

HEALTHCARE-ASSOCIATED INFECTIONS IN MICHIGAN HOSPITALS

2012 QUARTER 3 REPORT

Michigan Department of Community Health

*Surveillance for Healthcare-Associated & Resistant
Pathogens (SHARP) Unit*

July 1, 2012 – September 30, 2012

July – September 2012

Introduction

The Surveillance for Healthcare-Associated & Resistant Pathogens (SHARP) Unit within the Bureau of Disease Control, Prevention, and Epidemiology at the Michigan Department of Community Health (MDCH) provides a quarterly update on healthcare-associated infection (HAI) surveillance activities. This report includes the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network (NHSN) data from Michigan hospitals who have agreed to voluntarily share their data with MDCH SHARP. The main surveillance foci for the SHARP Unit were originally methicillin-resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile* (*C. difficile*, *C. diff*, or CDI) reports collected through the laboratory-identified (LabID) event option of the multidrug-resistant organism and *Clostridium difficile* infection (MDRO/CDI) module of NHSN. The SHARP Unit has also been actively reviewing device-associated data for Central Line Bloodstream Infections (CLABSIs), Catheter-Associated Urinary Tract Infections (CAUTIs), and Surgical Site Infections (SSIs).

Aggregated data from participating hospitals are used to show infection rates and trends in the incidence and prevalence of specific HAIs and MDROs. Previous quarterly, semi-annual, and annual SHARP NHSN reports are posted on the Michigan HAI website at www.michigan.gov/hai. Additional HAI background information, pertinent HAI definitions, Michigan's HAI Surveillance and Prevention Plan, Michigan's HAI Prevention Advisory Group roster, and details on MDCH SHARP's prevention collaboratives can also be found at this website.

Surveillance Initiative Statistics

Between July 1 and September 30, 2012, a cumulative total of 79 Michigan hospitals voluntarily participated in the SHARP Unit HAI surveillance initiative, as demonstrated by signed data use agreements as of February 15, 2013. Thirty-five of these hospitals used the LabID Event option of the MDRO/CDI module to monitor MRSA in their reporting plan; thirty-three shared these data with SHARP. Note that during this time period, reporting of MRSA and CDI LabID Events was not considered mandatory by the Centers for Medicare and Medicaid Services (CMS). Forty-four hospitals monitored and 40 shared *C. difficile* LabID Events. Areas of surveillance within the hospital varied by participating hospital and included the intensive care/critical care unit (ICU/CCU), specialty care areas (SCA), medical/surgical wards, or other, dependent upon individual hospital choice. Data from this quarter and previous quarters were used in this report to establish aggregate infection rates among participating Michigan hospitals and to monitor quarterly trends.

Of the 79 hospitals participating this quarter, most collected additional NHSN module data as indicated in Table 1. This is largely due to the CMS mandate for HAI reporting of CAUTI, CLABSI, and SSI (colon and abdominal hysterectomy procedures only) by acute care hospitals participating in the Inpatient Prospective Payment System (IPPS) which began in 2010. For example, 75 of the 79 hospitals during this quarter utilized the CAUTI module; of these, 72 shared data with the SHARP Unit. As more hospitals participate with the SHARP Unit and confer rights to these modules, analysis of the data is becoming more complete and accurate.

Table 1.

NHSN Modules in use

NHSN Module	Number of Hospitals Using Module¹	Number of Hospitals Sharing Data²
Catheter-Associated Urinary Tract Infection (CAUTI)	75	72
Surgical Site Infection (SSI)	74	69
Central Line-Associated Bloodstream Infection (CLABSI)	73	70
Ventilator-Associated Pneumonia (VAP)	47	50 ³
Clostridium difficile Infection (CDI) Laboratory-identified (LabID) Event	44	40
Methicillin-Resistant Staphylococcus aureus (MRSA) Laboratory-identified (LabID) Event	35	33
Vancomycin-Resistant Enterococci (VRE) LabID	12	N/A ⁴
Methicillin-Resistant Staphylococcus aureus (MRSA) Infection Surveillance	10	11
Clostridium difficile Infection (CDI) Surveillance	8	10
Vancomycin-Resistant Enterococci (VRE) Infection Surveillance	5	N/A
Acinetobacter LabID	5	N/A
Carbapenem-resistant Enterobacteriaceae LabID	5	N/A
Cephalosporin Resistant Klebsiella LabID	<5	N/A
Acinetobacter Infection Surveillance	<5	N/A
Carbapenem-resistant Enterobacteriaceae Infection Surveillance	<5	N/A
Cephalosporin Resistant Klebsiella Infection Surveillance	<5	N/A

¹This is the number of hospitals that have indicated module use in each of their reporting plans, for at least one month within the three month time period.

²This is the number of hospitals sharing data for the report period, as of the data access date.

³In some instances, the number of hospitals sharing data is greater than the number of hospitals using the module. This is explained by the time difference between when the reporting plans were observed and the data access date.

⁴N/A: Not applicable for this report (these data aren't included in the quarterly reports).

Figure 1. Number of Facilities with Module Use in Reporting Plan by Quarter

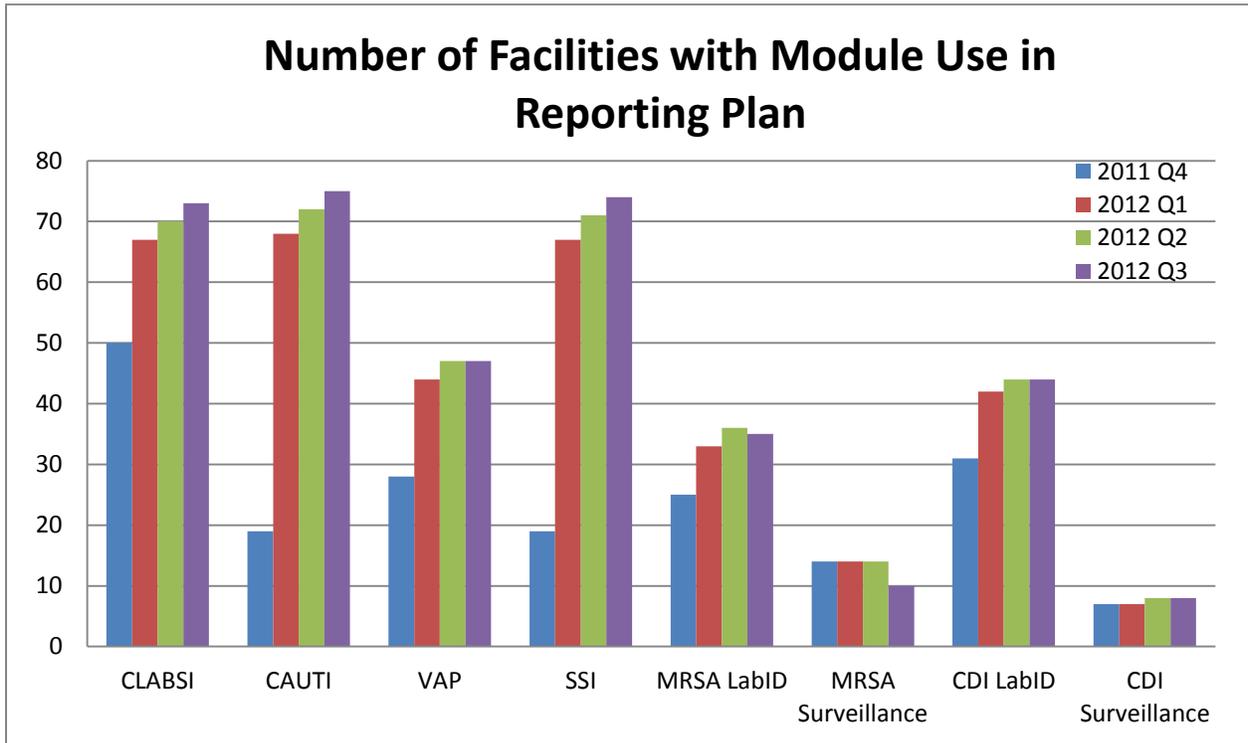
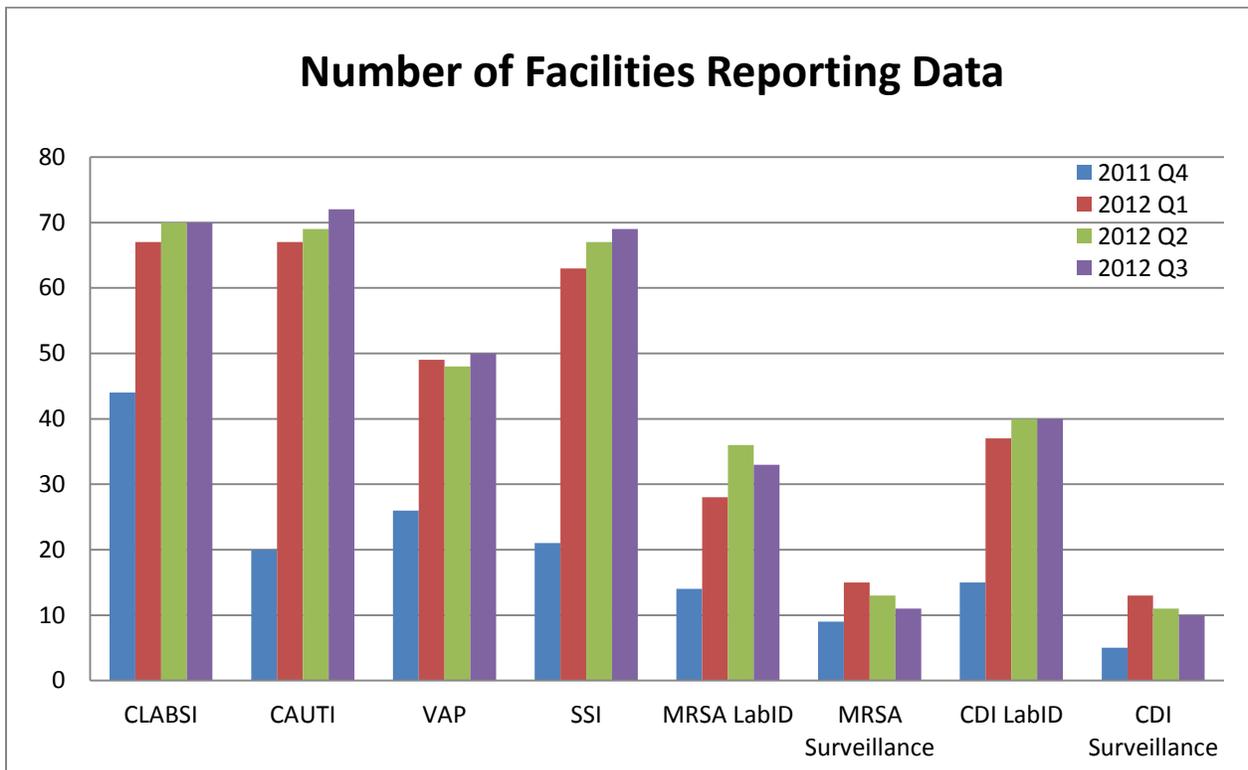


