PICNet
PROVINCIAL INFECTION CONTROL NETWORK OF BRITISH COLUMBIA
A program of the Provincial Health Services Authority

Methicillin-Resistant *Staphylococcus aureus* (MRSA) Surveillance Report

For the Fiscal Year 2012/2013

Prepared by:

Provincial Infection Control Network of British Columbia (PICNet)

September 2013

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Table of Contents

Acronyms

BC	British Columbia
CA	Community-associated
CI	Confidence interval
CNISP	Canadian Nosocomial Infection Surveillance Program
FHA	Fraser Health Authority
FQ	Fiscal quarter
FY	Fiscal year
HA	Health authority
HAI	Healthcare-associated infection
HCA	Healthcare-associated
ICP	Infection control practitioner
IHA	Interior Health Authority
MRSA	Methicillin-resistant *Staphylococcus aureus*
NHA	Northern Health Authority
PHC	Providence Health Care
PHSA	Provincial Health Services Authority
PICNet	Provincial Infection Control Network of British Columbia
SSC	PICNet's Surveillance Steering Committee
VCHA	Vancouver Coastal Health Authority
VIHA	Vancouver Island Health Authority

Summary

This annual report represents *newly* identified cases of MRSA (either infection or colonization) among inpatients admitted to acute care facilities in British Columbia (BC) during the fiscal year (FY) 2012/2013 (April 1, 2012 – March 31, 2013), with a focus on the cases of MRSA associated with reporting facility. This includes the cases associated with current admission to the reporting facility, and previous encounters with the reporting facility in the last twelve months.

A total of 2,785 cases of MRSA were newly identified among acute care inpatients during FY 2012/2013, of which 1,533 were healthcare-associated (HCA) with the reporting facility (55.0%).

Among the MRSA cases associated with the reporting facility, 1,031 cases were further classified into whether they were associated with the current admission or a previous encounter. Of these, 898 (69.0%) were associated with the current admission to the reporting facility, and 403 (31.0%) were associated with a previous encounter with the reporting facility in the last twelve months.

The provincial annual rate of MRSA associated with the reporting facility was 5.1 [95% confidence interval (CI): 4.8-5.3] per 10,000 inpatient days in FY 2012/2013. This is a statistically significant increase from the annual rate of 4.2 (95% CI: 3.9-4.4) per 10,000 inpatient days in FY 2011/2012 and 4.4 (95% CI: 4.1-4.6) per 10,000 inpatient days in FY 2010/2011.

The quarterly rates of MRSA associated with the reporting facility increased gradually in FY 2012/2013, and the increasing trend from Q2 of FY 2011/2012 to Q4 of FY 2012/2013 was statistically significantly (χ^2 for trend = 29.42, $p < 0.001$).

The annual rate of MRSA associated with the reporting facility in FHA was significantly higher in FY 2012/2013 than in the previous two years. The rates in IHA and VCHA were also higher in FY 2012/2013 than in the previous two years, with the difference being statistically significant between FY 2012/2013 and FY 2011/2012. There were no significant differences in the annual rates over the three fiscal years for VIHA, NHA, and PHSA.

The rates differed between the three hospital size categories (50 or fewer beds, 51-250 beds, and >250 beds). Hospitals with 50 or fewer beds had the highest rate of MRSA associated with the reporting facility in FY 2012/2013 (with a wide range of 95% CI due to their small denominators and higher numbers of cases in some hospitals); their rate increased significantly in FY 2012/2013 compared to the previous two fiscal years. Hospitals with 51-250 beds had the lowest rate. Their rate was higher in FY 2012/2013 than in the previous two years; however, this increase was not statistically significant. Hospitals with more than 250 beds had a higher rate in FY 2012/2013 than in the previous two years, with the increase being statistically significant between FY 2012/2013 and FY 2011/2012.

The rates also varied by hospital category (community hospital, regional hospital, tertiary/referral hospital). The rate of MRSA associated with the reporting facility in FY 2012/2013 was highest in tertiary/referral hospitals and lowest in regional hospitals, and this difference was statistically significant. The rate for community hospitals increased each year, with the difference between FY 2010/11 and FY 2012/13 being statistically significant. For regional and tertiary/referral hospitals, there were increases in the rates in FY2013/2012 compared to the previous two fiscal years, and the increase was statistically significant in FY 2012/2013 compared to FY 2011/2012 for tertiary/referral hospitals.

The rates also differed by hospital teaching status: Non-teaching hospitals had a lower rate of MRSA than teaching hospitals, but the difference was not statistically significant in FY 2012/2013. The rate in

non-teaching hospitals increased significantly in FY 2012/2013 compared to the previous two years. For teaching hospitals, the rate in FY 2012/2013 was significantly higher than FY 2011/2012, but non-significantly higher than FY 2010/2011.

By individual facility, 12 hospitals reported no cases of MRSA associated with the reporting facility in FY 2012/2013. The annual rate in FY 2012/2013 was significantly higher than the previous FY 2011/2012 rate in three hospitals, and significantly lower in one hospital.

HAs were consulted about variations of MRSA rates between their acute care facilities, and about any increasing rates in FY 2012/2013. PHC found that a higher rate in one facility was likely related to intensified screening. An investigation by VCHA did not find what factors were related to the increased MRSA rate in its facilities. For FHA, some medical programs may have increased their screening for MRSA for a certain period of time.

Please note that the rates of MRSA in this report are not risk-adjusted; therefore direct comparison between HAs or between individual facilities should not be made. MRSA screening policies vary by HA and hospitals, which can greatly affect the identification of MRSA cases. Variation also exists in how HA's apply the case definition and classification of MRSA. Population served and the prevalence of MRSA in the local community can also affect the MRSA rate in the hospital.

The provincial MRSA surveillance program included 79 acute care facilities across BC until quarter 2 (Q2) of FY 2012/2013, and expanded to include all 80 acute care facilities in BC since quarter 3 (Q3). Data aggregated at the facility level are reported to the Provincial Infection Control Network of BC (PICNet) by health authority (HA) on a quarterly basis.

Introduction

Staphylococcus aureus (S aureus) is a type of bacterium that frequently lives on the skin and in the nose of healthy individuals without causing health problems. *S aureus* only becomes a problem when it is a source of infection of the skin, lungs, blood, or other body systems. These bacteria can spread from person to person through casual contact (such as unclean hands) or through the sharing of contaminated objects. The emergence of strains resistant to antimicrobial agents, particularly the spread of Methicillin-resistant *Staphylococcus aureus* (MRSA) in healthcare settings, has become a major concern because MRSA infections are more difficult to treat than ordinary *S aureus* infections, and may result in higher mortality[1].

In healthcare facilities, surveillance is important for the detection of newly emerging resistance trends, the identification of vulnerable patient populations, and the assessment of the need for, and the effectiveness of, interventions[2]. MRSA in hospitals in British Columbia (BC) is monitored by each health authority (HA). In 2011, the Provincial Infection Control Network of BC (PICNet), in collaboration with representatives from Interior Health Authority (IHA), Fraser Health Authority (FHA), Vancouver Coastal Health Authority (VCHA), Providence Health Care (PHC), Vancouver Island Health Authority (VIHA), Northern Health Authority (NHA), and Provincial Health Services Authority (PHSA), launched a provincial surveillance program for MRSA in BC acute care facilities. A provincial MRSA surveillance protocol was developed by PICNet's Surveillance Steering Committee (SSC) to create standardized case definitions and minimum dataset. The protocol is reviewed annually to ensure consistency with national and international standards and to reflect scientific advances in MRSA epidemiology.

