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

Annual surveillance report of healthcare-associated infections in BC health care facilities

Fiscal Year 2015/16
(April 1, 2015 to March 31, 2016)

Prepared by:

Provincial Infection Control Network of British Columbia (PICNet)

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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.

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Executive Summary

Healthcare-associated infections are a threat to patient safety and quality care. Provincial surveillance programs have been established in British Columbia to monitor some important HAIs (i.e., CDI, MRSA, and CPO), as well as hand cleaning compliance in healthcare facilities. The table below summarizes the surveillance data for the fiscal year 2015/16, and compares them to previous years' results.

Highlights of surveillance results in BC healthcare facilities, 2015/16

Indicators	2015/16	Compared to 2014/15	Long-term trend
***Clostridium difficile* infection (CDI)**[a]			(from 2009/10)
Total number of cases identified	2,893	⇧	⇩
Number of new CDI associated with the reporting facility	1,443	⇧	⇩
Provincial rate of new CDI associated with the reporting facility and 95% confidence interval[b]	4.9 (4.6-5.1)	⬆	⬇
Methicillin-resistant *Staphylococcus aureus* (MRSA)[a]			(from 2010/11)
Total number of cases newly identified	3,358	⇧	⇧
Number of new MRSA associated with the reporting facility	1,569	⇧	⇧
Provincial rate of new MRSA associated with the reporting facility and 95% confidence interval[b]	4.9 (4.7-5.2)	⇧	⬆
Carbapenemase-producing organisms (CPO)[a]			(from 2014/15[c])
Number of new cases	94	N/A	N/A
Hand Hygiene Compliance (HCC)			(from 2010/11)
Percent compliance in acute care facilities	83.2%	⬆	⬆
Percent compliance in residential care facilities	83.6%	⬆	N/A[d]

Notes: ⇧⇩ statistically non-significant or not applicable; ⬆⬇statistically significant

a. includes cases identified in acute care facilities only; b. per 10,000 inpatient days; c. for the period from July 18, 2014 to March 31, 2015; d. provincial public reporting started in 2014/15

Key findings in 2015/16

- **CDI**: The provincial annual rate of new CDI associated with the reporting facility increased in 2015/16, after significant decreases in each of the previous four years. Over the long-term (from 2009/10 to 2015/16) however, the downward trend continues to be statistically significant.
- **MRSA**: There was a statistically significant upward trend in the provincial annual rates of MRSA associated with the reporting facility from 2010/11 to 2015/16, although the rates in 2015/16 did not change significantly from 2014/15.
- **CPO**: Over half of new CPO cases (57.3%) reported a healthcare exposure outside Canada in the past twelve months.
- **HCC**: Compliance surpassed the target performance of 80% in the last two years for both acute care facilities and residential care facilities. Compliance has improved continuously from 2010/11 to 2015/16 in acute care facilities.

It is worth noting that variations in surveillance methods exist among health authorities. The rates of CDI, MRSA, and HCC in this report are not risk-adjusted, therefore direct comparison between health authorities or healthcare facilities is not recommended.

Introduction

Healthcare-associated infections (HAIs) are infections or colonizations that people acquire during or shortly after receiving care for other medical conditions. They can be acquired anywhere health care is delivered, including pre-hospital care settings, acute care facilities, outpatient clinics, residential care facilities, and rehabilitation centers.

HAIs can significantly affect patient safety and quality care. They are one of the most common complications of medical care (1), causing increased morbidity and mortality, prolonged hospital stay, and extra costs. As a collaborative effort to prevent and control HAIs in acute care facilities in British Columbia (BC), the Provincial Infection Control Network of British Columbia (PICNet), the health authorities (HAs), and related agencies in BC have worked together to establish provincial surveillance programs to monitor the occurrence of some important HAIs, including *Clostridium difficile* infection (CDI), methicillin-resistant *Staphylococcus aureus* (MRSA), and carbapenamase-producing organisms (CPOs). Details of provincial surveillance protocols for CDI, MRSA, and CPO, including case definitions and classification, are posted on PICNet's website (https://www.picnet.ca/surveillance/). Given the proven effectiveness of hand hygiene in reducing HAIs (2,3), hand cleaning compliance (HCC) among healthcare providers working in BC healthcare facilities is audited regularly, and the audit results are submitted to PICNet quarterly.

This report summarizes the surveillance data of CDI, MRSA, CPO, and HCC in the fiscal year 2015/16 (April 1, 2015–March 31, 2016) and compares them to previous years' results. It is important to note that the classification of CDI and MRSA as either healthcare-associated (HCA), community-associated (CA), or of unknown origin is based on the patient's healthcare encounter history. Classifying a case of CDI or MRSA as HCA does not necessarily indicate that the patient acquired the bacteria during hospitalization or from medical care. Approximately 2% of the general population are colonized with MRSA (4) and more than 8% of admitted patients are carriers of toxinogenic *C. difficile* without symptoms (5,6). In addition, the rates of CDI, MRSA, and HCC are not risk-adjusted. They are provided to show the overall trends over time within each HA, rather than for comparison between HAs or between health care facilities.

Clostridium difficile infection (CDI)

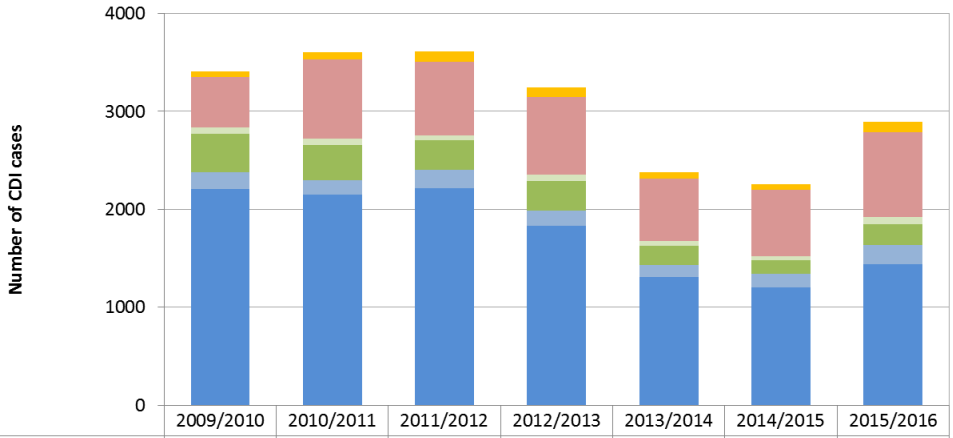
CDI is the most common cause of infectious diarrhea in healthcare settings (7). Since the fiscal year 2009/10 (April 2009), a provincial surveillance program has been in place to monitor the occurrence of CDI in acute care facilities. The following tables and graphs present CDI cases identified in FY 2015/16, which includes new cases and relapses of CDI among inpatients.

Overview of CDI cases identified in 2015/16

A total of 2,893 cases of CDI were reported in 2015/16. About two-thirds of these cases were classified as HCA (1,919 cases, 66.3%), 866 (29.9%) were CA, and 108 (3.7%) were of unknown origin. Among 1,919 HCA cases, 1,443 (49.9% of total CDI cases) were new CDI associated with the reporting facility, 192 (6.6%) were new CDI associated with another facility, 212 (7.3%) were relapses of CDI associated with the reporting facility, and 72 cases (2.5%) were relapses of CDI associated with another facility (Figure 1).