Figure 2. Number of Facilities Reporting Data by Quarter



Methicillin-Resistant *Staphylococcus aureus* (MRSA) Data

Table 2 (below) indicates that between July 1 and September 30, 2012, 1322 MRSA isolates were reported from thirty-five participating hospitals using the MDRO/CDI module, LabID Event option. The NHSN definition for MRSA LabID Event includes the first positive MRSA isolate from any specimen per calendar month per patient, or a positive MRSA isolate from a blood source when there haven't been any other positive blood specimens in the previous 2 weeks from that patient. Specimens must be collected for clinical purposes and not for the purpose of active surveillance testing or screening. Note that testing protocol and type of test used (i.e. PCR, assay, culture) vary by facility. Additionally, data from the LabID Event option of the MDRO/CDI module are considered proxy measures of MRSA exposure burden, and do not distinguish between patient colonization and infection.

Fifteen percent of the MRSA LabID Events this quarter were determined to be healthcare facility-onset (HO), and the remaining 85% were determined to be community-onset (CO). NHSN defines 'healthcare facility-onset' as a 'LabID Event specimen collected greater than 3 days after admission to the facility (i.e., on or after day 4)'. 'Community-onset' is defined by NHSN as a 'LabID Event specimen collected as an outpatient or an inpatient less than or equal to 3 days after admission to the facility (i.e. days 1, 2, or 3 of admission)'.

Again this quarter, the percent of events which were healthcare facility-onset varied by specimen source; however, the distribution of this variation appears to have remained fairly stable from the previous quarterly reports. There are a few exceptions to note. The percentage of HO skin specimens increased from 0% to 17%, and the percentage of HO blood specimens decreased from 31% to 22%.

Table 2.

Aggregate Methicillin-Resistant *Staphylococcus aureus* (MRSA) LabID Data

	October – December 2011 Quarterly Report	January – March 2012 Quarterly Report	April – June 2012 Quarterly Report	July – September 2012 Quarterly Report
Frequency, Number				
<i>Hospitals with a DUA</i> ¹	54	73	76	79
<i>Hospitals reporting MRSA LabID</i> ²	25	33	36	35
<i>Hospitals sharing MRSA LabID</i>	14	28	36	29
<i>Aggregated LabID Events</i>	371	1142	1289	1322
Onset, Number (%)				
<i>Healthcare Facility-Onset (HO)</i>	86 (23)	188 (16)	230 (18)	196 (15)
<i>Community-Onset (CO)</i>	285 (77)	954 (84)	1059 (82)	1126 (85)
Specimen Source, Number (%HO)³				
<i>Blood</i>	49 (14)	96 (18)	98 (31)	121 (22)
<i>Sputum</i>	84 (42)	163 (42)	153 (39)	128 (39)
<i>Wound</i>	91 (5)	345 (8)	404 (11)	480 (5)
<i>Abcess</i>	13 (0)	44 (9)	102 (10)	161 (8)
<i>Urine</i>	18 (22)	116 (11)	127 (9)	111 (9)
<i>Skin</i>	3 (0)	16 (6)	6 (0)	6 (17)
<i>Other</i>	113 (31)	362 (16)	399 (19)	315 (22)
Surveillance Location, Number (% , %HO)⁴				
<i>Intensive/Critical Care Unit</i>	143 (39, --)	244 (21, 39)	280 (22, 37)	272 (21, 34)
<i>Specialty Care Area</i>	-----	14 (1, 29)	21 (2, 52)	----
<i>Wards</i>	192 (52, --)	487 (43, 18)	528 (41, 22)	544 (41, 19)
<i>Outpatient</i>	36 (10, --)	397 (35, 0)	460 (36, 0)	506 (38, 0)
<i>Other</i>	-----	-----	----	----

¹DUA: Data Use Agreement. This is a document signed between the hospital and the Michigan Department of Community Health which outlines how the data will be shared and used, and how confidentiality will be protected.

²MRSA Lab ID: Methicillin-Resistant *Staphylococcus aureus* (MRSA) Laboratory-Identified (LabID) Event. This is an option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking laboratory results without conducting additional surveillance for infections.

³The number in parentheses under "Specimen Source" is the percent of isolates obtained from that source which are healthcare-onset.

⁴The numbers in parentheses under "Surveillance Location" are the percent of isolates from each location, followed by the percent of isolates from each location which are healthcare-onset. Percent HO is unavailable for the 2011 Quarter 4 Report.

Clostridium difficile Infection (CDI) Data

As shown in Table 3 (below), this quarter there were 955 reports of CDI from 40 hospitals which shared MDRO/CDI LabID Event data with the SHARP Unit. The NHSN definition for CDI LabID Event includes the first positive *C. diff* test result without a prior positive in the previous 2 weeks. As with MRSA LabID Events, *C. difficile* LabID Event specimens must be collected for clinical purposes, not for the purpose of active surveillance testing or screening. Testing protocol and type of test used (i.e. PCR, assay, culture) may vary by facility. *C. difficile* LabID Event data are considered proxy measures of exposure burden, and do not distinguish between patient colonization and infection.

Thirty-six percent of CDI LabID Events were considered healthcare facility-onset (HO), an increase from 29% last quarter. Seventeen percent were considered community-onset healthcare facility-associated (CO-HCFA), and forty-seven percent were reported as community-onset (CO), down from 52% in the previous quarter. Community-onset healthcare facility-associated is defined as a 'community-onset LabID Event collected from a patient who was discharged from the facility less than or equal to 4 weeks prior to the date the stool specimen was collected.' (Healthcare facility-onset and community-onset are defined under the MRSA LabID Event data heading).

Fourteen percent of CDI LabID Events occurred in patients who had a prior CDI LabID Event entered in a previous month. In addition, 8% of LabID Events were recurrent CDI assays. A recurrent CDI assay is a '*C. difficile* LabID Event specimen obtained greater than 2 weeks and less than or equal to 8 weeks after the most recent LabID Event for that patient.'

As with the MRSA module, the percentages of isolates from each location, as well as the percentages of healthcare facility-onset within each location, were distributed very consistently compared to the previous quarterly reports. One exception is the percentage of HO CDI LabID events increased from 41% to 60% in Intensive or Critical Care Units.

Table 3.