In fiscal year (FY) 2012/2013, MRSA cases were divided into five groups according to the time of MRSA identification and patients' healthcare encounter history within the previous twelve months: Healthcare-associated (HCA) with the current admission to the reporting facility (facility-onset), HCA with a previous encounter with the reporting facility (community-onset), HCA with another facility (community-onset), Community-associated (CA), and Unknown (see Glossary for definitions). Aggregated facility data are submitted quarterly to PICNet by each HA.

This report summarizes newly identified MRSA cases in the FY 2012/2013 (April 1, 2012 - March 31, 2013), with a focus on the MRSA cases associated with the reporting facility. This includes cases associated with the current admission to the reporting facility, and previous encounters with the reporting facility in the last twelve months.

Please note that the MRSA cases in this report represent *inpatients that were admitted to acute care facilities and newly identified with MRSA either as an infection or colonization.* The rates of HCA MRSA in this report were not risk-adjusted; therefore, comparison of the rates between HAs or between healthcare facilities is not recommended. Many factors can affect the rate of HCA MRSA, such as the intensity of MRSA screening performed by the facility, the patients' exposure history to healthcare and antibiotics, environmental conditions, and the prevalence of MRSA in the community.

Surveillance results

Population under surveillance

The provincial MRSA surveillance program expanded to includes all 80 acute care facilities across BC in FY 2012/2013. All patients who were admitted to these facilities for acute care were under surveillance for MRSA. Table 1 summarizes the characteristics of the facilities during FY 2012/2013, and estimated general population in each HA on July 1, 2012.

Table 1. Summary of facilities participating in the provincial MRSA surveillance program by health authority, fiscal year 2012/2013

Health authority	IHA	FHA	VCHA[i]	VIHA[ii]	NHA	PHSA	Total
Total number of facilities	**22**	**14**	**11**	**13**	**18**	**2**	**80**
By hospital size[iii]							
1-50 beds	16	3	6	5	17		47
51-250 beds	5	7	2	5	1	2	22
>250 beds	1	4	3	3			11
By hospital category							
Community hospital	16	7	6	9	9		47
Regional Hospital	4	4	3	2	8		21
Tertiary/Referral Hospital	2	3	2	2	1	2	12
By teaching status							
Non-teaching hospital	21	8	5	11	16		61
Teaching hospital	1	6	6	2	2	2	19
Total acute care beds[iv]	**1,251**	**2,698**	**1,719**	**1,489**	**552**	**249**	**7,957**
Total acute care admissions	**70,474**	**135,000**	**85,865**	**71,471**	**28,474**	**26,041**	**417,325**
Total inpatient days	**490,192**	**1,058,007**	**649,935**	**552,172**	**183,943**	**88,858**	**3,023,107**
Estimated general population in 2012[v]	739,640	1,650,062	1,175,283	764,824	292,764	N/A	4,622,573

Notes:

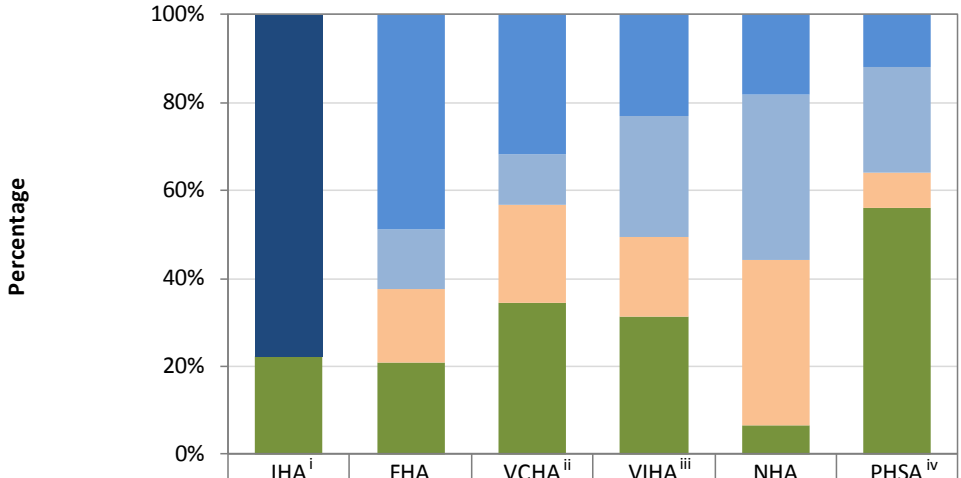
i. Includes the facilities of Providence Health Care (PHC); the same hereinafter.
ii. Includes St. Joseph's General Hospital, which participated in the provincial MRSA surveillance program from Q3 of FY 2012/2013.
iii. Based on the count of acute care beds in Q4 of FY 2012/2013; the same hereinafter. The number of beds may vary by quarter due to temporary closure of acute care beds by facilities.
iv. Based on the average of quarterly counts of acute care beds in each health authority.
v. BC Stats. Population Estimates. http://www.bcstats.gov.bc.ca/

Overview of MRSA cases

A total of 2,785 cases of MRSA were newly identified in BC acute care facilities during FY 2012/2013. Variation existed among HAs in how they applied the case definition and how they classified cases (see "Data limitations" in the section "About the MRSA surveillance program"). Overall, 1,533 cases of MRSA were classified as HCA with the reporting facility, accounting for 55.0% of all MRSA identified. In addition, 507 (18.2%) cases were HCA with another facility, and 745 (26.8%) cases were CA or of unknown association.

Among the MRSA cases associated with the reporting facility, 1,031 were further classified into whether they were associated with current admission, or a previous encounter in the last twelve months. Of these, 898 (69.0%) were associated with current admission to the reporting facility, and 403 (31.0%) were associated with a previous encounter with the reporting facility in last twelve months.

Figure 1. Proportion of newly identified MRSA cases among acute care inpatients by case classification and health authority, fiscal year 2012/2013



	IHA[i]	FHA	VCHA[ii]	VIHA[iii]	NHA	PHSA[iv]
HCA with current admission in the reporting facility	77.6%	48.8%	31.7%	23.2%	18.2%	12.0%
HCA with previous encounter with the reporting facility		13.6%	11.6%	27.5%	37.6%	24.0%
HCA with another facility	0.0%	16.6%	22.4%	18.0%	37.6%	8.0%
CA/Unknown	22.1%	21.0%	34.4%	31.3%	6.5%	56.0%
Total number of cases[v]	298	973	1,010	284	170	50

Notes: HCA: healthcare-associated; CA: community-associated

i. IHA did not separate the cases of MRSA associated with reporting facility between current admission and previous encounter. It also assigned MRSA cases that were associated with another facility within IHA to the appropriate facilities, the cases that were associated with the facilities outside of IHA as "healthcare-associated with another facility", and the remaining cases as "Community-associated".

ii. Includes PHC, which defines another facility as a facility that is within PHC. PHC classified the cases that were not associated with PHC facilities as "Not-PHC-associated", which were merged into the "Unknown".

iii. Includes Q3 and Q4 of FY 2012/2013 data from St Joseph's Hospital.

iv. PHSA classified the MRSA cases other than those associated with the reporting facility as "Community-associated" or "Unknown".