Compared with last year, the number of total CDI cases in 2015/16 increased by 28.0%, and the number of new CDI associated with the reporting facility increased by 19.7%, respectively. This followed continuous decreases in the number of both total CDI cases and new CDI associated with the reporting facility over the previous four years (Figure 1).

Figure 1. Number of cases of CDI identified in BC acute care facilities by case classification, 2009/10–2015/16



	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
Unknown	63	72	104	96	63	62	108
CA	516	812	753	794	636	674	866
HCA with another facility, relapse	62	63	54	71	46	47	72
HCA with reporting facility, relapse	390	362	302	297	201	139	212
HCA with another facility, new cases	171	143	188	153	121	132	192
HCA with reporting facility, new cases	2,210	2,152	2,212	1,835	1,309	1,206	1,443
Total number of CDI cases	**3,442**	**3,604**	**3,613**	**3,246**	**2,376**	**2,260**	**2,893**

CA: community-associated; HCA: healthcare-associated

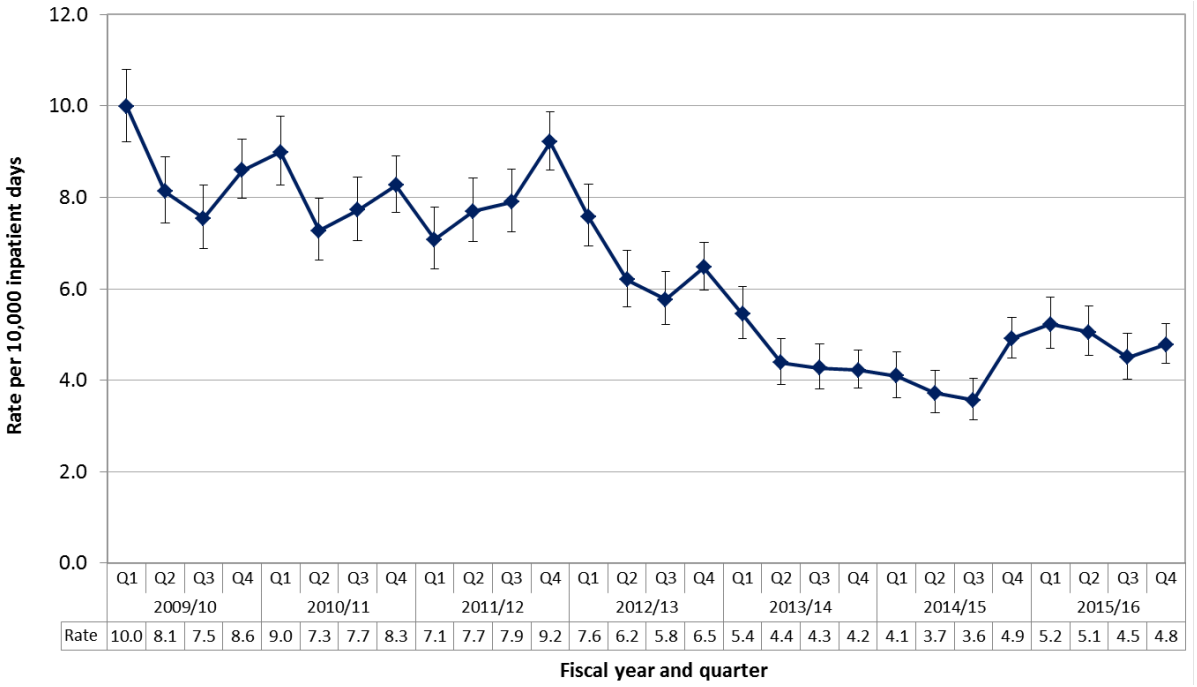
Rate of new CDI associated with the reporting facility in 2015/16

The provincial annual rate of new CDI associated with the reporting facility in 2015/16 was 4.9 per 10,000 inpatient days, with a 95% confidence interval (CI) of 4.6–5.1. The rate of CDI varied by fiscal quarter and HA (Table 1). After a significant increase in Q4 2014/15 (Figure 2), the provincial quarterly rates fluctuated during 2015/16, with no statistically significant difference. Detailed annual rates of CDI for each acute care facility are presented in Appendix D.

Table 1. Rate of new CDI associated with the reporting facility per 10,000 inpatient days and 95% confidential interval by fiscal quarter and health authority, 2015/16

Quarter	Q1	Q2	Q3	Q4	Annual
IHA	3.9 (2.8–5.4)	5.3 (4.0–6.9)	4.9 (3.7–6.5)	4.6 (3.6–5.8)	4.7 (4.1–5.3)
FHA	5.6 (4.7–6.7)	5.0 (4.2–6.0)	4.2 (3.5–5.0)	5.4 (4.7–6.2)	5.1 (4.6–5.5)
VCHA	7.5 (6.3–9.0)	7.3 (6.0–8.8)	6.8 (5.6–8.2)	5.9 (4.9–7.0)	6.8 (6.2–7.4)
VIHA	3.9 (2.9–5.2)	3.0 (2.2–4.2)	3.3 (2.4–4.5)	3.3 (2.6–4.3)	3.4 (2.9–3.9)
NHA	1.0 (0.4–2.6)	1.7 (0.8–3.5)	1.1 (0.5–2.6)	2.0 (1.2–3.4)	1.5 (1.1–2.2)
PHSA	2.7 (0.9–7.9)	9.6 (5.4–17.2)	4.3 (1.8–10.1)	5.6 (2.7–11.6)	5.6 (3.8–8.1)
Province	5.2 (4.7–5.8)	5.1 (4.5–5.6)	4.5 (4.0–5.0)	4.8 (4.4–5.2)	4.9 (4.6–5.1)

Figure 2. Quarterly rate of new CDI associated with the reporting facility per 10,000 inpatient days, 2009/10–2015/16