Aggregate *Clostridium difficile* Infection (CDI)¹ LabID Data

	October - December 2011 Quarterly Report	January – March 2012 Quarterly Report	April – June 2012 Quarterly Report	July – September 2012 Quarterly Report
Frequency, Number				
<i>Hospitals with DUA</i> ²	54	73	76	79
<i>Hospitals Reporting CDI LabID</i> ³	31	42	44	44
<i>Hospitals Sharing CDI LabID</i>	15	37	40	40
<i>Aggregated LabID Events</i>	291	991	934	955
Onset, Number (%)				
<i>Healthcare Facility-Onset (HO)</i>	87 (30)	359 (36)	270 (29)	341 (36)
<i>Community-Onset Healthcare Facility-Associated (CO-HCFA)</i>	45 (15)	183 (18)	178 (19)	163 (17)
<i>Community-Onset (CO)</i>	159 (55)	449 (45)	486 (52)	451 (47)
Previous CDI, Number (%)				
<i>Previously Positive</i>	36 (12)	110 (11)	109 (12)	136 (14)
<i>CDI assay, recurrent</i>	19 (7)	67 (7)	66 (7)	80 (8)
Surveillance Location, Number (% , %HO)⁴				
<i>Intensive/Critical Care Unit</i>	71 (24, --)	196 (20, 56)	175 (19, 41)	171 (18, 60)
<i>Specialty Care Area</i>	5 (2, --)	61 (6, 57)	65 (7, 43)	4 (0, 50)
<i>Wards</i>	159 (55, --)	548 (55, 39)	524 (56, 33)	624 (65, 38)
<i>Outpatient</i>	59 (19, --)	186 (19, 0)	170 (18, 0)	155 (16, 0)
<i>Other</i>	----	----	----	1 (0,0)

¹The specimen source of all *C. difficile* isolates is stool (100%)

²DUA: Data Use Agreement. This is a document signed between the facility and the Michigan Department of Community Health which outlines how the data will be shared and used.

³CDI Lab ID: *Clostridium difficile* Infection (CDI) Laboratory-Identified (LabID) Event. This is an option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking laboratory results without conducting additional surveillance for infections.

⁴The numbers in parentheses under "Surveillance Location" are the percent of isolates from each location, followed by the percent of isolates from each location which are healthcare-onset. Percent HO is unavailable for the 2011 Quarter 4 Report.

Multidrug-Resistant Organisms (MDRO) Summary Data

Tables 4 and 5 (below) provide an overview of MRSA LabID and Infection Surveillance event rates. Table 4 provides overall MRSA Infection Surveillance data as well as inpatient and outpatient LabID event data, and Table 5 displays data stratified by onset.

Table 4.						
Cumulative Michigan MRSA Rate						
	Facilities	Number of MRSA Events	Number of Patient Days	Number of Patient Admits/Encounters	MRSA Rate¹	MRSA Prevalence Rate²
MRSA Inpatient LabID ³	33	795 LabID ⁴	360,078	85,437 Admits	2.2079	0.9305
MRSA Outpatient LabID	7	425 LabID	----	112,273 Encounters	----	0.3785
MRSA Surveillance	11	9 Infection ⁵	19,110	---- ⁶	0.4710	----

Michigan Rate

¹MRSA Rate: Methicillin-Resistant *Staphylococcus aureus* (MRSA) rate. This is the number of MRSA LabID Events or surveillance infections per 1,000 patient days.

²MRSA Prevalence Rate. This is the number of MRSA LabID Events per 100 patients admitted or 100 encounters.

³MRSA Lab ID: MRSA Laboratory-Identified (LabID) Event. This is an option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking laboratory results without conducting additional surveillance for infections.

⁴The number of MRSA LabID Events indicated in this table is less than the number of MRSA LabID Events indicated in Table 2. This is because events used to calculate a rate required denominator data (patient days and/or admissions). Those without denominator data were excluded from the calculation.

⁵Infection: MRSA event under infection surveillance. This is an option in the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module for tracking infections through surveillance.

⁶The infection surveillance module does not collect the number of patient admissions; therefore this number is unavailable and a MRSA Infection Surveillance Prevalence Rate cannot be calculated.

The MRSA Inpatient LabID Event rate increased significantly this quarter, from 2.03 to 2.21 per 1,000 patient days (p=0.0154). MRSA Inpatient LabID Event Rate trends are displayed in Figure 3. This quarter, the MRSA Outpatient rate was calculated as a prevalence rate for the first time, and was 0.38 per 100 encounters. Outpatient and Surveillance trends will continue to be monitored; however, we are not monitoring them as closely as inpatient LabID events.

Figure 3. Inpatient MRSA LabID Rate Trends by Quarter

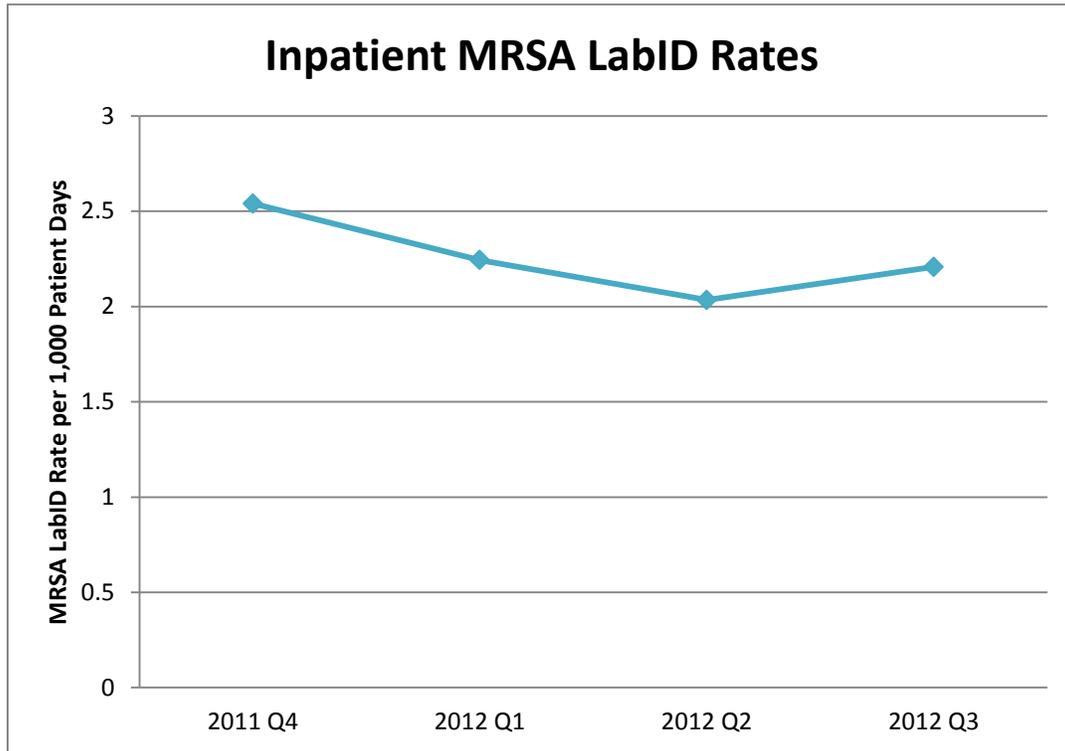


Table 5 (below) provides inpatient MRSA LabID rates stratified by onset. This is the third time SHARP has received enough data to stratify MRSA LabID rates by community-onset and healthcare facility-onset. Trends are beginning to become available for stratified MRSA LabID rates.

Table 5.
Michigan Inpatient MRSA LabID Rate by Onset

Number of Facilities	Onset	Number of Inpatient MRSA Events	Number of Patient Days	Number of Patient Admits	MRSA Incidence Rate ¹	MRSA CO Prevalence Rate ²	Percentage of Total
33	HO ³	150 LabID ⁴	360,078	----	0.4166	----	20
33	CO ⁵	607 LabID	----	85,437	----	0.7105	80

Michigan Rate

¹MRSA Incidence Rate: Methicillin-Resistant *Staphylococcus aureus* (MRSA) rate. This is the number of incident HO MRSA LabID Events per 1,000 patient days. Prior to Quarter 3, 2012, this rate included both prevalent and incident HO MRSA LabID events.

²MRSA CO Prevalence Rate. This is the number of MRSA LabID Events per 100 patients admitted.

³HO: Healthcare facility-onset

⁴MRSA Lab ID: MRSA Laboratory-Identified (LabID) Event. This is an option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking laboratory results without conducting additional surveillance for infections.

