

HEALTHCARE-ASSOCIATED INFECTIONS IN MICHIGAN HOSPITALS

2012 QUARTER 2 REPORT

Michigan Department of Community Health

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

April 1, 2012 – June 30, 2012

Data Access Date: November 15, 2012

April - June 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 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 MDCH SHARP's prevention collaboratives can also be found at this website.

Surveillance Initiative Statistics

Between April 1 and June 30, 2012, a cumulative total of 76 Michigan hospitals voluntarily participated in the SHARP Unit HAI surveillance initiative, as demonstrated by signed data use agreements as of November 15, 2012. Thirty-six of these hospitals used the LabID Event option of the MDRO/CDI module to monitor MRSA in their reporting plan; all thirty-six 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, previous quarters, and the 2010-2011 Annual Report were used in this report to establish aggregate infection rates among participating Michigan hospitals and to monitor quarterly trends.

Of the 76 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 only) by acute care hospitals participating in the Inpatient Prospective Payment System (IPPS) which began in 2010. For example, 72 of the 76 hospitals during this quarter utilized the CAUTI module; of these, 69 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 Module ¹	Number of Hospitals Sharing Data ²
Central Line-Associated Bloodstream Infection (CLABSI)	70	70
Catheter-Associated Urinary Tract Infection (CAUTI)	72	69
Surgical Site Infection (SSI)	71	67
Ventilator-Associated Pneumonia (VAP)	47	48
Clostridium difficile Infection (CDI) Laboratory-identified (LabID) Event	44	40
Methicillin-Resistant Staphylococcus aureus (MRSA) Laboratory-identified (LabID) Event	36	36
Methicillin-Resistant Staphylococcus aureus (MRSA) Infection Surveillance	14	13
Vancomycin-Resistant Enterococci (VRE) LabID	11	N/A ⁴
Post-Procedure Pneumonia (PPP)	9	N/A
Clostridium difficile Infection (CDI) Surveillance	8	11
Vancomycin-Resistant Enterococci (VRE) Infection Surveillance	6	N/A
Acinetobacter LabID	6	N/A
Carbapenem-resistant Enterobacteriaceae LabID	5	N/A
Cephalosporin Resistant Klebsiella LabID	5	N/A
Acinetobacter Infection Surveillance	<5 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 (data are not included in quarterly reports).

⁵To maintain confidentiality, aggregate data are not displayed when less than 5 hospitals contribute.

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

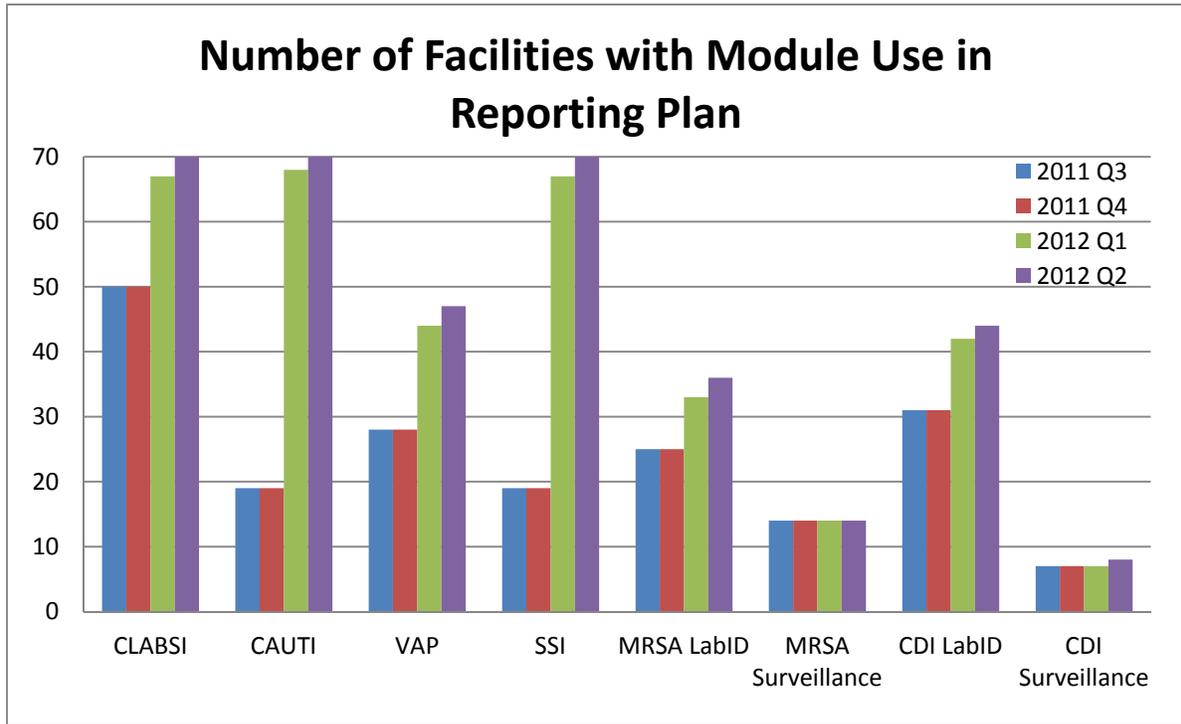
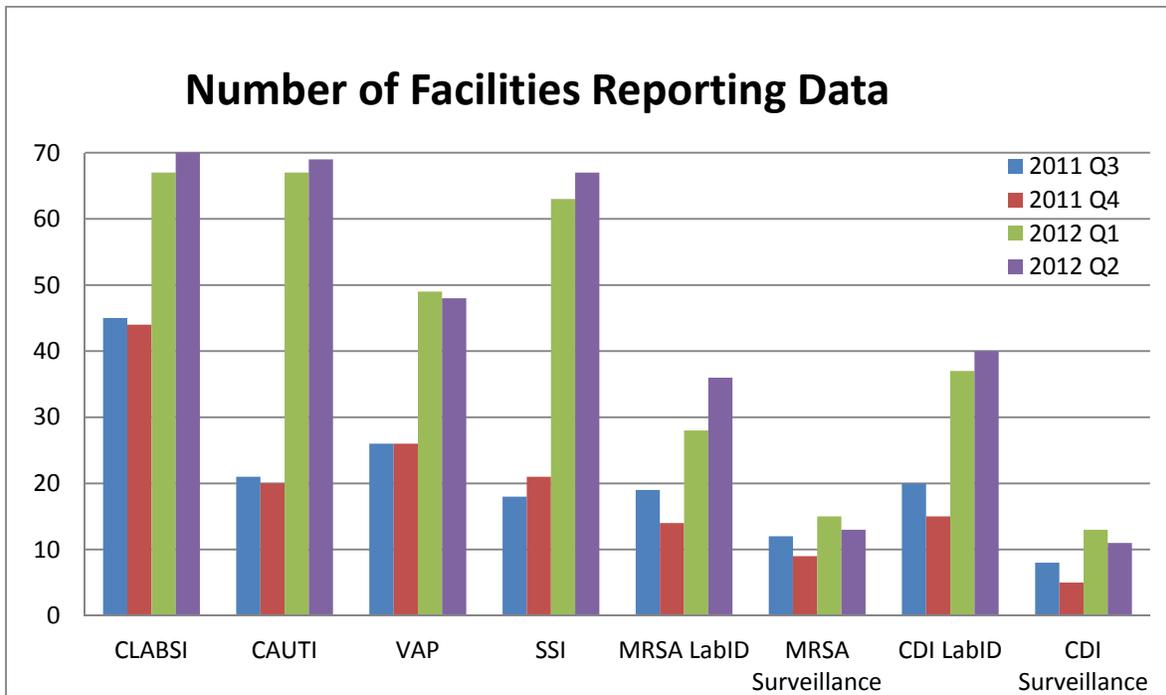