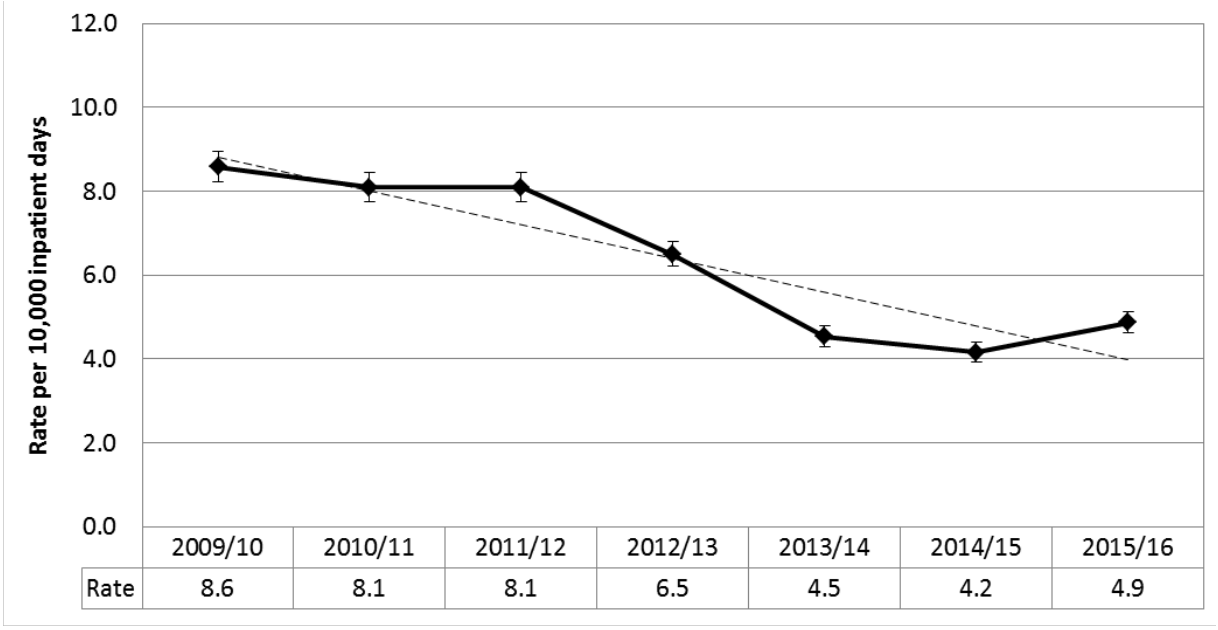
Note: The vertical bars on the line represent the 95% confidence interval of the rates

Trends of CDI associated with the reporting facility

The provincial annual rate of CDI associated with the reporting facility in 2015/16 was significantly higher than in 2014/15, but was significantly lower than the rates from 2009/10 to 2012/13 (Figure 3).

The year 2015/16 was the first increase in the annual CDI rate after significant decreases in each of the previous four years. However, over the long-term (from 2009/10 to 2015/16), the downward trend continues to be statistically significant. The provincial annual rate decreased by 43.2%, from 8.6 per 10,000 inpatient days in 2009/10 to 4.9 per 10,000 inpatient days in 2015/16 (Figure 3).

Figure 3. Provincial annual rate of new CDI associated with the reporting facility per 10,000 inpatient days, 2009/10–2015/16



	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Rate	8.6	8.1	8.1	6.5	4.5	4.2	4.9

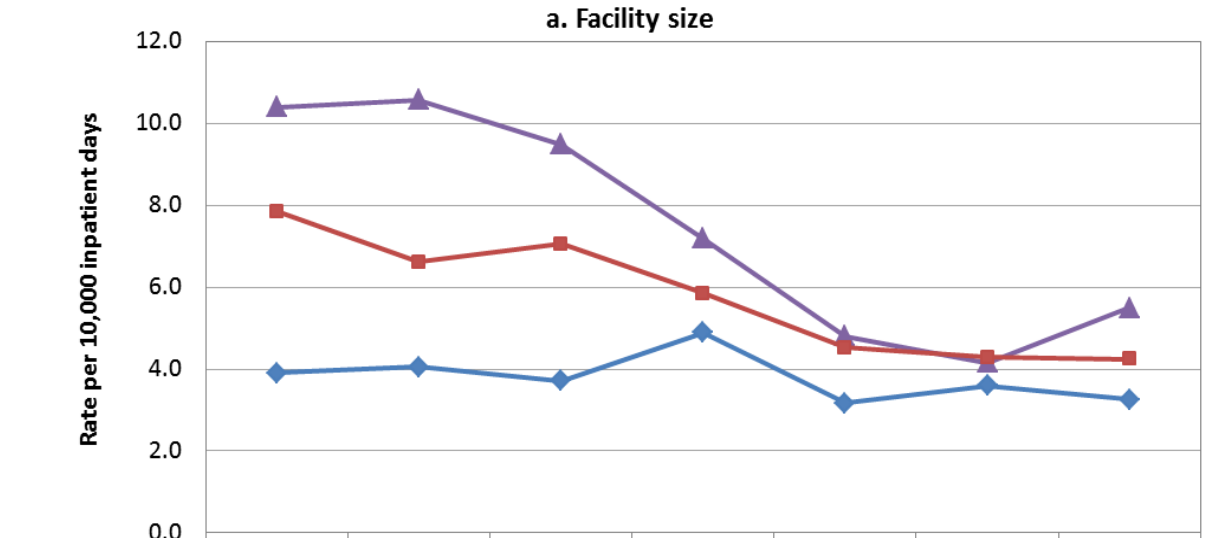
Note: Vertical bars on the line represent the 95% confidence interval of the rates and the dashed line represents the linear trendline of the rates

To further analyze the trend of CDI, the rates were aggregated by facility size based on the number of acute care beds (i.e. 1-50 beds, 51-250 beds, and >250 beds); facility type[1] (i.e. tertiary or referral hospital, regional hospital, and community hospital); teaching status (i.e. whether or not providing teaching/training to medical students, nursing students, and other healthcare professionals); and health authority. The downward trend was statistically significant for the facilities with 51-250 beds and with more than 250 beds (Figure 4.a), all facility types (Figure 4.b), both teaching and non-teaching facilities (Figure 4.c), and four HAs (IHA, FHA, VCHA and VIHA) (Figure 4.d). It is worth noting that 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 who are at higher risk for acquiring CDI. Those facilities have seen the greatest decrease in the CDI rates since 2009/10 (Figure 4.a–c).

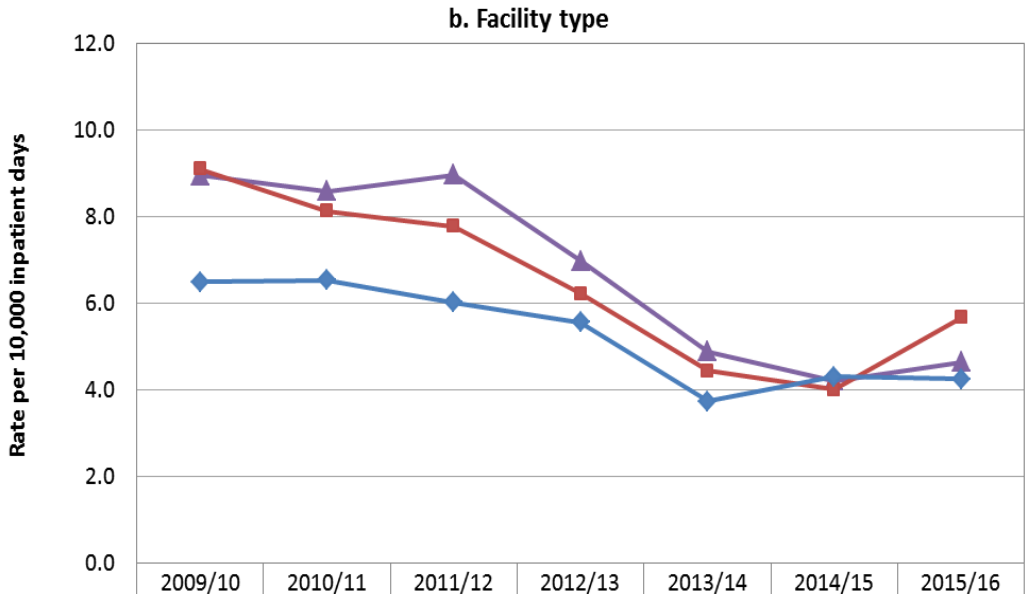
[1] The classification of hospital types in this report is based on the healthcare services provided and the population served by the hospital, including:

- 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, and in some cases, across the province. 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 hospitals typically provide health care services to the patients in its region, with large numbers of beds for intensive care and long-term care, providing specialist and sub-specialist services, such as surgery, plastic surgery, childbirth, bioassay laboratories, and so forth.
- Community hospitals offer an appropriate range of integrated health and social care designed to meet the needs of the local people. Medical care is predominantly provided by general practitioners working with consultant medical colleagues.