⁵CO: Community-onset

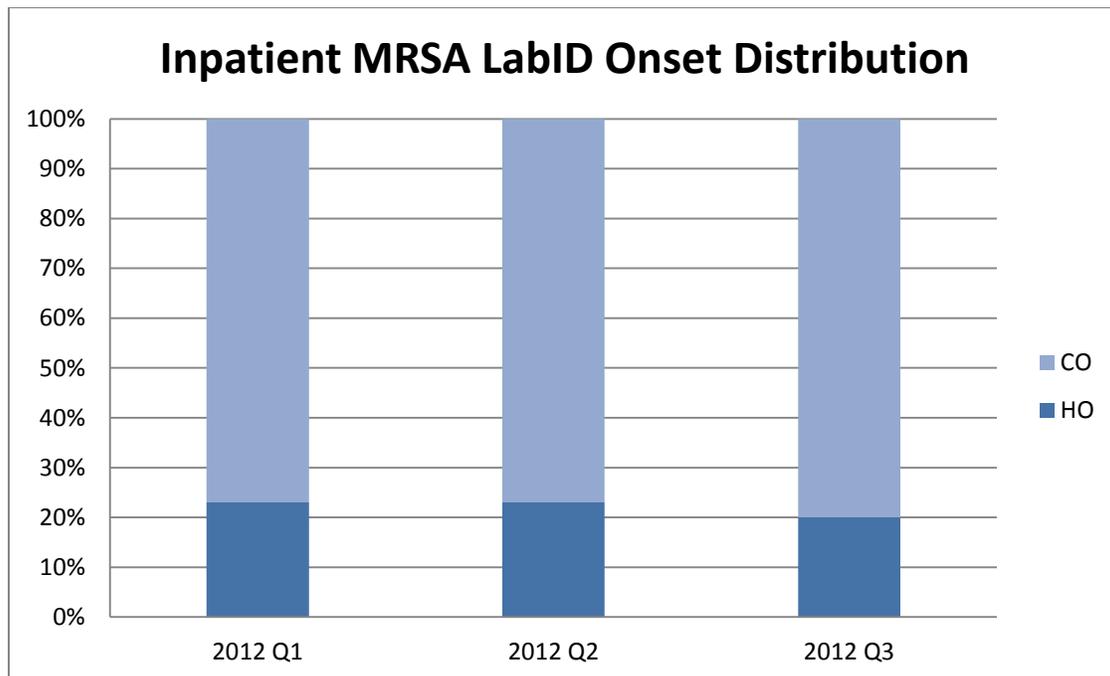
Healthcare facility-onset infections occur when the LabID specimen was collected on or after day 4 of admission to the facility. Because they are incident infections, only a MRSA incidence rate can be calculated. The HO MRSA incidence rate decreased slightly from 0.4437 to 0.4166 per 1,000 patient days from the previous quarter to the present. This decrease was not statistically significant. A small part of this decrease may be attributed to a difference in incidence calculations. In prior reports, incidence rates included all HO LabID events; the present report only included incident HO LabID events, and excluded prevalent HO LabID events (LabID events that, although they are considered HO based on the date admitted to the facility, are considered prevalent because of the date admitted to a new location within the facility). However, this included very few infections, so the rates are still comparable.

Community-onset infections occur when the LabID specimen was collected 3 days or less after admission to the facility. These are prevalent infections, so a MRSA prevalence rate is calculated. The MRSA prevalence rate last quarter was 0.6085 per 100 admissions; it significantly increased to 0.7105 this quarter ($p=0.0002$).

The majority (80%) of inpatient MRSA LabID events were community-onset. The remaining 20% were healthcare facility-onset. The graphical display of this can be seen below in Figure 4, along with quarter 1 and 2 data. All quarters showed a similar distribution of HO and CO events.

The percentage distributions of CO and HO LabID Events in Table 5 are slightly different from the percentage distributions in Table 2. This is explained by the greater number of overall LabID events in Table 2. The numbers of LabID events in Tables 4 and 5 are lower than in Table 2 because only LabID events which had corresponding denominators (i.e. patient days or admits) were included in the table.

Figure 4. Inpatient MRSA LabID Onset Distribution (percentages)



Tables 6 and 7 (below) provide an overview of CDI LabID and Infection Surveillance event rates. Table 6 provides CDI Infection Surveillance data as well as inpatient and outpatient LabID event data, and Table 7 displays data stratified by onset.

Table 6.

Cumulative Michigan CDI Rate

	Facilities	Number of CDI Events	Number of Patient Days	Number of Patient Admits/ Encounters	CDI Rate ¹	CDI Prevalence Rate ²
CDI Inpatient LabID ³	40	780 LabID ⁴	418,280	106,350 Admits	18.6478	0.7334
CDI Outpatient LabID	12	125 LabID	----	188,938 Encounters	----	0.0662
CDI Surveillance	10	5 Infection ⁵	9,774	---- ⁶	5.1156	----

Michigan Rate

¹CDI Rate: *Clostridium difficile* rate. This is the number of CDI LabID or surveillance events per 10,000 patient days.

²CDI Prevalence Rate. This is the number of *C. diff* LabID events per 100 patients admitted.

³CDI Lab ID: *Clostridium difficile* Infection (CDI) Laboratory-Identified (LabID) Event. This is an option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking laboratory results without conducting additional surveillance for infections.

⁴The number of CDI LabID Events indicated in this table is less than the number of CDI LabID Events indicated in Table 3. This is because events used to calculate a rate required denominator data (patient days and/or admissions). Those without denominator data were excluded from the calculation.

⁵Infection: *C. diff* event under infection surveillance. This is an option in the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module for tracking infections through surveillance.

⁶The infection surveillance module does not currently provide the number of patient admissions; therefore this number is unavailable and a *C. diff* Prevalence Rate cannot be calculated.

The CDI Inpatient LabID Event rate increased this quarter, from 17.83 to 18.65 per 10,000 patient days. This increase was not statistically significant. Overall CDI Inpatient LabID Event rate trends can be seen in Figure 5. The CDI Outpatient LabID rate was calculated as a prevalence rate for the first time this quarter, and was 0.07 per 100 encounters.

Figure 5. Inpatient CDI LabID Rate Trends by Quarter

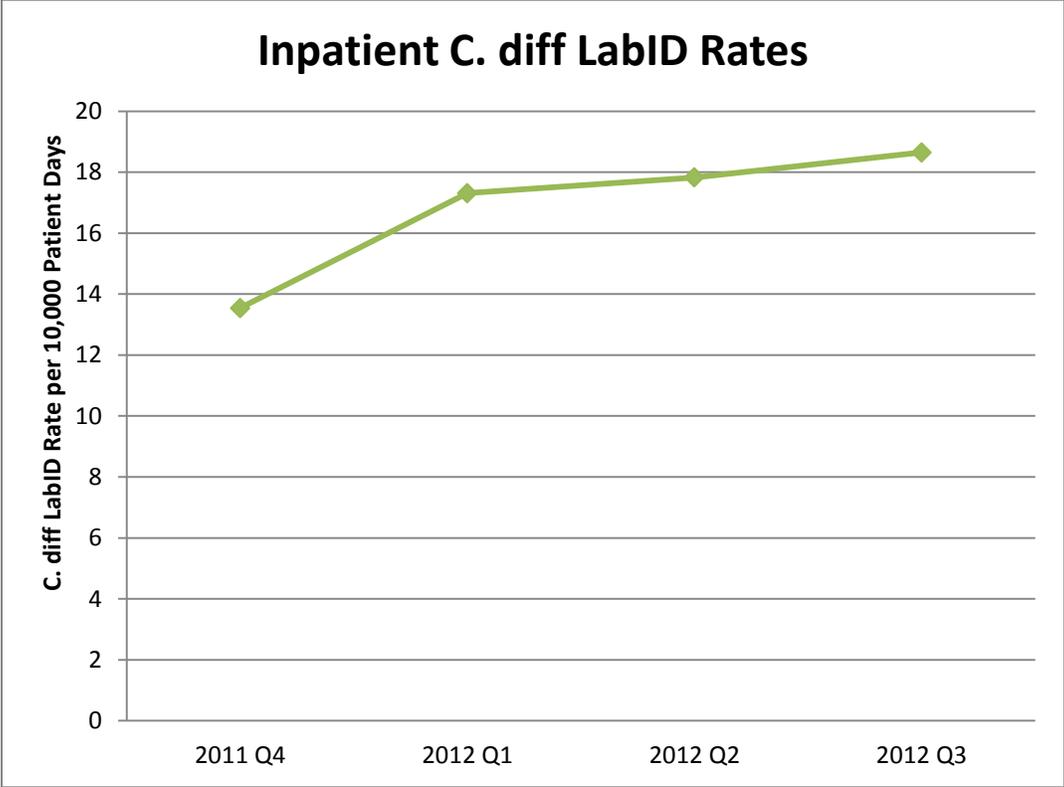


Table 7 (below) provides inpatient CDI LabID Rates stratified by onset. This is the third time SHARP has received enough data from reporting hospitals to stratify CDI LabID Rates by healthcare facility-onset, community-onset, and community-onset healthcare facility-associated. Trend data is beginning to become available for stratified CDI LabID rates.

Table 7.