Figure 2. Number of Facilities Sharing Data by Quarter



In 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. Also, some hospitals are sharing data out-of-plan.

Methicillin-Resistant *Staphylococcus aureus* (MRSA) Data

Table 2 (below) indicates that between April 1 and June 30, 2012, 1289 isolates of MRSA were reported from thirty-six 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.

Eighteen percent of the MRSA LabID Events this quarter were determined to be healthcare facility-onset (HO), and the remaining 82% 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 and annual reports. The two exceptions to this were blood specimens (the percent HO increased from 18 to 31), and the percent HO from specialty care areas increased from 29 to 52. Outside of these two notable changes, even though the number of facilities and events per quarter are increasing, the distributions remain consistent.

Table 2.

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

	Cumulative Data October 2010 – September 2011	October – December 2011 Quarterly Report	January – March 2012 Quarterly Report	April – June 2012 Quarterly Report
Frequency, Number				
<i>Hospitals with a DUA</i> ¹	56	54	73	76
<i>Hospitals reporting MRSA LabID</i> ²	27	25	33	36
<i>Hospitals sharing MRSA LabID</i>	19	14	28	36
<i>Aggregated LabID Events</i>	2793	371	1142	1289
Onset, Number (%)				
<i>Healthcare Facility-Onset (HO)</i>	537 (19)	86 (23)	188 (16)	230 (18)
<i>Community-Onset (CO)</i>	2256 (81)	285 (77)	954 (84)	1059 (82)
Specimen Source, Number (%HO)³				
<i>Blood</i>	236 (25)	49 (14)	96 (18)	98 (31)
<i>Sputum</i>	589 (41)	84 (42)	163 (42)	153 (39)
<i>Wound</i>	1175 (7)	91 (5)	345 (8)	404 (11)
<i>Abcess</i>	77 (12)	13 (0)	44 (9)	102 (10)
<i>Urine</i>	206 (10)	18 (22)	116 (11)	127 (9)
<i>Skin</i>	106 (7)	3 (0)	16 (6)	6 (0)
<i>Other</i>	404 (29)	113 (31)	362 (16)	399 (19)
Surveillance Location, Number (% , %HO)⁴				
<i>Intensive/Critical Care Unit</i>	747 (27, 39)	143 (39) ⁵	244 (21, 39)	280 (22, 37)
<i>Specialty Care Area</i>	27 (1,7)	-----	14 (1, 29)	21 (2, 52)
<i>Wards</i>	1164 (42, 21)	192 (52)	487 (43, 18)	528 (41, 22)
<i>Outpatient</i>	855 (31, 0)	36 (10)	397 (35, 0)	460 (36, 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.

Clostridium difficile Infection (CDI) Data

As shown in Table 3 (below), this quarter there were 934 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.

Twenty-nine percent of CDI LabID Events were considered healthcare facility-onset (HO). Nineteen percent were considered community-onset healthcare facility-associated (CO-HCFA), and fifty-two percent were reported as community-onset (CO). 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).

Twelve percent of CDI LabID Events occurred in patients who had a prior CDI LabID Event entered in a previous month. In addition, 7% 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 hospital onset within each location, were distributed very consistently compared to the previous quarterly and annual reports.

Table 3.