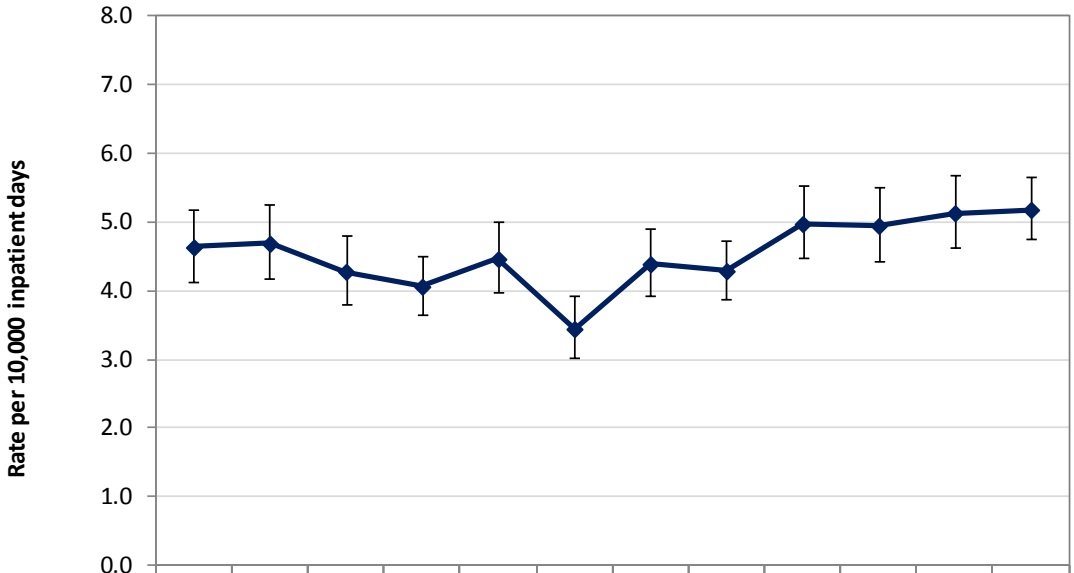
v. MRSA screening policy and surveillance strategy varied by health authorities, which could affect identification of MRSA cases.

Provincial rate of MRSA associated with the reporting facility

The provincial rate of MRSA associated with the reporting facility was 5.1 per 10,000 inpatient days [95% confidence interval (CI): 4.8-5.3] in FY 2012/2013. This was a statistically significant increase from the annual rate of 4.2 (95% CI: 3.9-4.4) per 10,000 inpatient days in FY 2011/2012 and 4.4 (95% CI: 4.1-4.6) per 10,000 inpatient days in FY 2010/2011.

The quarterly rates of MRSA increased gradually in FY 2012/2013, and the increasing trend from Q2 of FY 2011/2012 to Q4 of FY 2012/2013 was statistically significant (χ^2 for trend = 29.42, $p < 0.001$) (Figure 2).

Figure 2. Provincial rate of MRSA associated with the reporting facility per 10,000 inpatient days by fiscal quarter, FY 2010/2011 to FY 2012/2013



	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	2010/2011[i]				2011/2012				2012/2013			
Rate of new cases of MRSA associated with reporting facility	4.6	4.7	4.3	4.1	4.5	3.4	4.4	4.3	5.0	4.9	5.1	5.2
Number of new cases of MRSA associated with reporting facility	299	294	272	341	288	220	298	392	335	332	362	504

Fiscal year and quarter[ii]

Note: Bars in the line chart represent 95% confidence interval of the rates.

i. Excluded from this report was NHA for FY 2010/2011, which did not apply PICNet's MRSA case definition retrospectively to their cases identified in 2010/2011.

ii. Data were aggregated by fiscal quarter for each HA except PHSA, which aggregated the data by calendar quarter (for start and end date of each quarter, see Fiscal Year in the Glossary).

Rate of MRSA associated with the reporting facility, by health authority

The rate of MRSA associated with the reporting facility varied by HA and fiscal year (Table 2); however, comparison between HAs is not recommended due to differences in MRSA identification strategies and at-risk population served. In FHA, the annual rate was significantly higher in FY 2012/2013 than in FY 2010/2011 and in FY 2011/2012. IHA and VCHA reported a significantly higher rate in FY 2012/2013 than in FY 2011/2012, but non-significantly higher than in FY 2010/2011. For VIHA, NHA, and PHSA, there were no statistically significant differences in annual rates over three fiscal years.

Table 2. Rate of MRSA associated with the reporting facility per 10,000 inpatient days, by health authority

Health Authority	2010/2011	2011/2012	2012/2013
IHA[i]	4.0 (3.5-4.6)	3.4 (2.9-4.0)	4.7 (4.2-5.4)
FHA	4.7 (4.3-5.1)	4.7 (4.3-5.1)	5.7 (5.3-6.2)
VCHA	6.1 (5.5-6.7)	5.3 (4.8-5.9)	6.7 (6.1-7.4)
VIHA[ii]	2.6 (2.2-3.1)	2.9 (2.5-3.4)	2.6 (2.2-3.1)
NHA[iii]	N/A	3.6 (2.8-4.6)	5.2 (4.2-6.3)
PHSA	1.8 (1.1-2.9)	2.1 (1.4-3.3)	2.0 (1.3-3.2)
Total	**4.4 (4.1-4.6)**	**4.2 (3.9-4.4)**	**5.2 (4.9-5.4)**

Notes: Comparison between HAs is not recommended due to differences in MRSA identification strategy and at-risk population.

iii. Excludes facilities that the data were not unavailable for certain periods in FY 2010/2011 and FY 2011/0212.

iv. Includes Q3 and Q4 of FY 2012/2013 data from St Joseph's Hospital.

v. Data were not available for FY 2010/2011.

Rate of MRSA associated with the reporting facility, by facility type

The rate of MRSA associated with the reporting facility differed by hospital size (50 or fewer beds, 51-250 beds, and >250 beds). Hospitals with 50 or fewer beds had the highest rate of MRSA associated with the reporting facility in FY 2012/2013; however, the MRSA incidence varied remarkably, ranging from no cases in 12 of those hospitals to 10 or more cases in 4 of those hospitals, with one hospital having 25 cases. Due to their small denominators, higher numbers of MRSA cases in some hospitals greatly affected the overall rate for this category, and resulted in a wide range of 95% CI. The lowest rate in FY 2012/2013 was in hospitals with 51-250 beds, which differed significantly from hospitals with 50 or fewer beds, and from those with more than 250 beds (Table 3).

The annual rate increased significantly in hospitals with 50 or fewer beds in FY 2012/2013 compared to the previous two fiscal years. The rate in hospitals with 51-250 beds, or those with more than 250 beds, was higher in FY 2012/2013 than in the previous two years, with the increase being statistically significant between FY 2012/2013 and FY 2011/2012 in hospitals with more than 250 beds.

Table 3. Annual rate of MRSA associated with the reporting facility per 10,000 inpatient days by hospital size

Hospital size	2010/2011	2011/2012	2012/2013
1-50 beds	3.1 (2.5-3.8)	3.8 (3.1-4.6)	5.9 (5.0-6.8)
51-250 beds	3.8 (3.4-4.2)	3.7 (3.4-4.1)	4.4 (4.1-4.9)
>250 beds	5.1 (4.7-5.4)	4.5 (4.2-4.8)	5.3 (5.0-5.7)
Total	**4.4 (4.1-4.6)**	**4.2 (3.9-4.4)**	**5.1 (4.8-5.3)**

The rates also varied by hospital category (Community hospital, Regional Hospital, Tertiary/Referral Hospital). The annual rate of MRSA associated with the reporting facility in FY 2012/2013 was highest in tertiary/referral hospitals and lowest in regional hospitals. The difference between these two categories was statistically significant (Table 4).

