LabID also labels cultures taken from patients upon a 1-day readmission to the hospital as community onset, whereas these cases are considered healthcare facility onset by traditional reporting.

Importantly, hospitals changing from traditional surveillance to the LabID protocol for MRSA BSI surveillance should not compare new LabID healthcare facility–onset BSI rates to rates obtained during times of prior traditional surveillance. Seventy-one percent of hospitals in our network with at least 1 case of healthcare facility–onset BSI by either surveillance method had different LabID and traditional MRSA BSI rates over the 6-month study period; therefore, perceived changes in BSI rates may reflect only the change in surveillance method.

MRSA BSI surveillance with LabID has several advantages over traditional surveillance. The LabID protocol is simple and can be fully automated; analysis of current clinical information or a recent hospitalization is unnecessary. Also, by including secondary BSIs, LabID decreases potential bias related to subjectivity in reporting. We suggest a simple adjustment to the LabID protocol to label positive cultures from day 3 of admission onward (instead of day 4) as healthcare facility-onset cases. This change would allow LabID to capture 92% instead of 76% of our network's traditional healthcare facility-onset cases of MRSA BSI and decrease confusion between LabID and other NHSN definitions of healthcare-associated infections.

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FIGURE 1.

Flowchart used to analyze positive blood cultures for methicillin-resistant *Staphylococcus aureus* (MRSA) from 32 community hospitals by both laboratory-identified (LabID) event reporting and traditional laboratory-confirmed bloodstream infection (LCBI) protocols. a, Of the 121 secondary BSIs excluded by the traditional protocol, LabID labeled 109 (90%) as community onset and 12 (10%) as healthcare facility onset. Common primary sites of infection included urine (16%), lung (15%), abscess (12%), surgical site infection (7%), and other sites (42%). b, Prior discharge within 1 day of readmission associated with positive blood cultures. BSI, bloodstream infection.

TABLE 1

Number of Concordant and Discordant Healthcare Facility–Onset Cases of Methicillin-Resistant *Staphylococcus aureus* (MRSA) Bloodstream Infections (BSIs) and Reason for Discordance by Surveillance Method

Category	LabID healthcare facility–onset cases (<i>n</i> = 31)	Traditional LCBI healthcare facility–onset cases (<i>n</i> = 25)
Concordant healthcare facility–onset cases	19 (61)	19 (76)
Discordant healthcare facility–onset cases ^a	12 (39)	6 (24)
Secondary BSI	12	0
Day 3 vs day 4 of admission ^b	0	4
Readmitted within 1 day of prior discharge	0	2

NOTE. Data are no. (%), unless otherwise indicated. LabID, laboratory identified; LCBI, laboratory-confirmed BSI.

^aDiscordant LabID healthcare facility–onset cases were labeled as healthcare facility onset by LabID but were excluded by traditional surveillance as secondary BSIs. Discordant traditional LCBI healthcare facility–onset cases were labeled as healthcare facility onset by traditional surveillance but as community onset by LabID.

^bLabID designates MRSA BSIs as healthcare facility onset if positive cultures are from day 4 of admission or later. The traditional LCBI protocol begins labeling cases as healthcare facility onset on day 3 of admission.