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

	Cumulative Data October 2010 – September 2011	October – December 2011 Quarterly Report	January – March 2012 Quarterly Report	April – June 2012 Quarterly Report
Frequency, Number				
<i>Hospitals with DUA</i> ²	56	54	73	76
<i>Hospitals Reporting CDI LabID</i> ³	32	31	42	44
<i>Hospitals Sharing CDI LabID</i>	29	15	37	40
<i>Aggregated LabID Events</i>	2004	291	991	934
Onset, Number (%)				
<i>Healthcare Facility-Onset (HO)</i>	783 (39)	87 (30)	359 (36)	270 (29)
<i>Community-Onset Healthcare Facility-Associated (CO-HCFA)</i>	421 (21)	45 (15)	183 (18)	178 (19)
<i>Community-Onset (CO)</i>	800 (40)	159 (55)	449 (45)	486 (52)
Previous CDI, Number (%)				
<i>Previously Positive</i>	-----	36 (12)	110 (11)	109 (12)
<i>CDI assay, recurrent</i>	-----	19 (7)	67 (7)	66 (7)
Surveillance Location, Number (% , %HO)⁴				
<i>Intensive/Critical Care Unit</i>	459 (23, 51)	71 (24) ⁵	196 (20, 56)	175 (19, 41)
<i>Specialty Care Area</i>	116 (6, 55)	5 (2)	61 (6, 57)	65 (7, 43)
<i>Wards</i>	1167 (58, 42)	159 (55)	548 (55, 39)	524 (56, 33)
<i>Outpatient</i>	261 (13, 0)	59 (19)	186 (19, 0)	170 (18, 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.

Multidrug-Resistant Organisms (MDRO) Summary Data

Tables 4 and 5 (below) provide an overview of the rates of MRSA LabID and Infection Surveillance Events for multidrug-resistant organisms (MDROs). 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. Data are shown for organisms where five or more facilities are conducting surveillance for that particular organism.

Table 4.						
Cumulative Michigan MRSA Rate						
	Facilities	Number of MRSA Events	Number of Patient Days/Encounters	Number of Patient Admits	MRSA Rate¹	MRSA Prevalence Rate²
MRSA Inpatient LabID	36	706 LabID ^{3,4}	347,071 Patient Days	83,814	2.0342	0.8423
MRSA Surveillance	13	7 Infection ⁵	27,815 Patient Days	---- ⁶	0.2517	----
MRSA Outpatient LabID	11	367 LabID	197,599 Encounters	----	1.8573	----

Michigan Rate

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

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

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 inpatient MRSA LabID Events indicated here is less than the number of MRSA LabID Events indicated in Table 7. 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 decreased significantly this quarter, from 2.24 to 2.03 per 1,000 patient days (p=0.0131). MRSA Inpatient LabID Event Rate trends are displayed in Figure 3. The MRSA Outpatient LabID Rate was not statistically significantly different from the previous quarter, increasing slightly from 1.85 to 1.86 per 1,000 patient encounters.

Figure 3. Inpatient MRSA LabID Rate Trends by Quarter

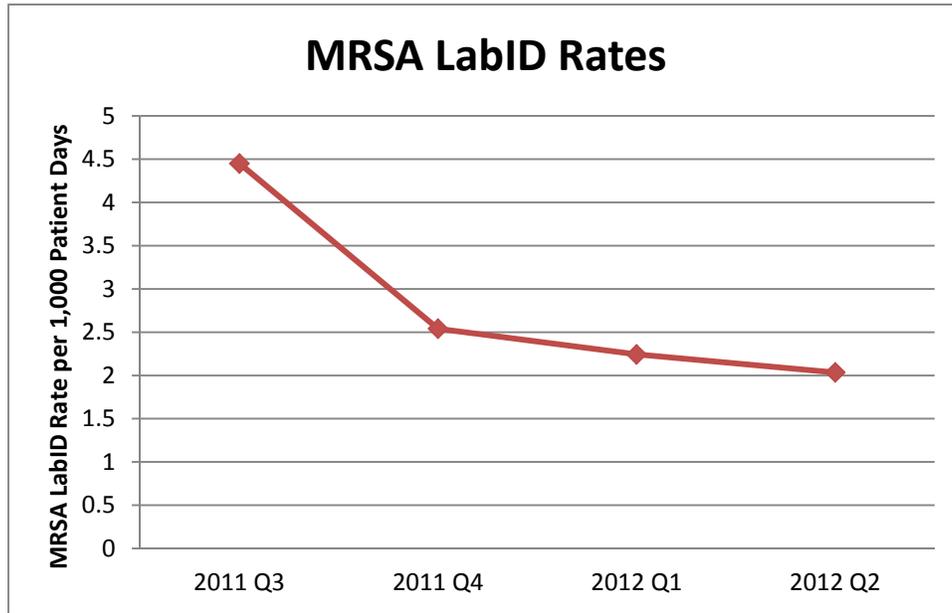


Table 5 (below) provides inpatient MRSA LabID rates stratified by onset. This is the second time SHARP has received enough data to stratify MRSA LabID rates by community-onset and healthcare facility-onset. Trend data is beginning to become available for stratified MRSA LabID rates.

Table 5.							
Michigan MRSA LabID Rate by Onset							
Number of Facilities	Onset	Number of Inpatient MRSA Events	Number of Patient Days	Number of Patient Admits	MRSA Rate ¹	MRSA Prevalence Rate ²	Percentage of Total
36	HO ³	154 LabID ⁴	347,071	----	0.4437	----	23%
36	CO ⁵	510 LabID	----	83,814	----	0.6085	77%

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 or encounters.

²MRSA 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.