The rate for community hospitals increased each year, with the difference between 2010/2011 and 2012/2013 being statistically significant. The rate also increased in regional and tertiary/referral hospitals in FY2013/2012 compared to the previous two years; the increase was statistically significant between FY 2012/2013 and FY 2011/2012 in tertiary/referral hospitals.

Table 4. Annual rate of MRSA associated with the reporting facility per 10,000 inpatient days by hospital category

Hospital category	2010/2011	2011/2012	2012/2013
Community hospital	3.0 (2.6-3.5)	4.1 (3.6-4.8)	4.9 (4.3-5.5)
Regional hospital	4.5 (4.0-5.0)	3.9 (3.5-4.4)	4.6 (4.2-5.0)
Tertiary/Referral hospital	4.8 (4.5-5.2)	4.3 (4.0-4.6)	5.4 (5.1-5.8)
Total	**4.4 (4.1-4.6)**	**4.2 (3.9-4.4)**	**5.1 (4.8-5.3)**

Note: Please refer to the Glossary for the definition of each hospital category.

Non-teaching hospitals had a lower rate of MRSA than teaching hospitals, but the difference was not statistically significant in FY 2012/2013 (Table 5). The rate in non-teaching hospitals increased significantly in FY 2012/2013 compared to the previous two years. The rate in teaching hospitals in FY 2012/2013 was significantly higher than FY 2011/2012, but non-significantly higher than in FY 2010/2011.

Table 5. Annual rate of MRSA associated with the reporting facility per 10,000 inpatient days by teaching status of hospital

Teaching status	2010/2011	2011/2012	2012/2013
Non-teaching hospital	3.6 (3.2-4.0)	3.8 (3.5-4.3)	5.0 (4.6-5.5)
Teaching hospital	4.8 (4.5-5.1)	4.3 (4.0-4.6)	5.1 (4.8-5.4)
Total	**4.4 (4.1-4.6)**	**4.2 (3.9-4.4)**	**5.1 (4.8-5.3)**

Note: Please refer to the Glossary for the definition of teaching hospital.

Please note that the hospital types are mutually exclusive in each group (i.e., <50 beds vs. 51-250 beds vs. >250 beds; or community hospital vs. regional hospital vs. tertiary/referral hospital; or teaching vs. nonteaching), but not exclusive between the groups, e.g., the larger hospitals tend to be tertiary/referral hospitals and also tend to be teaching hospitals. They are more likely to care for more severe and more vulnerable patients.

Rate of MRSA associated with the reporting facility, by acute care facility

Table 6 below presents the rate of MRSA associated the reporting facility for each hospital, listed in alphabetical order. The 95% CI of the rate is provided to show the reliability of the rate. The wide range of 95% CI for some facilities is due to the small numerators (i.e., number of cases of MRSA associated with the reporting facility) and/or denominators (inpatient days). The wider the range of CI, the less confidence there is in the rate, because there is a greater margin for error. The rates in facilities with a wide CI may vary substantially from reporting period to reporting period, as slight changes in case numbers – even one case – can considerably affect the rate. Those facilities with a wide range of 95% CI (where the difference between the upper limit and lower limit of 95% CI was greater than twice the rate) are denoted in the table below with the letter 'E', indicating that the rate may not be reliable.

Example	In a facility with 30 acute care beds, if there were two cases of MRSA associated with the facility and 8,000 inpatient days in FY 2010/2011, and three cases of MRSA associated with the facility and 6,000 inpatient days in FY 2011/2012, the rates would be 2.5 and 5.0, respectively. As demonstrated in this example, the rate has doubled, although the number of cases has increased only by one case. For this reason, those rates with small numerators and/or denominators are flagged with the letter 'E' in the table below.

Please note that the rates in this table represent HCA MRSA newly identified among inpatients admitted to each acute care facility, and are not risk-adjusted. The rate in the hospital can be affected by MRSA identification strategies and the prevalence of MRSA in the local community. In addition, the large hospitals usually serve as tertiary hospitals with specialty care to the patients, and may also provide teaching or training to medical and nursing students, and other healthcare professionals. These hospitals are more likely to admit patients with greater severity of illness or transferred from other healthcare facilities, which may in turn increase the risk of acquiring MRSA. **Rates are therefore not comparable between individual facilities.**

Twelve hospitals reported no cases of MRSA associated with the reporting facility in FY 2012/2013. The annual rate was higher in FY 2012/2013 than in the previous FY 2011/2012 in 44 hospitals, with a significant increase in three hospitals (Royal inland Hospital, St. Mary's Hospital and Vancouver General Hospital), and the rate was lower in 29 hospitals, with a significant decrease in one hospital (Mount Saint Joseph Hospital). The rate in the remaining hospitals did not change in FY 2012/2013 compared to FY 2011/2012.

Table 6. Annual rate of MRSA associated with the reporting facility per 10,000 inpatient days by facility