Michigan CDI LabID Rate by Onset

Number of Reporting Facilities	Onset	Number of Inpatient LabID CDI Events	Number of Patient Days	Number of Patient Admits	CDI Incidence Rate ¹	CDI CO of CO-HCFA Prevalence Rate ²	Percentage of Total
40	HO ³	315 LabID ⁴	418,280	----	7.5308	----	41
40	CO-HCFA ⁵	131 LabID	----	106,350	----	0.1232	17
40	CO ⁶	323 LabID	----	106,350	----	0.3037	42

Michigan Rate

¹CDI Incidence Rate: *Clostridium difficile* rate. This is the number of CDI LabID events or surveillance infections per 10,000 patient days. This is the number of incident HO CDI LabID Events per 10,000 patient days. Prior to Quarter 3, 2012, this rate included both prevalent and incident HO CDI LabID events.

²CDI CO or CO-HCFA Prevalence Rate. This is the number of CDI LabID events per 100 patients admitted.

³HO: Healthcare facility-onset

⁴CDI Lab ID: *Clostridium difficile* Infection (CDI) Laboratory-Identified (LabID) Event. This is an option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking laboratory results without conducting additional surveillance for infections.

⁵CO-HCFA: Community-onset healthcare facility-associated

⁶CO:Community-onset

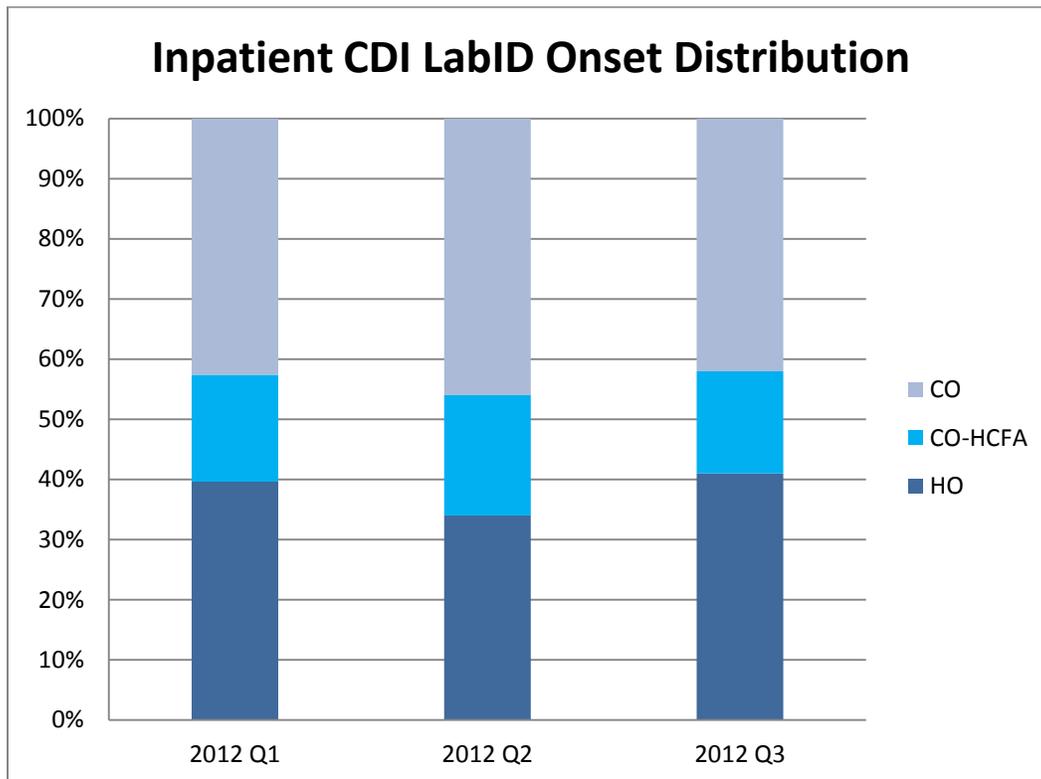
Healthcare facility-onset infections occur when the LabID specimen was collected on or after day 4 of admission to the facility. Because they are incident infections, only a CDI incidence rate can be calculated. The HO CDI incidence rate increased significantly from 5.8854 to 7.5308 per 10,000 patient days from the last quarter to the present ($p < 0.0001$). Although HO LabID events increased, it should be noted that, last quarter, there were different incidence calculations. In prior reports, incidence rates included all HO LabID events; the present report only included incident HO LabID events, and excluded prevalent HO LabID events (LabID events that, although they are considered HO based on the date admitted to the facility, are considered prevalent because of the date admitted to a new location within the facility). However, this included very few infections, so the rates are still comparable.

Community-onset infections occur when the LabID specimen was collected 3 days or less after admission to the facility. These are prevalent infections, so a CDI prevalence rate is calculated. The CO CDI prevalence rate decreased from 0.3114 to 0.3037 per 100 admissions from the previous quarter. This was not significant. Community-onset healthcare facility-associated infections occur when the LabID specimen was collected from a patient who was discharged from the facility 4 weeks or less prior to the date the current stool specimen was collected. The CO-HCFA prevalence rate also had a non-significant decrease (from 0.1343 to 0.1232 per 100 admissions).

The majority (42%) of inpatient CDI LabID events were community-onset, followed closely by healthcare facility-onset (41%). The remaining infections were community-onset healthcare facility-associated (17%). The graphical display of this from the previous quarters and the present quarter can be seen in Figure 6.

The percentage distributions of CO, CO-HCF, and HO LabID Events in Table 7 are slightly different from the distributions in Table 3. This is explained by the greater number of overall LabID events in Table 3. The number of LabID events in Tables 6 and 7 are lower than in Table 3 because only LabID events which had corresponding denominators (i.e. patient days) were included in the rate table.

Figure 6. Inpatient CDI LabID Onset Distribution



Device-Associated Summary Data

Table 8 (below) provides a summary of Device-Associated Infection Rates as well as the Device Utilization (DU) Ratios for each device: urinary catheters, central lines, and ventilators. In all device-associated rate analyses, facilities reporting zero patient days and zero device days were excluded.

Of the 75 hospitals with CAUTI in their reporting plans, 72 shared data for at least one month. Of the 73 hospitals with CLABSI in their reporting plan, 70 shared data. Although there were only 47 hospitals that had VAP in their reporting plan, 50 shared data. The additional facilities most likely changed their reporting plans between the data pull date and the date reporting plans were observed.

Table 8.								
Michigan Device-Associated Rates								
Type of Infection	Number of Hospitals	Number of Infections	Number of Patient Days	Number of Device Days	MI Rate ¹	US Rate ²	MI DU ³	US DU ⁴
CAUTI ⁵	72	245	280,698	98,904	2.4771	1.5253	0.3524	0.2955
CLABSI ⁶	70	75	248,856	81,698	0.9180	0.9633	0.3283	0.2689
VAP ⁷	50	26	69,085	22,707	1.1450	1.3347	0.3287	0.2996

Michigan Rate
 US Comparative Rate

¹MI Rates are the number of device-associated infections per 1,000 device days among participating hospitals.
²The US comparative rates were calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This is according to 2010 NHSN data (Am J Infect Control 2011;39:798-816). These data are for a descriptive reference only, and do not necessarily represent the true national rate.
³DU: Device Utilization. The proportion of days on a device divided by the total number of patient days reported for the unit. The device could be a catheter, central line, or ventilator. The MI DU is the proportion of patient days that are spent using a device.
⁴The US comparative DU was calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This is according to 2010 NHSN data (Am J Infect Control 2011;39:798-816). These data are for a descriptive reference only, and do not necessarily represent the true national DU ratio.
⁵ CAUTIs are defined using symptomatic urinary tract infection (SUTI) criteria or Asymptomatic Bacteremic UTI (ABUTI) criteria. UTIs must be catheter-associated (i.e. patient had an indwelling urinary catheter at the time of or within 48 hours before onset of the event).
⁶CLABSIs are laboratory-confirmed bloodstream infections (LCBI) that are not secondary to a community-acquired infection, or an HAI meeting CDC/NHSN criteria at another body site. BSIs must be central line associated (i.e., a central line or umbilical catheter was in place at the time of, or within 48 hours before, onset of the event).
⁷VAPs can be identified by using a combination of radiologic, clinical and laboratory criteria. PNEUs must be ventilator-associated (i.e., patient was intubated and ventilated at the time of or within 48 hours before the onset of the event).

There was a decrease in Michigan CAUTI rates. This decrease was not statistically significant, from 2.62 to 2.48 per 1,000 device days. There was a non-significant increase in the MI CLABSI rate (0.78 to 0.92 per 1,000 device days). The VAP rate decreased significantly from the previous quarter to the present (1.57 to 1.15 per 1,000 device days (p=0.0334)).