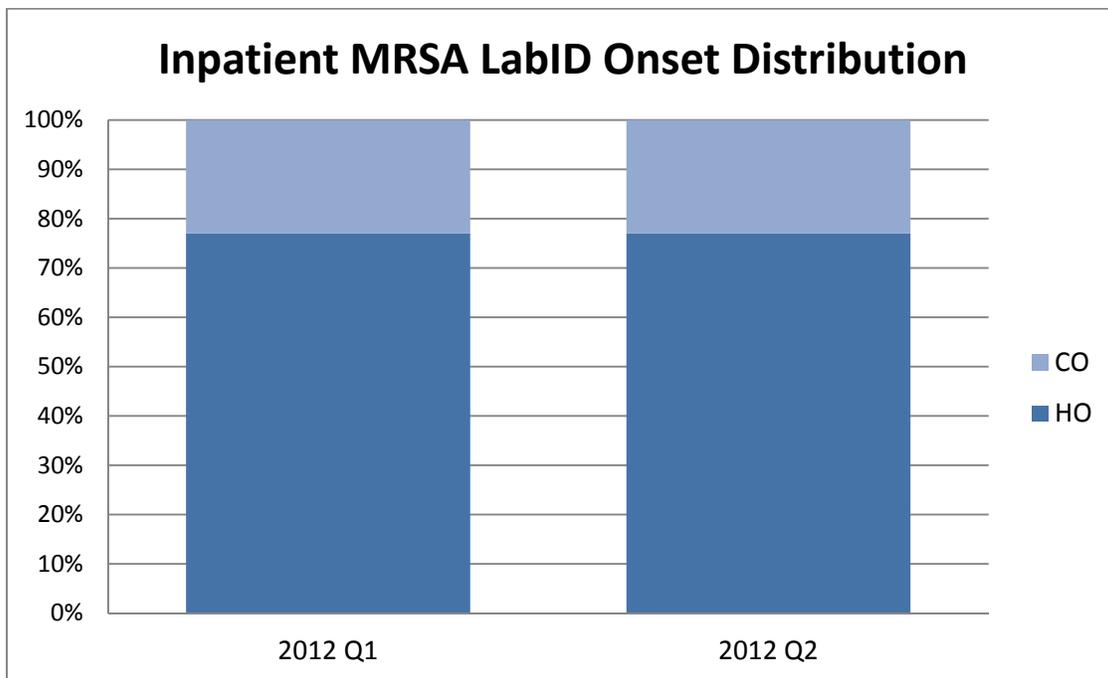
⁵CO: Community-onset

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 from 0.5120 to 0.4437 per 1,000 patient days from the previous quarter to the present. This decrease was not statistically significantly different. 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 0.7224 per 100 admissions; it significantly decreased to 0.6085 this quarter ($p=0.0004$).

The majority (77%) of inpatient MRSA LabID events were community-onset. The remaining 23% were healthcare facility-onset. The graphical display of this can be seen below in Figure 4, along with quarter 1 data. Both quarters showed the same 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 rate table.

Figure 4. Inpatient MRSA LabID Onset Distribution (percentages)



Tables 6 and 7 (below) provide an overview of the rates of CDI LabID and Infection Surveillance Events for multidrug-resistant organisms (MDROs). Table 6 provides CDI Infection Surveillance data as well as inpatient and outpatient LabID event data, and Table 7 displays data stratified by onset. Data are shown where five or more facilities are conducting CDI surveillance.

Table 6.

Cumulative Michigan CDI Rate

	Facilities	Number of CDI Events	Number of Patient Days or Encounters	Number of Patient Admits	CDI Rate ¹	CDI Prevalence Rate ²
CDI Inpatient LabID	40	736 LabID ^{3,4}	412,889 Patient Days	107,243	17.8256	0.6863
CDI Surveillance	11	5 Infection ⁵	21,902 Patient Days	---- ⁶	2.2829	----
CDI Outpatient LabID	13	118 LabID	290,003 Encounters	----	4.0689	----

Michigan Rate

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

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.

⁴Infection: *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.

⁵The 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 remained quite stable this quarter, from 17.31 to 17.83 per 10,000 patient days. Overall CDI Inpatient LabID Event rate trends can be seen in Figure 5. The CDI Outpatient LabID rate decreased significantly from 5.40 to 4.07 per 10,000 patient encounters (p=0.0022).

Figure 5. Inpatient CDI LabID Rate Trends by Quarter

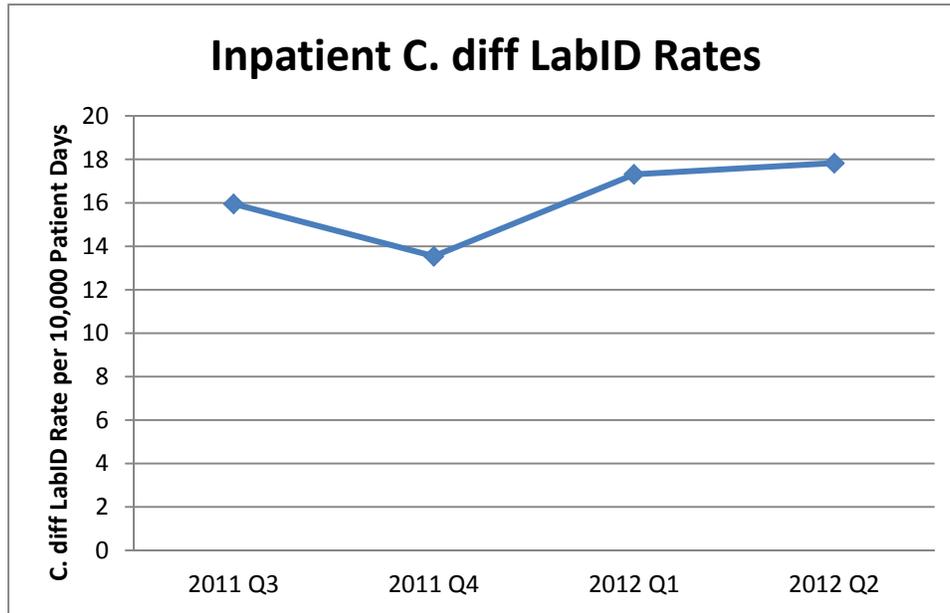


Table 7 (below) provides inpatient CDI LabID Rates stratified by onset. This is the second time SHARP has received enough data from reporting hospitals to stratify CDI LabID Rates by healthcare facility-onset, community-onset, and community-onset healthcare facility-associated. Trend data is beginning 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 Rate ¹	CDI Prevalence Rate ²	Percentage of Total
40	HO ³	243 LabID ⁴	412,889	----	5.8854	----	34%
40	CO-HCFA ⁵	144 LabID	----	107,243	----	0.3114	20%
40	CO ⁶	334 LabID	----	107,243	----	0.1343	46%

Michigan Rate

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

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

³ HO: Healthcare facility-onset

⁴ CDI 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.