Figure 4. Annual rate of new CDI associated with the reporting facility per 10,000 inpatient days by facility group, 2009/10–2015/16

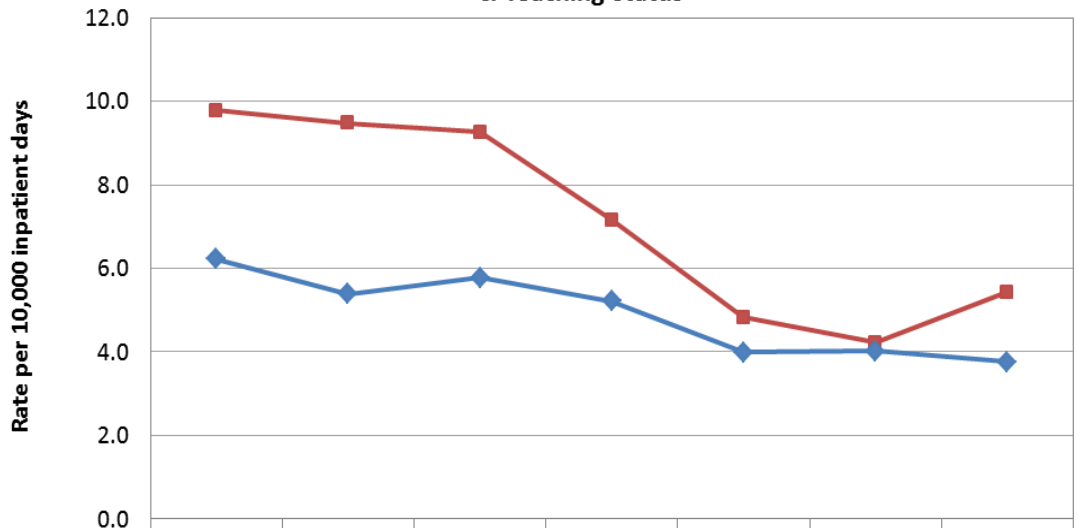


	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
>250 beds	10.4	10.6	9.5	7.2	4.8	4.2	5.5
51-250 beds	7.8	6.6	7.1	5.8	4.5	4.3	4.2
1-50 beds	3.9	4.1	3.7	4.9	3.2	3.6	3.3



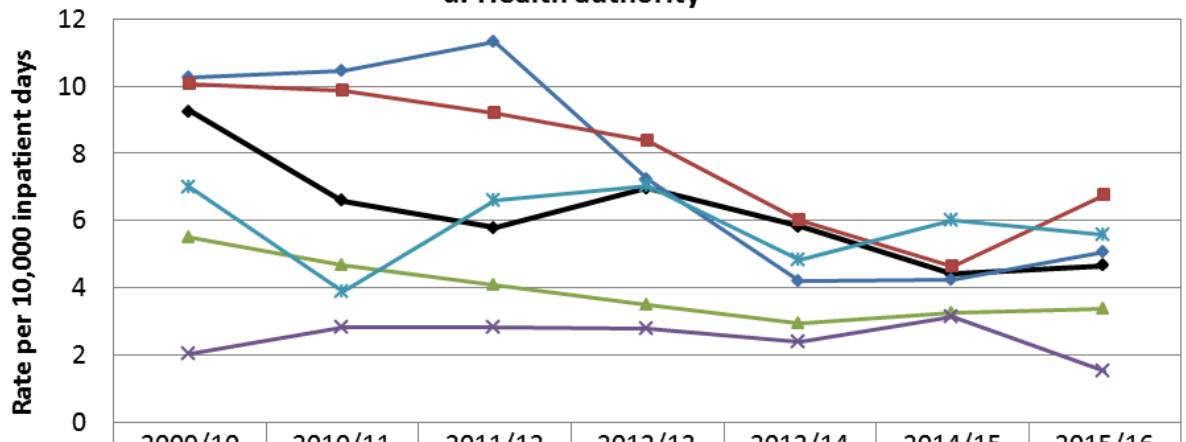
	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Tertiary/Referral hospital	8.9	8.6	9.0	7.0	4.9	4.2	4.6
Regional hospital	9.1	8.1	7.8	6.2	4.4	4.0	5.7
Community hospital	6.5	6.5	6.0	5.5	3.7	4.3	4.2

c. Teaching status



	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Teaching hospital	9.8	9.5	9.3	7.2	4.8	4.2	5.4
Non-teaching hospital	6.2	5.4	5.8	5.2	4.0	4.0	3.8

d. Health authority

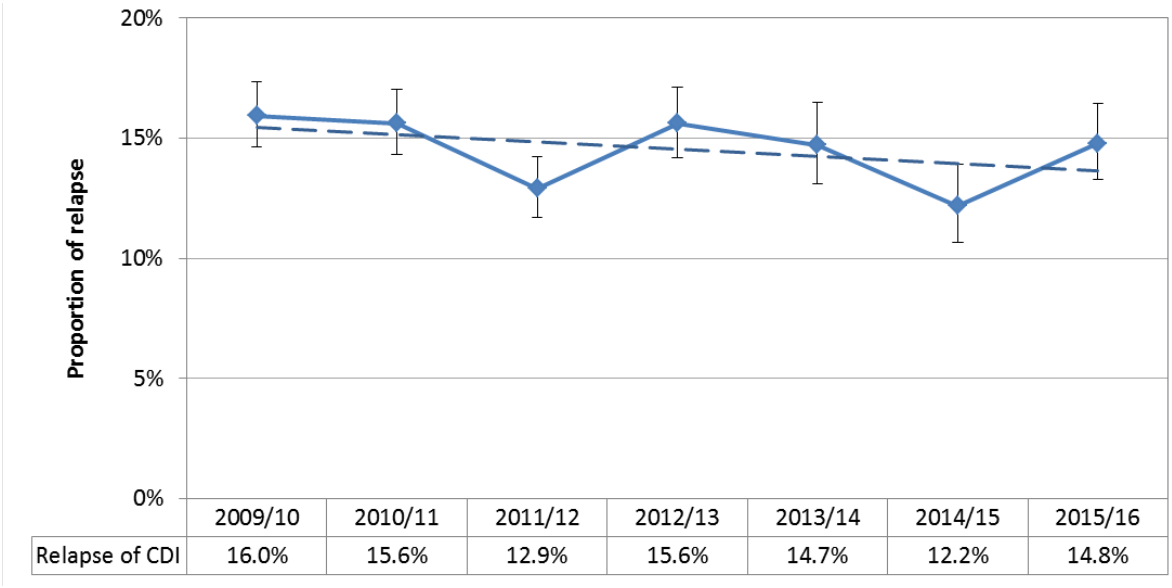


	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
IHA	9.2	6.6	5.8	7.0	5.8	4.4	4.7
FHA	10.3	10.5	11.3	7.2	4.2	4.3	5.1
VCHA	10.0	9.9	9.2	8.4	6.0	4.7	6.8
VIHA	5.5	4.7	4.1	3.5	2.9	3.3	3.4
NHA	2.1	2.8	2.8	2.8	2.4	3.1	1.5
PHSA	7.0	3.9	6.6	7.0	4.8	6.0	5.6