Acute care facility	Facility type[i]	2010/2011	2011/2012	2012/2013
100 Mile District Hospital	S,C,N	13.9 (7.3-26.4)	7.8 (3.3-18.3)	17.2 (9.0-32.6)
Abbotsford Regional Hospital	L,T,Y	2.9 (2.0-4.1)	2.8 (2.0-4.0)	3.0 (2.2-4.2)
Arrow Lakes Hospital[ii]	S,C,N	0.0	0.0	0.0
BC Children's Hospital	M,T,Y	2.9 (1.6-5.4)	2.4 (1.2-4.7)	4.4 (2.6-7.5)
BC Women's Hospital	M,T,Y	1.1 (0.5-2.4)	2.0 (1.1-3.5)	0.7 (0.3-1.8)[E]
Bella Coola General Hospital	S,C,N	0.0	0.0	0.0
Boundary Hospital[ii]	S,C,N	15.6 (5.3-45.9)[E]	14.2 (4.8-41.7)[E]	11.8 (4.6-30.4)[E]
Bulkley Valley District Hospital[iv]	S,R,N	N/A	7.8 (3.3-18.2)	0.0
Burnaby Hospital	L,R,Y	6.6 (5.3-8.3)	5.4 (4.2-6.9)	6.2 (4.9-7.8)
Campbell River & District General Hospital	M,C,N	4.4 (2.5-7.7)	3.5 (1.8-6.7)	1.8 (0.7-4.1)
Cariboo Memorial Hospital and Health Centre	S,C,N	2.0 (0.6-7.4)[E]	1.0 (0.2-5.7)[E]	3.8 (1.5-9.7)[E]
Chetwynd General Hospital[iv]	S,C,N	N/A	0.0	0.0
Chilliwack General Hospital	M,C,Y	2.4 (1.4-4.1)	3.6 (2.4-5.5)	3.6 (2.4-5.6)
Cormorant Island Community Health Centre	S,C,N	40.9 (13.9-119.6)[E]	12.6 (2.2-70.9)[E]	0.0
Cowichan District Hospital	M,C,N	3.3 (2.0-5.6)	3.3 (1.9-5.5)	1.7 (0.8-3.4)
Creston Valley Hospital[iii]	S,C,N	5.0 (1.7-14.7)[E]	3.6 (0.6-20.6)[E]	2.0 (0.3-11.2)[E]
Dawson Creek Hospital[iv]	S,R,N	N/A	1.2 (0.3-4.4)[E]	1.2 (0.3-4.4)[E]
Delta Hospital	M,C,N	1.3 (0.4-3.8)[E]	5.3 (3.0-9.2)	3.8 (2.0-7.2)
Dr. Helmcken Memorial Hospital & Health Centre	S,C,N	0.0	5.6 (1.0-31.5)[E]	17.7 (6.0-51.8)[E]
Eagle Ridge Hospital	M,C,N	2.5 (1.4-4.5)	2.6 (1.5-4.4)	5.1 (3.6-7.2)
East Kootenay Regional Hospital[iii]	M,R,N	12.7 (9.1-17.9)	6.3 (3.2-12.5)	7.5 (4.8-11.6)
Elk Valley Hospital[iii]	S,C,N	9.9 (4.2-23.2)	15.1 (5.9-38.7)[E]	7.5 (2.5-21.9)[E]
Fort Nelson General Hospital[iv]	S,C,N	N/A	14.0 (6.0-32.8)	3.6 (0.6-20.6)[E]
Fort St. John General Hospital[iv]	S,R,N	N/A	4.1 (1.9-8.9)	2.5 (1.0-6.5)[E]
Fraser Canyon Hospital[iv]	S,C,N	2.8 (0.5-15.6)[E]	13.2 (5.6-30.8)	9.4 (3.2-27.5)[E]
G.R. Baker Memorial Hospital[iv]	S,R,Y	N/A	1.5 (0.4-5.5)[E]	3.9 (1.7-9.1)
Golden & District General Hospital[iii]	S,C,N	8.7 (2.4-31.8)[E]	0.0	5.4 (1.0-30.5)[E]
Invermere & District Hospital[iii]	S,C,N	14.6 (5.7-37.5)[E]	7.3 (1.3-41.0)[E]	8.8 (2.4-32.2)[E]
Kelowna General Hospital	L,T,Y	4.5 (3.5-5.7)	2.6 (1.9-3.7)	2.9 (2.1-3.9)
Kitimat General Hospital[iv]	S,R,N	N/A	4.1 (1.4-12.1)[E]	15.0 (7.9-28.4)
Kootenay Boundary Regional Hospital[ii]	M,R,N	9.0 (4.9-16.6)	4.1 (1.7-9.5)	3.3 (1.7-6.2)
Kootenay Lake Hospital[ii]	S,C,N	1.7 (0.3-9.8)[E]	0.0	7.6 (4.1-14.1)
Lady Minto Gulf Islands Hospital	S,C,N	3.3 (0.9-11.9)[E]	6.1 (2.4-15.8)[E]	7.1 (2.8-18.2)[E]
Lakes District Hospital	S,C,N	N/A[d]	0.0	2.6 (0.5-14.8)[E]

Acute care facility	Facility type[i]	2010/2011	2011/2012	2012/2013
Langley Memorial Hospital	M,R,Y	3.4 (2.3-4.9)	3.5 (2.4-5.1)	2.0 (1.2-3.2)
Lillooet Hospital and Health Centre	S,C,N	0.0	0.0	5.2 (0.9-29.2)[E]
Lion's Gate Hospital	L,R,Y	5.9 (4.5-7.7)	4.6 (3.4-6.2)	6.6 (5.2-8.4)
Mackenzie and District Hospital[iv]	S,C,N	N/A	23.1 (6.4-84.0)[E]	18.1 (5.0-65.8)[E]
Matsqui Sumas Abbotsford	S,C,N	0.0	1.1 (0.2-6.0)[E]	5.6 (2.4-13.1)
McBride and District Hospital[iv]	S,C,N	N/A	0.0	23.7 (6.5-86.1)[E]
Mills Memorial Hospital[iv]	S,R,N	N/A	3.1 (1.3-7.3)	5.4 (2.8-10.2)
Mission Memorial Hospital	S,C,N	5.3 (2.4-11.6)	4.2 (1.8-9.7)	2.1 (0.7-6.3)[E]
Mount Saint Joseph Hospital	M,C,Y	3.3 (1.9-5.7)	9.4 (6.7-13.0)	3.2 (1.8-5.6)
Nanaimo Regional General Hospital	L,R,N	3.0 (2.1-4.3)	4.1 (3.1-5.5)	3.1 (2.2-4.3)
Nicola Valley Health Centre	S,C,N	10.3 (3.5-30.2)[E]	3.0 (0.5-17.1)[E]	0.0
Northern Haida Gwaii Hospital[iv]	S,C,N	N/A	0.0	22.4 (6.1-81.3)[E]
Peace Arch Hospital	M,R,N	3.9 (2.7-5.6)	3.4 (2.3-5.0)	2.7 (1.8-4.2)
Penticton Regional Hospital	M,R,N	2.2 (1.3-3.9)	2.5 (1.5-4.3)	1.1 (0.5-2.4)
Port Hardy Hospital	S,C,N	0.0	3.2 (0.6-18.3)[E]	3.2 (0.6-17.9)[E]
Port McNeill and District Hospital	S,C,N	0.0	0.0	0.0
Powell River General Hospital	S,C,N	10.7 (6.0-19.2)	4.9 (2.1-11.4)	14.0 (8.6-22.7)
Prince Rupert Regional Hospital[iv]	S,R,N	N/A	4.4 (1.7-11.2)[E]	5.8 (2.6-12.6)
Princeton General Hospital	S,C,N	11.7 (3.2-42.6)[E]	6.4 (1.1-36.4)[E]	0.0
Queen Charlotte Islands Hospital[iv]	S,C,N	N/A	0.0	0.0
Queen Victoria Hospital and Health Centre	S,C,N	0.2 (0.0-1.1)[E]	3.4 (0.6-19.1)[E]	3.5 (0.6-19.9)[E]
Queen's Park Care Centre	M,C,N	2.0 (0.8-4.6)	4.0 (2.4-6.7)	7.2 (4.9-10.6)
Richmond Hospital	M,R,Y	3.5 (2.3-5.2)	3.4 (2.3-5.0)	5.1 (3.7-7.0)
Ridge Meadows Hospital	M,R,N	4.3 (3.0-6.4)	6.4 (4.7-8.7)	10.2 (8.1-12.9)
Royal Columbian Hospital	L,T,Y	4.5 (3.6-5.7)	4.9 (4.0-6.1)	7.0 (5.9-8.4)
Royal Inland Hospital	M,T,N	4.5 (3.3-6.2)	5.1 (3.8-6.9)	8.6 (7.0-10.7)
Royal Jubilee Hospital	L,T,Y	2.3 (1.6-3.1)	2.9 (2.2-3.9)	2.2 (1.5-3.0)
RW Large Hospital	S,C,N	0.0	0.0	0.0
Saanich Peninsula Hospital	M,C,N	2.2 (1.0-5.2)	0.4 (0.1-2.4)[E]	2.7 (1.2-5.8)
Shuswap Lake General Hospital	S,C,N	1.5 (0.8-2.8)	6.1 (3.3-11.3)	15.4 (10.4-22.7)
South Okanagan General Hospital	S,C,N	6.1 (2.4-15.8)[E]	1.4 (0.3-8.1)[E]	1.6 (0.3-9.2)[E]
Squamish General Hospital	S,C,N	2.0 (0.4-11.2)[E]	12.0 (5.8-24.7)	1.8 (0.3-9.9)[E]
St. John Hospital[iv]	S,C,N	N/A	1.5 (0.3-8.7)[E]	2.8 (0.8-10.4)[E]
St. Joseph's General Hospital[v]	M,R,N	N/A	N/A	8.6 (5.5-13.2)
St. Mary's Hospital	S,C,N	5.9 (3.1-11.3)	0.7 (0.1-3.9)[E]	7.8 (4.4-14.0)
St. Paul's Hospital	L,T,Y	6.2 (5.0-7.6)	6.3 (5.1-7.7)	4.9 (3.9-6.2)