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

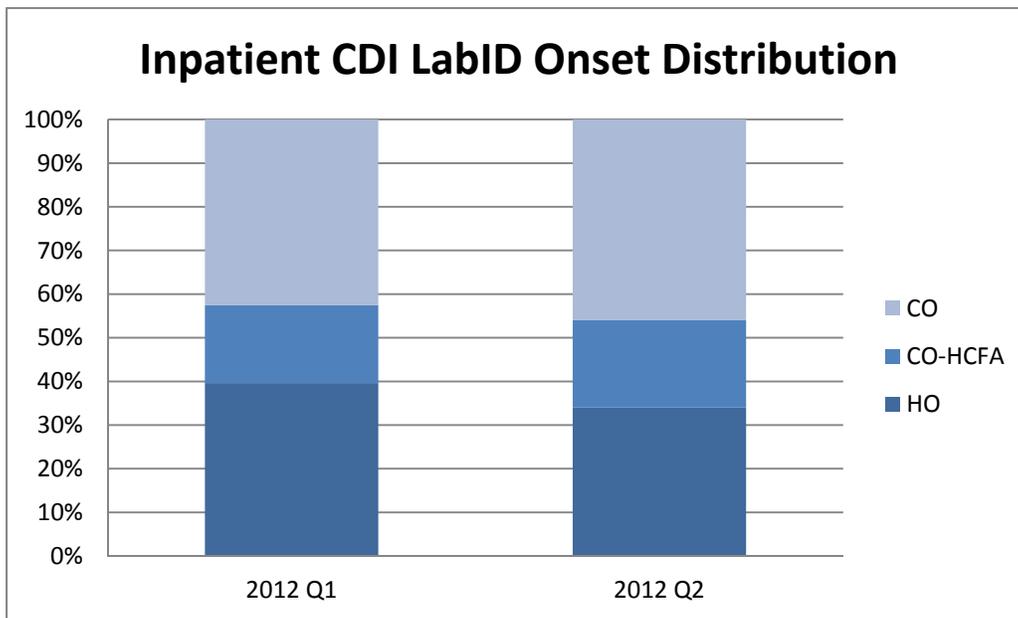
⁶ CO: Community-onset

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 decreased significantly from 6.8591 to 5.8854 per 10,000 patient days from the last quarter to the present ($p=0.0158$). 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 increased from 0.2831 to 0.3114 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 increased non-significantly from 0.1180 to 0.1343 per 100 admissions.

The majority (46%) of inpatient CDI LabID events were community-onset, followed by healthcare facility-onset (34%). The remaining infections were community-onset healthcare facility-associated (20%). The graphical display of this from the previous quarter 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 the Device-Associated Infection Rates as well as the Device Utilization (DU) Ratios for each device: urinary catheters, central lines, and ventilators. Data are shown for infections where five or more facilities collected and shared data for that particular infection.

Of the 72 hospitals with CAUTI in their reporting plans, 69 shared data. All 70 hospitals with CLABSI in their reporting plan for at least one month shared data. Although there were only 47 hospitals that had VAP in their reporting plan, 48 shared data. The additional facility was either reporting data out of plan or changed their reporting plan between the data pull date and when 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	69	255	232,202	97,300	2.6208	1.5960	0.4190	0.3088
CLABSI ⁶	70	63	238,025	81,226	0.7756	1.0854	0.3413	0.2557
VAP ⁷	48	39	88,860	24,774	1.5742	1.4337	0.2788	0.3028

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).
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, in this case a urinary catheter.
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).
⁵CAUTIs 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 an increase in Michigan rates for the CAUTI module. This increase was statistically significant, from 2.13 to 2.62 per 1,000 device days (p=0.0014). There was a non-significant decrease for CLABSI (0.80 to 0.78 per 1,000 device days). The VAP rate increased significantly from the previous quarter (0.88 per 1,000 device days) to the present (1.57 per 1,000 device days (p=0.0019)).

The Michigan DU ratio increased for all three device-associated modules. 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.