The Michigan DU ratio decreased for CAUTI and CLABSI, but increased for VAP. Figures 7 and 8 below demonstrate the Michigan and U.S. Device-Associated Infection Rates and Device Utilization Ratios, respectively, for the past four quarters. All DU ratio changes were statistically significant.

Figure 7. Device-Associated Infection Rate Trends by Quarter

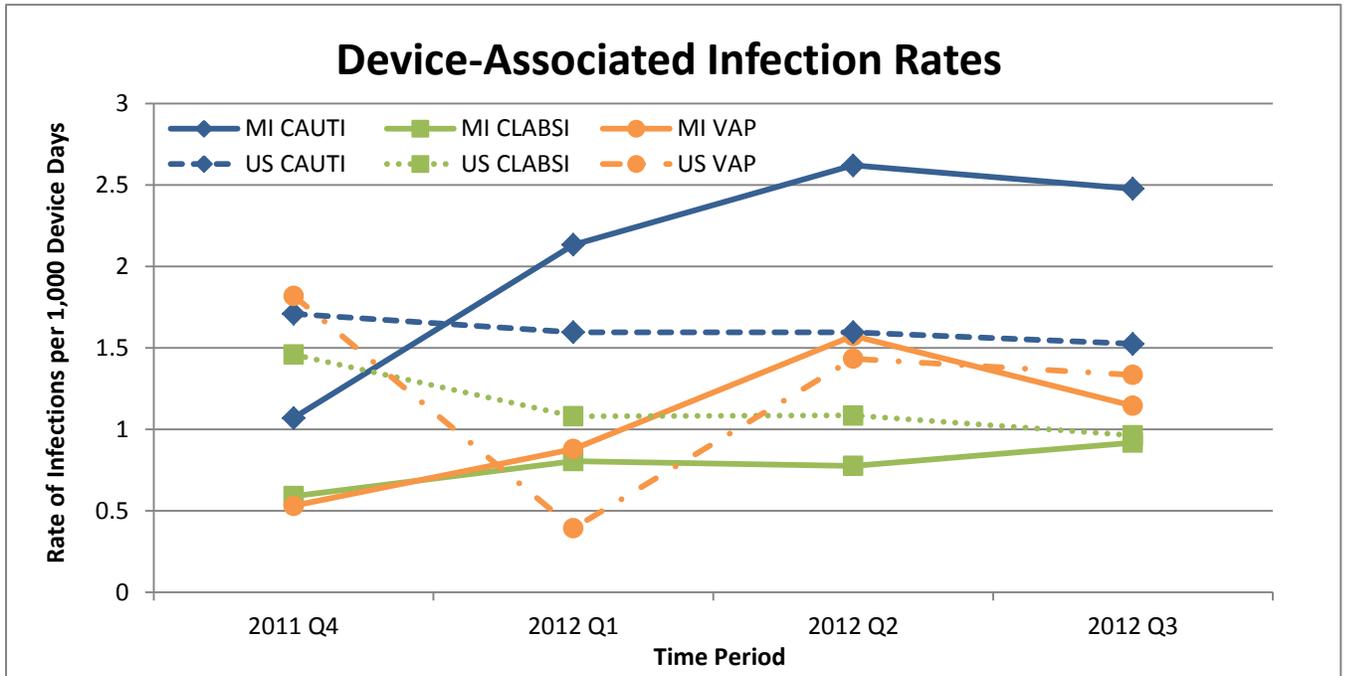


Figure 8. Device Utilization Ratio Trends by Quarter

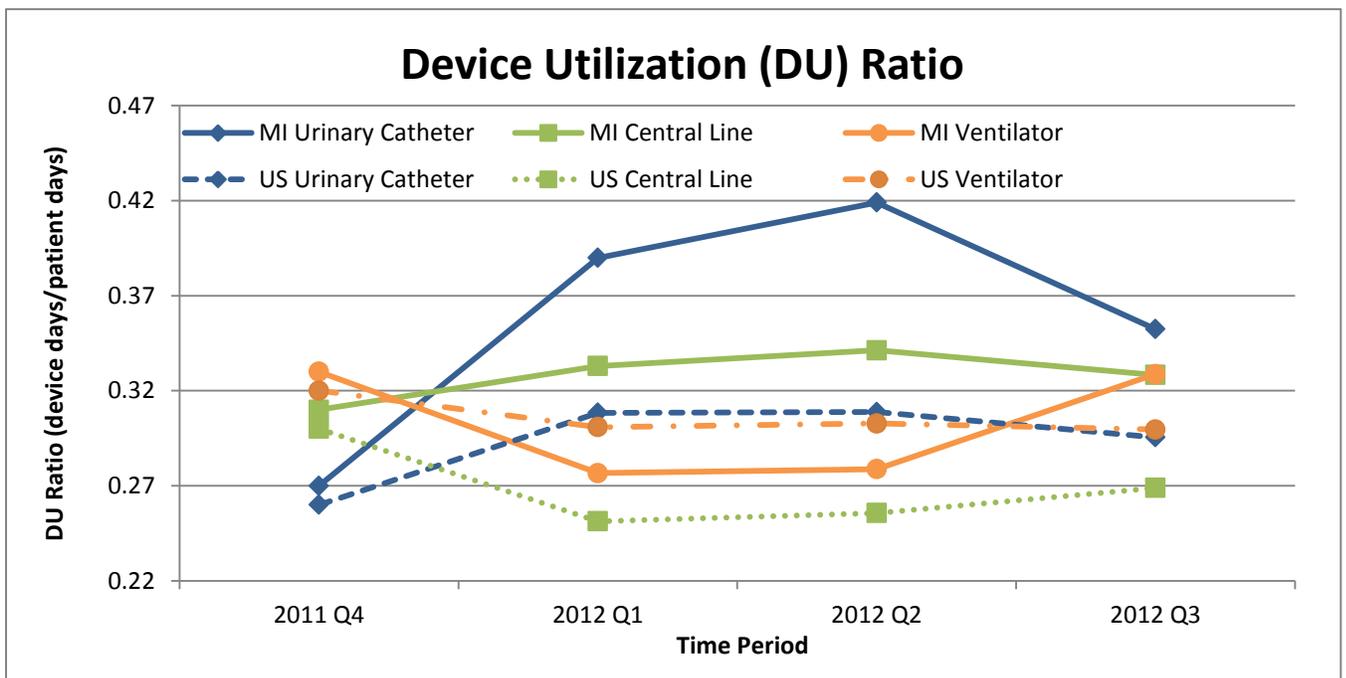


Table 9.

Michigan NICU Device-Associated Rates by Birth Weight

Type of Infection	Birth weight Code	Number of Reporting Hospitals	Number of Infections	Number of Patient Days	Number of Device Days	MI Rate ¹	US Rate ²	MI DU ³	US DU ⁴
CLABSI⁵	OVERALL	16	10	36,300	7,671	1.3036	1.5058	0.2113	0.2751
	A ⁶	13	4	5,625	1,856	2.1552*	2.5694	0.3299	0.4304
	B ⁷	15	3	5,144	1,517	1.9776	1.9817	0.2949	0.3732
	C ⁸	14	2	8,629	1,538	1.3004	1.2694	0.1782*	0.2820
	D ⁹	13	0	9,580	1,218	0.0000	0.8752	0.1271*	0.1776
	E ¹⁰	15	1	7,322	1,542	0.6485	0.8158	0.2106*	0.2381
VAP¹¹	OVERALL	14	0	16,301	1,906	0.0000	1.1016	0.1169	0.1582
	A	5	0	3,000	890	0.0000	1.5578	0.2967*	0.3862
	B	7	0	2,483	567	0.0000	1.4450	0.2284*	0.2229
	C	6	0	4,096	190	0.0000	1.0013	0.0464*	0.1078
	D	6	0	4,593	96	0.0000	0.5217	0.0209	0.0681
	E	5	0	2,129	163	0.0000	0.2062	0.0766*	0.1265

Michigan Rate
 US Comparative Rate

¹MI Rates are the number of device-associated infections per 1,000 device days among participating hospitals.

²The US comparative rates were calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This is according to 2010 NHSN data (Am J Infect Control 2011;39:798-816). These data are for a descriptive reference only, and do not necessarily represent the true national rate.

³DU: Device Utilization. The proportion of days on a device over the total number of patient days reported for the unit. The device could be a catheter, central line, or ventilator. The MI DU is the proportion of patient days that are spent using a device.

⁴The US comparative DU was calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This is according to 2010 NHSN data (Am J Infect Control 2011;39:798-816). These data are for a descriptive reference only, and do not necessarily represent the true national DU ratio.

⁵CLABSIs are laboratory-confirmed bloodstream infections (LCBI) that are not secondary to a community-acquired infection, or an HAI meeting CDC/NHSN criteria at another body site. BSIs must be central line associated (i.e., a central line or umbilical catheter was in place at the time of or within 48 hours before onset of the event).