Acute care facility	Facility type[i]	2010/2011	2011/2012	2012/2013
Stuart Lake Hospital	S,C,N	N/A[d]	6.3 (1.1-35.9)[E]	0.0
Surrey Memorial Hospital	L,T,Y	7.4 (6.3-8.7)	6.3 (5.4-7.5)	7.8 (6.7-9.1)
Tofino General Hospital	S,C,N	0.0	12.5 (3.4-45.4)[E]	0.0
UBC Hospital	S,R,Y	1.0 (0.2-5.4)[E]	0.0	1.0 (0.2-5.4)[E]
University Hospital of Northern BC[iv]	M,T,Y	N/A	3.9 (2.7-5.6)	6.0 (4.5-8.0)
Vancouver General Hospital	L,T,Y	7.5 (6.5-8.7)	5.3 (4.5-6.3)	8.9 (7.8-10.1)
Vernon Jubilee Hospital	M,R,N	2.5 (1.5-4.2)	1.3 (0.6-2.7)	1.6 (0.9-3.0)
Victoria General Hospital	L,T,Y	1.9 (1.3-2.8)	1.5 (1.0-2.4)	1.6 (1.0-2.4)
West Coast General Hospital	M,C,N	3.0 (1.4-6.6)	3.6 (1.8-7.5)	5.2 (2.9-9.3)
Wrinch Memorial Hospital[iv]	S,R,N	N/A	0.0	15.1 (6.5-35.4)

Notes:

i. Letter in the facility type represents: S: hospital with 1-50 beds, M: hospital with 21-250 beds, L: hospital with >250 beds, C: Community hospital, R: Regional hospital, T: Tertiary/Referral hospital, N: Non-teaching hospital, Y: Teaching hospital.

ii. The rate for FY 2010/2011 includes Q1 and Q2 data only and the rate for FY 2011/2012 includes Q3 and Q4 data only. The data were not available from Q3 of FY 2010/2011 to Q2 of FY 2011/2012 due to information system upgrades in progress.

iii. The rate for data for FY 2011/2012 includes Q3 and Q4 data only. The data were not available for Q1 and Q2 of FY 2011/2012 due to information system upgrades in progress.

iv. Data were not available in FY 2010/2011.

v. Data were not available before Q3 of FY 2012/2013.

E. Indicates an estimated rate that the difference between the upper limit and lower limit of 95% confidence interval was greater than twice the rate, thus the rate may not be reliable.

Discussion

In FY 2012/2013, the provincial MRSA surveillance program expanded to include all 80 acute care facilities across BC. The provincial MRSA surveillance protocol, as well as surveillance practices in each HA, is reviewed annually. HCA MRSA was defined based on the time of MRSA identification and the patient's healthcare encounter history in the previous twelve months. MRSA strains can circulate freely in the community[3], and about 1.5% of the general population may carry MRSA without experiencing any clinical symptoms[4]; thus MRSA cases classified as HCA were not necessarily acquired in that facility, or due to healthcare services. Some of them may in fact have been contracted in the community.

There were variations among HAs in how the MRSA case definition and classification was applied (see "Data limitations" in the section "About the MRSA surveillance program"). MRSA screening policy also varied by HA and hospitals, which can highly affect the identification of MRSA cases. The MRSA rate should therefore not be interpreted as a performance indicator of the facility. Those hospitals reporting higher rates may have more patients vulnerable to MRSA, and/or may be more aggressively screening for MRSA.

A significant increase in the quarterly rate of MRSA associated with the reporting facility was observed at the provincial level since Q2 of FY 2011/2012, when the provincial standardized MRSA surveillance program was implemented in all HAs (the data from Q1 of FY 2010/2011 to Q2 of FY 2011/2012 were submitted by HA, applying the MRSA case definition retrospectively to the cases of MRSA they had collected). The increase was observed in three of six HAs and in most types of hospitals in 2012/2013. HAs were consulted about the variation of MRSA rates between their acute care facilities, and about any increasing rates in FY 2012/2013. PHC compared the MRSA rates in its two facilities and found that a higher rate in one facility was likely related to intensified screening[5]. An investigation on the increasing MRSA rate by VCHA showed no correlation between MRSA prevalence in hospitals (as measured by MRSA flagged patient days by fiscal period) and MRSA incidence rates, among the two hospitals for which the prevalence data were readily available, nor evidence of increased transmission as a result of increased prevalence within their facilities (Leslie Forrester, personal communication, June 19 and July 5, 2013). VCH also found no increase in the MRSA screening samples sent to their laboratory in last year. In FHA, some medical programs may have increased their screening for MRSA for a certain period of time (Tara Donovan, personal communication, August 21, 2013).

The data presented in this report include MRSA cases among inpatients that were the first identified either as infection or colonization of MRSA. According to the surveillance results from hospitals participating in the Canadian Nosocomial Infection Surveillance Program (CNISP)[6], the overall MRSA rate in Canadian hospitals has increased gradually over the past decade. Most of the increase is accounted for by greater numbers of colonized patients (reflecting perhaps widespread MRSA screening practices), with little or no increase in MRSA infection rates. More than two-thirds of MRSA cases identified were colonizations. Research in the United States also showed that the overall prevalence of MRSA has continuously increased among inpatients in the past decade[7,8]. However, invasive MRSA infections have demonstrated reductions in both the US[8,9] and England[10] following the implementation of preventive interventions. Because the provincial BC surveillance data did not distinguish MRSA infections from MRSA colonizations, further analysis was not possible.

The rates of MRSA in this report were not risk-adjusted, therefore comparison of rates between HAs or individual facilities should be avoided. This report is also subject to the data limitations described below in the section "About MRSA surveillance program". Due to unique challenges in the populations

served and environment faced by each facility, each HA is at the best position to respond to the MRSA rates in its region and in its affiliated healthcare facilities.

Acknowledgements

PICNet wishes to thank all participants in each HA and their affiliated healthcare facilities for their ongoing support and participation in the provincial HAI surveillance program.

PICNet recognizes important contributions from the members of PICNet's Surveillance Steering Committee on development of the provincial MRSA surveillance program and associated reports, especially Dr. Guanghong Han, PICNet's epidemiologist, for compiling this report.

About the MRSA surveillance program

Purpose of MRSA surveillance

The provincial MRSA surveillance program is a collaboration between PICNet and all BC health authorities, and involves the voluntary participation of all acute care facilities in the province. The main purpose of this MRSA surveillance program is to collect data on MRSA incidence (either infection or colonization) for monitoring the rates and trends of healthcare-associated MRSA in BC acute care facilities, and providing the provincial epidemiological information to assist HA in the development and evaluation of MRSA intervention programs.