Figure 7. Device-Associated Infection Rate Trends by Quarter

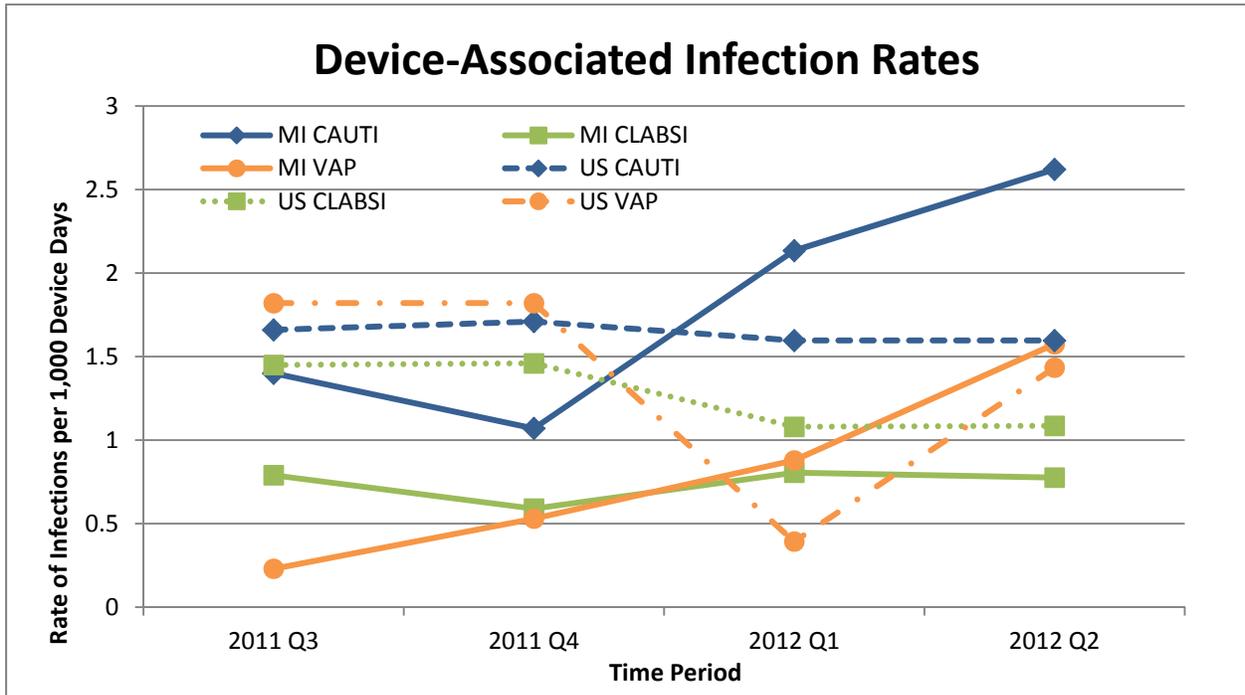


Figure 8. Device Utilization Ratio Trends by Quarter

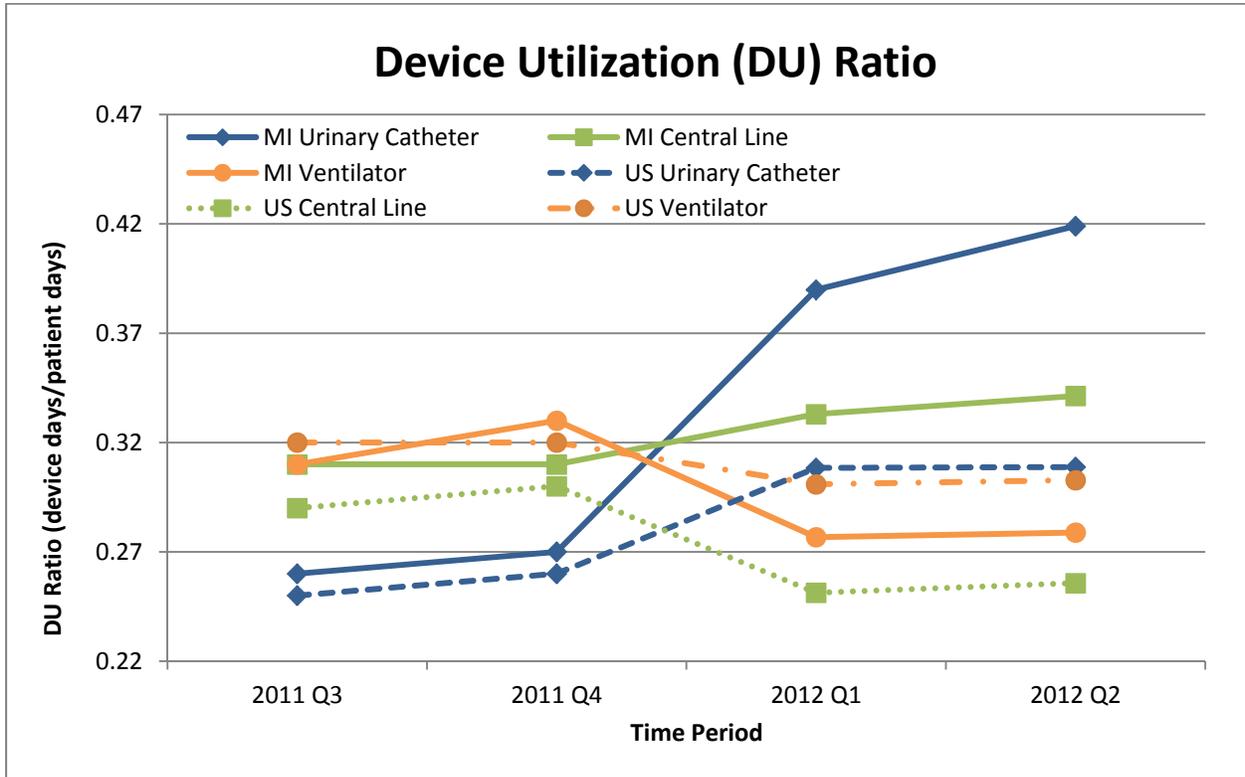


Table 9.

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
CAUTI⁵	A ⁶	9	0	1390	3	0.0000	----	0.0022	----
	B ⁷	9	0	1409	3	0.0000	----	0.0021	----
	C ⁸	9	0	3365	50	0.0000	----	0.0149	----
	D ⁹	9	0	4703	28	0.0000	----	0.0060	----
	E ¹⁰	9	0	3618	33	0.0000	----	0.0091	----
CLABSI¹¹	A	16	0	4700	1488	0.0000	2.6874	0.3166	0.4270
	B	16	4	4769	1417	2.8229	2.2166	0.2971	0.3837
	C	16	1	7830	1730	0.5780	1.2998	0.2209	0.2918
	D	16	0	9767	1152	0.0000	0.9896	0.1179	0.1883
	E	16	2	7418	1277	1.5662	0.8112	0.1721	0.2460
VAP¹²	A	8	1	2219	850	1.1765	1.3821	0.3831	0.3898
	B	8	0	1651	212	0.0000	0.9354	0.1284	0.2423
	C	8	0	3371	109	0.0000	0.8867	0.0323	0.1086
	D	9	0	4666	96	0.0000	0.4277	0.0206	0.0828
	E	8	0	3601	198	0.0000	0.4367	0.0550	0.1385

 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).

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).

⁵CAUTIs are

⁶A: Birthweight ≤750g

⁷B: Birthweight 751 – 1000g

⁸C: Birthweight 1001 – 1500g

⁹D: Birthweight 1501 – 2500g

¹⁰E: Birthweight >2500g

¹¹CLABSIs 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).

¹²VAPs 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).