⁶A: Birthweight ≤750g

⁷B: Birthweight 751 – 1000g

⁸C: Birthweight 1001 – 1500g

⁹D: Birthweight 1501 – 2500g

¹⁰E: Birthweight >2500g

¹¹VAPs can be identified by using a combination of radiologic, clinical and laboratory criteria. PNEUs must be ventilator-associated (i.e., patient was intubated and ventilated at the time of or within 48 hours before the onset of the event).

*Indicates significantly different from the previous quarter.

Table 9 (above) displays the Michigan NICU Device-Associated rates stratified by birth weight. Since the previous quarter, only the CLABSI rate increase from 0.000 to 2.1552 per 1,000 device days among birth weight code A neonates was significant. The DU ratios showing an asterisk were significant.

Standardized Infection Ratios

Table 10 (below) provides information on the Standardized Infection Ratio (SIR) for CAUTIs, CLABSIs and SSIs in the third quarter of 2012. An SIR is defined as the ratio of observed events compared to the number of predicted events, while accounting for unit type or procedure. Of the 75 hospitals participating in the CAUTI reporting module, 70 provided data to the SHARP Unit valid for SIR calculations. Of the 73 hospitals participating in the CLABSI reporting module, 70 shared CLABSI SIR data. Of the 74 hospitals participating in the SSI module, 69 shared SSI SIR data. The majority of SSI infections reported were colon surgeries (66 hospitals) and abdominal hysterectomies (63 hospitals).

Table 10.

Standardized Infection Ratios (SIR)

Type of Infection	Number of Hospitals	Procedures Done	Device Days	Observed ¹	Predicted ²	MI SIR ³	MI p-value	MI 95% CI ⁴
CAUTI ⁵	70	N/A	96,195	241	205.5	1.173	0.0085	1.029, 1.331
CLABSI ⁶	70	N/A	89,104	87	175.7	0.495	<0.0001	0.397, 0.611
SSI ⁷	69	11,205	N/A	257	241.5	1.064	0.1670	0.936, 1.205
SSI COLO ⁸	66	2,043	N/A	112	111.149	1.008	0.4804	0.826, 1.217
SSI HYST ⁹	63	2,070	N/A	47	29.707	1.582	0.0021	1.155, 2.115

Michigan Data
 US Data

¹Observed: Number of infections (CAUTI, CLABSIs or SSIs) reported during the time frame.

²Predicted: The number of CAUTIs or CLABSIs predicted based on the type of hospital unit(s) under surveillance, or the number of SSIs predicted based upon 2009 national SSI rates by procedure type.

³SIR: Standardized Infection Ratio: Ratio of observed events compared to the number of predicted events, accounting for unit type or procedure. An SIR of 1 can be interpreted as having the same number of events that were predicted. An SIR that is between 0 and 1 represents **fewer** events than predicted, while an SIR of greater than 1 represents **more** events than expected.

⁴95% CI: 95% confidence interval around the SIR estimate. A 95% CI indicates that 95% of the time, the actual SIR will fall within this interval.

⁵CAUTI: Catheter-Associated Urinary Tract Infection. CAUTIs are defined using symptomatic urinary tract infection (SUTI) criteria or Asymptomatic Bacteremic UTI (ABUTI) criteria. UTIs must be catheter-associated (i.e. patient had an indwelling urinary catheter at the time of or within 48 hours before onset of the event).

⁶CLABSI: Central Line-Associated Blood Stream Infection. CLABSIs are laboratory-confirmed bloodstream infections (LCBI) that are not secondary to a community-acquired infection, or an HAI meeting CDC/NHSN criteria at another body site. BSIs must be central line associated (i.e., a central line or umbilical catheter was in place at the time of, or within 48 hours before, onset of the event).

⁷SSI: Surgical Site Infection. Includes any superficial incisional, deep incisional, or organ/space SSI.

⁸SSI COLO: Colon surgeries

⁹SSI HYST: Abdominal Hysterectomies

The CAUTI SIR this quarter was 1.173, which indicated significantly more infections than expected. This quarter's CLABSI SIR demonstrates that Michigan facilities again had significantly fewer CLABSIs than predicted based on national averages. An SIR of 0.495 indicates that Michigan had 50.5% fewer CLABSIs than expected. The SSI SIR was 1.064, which is not significantly different than expected. Compared to the previous quarter's MI SIRs, none of these were significantly different. The SSI colon surgery (COLO) and SSI abdominal hysterectomy (HYST) SIRs were 1.008 and 1.582, respectively. The SIR for SSI HYST procedures increased significantly from the previous quarter to the present.

Figures 9, 10, and 11 (below) display the SIR for the CAUTI, CLABSI, and SSI modules over time. The center dot on each point represents the calculated SIR for the respective time period. The upper and lower marks represent the upper and lower ends of the 95% Confidence Interval (CI) surrounding the SIR. A 95% CI means that 95% of the time, the true SIR will be located within this interval. If the interval does not cross 1, then the calculated SIR is statistically significantly different from the predicted value. The number 1, or the null value, is indicated by the dashed line.