Population under surveillance

The population under surveillance consists of inpatients in acute care facilities in BC. This includes patients admitted to the emergency department awaiting placement (e.g. patients admitted to a service who are waiting for a bed), patients in alternative level of care beds, patients in psychiatric beds, and patients in labour and delivery beds.

Excluded are outpatient visits to acute care facilities, patients in extended care beds housed in acute care facilities, and patients with short-term emergency room admissions.

Data collection and reporting

The provincial MRSA surveillance protocol, including case definitions and core data elements, was developed by the PICNet Surveillance Steering Committee (SSC) to standardize data collection with minimum burden to the HAs. Each HA incorporated the core data elements into their MRSA surveillance form and database. Data on individual MRSA cases are collected daily by infection control practitioners (ICP) and managed at each HA. Every quarter, the HAs aggregate their MRSA cases by facility and MRSA classification, and submit the data to PICNet along with facility-specific denominators. PICNet then consolidates the aggregated data for provincial analysis and reporting. At the end of each fiscal year, the HAs provide updates on their quarterly data submissions. Data updates submitted after the data submission due dates may not be reflected in this report, but will be presented in future reports.

Data limitations

This report is subject to at least the following limitations:

First, the intensity of MRSA screening varies from hospital to hospital, which greatly affects the identification of MRSA. Those hospitals which conduct more intense screening of patients (such as all patients admitted to the facility) may identify more MRSA cases than those which screen patients in specific situations only. The sensitivity of laboratory methods used in identifying MRSA may also differ by hospital.

Second, MRSA colonization and MRSA infection were not distinguished in the surveillance. Only newly identified MRSA cases, either colonizations or infections, were reported. Not included were infections developed after colonizations; infections and/or colonizations identified in different body sites or from another strain of MRSA; re-infections; or re-colonizations. The data in this report represent the incidence of MRSA in BC acute care facilities.

Third, variation exists among the HAs in how MRSA case definition and classification is applied. A twelve-month look-back period and 48 hours (or two calendar days, with the day of admission counted as the first day) after admission to classify MRSA associated with the reporting facility is employed by all HAs except PHC and FHA, which use more than seventy-two hours after admission. PHC also applied a four-week look-back period in FY 2010-2011 and FY 2011/2012. For MRSA to be classified as HCA with a previous encounter with the reporting facility, the previous encounter requires hospitalization for a period of at least one overnight stay. There are variations in this classification: FHA, VCHA, and VIHA employ an admission of more than forty-eight hours in the past twelve months, and IHA and PHSA include frequent visits to outpatient clinics and any admissions to the healthcare facility. In addition, IHA did not separate the MRSA cases that were associated with reporting facility between the current admission and a previous encounter in their FY 2012/2013 data. It also assigned the cases that were associated with another IHA facility to the appropriate facilities, the cases that were associated with the facilities out of IHA as "associated with another facility", and the remaining cases as "Community-associated". PHC defines another facility as a facility within PHC. The MRSA cases that were not associated with a PHC facility were classified as "Not-PHC-associated", which were merged into the category "Unknown" in this report. PHSA classifies all MRSA cases other than those associated with the reporting facility as "Community-associated" or "Unknown", including those cases associated with another facility. So the cases of "Community-associated" or "unknown" were combined as "Community-associated/Unknown" in this report.

Fourth, review of medical charts is required to apply MRSA case definitions and classification. The ability to determine the healthcare encounter history of a patient for the past twelve months relies on availability and accessibility of the patient information system used in each hospital and HA. The quality of medical chart documentation varies by facility and by healthcare provider. The inclusion criteria for classifying MRSA in chart reviews may also vary among HAs or by infection control practitioners (ICP). Furthermore, double-reporting may occur if the same MRSA case was identified in a number of HAs.

Lastly, both MRSA cases and denominator data were aggregated by HA at the facility level by fiscal quarter with the exception of PHSA, which aggregated the data by calendar quarter. The data were not available for NHA in FY 2010/2011 because a standard case definition for MRSA surveillance was not in place in NHA prior to April 1, 2011, and for some facilities in IHA for certain periods from Q3 of FY 2010/2011 to Q2 of FY 2011/2012 due to information system upgrades. St Joseph's General Hospital in VIHA participated in the provincial MRSA surveillance program and submitted the data from Q3 of FY 2012/2013.

PICNet and each HA and their healthcare facilities have been continuously working together to enhance the surveillance and reporting mechanisms that monitor MRSA and other HAIs, in an effort toward improving our understanding of MRSA epidemiology in British Columbia.

Glossary

Acute care facility

Acute care facilities are healthcare facilities in which patients are treated for brief but severe episodes of illness, for the sequelae of an accident or other trauma, or during recovery from surgery. In this report, acute care facility refers to acute care hospitals in BC.

Colonization

Colonization is the presence of MRSA on tissue without observable clinical symptoms or immune reaction. Common sites of colonization include the nostrils, belly button, underarms, groin, etc.

Community-associated (CA) (Not healthcare-associated)

- An MRSA case (as defined above) identified ≤ 48 hours after the patient was admitted to your acute care facility, **AND** there was no documented history for any of following healthcare exposure within the last twelve months:
- Admitted to an acute care facility
- Residence in a long-term care facility or rehab centre
- Frequent visits to an outpatient clinic (e.g., dialysis, oncology) in the healthcare facilities
- Use of indwelling catheters or other medical device

Confidence Interval (CI)

A confidence interval gives an estimated range of values that is likely to include an unknown population parameter to indicate the reliability of an estimate. The 95% CI of the rate and proportion in this report are calculated using Wilson score intervals[11].

Fiscal Quarter and Calendar Quarter

Fiscal quarter (FQ) is a specified period within a budget or financial year. There are four FQs in a fiscal year. Start and end dates of each FQ vary from year to year. Calendar quarter is a period of three consecutive months starting on the first day of January, April, July or October. Below are the start and end dates of each quarter for the fiscal year from 2009/2010 to 2011/2012:

Start and end date of quarters for this report

Fiscal year	Quarter code	Fiscal quarter		Calendar quarter	
		Start date	End date	Start date	End date
2010/2011	**Q1**	01-Apr-2010	24-Jun-2010	01-Apr-2010	30-Jun-2010
	Q2	25-Jun-2010	16-Sep-2010	01-Jul-2010	30-Sep-2010
	Q3	17-Sep-2010	09-Dec-2010	01-Oct-2010	31-Dec-2010
	Q4	10-Dec-2010	31-Mar-2011	01-Jan-2011	31-Mar-2011
2011/2012	**Q1**	01-Apr-2011	23-Jun-2011	01-Apr-2011	30-Jun-2011
	Q2	24-Jun-2011	15-Sep-2011	01-Jul-2011	30-Sep-2011
	Q3	16-Sep-2011	08-Dec-2011	01-Oct-2011	31-Dec-2011
	Q4	09-Dec-2011	31-Mar-2012	01-Jan-2012	31-Mar-2012

2012/2013	**Q1**	01-Apr-2012	21-Jun-2012	01-Apr-2012	30-Jun-2012
	Q2	22-Jun-2012	13-Sep-2012	01-Jul-2012	30-Sep-2012
	Q3	14-Sep-2012	06-Dec-2012	01-Oct-2012	31-Dec-2012
	Q4	07-Dec-2012	31-Mar-2013	01-Jan-2013	31-Mar-2013

Fiscal Year (FY)

A term used to differentiate a budget or financial year from the calendar year. The fiscal year in BC runs from April 1 of the prior year through March 31 of the next year. For example: FY 2010/2011 is from April 1, 2010 to March 31, 2011.