Table 9 (above) displays the Michigan NICU Device-Associated rates stratified by birth weight. This is the second time the CLABSI and VAP modules have been made available; no rates were significantly different from the first quarter. This report is the first time CAUTI rates have been calculated, due to the increased number of hospitals sharing data with the SHARP Unit.

Standardized Infection Ratios

Table 10 (below) provides information on the Standardized Infection Ratio (SIR) for CAUTIs, CLABSIs and SSIs in the second 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 72 hospitals participating in the CAUTI reporting module, 69 provided data to the SHARP Unit. All 70 of the hospitals participating in the CLABSI reporting module shared data. Of the 71 hospitals participating in the SSI module, 67 shared data with the SHARP Unit. Due to CMS reporting requirements, the majority of SSI infections reported were colon surgeries and abdominal hysterectomies.

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 ⁴	MI 95% CI ⁵
CAUTI ⁶	70	N/A	94,613	253	198.25	1.276	0.0001	(1.124, 1.443)
CLABSI ⁷	69	N/A	87,239	74	169.69	0.436	0.0000	(0.342, 0.547)
SSI ⁸	67	10,815	N/A	239	254.22	0.940	0.1783	(0.822, 1.070)
SSI COLO ⁹	66	2,099	N/A	115	124.46	0.924	0.2125	(0.760, 1.113)
SSI HYST ¹⁰	64	1,881	N/A	33	36.43	0.906	0.3212	(0.619, 1.280)

 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 for the same number and type of procedures performed 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.

⁴P-value: a test of significance. A p-value of <0.05 is considered statistically significantly different than expected.

⁵95% 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.

⁶CAUTI: Catheter-Associated Urinary Tract Infection

⁷CLABSI: Central Line-Associated Blood Stream Infection

⁸SSI: Surgical Site Infection

⁹SSI COLO: Colon surgeries, accessed 11-30-12

¹⁰SSI HYST: Abdominal Hysterectomies, accessed 11-30-12

The CAUTI SIR this quarter was 1.276, which indicated significantly more infections than expected. This quarter's CLABSI SIR demonstrates that Michigan facilities had significantly fewer CLABSIs than predicted based on national averages. An SIR of 0.436 indicates that Michigan had 56.4% fewer CLABSIs than expected. The SSI SIR was 0.940, which is not significantly different than expected. Compared to the previous quarter's MI SIRs, none were significantly different. The SSI COLO and SSI HYST SIRs were 0.924 and 0.906, respectively. Neither result indicated significantly different observed infections compared to expected.

Figures 9 and 10 (below) display the SIR for the CLABSI and SSI modules for the previous four quarters. There were not enough historical data in SHARP-produced quarterly reports to create a CAUTI figure. 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 surround 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. CLABSI Standardized Infection Ratios