Relapse of healthcare-associated CDI

Relapses of CDI were identified among HCA cases based on the patient's CDI history. Of all 1,919 HCA CDI cases reported in 2015/16, 284 cases were relapses (14.8%, 95% CI: 13.3%–16.5%). The proportion of relapses in 2015/16 was not significantly different from any one of the previous years; however, there is a statistically significant downward trend in the proportion of relapses among HCA CDI from 2009/10 to 2015/16 (Figure 5).

Figure 5. Proportion of relapses among healthcare-associated CDI cases, 2009/10–2015/16



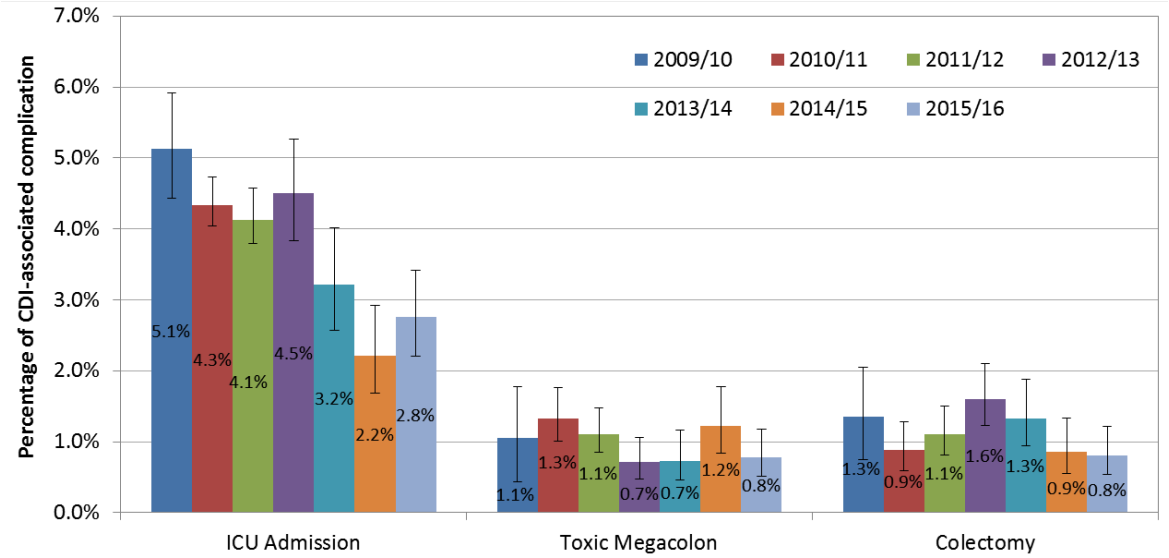
	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Relapse of CDI	16.0%	15.6%	12.9%	15.6%	14.7%	12.2%	14.8%

Note: Vertical bars on the line represent the 95% confidence interval of the percentages and the dashed line represents the linear trendline of the percentages

Complications within 30 days of diagnosis

CDI cases were followed up 30 days after diagnosis or up to the point of patient discharge or transfer (whichever comes first) to assess if the patients were admitted to an intensive care unit (ICU), or developed toxic megacolon, or required partial or entire colectomy due to CDI. Among the 2,834 CDI cases in 2015/16 (excluding 59 cases from PHSA, which stopped collecting data on CDI-associated complications from FY 2013/14), 78 (2.8%) were admitted to ICU, 22 (0.8%) developed toxic megacolon, and 23 (0.8%) required partial or entire colectomy. Compared to previous years (Figure 6), the percentage of ICU admissions in 2015/16 was non-significantly higher than in 2014/15, but was significantly lower than the years 2009/10 through 2012/13. The percentage of toxic megacolon and colectomy was within the range of previous years.

Figure 6. CDI-associated complications within 30 days of diagnosis, 2009/10–2015/16



Note: Vertical bars on the line represent the 95% confidence interval of the percentage to show an estimated range of values

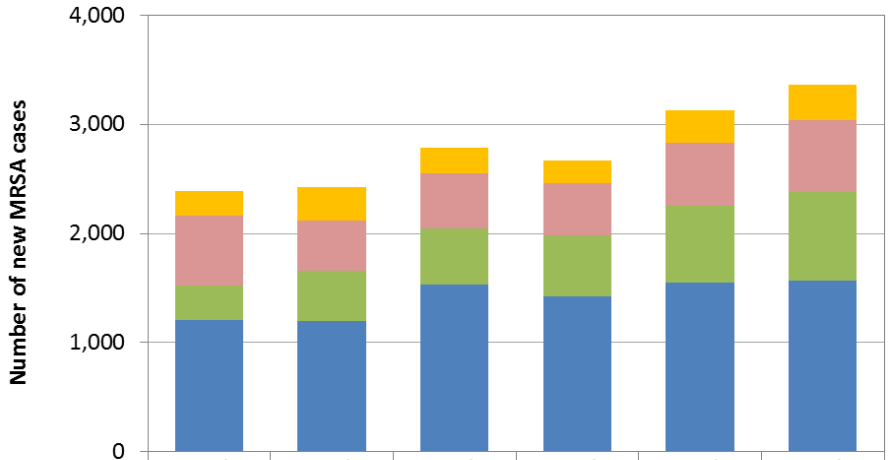
Methicillin-resistant *staphylococcus aureus* (MRSA)

MRSA is still a major patient threat in healthcare settings, such as a hospital or residential care facility, and can cause severe problems such as bloodstream infections, pneumonia, and surgical site infections — even sepsis and death (8). To monitor the trend of MRSA in acute care facilities across BC, a standard provincial surveillance protocol was implemented in fiscal year 2010/11. The following data summarize the newly identified cases of MRSA among inpatients in the fiscal year 2015/16, with a focus on MRSA cases associated with the reporting facility.

Overview of MRSA cases

A total of 3,358 cases of MRSA were newly identified among inpatients in BC acute care facilities during 2015/16. Of these, 1,569 (46.7%) were classified as HCA with the reporting facility, 810 (24.1%) were HCA with another facility, 655 (18.5%) were CA, and 324 (9.7%) were of unknown origin. This represents an increase for each MRSA category compared to the previous year 2014/15 (Figure 7). Overall, the total number of MRSA cases has increased over the past six years.