Figure 9. CAUTI Standardized Infection Ratios

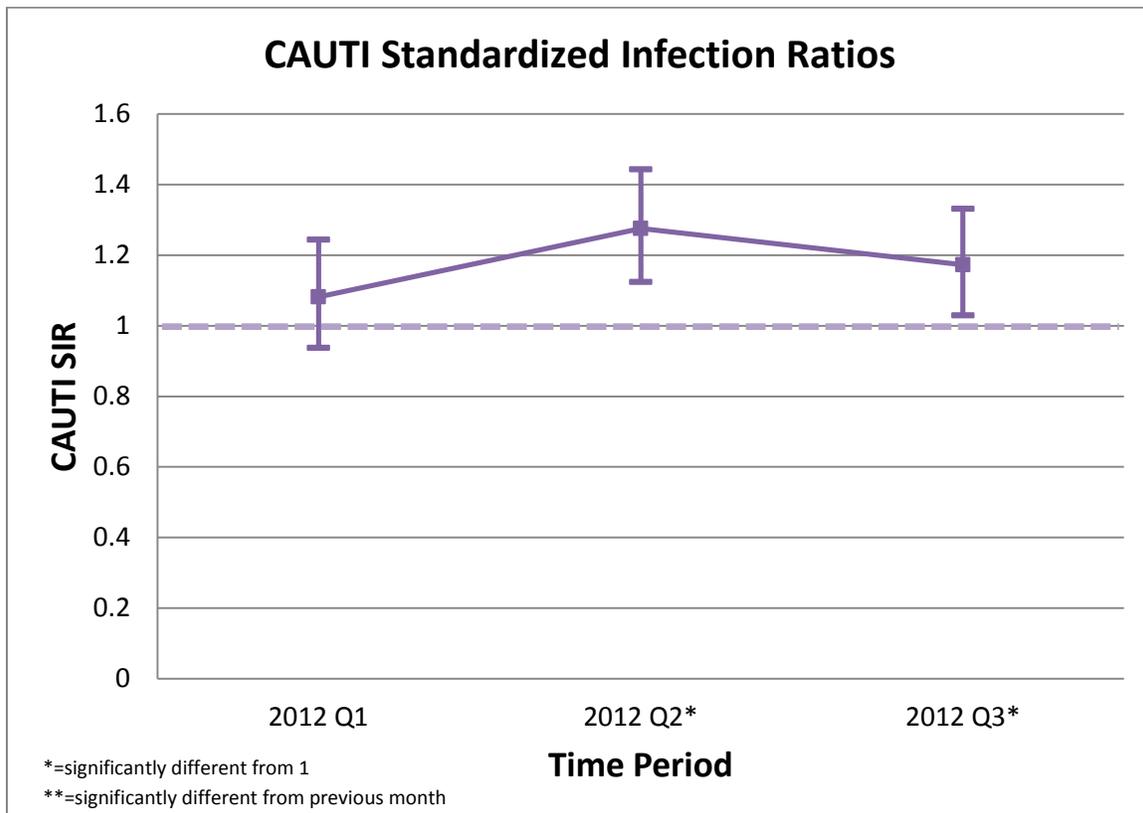


Figure 10. CLABSI Standardized Infection Ratios

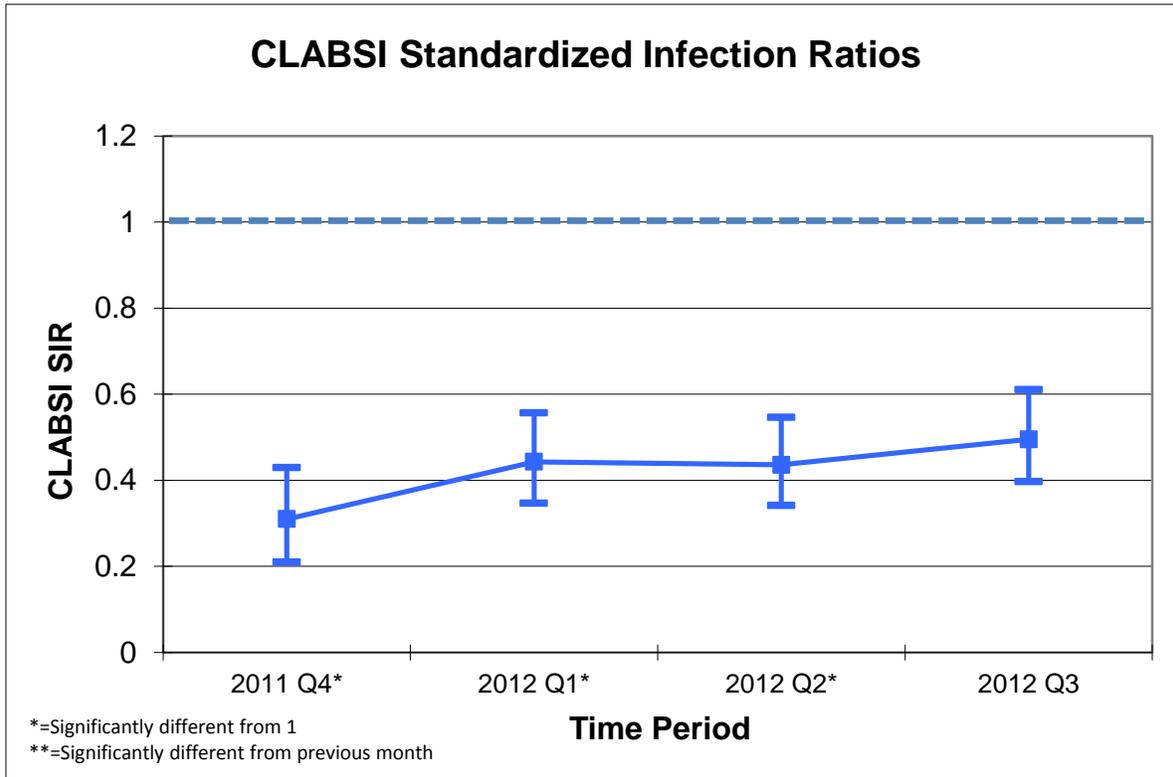
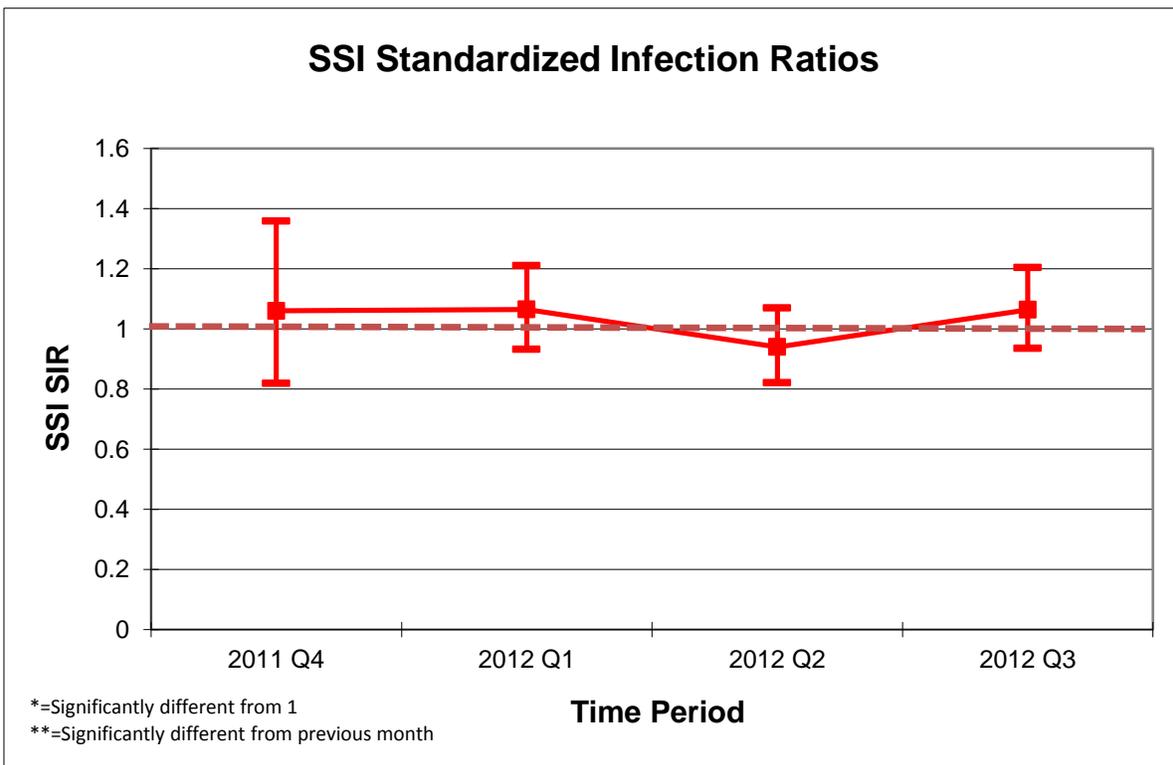


Figure 11. SSI Standardized Infection Ratios



Conclusions

This quarter, hospital participation was relatively stable, increasing slightly from 76 hospitals participating in the 2nd quarter of 2012 to 79 participating in the third quarter of 2012. This continued to be stable after an almost 20 hospital increase from the fourth quarter of 2011 to the first quarter of 2012, mostly due to CMS reporting requirements and hospitals sharing data with MHA through the SHARP Unit.

The overall inpatient MRSA LabID event rate increased significantly. The MRSA HO incidence rate decreased slightly, while the MRSA CO prevalence rate increased significantly ($p=0.0002$). The distribution of HO vs. CO remained similar, with a slight increase in CO infections. The CDI HO LabID rate increased significantly ($p<0.0001$), while both the CO and CO-HCFA LabID rates decreased non-significantly.

The CAUTI rate decreased, although not significantly, and the DU ratio also decreased. The CAUTI SIR was significantly higher than expected, but it decreased from the previous quarter. The CLABSI rate increased non-significantly while the CLABSI DU ratio decreased. The CLABSI SIR was significantly lower than expected, and not significantly different from the previous quarter (it only slightly increased). The VAP rate decreased significantly ($p=0.0334$) while the VAP DU ratio increased. Historically, the VAP rate has been unstable in SHARP reports. We are hoping to see some improvement in stability once the VAP definition changes to Ventilator-Associated Events (VAE) beginning in 2013 reports. The overall SSI SIR, the SSI Colon Surgery (COLO) SIR, and the SSI abdominal hysterectomy (HYST) SIR were all higher than expected (Michigan hospitals experienced more SSI infections than expected). However, only the SSI HYST SIR was significantly higher than expected and was the only SIR to significantly increase from the previous quarter.

Beginning in the first quarter of 2013, SIRs will be made available for MRSA bacteremia LabID events and CDI LabID events. We hope to be able to provide SIRs for additional modules in the future as well. As future reports continue to be generated using large Michigan datasets, trends will continue to stabilize. As more and more prevention initiatives and collaboratives are implemented, we hope that Michigan HAIs will decrease in the future.

Acronyms Used in Quarterly Reports

ARRA	American Recovery and Reinvestment Act
CAUTI	Catheter-Associated Urinary Tract Infection
CDC	Centers for Disease Control & Prevention
CDI	<i>Clostridium difficile</i> Infection
CLABSI	Central Line-Associated Bloodstream Infection
CMS	Centers for Medicare & Medicaid Services
CO	Community Onset
CO-HCFA	Community Onset, Healthcare Facility-Associated
COLO	Colon Surgery
DUA	Data Use Agreement
HAI	Healthcare-Associated Infection
HYST	Abdominal Hysterectomy
HO	Healthcare-Facility Onset
ICU/CCU	Intensive Care Unit/Critical Care Unit
LabID	Laboratory-Identified (Event)
MDCH	Michigan Department of Community Health
MDRO	Multidrug-Resistant Organism
MHA	Michigan Health & Hospital Association
MPRO	Michigan's Quality Improvement Organization
MRSA	Methicillin-Resistant <i>Staphylococcus aureus</i>
NHSN	National Healthcare Safety Network
SCA	Specialty Care Area
SHARP	Surveillance for Healthcare-Associated & Resistant Pathogens Unit
SSI	Surgical Site Infection
VAE	Ventilator-Associated Event
VAP	Ventilator-Associated Pneumonia



Surveillance for Healthcare-Associated & Resistant Pathogens (SHARP) Unit

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