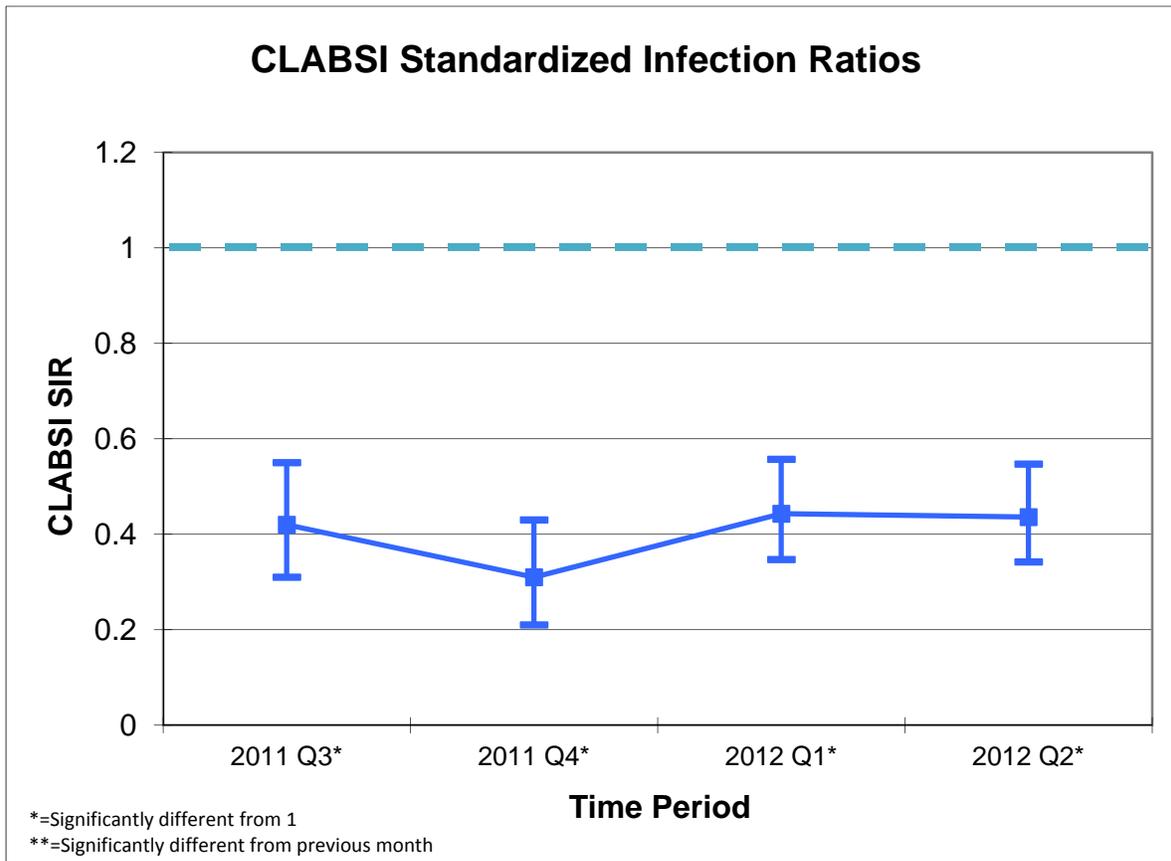
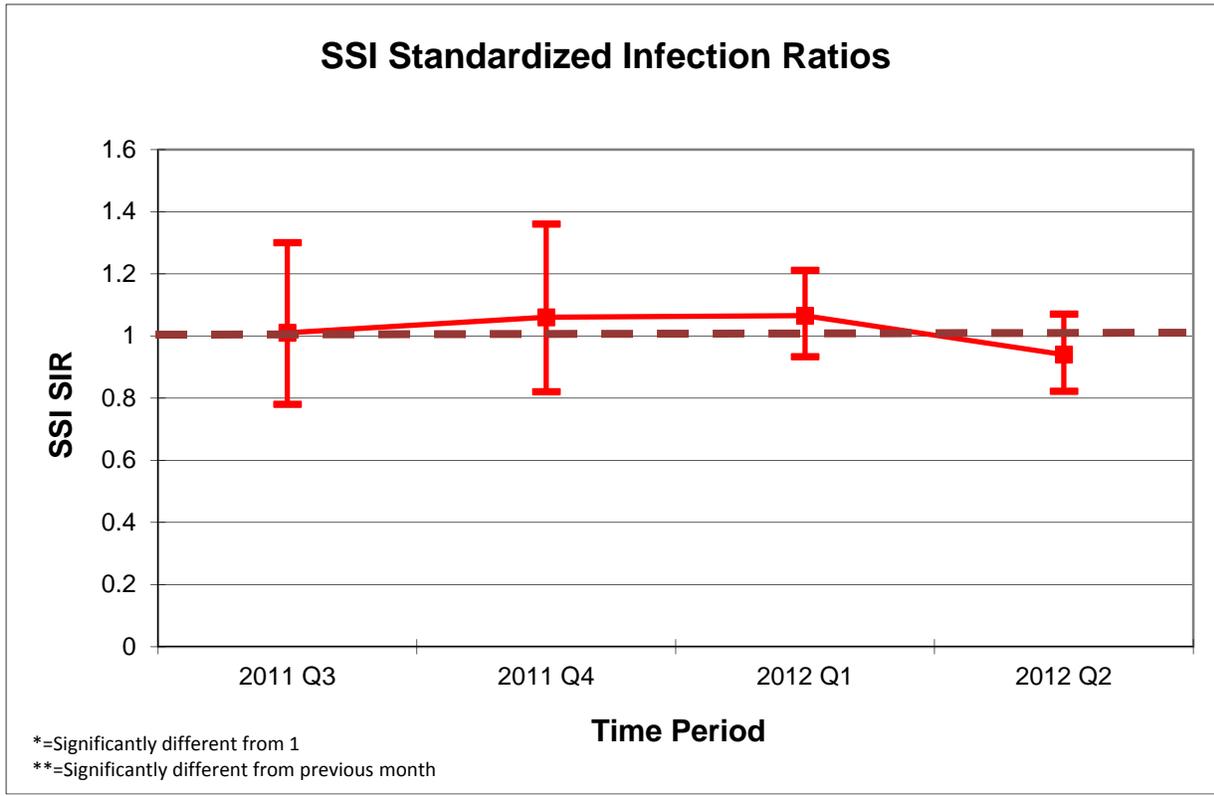


Figure 10. SSI Standardized Infection Ratios



While the SSI SIR is not significantly different from expected or the previous month, it is important to note the width of the 95% confidence interval. Because there are so many more hospitals providing data than previously, this range has decreased substantially. A smaller confidence interval means that there is more certainty in the results.

Conclusions

This quarter, there was relatively stable hospital participation, from 73 in the first quarter of 2012 to 76 in the second quarter of 2012. This was much more 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 Keystone through the SHARP Unit.

The overall inpatient MRSA LabID event rate decreased, and the outpatient MRSA LabID event rate remained about the same. The MRSA HO incidence rate decreased non-significantly, and the MRSA CO prevalence rate decreased significantly ($p=0.0004$). The distribution of HO vs. CO remained about the same. The overall inpatient CDI LabID rate remained about the same, while the outpatient CDI LabID rate decreased significantly ($p=0.0022$). The CDI HO LabID Rate decreased significantly ($p=0.0158$) while both the CO and CO-HCFA LabID Rates increased non-significantly.

The CAUTI rate increased significantly ($p=0.0014$), and the DU ratio increased. The CAUTI SIR was significantly higher than expected, and increased almost significantly from the previous quarter. However, when stratified into the original 25 hospitals contributing data vs. all hospitals, the CAUTI SIR and DU ratios remained fairly constant. The report detailing this is currently in preparation by the SHARP Unit and will be made available in the near future.

The CLABSI rate decreased non-significantly while the CLABSI DU ratio increased, and the VAP rate increased significantly ($p=0.0019$) while the VAP DU ratio increased as well. While we are unsure of the reason for the VAP increase, the VAP rate has been unstable in previous reports. Due to the increase in participating facilities this year, the facility- and patient-types may be different than previous years and quarters. This is why rate measurements are not as reliable as SIR. Unfortunately, at this time, there are only SIRs available for CAUTI, CLABSI, and SSI. The CLABSI SIR was significantly lower than expected, but not significantly different from the previous quarter. The overall SSI SIR, the SSI COLO SIR, and the SSI HYST SIR were slightly lower than expected, but not significantly. The overall SSI SIR was not significantly different from the previous quarter. It is expected that SIRs will be made available for MRSA bacteremia LabID events and CDI LabID events in February 2013.

We are investigating possible reasons for the rate and SIR increases in order to provide future prevention recommendations. However, rates have considerably stabilized from the previous quarter to the present. As future reports are generated with a larger population, these trends will hopefully continue to stabilize or decrease.

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
DUA	Data Use Agreement
HAI	Healthcare-Associated Infection
ICU	Intensive 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
VAP	Ventilator-Associated Pneumonia



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

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