Figure 7. Number of newly identified MRSA cases in BC acute care facilities, 2010/11–2015/16

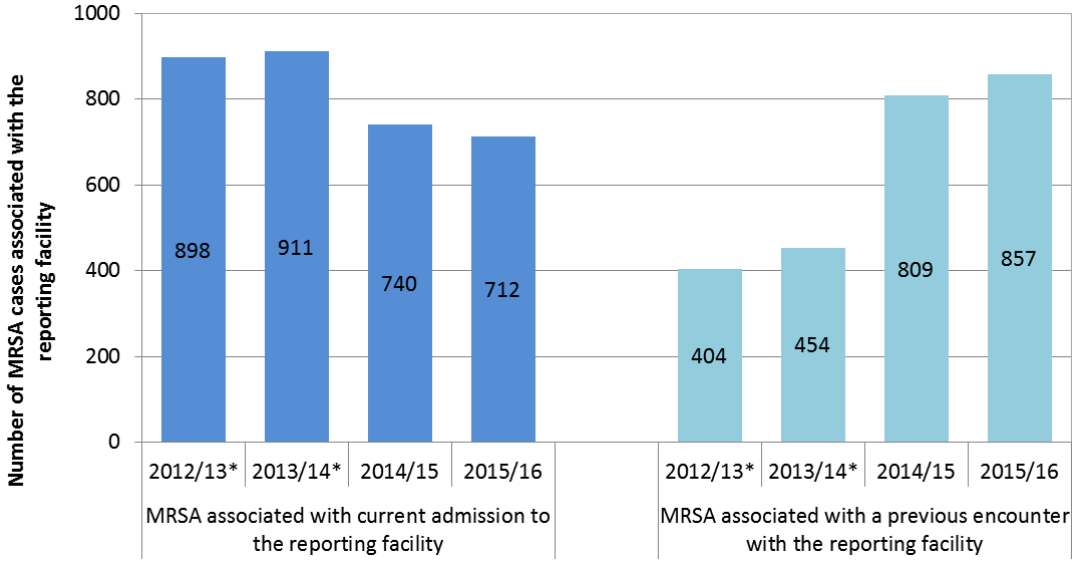


	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Unknown	218	299	241	209	294	324
CA	648	467	506	477	579	655
HCA with another facility	312	457	507	553	702	810
HCA with the reporting facility	1,207	1,198	1,535	1,426	1,549	1,569
Total number of MRSA cases	**2,385**	**2,421**	**2,789**	**2,665**	**3,130**	**3,358**

HCA: healthcare-associated; CA: community-associated

Since 2012/13, MRSA cases associated with the reporting facility were further classified as associated with either current admission to, or a previous encounter with, the reporting facility in the last twelve months. Among the 1,569 cases associated with the reporting facility in 2015/16, 712 (45.4%) were associated with a current admission to the reporting facility, and 857 (54.6%) were associated with a previous encounter with the reporting facility. The number of MRSA cases associated with a current admission decreased in the last three years, whereas the number of MRSA cases associated with a previous encounter increased during the same time period (Figure 8). It is important to note that MRSA cases classified as associated with a previous encounter with the reporting facility were highly likely to be acquired from other sources, such as the community, where MRSA is widely spread (4).

Figure 8. Number of MRSA cases associated with the reporting facility, 2012/13–2015/16



* excludes 231 cases in 2013/14 and 61 cases in 2013/14 from IHA, which did not separate the MRSA cases associated with the current admission from those associated with a previous encounter with the reporting facility

Rate of MRSA associated with the reporting facility in 2015/16

The provincial annual rate of MRSA associated with the reporting facility in 2015/16 was 4.9 per 10,000 inpatient days (95% CI: 4.7 - 5.2). The rate of MRSA associated with a current admission to the reporting facility was statistically significantly lower than that associated with a previous encounter with the reporting facility (Table 2). This difference was observed in four out of six HAs[2] (IHA, FHA, VIHA, and NHA), whereas VCHA reported a higher rate of MRSA associated with current admission to the reporting facility than that associated with a previous encounter with the reporting facility. There was no significant difference between the rate of MRSA associated with current admission to the reporting facility and associated with a previous encounter with the reporting facility in PHSA. The annual rate of MRSA for each acute care facility is presented in Appendix D.

Table 2. Rate of MRSA associated with the reporting facility per 10,000 inpatient days and 95% confidential interval by health authority, 2015/16

Health authority	MRSA associated with current admission to the reporting facility	MRSA associated with a previous encounter with the reporting facility	Total
IHA	0.8 (0.6–1.1)	1.9 (1.6–2.4)	2.8 (2.4–3.3)
FHA	3.1 (2.8–3.4)	4.0 (3.6–4.4)	7.1 (6.6–7.6)
VCHA	3.5 (3.1–3.9)	2.2 (1.8–2.6)	5.6 (5.1–6.2)
VIHA	0.9 (0.7–1.1)	1.6 (1.3–1.9)	2.5 (2.1–2.9)
NHA	1.2 (0.8–1.8)	2.8 (2.2–3.7)	4.0 (3.2–5.0)
PHSA	1.2 (0.7–2.3)	1.7 (1.0–2.9)	2.9 (2.0–4.4)
Province	2.2 (2.1–2.4)	2.7 (2.5–2.9)	4.9 (4.7–5.2)

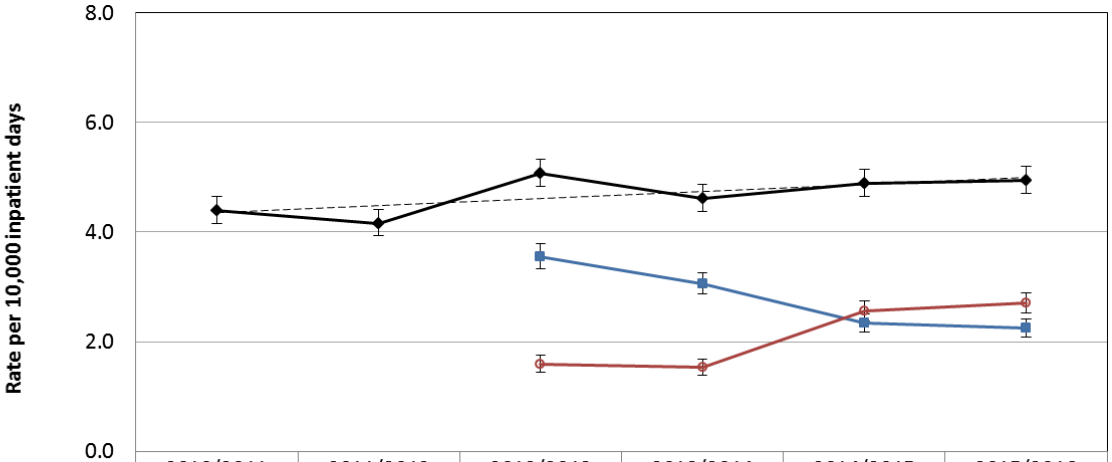
[2] See data limitation in the Appendix A.

Trend of new MRSA associated with the reporting facility

There was little change in the provincial annual rate of MRSA associated with the reporting facility in 2015/16 compared with the previous year 2014/15 (Figure 9). The MRSA rate in 2015/16 was also not statistically significantly different from 2012/13 and 2013/14, but was significantly higher than 2010/11 and 2011/12. However, when examining a long-term trend over the period from 2010/11 to 2015/16, there has been a statistically significant upward trend in MRSA rates associated with the reporting facility (Figure 9).