Healthcare-associated with Current Admission in reporting facility

An MRSA case identified >48 hours (or >2 calendar days) after the patient was admitted to your acute care facility

Healthcare-associated with Previous Encounter with Your Acute Care Facility

- An MRSA case identified ≤48 hours (or >2 calendar days) after the patient was admitted to your acute care facility, **AND** one of the followings
- The patient was admitted to your acute care facility for a period of at least overnight (or >=24 hours) within the last twelve months, OR
- Presence of indwelling catheters or other medical device at time of admission, which was inserted by your facility, OR
- Documented history of weekly visits to an outpatient clinic (e.g., dialysis, oncology) in your facility in the last twelve months

Healthcare-associated with another facility:

- An MRSA case identified≤ 48 hours after the patient was admitted to your acute care facility, **AND** one of the followings
- The patient had an encounter with another healthcare facility, either as an inpatient (including acute care and long-term care) or as an outpatient (e.g., for dialysis, oncology), within the last twelve months, OR
- Presence of indwelling catheters or other medical device at time of admission, which was inserted by another facility

Health Authority (HA)

A Health Authority manages and delivers healthcare services. There are five regional Health Authorities which govern, plan, and coordinate services regionally within sixteen health service delivery areas, and a Provincial Health Services Authority which coordinates and/or provides provincial programs and specialized services (please note, in this report, PHC is analyzed separately from VCHA due to differences in case definition).

The six HAs in BC are:

- Interior Health Authority (IHA)
- Fraser Health Authority (FHA)

- Northern Health Authority (NHA)
- Vancouver Coastal Health Authority (VCHA) [includes Providence Health Care (PHC)]
- Vancouver Island Health Authority (VIHA)
- Provincial Health Services Authority (PHSA)

Hospital category

The hospital category in this report is based on the healthcare services that the hospital provides and the population to be served, including:

- **Tertiary/Referral hospital** refers to a major hospital that provides a wide range of acute in-patient and out-patient specialist services together with the necessary support systems for the patients across the health authority. Patients will often be referred from smaller hospitals for major operations, consultations with specialist and sub-specialists and when sophisticated intensive care facilities are required.
- **Regional hospital** typically provides healthcare services to the patients in its region, with a large numbers of beds for intensive care and long-term care, and also providing specialist and sub-specialist services, such as surgery, plastic surgery, childbirth, bioassay laboratories, and so forth.
- **Community hospital** offers an appropriate range of integrated health and social care designed to meet the needs of local people. Medical care is predominantly provided by general practitioners working with consultant medical colleagues.

Infection

Infection refers to the invasion of bacteria into tissue with the manifestation of clinical symptoms of infection, such as increased white blood cell counts, fever, lesions, furuncles, drainage from a break in skin continuity, or erythema. Infections require treatment.

Isolate

A bacterial or fungal strain that has been isolated in the laboratory from specimens collected from the patients.

Inpatient day

An accounting unit used by healthcare facilities and healthcare planners. Each day represents a unit of time during which the services of the institution or facility are used by a patient; e.g. 50 patients in a hospital for 1 day would represent 50 inpatient days.

Methicillin-Resistant *Staphylococcus aureus* (MRSA)

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a type of staph bacteria that is resistant to certain antibiotics called beta-lactams. These antibiotics include Methicillin and other more common antibiotics such as oxacillin, penicillin, and amoxicillin. PICNet's MRSA surveillance program focuses on newly identified MRSA cases, which must meet ALL of the following criteria:

- Laboratory identification of MRSA, including *Staphylococcus aureus* cultured from any specimen that tests oxacillin-resistant by standard susceptibility testing methods; or by a positive result for penicillin binding protein 2a (PBP2a); or molecular testing for mecA. Positive results of

specimens tested by other validated polymerase chain reaction (PCR) tests for MRSA may also be included

- The patient must be admitted to an acute care facility
- The MRSA must be newly identified at the time of hospital admission or identified during hospitalization, either as infection or colonization

This includes:

- MRSA infection or colonization identified for the first time during their hospital admission
- Patients identified in the emergency department and then admitted to the reporting acute care facility
- Patients that have been identified as being positive for MRSA in outpatient clinics (including ambulatory care) or other healthcare facilities were admitted to the reporting acute care facility with MRSA

This DOES NOT include:

- Patients that were previously identified as being positive for MRSA in the reporting acute care facility or other acute care facilities before current admission
- Cases identified in the emergency department or outpatient clinics but are not admitted to the reporting acute care facility
- Cases re-admitted with MRSA
- MRSA cases transferred from another acute care facility

Nosocomial infection

Infection associated with admission to the reporting healthcare facility.

Rate for MRSA associated reporting facility per 10,000 inpatient days

$$\text{Rate per 10,000 inpatient days} = \frac{\text{Number of MRSA associated with the reporting facility within a defined period}}{\text{Sum of inpatient days during the same period}} \times 10{,}000$$

A defined period can be a quarter or several quarters, or a year (annual rate).

Statistical significance

In statistics, a result is called statistically significant if it is unlikely to have occurred by chance. In this report, the difference is considered as statistically significant if the 95% confidence intervals of the two rates, proportions, percentages, or means do not overlap (i.e., the lower limit of one confidence interval is greater than the upper limit of the other confidence interval).

Teaching hospital

A teaching hospital combines assistance to patients with teaching to medical and nurse students, and other healthcare professionals, and is often linked to a medical school, nursing school, or university. A teaching hospital can be a community hospital, or regional hospital, or tertiary/referral hospital.

Trend test

Trend test is an aspect of statistical analysis that tries to determine whether there is a statistically significant trend upwards or downwards over a period of time or among specific ordinal categories. This report uses Mantel-Haenszel Chi-square test for linear trend at a statistically significant level of $p < 0.05$.

Unknown association

A MRSA case where there is insufficient information on healthcare exposure history to classify as a healthcare-associated case or community-associated.

Surveillance Steering Committee

The Provincial Infection Control Network of British Columbia (PICNet) is a provincially supported professional collaborative that provides guidance and advice on healthcare-associated infection prevention and control in British Columbia. Under the aegis and accountability framework of the Provincial Health Services Authority, PICNet connects healthcare professionals from across the province to develop and create guidelines and tools, with a focus on surveillance, education, and evidence-based practice.

PICNet's **Surveillance Steering Committee** provides guidance to PICNet's surveillance programs and assists the PICNet Management Office in implementation within the participating Health Authorities.

- Jun Chen Collet, Provincial Health Services Authority
- Tara Donovan, Fraser Health Authority
- Leslie Forrester, Vancouver Coastal Health Authority
- Bruce Gamage (Co-Chair), Provincial Infection Control Network of BC
- Dr. Guanghong Han(Co-chair), Provincial Infection Control Network of BC
- Deanna Hembroff, Northern Health Authority
- Dr. Bonnie Henry, Provincial Health Services Authority
- Dr. Linda Hoang, BC Association of Medical Microbiologists
- Anthony Leamon, Vancouver Island Health Authority
- Dr. Julie Mori, Interior Health Authority
- Dr. Elisa Lloyd-Smith, Providence Health Care

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