A further analysis shows that there was a significant decrease in the rate of MRSA associated with current admission to the reporting facility from 2012/13 to 2015/16, while the rate of MRSA associated with a previous encounter with the reporting facility increased significantly during this period (Figure 9). The different trends in MRSA rates may indicate that current HAI prevention and control strategies, which have mostly focused on the healthcare settings, work well in reducing MRSA transmission in the healthcare facilities, but have little impact outside the hospital setting, as would be expected.

Figure 9. Annual rate of new MRSA associated with the reporting facility per 10,000 inpatient days, 2010/11–2015/16



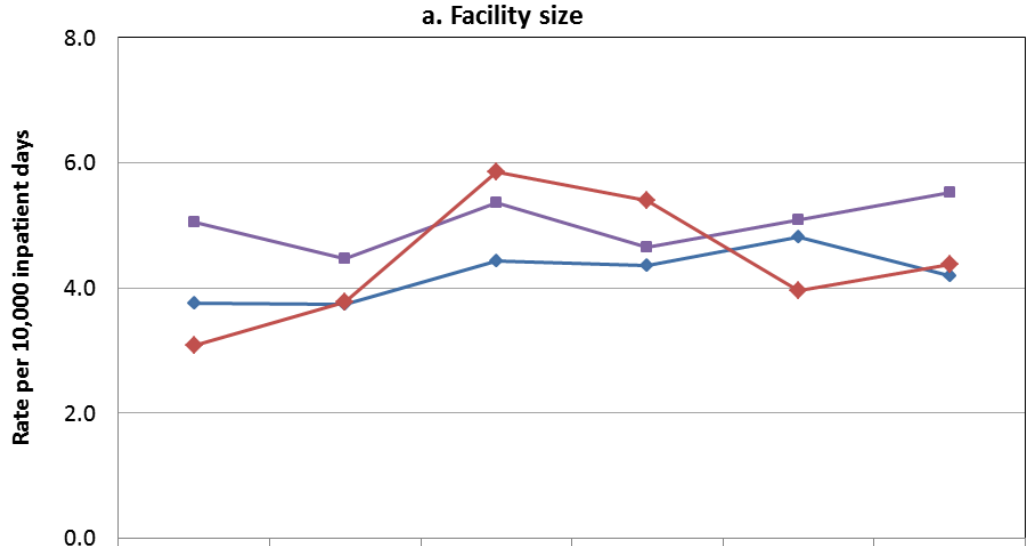
	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
Total	4.4	4.2	5.1	4.6	4.9	4.9
MRSA associated with current admission			3.5	3.1	2.3	2.2
MRSA associated with a previous encounter			1.6	1.5	2.6	2.7

Note: Vertical bars on the line represent the 95% confidence interval of the rates to show an estimated range of values. The dashed line represents the linear trendline of the rates. The data in 2010/11 and 2011/12 were not broken down by the time of healthcare encounter.

Variations in MRSA trends were evident when facilities were grouped by size, type, teaching status, and health authority. The increasing trend was statistically significant for each group of facility size (Figure 10.a) and teaching status (Figure 10.c); community hospitals and regional hospitals (Figure 10.b); and one health authority (FHA) (Figure 10.d). There were no significant trends in the tertiary/referral hospitals, or four HAs (VCHA, VIHA, NHA, and PHSA). One health authority (IHA) demonstrated a significant downward trend in MRSA rates over the six years (Figure 10.d).

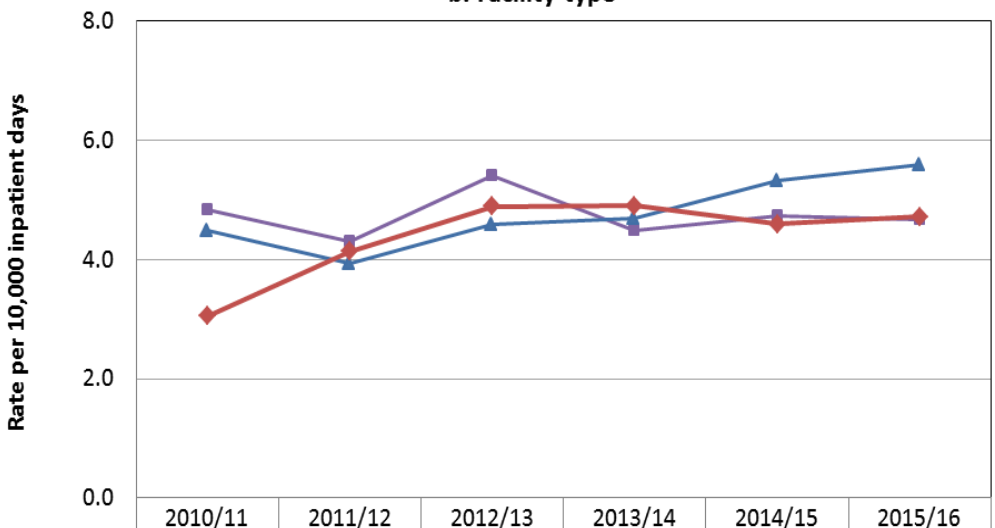
Figure 10. Annual rate of new MRSA associated with the reporting facility per 10,000 inpatient days by facility group, 2010/11–2015/16

a. Facility size



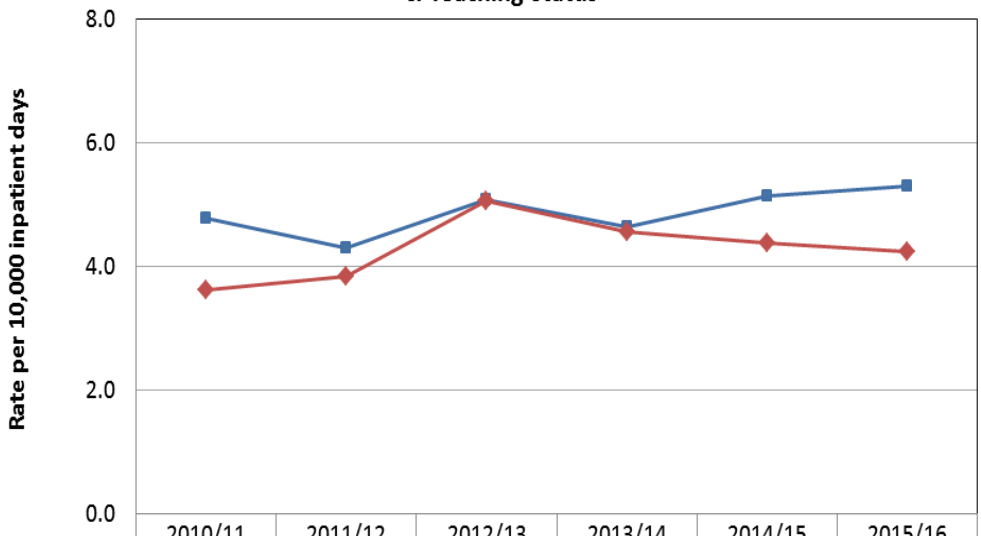
	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
>250 beds	5.1	4.5	5.4	4.6	5.1	5.5
51-250 beds	3.8	3.7	4.4	4.4	4.8	4.2
1-50 beds	3.1	3.8	5.9	5.4	4.0	4.4

b. Facility type



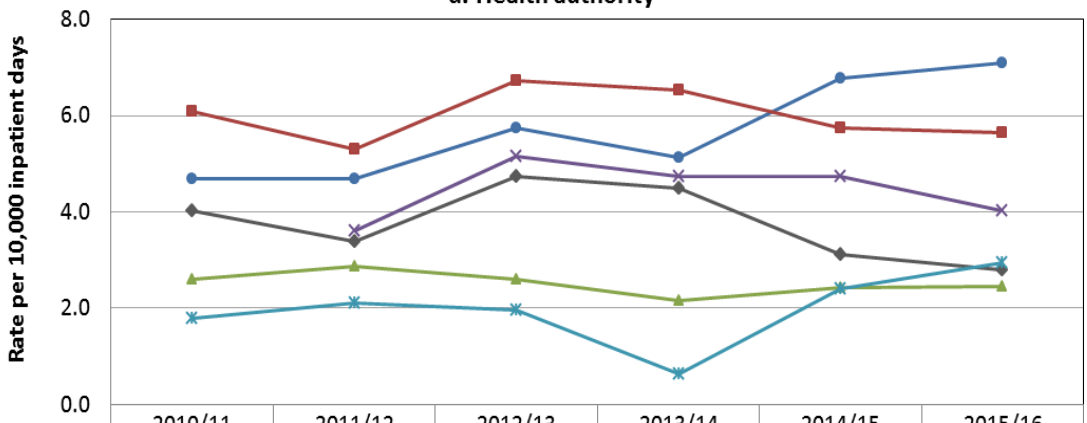
	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Tertiary/Referral hospital	4.8	4.3	5.4	4.5	4.7	4.7
Regional hospital	4.5	3.9	4.6	4.7	5.3	5.6
Community hospital	3.1	4.1	4.9	4.9	4.6	4.7

c. Teaching status



	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Teaching hospital	4.8	4.3	5.1	4.6	5.2	5.3
Non-teaching hospital	3.6	3.8	5.1	4.6	4.4	4.3

d. Health authority



	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
IHA	4.0	3.4	4.7	4.5	3.1	2.8
FHA	4.7	4.7	5.8	5.1	6.8	7.1
VCHA	6.1	5.3	6.7	6.5	5.7	5.6
VIHA	2.6	2.9	2.6	2.2	2.4	2.5
NHA		3.6	5.2	4.7	4.7	4.0
PHSA	1.8	2.1	2.0	0.6	2.4	2.9

Carbapenemase-producing organisms (CPO)

CPO are emerging pathogens that have limited antibiotic treatment options, and consequently poor clinical outcomes: up to 50% of the severe forms of these infections result in death (9). In response to recent global increases of CPO and an outbreak in a BC hospital in February 2014, mandatory provincial surveillance to monitor CPOs in BC was introduced for acute care facilities in July 2014. The following data provide an update on new CPO cases identified during fiscal year 2015/16; only the number of new CPO cases is presented. The rate of CPO was not calculated because CPO is still rare in most BC healthcare facilities, and current CPO screening is targeted towards high-risk patients, including all inpatients, hemodialysis patients, and other patients who are deemed at high risk for CPO transmission by each individual HA. It is hard to track all of the patients being screened (denominator) in a manner that allows the precise calculation of a provincial rate for CPO.

New cases of CPO in 2015/16

A total of 94 new cases of CPO were identified from 85 patients who visited BC acute care facilities during 2015/16. Nine patients were identified with two different carbapenamase genes, with each carbapenamase gene being counted as a new case of CPO. NDM was the predominant gene identified, accounting for 54.2% of CPO cases, followed by OXA-48 (20.2%), and KPC (14.9%). Other genes, including OXA-23 and OXA-51, accounted for 9.6% (Table 3).

Among the 94 new cases of CPO, 70 (74.5%) were identified in FHA, 21 cases (22.3%) were in VCHA, 2 cases (2.1%) were in VIHA, and 1 case (1.1%) was in IHA. There were no CPO cases in NHA or PHSA (Table 4).

Table 3. Number of new cases of CPO identified in BC acute care facilities by carbapenemase gene, 2015/16

Gene	Number of new CPO cases	Percent
NDM	51	54.2%
OXA-48	19	20.2%
KPC	14	14.9%
SME	1	1.1%
Other genes	9	9.6%
Total	**94**	**100.0%**

Table 4. Number of new cases of CPO identified in BC acute care facilities by health authority, 2015/16

Health authority	Number of new CPO cases	Percent
IHA	1	1.1%
FHA	70	74.5%
VCHA	21	22.3%
VIHA	2	2.1%
NHA	0	0
PHSA	0	0
Total	**94**	**100.0%**

Antibiotic susceptibility

Carbapenem-class antibiotics, such as Ertapenem, Imipenem, and Meropenem, are considered last-resort antibiotics, usually reserved for treating infections from multidrug-resistant organisms (16). Among the isolates that new cases of CPO were identified, 98.5% of isolates were resistant to Ertapenem, 81.8% were resistant to Imipenem, and 100% were resistant to Meropenem (Table 5).

Colistin and Tigecycline are two antibiotics that are commonly used for CPO infections (17). Only 37 isolates with CPO were tested for susceptibility to Colistin and two isolates were tested for Tigecycline. None of them were found to be resistant to Colistin or Tigecycline (Table 5).

The new CPO cases were also highly resistant to other antibiotics, as expected (Table 5).

Table 5. Susceptibility of selected antibiotics among new CPO cases, 2015/16

Antibiotic	Number of isolates tested	Susceptible	Intermediate	Resistant
Ertapenem	66	0	1 (1.5%)	65 (98.5%)
Imipenem	55	3 (5.5%)	3 (5.5%)	49 (89.1%)
Meropenem	70	0	0	70 (100%)
Colistin	37	37 (100%)	0	0
Tigecycline	2	2 (100%)	0	0
Ceftazidime	70	3 (4.3%)	0	67 (95.7%)
Ciprofloxacin	71	10 (14.1%)	1 (1.4%)	60 (84.5%)
Gentamicin	73	22 (30.1%)	4 (5.5%)	47 (64.4%)
Piperacillin/Tazobactam	71	1 (1.4%)	0	70 (88.6%)
Tobramycin	71	19 (26.8%)	1 (1.4%)	51 (71.8%)
Trimethoprim/Sulfamethoxazole	72	23 (31.9%)	0	49 (68.1%)

Risk factors for CPO transmission

New CPO cases were investigated for the risk factors that may contribute to CPO transmission in the past twelve months, including healthcare encounters outside Canada (e.g. overnight hospitalization, certain medical or surgical procedures), close contact with a CPO patient or their environment, transfer from a unit which was under investigation for CPO transmission, and CPO transmission within the reporting facility. Of the 94 new cases of CPO, 54 (57.3%) reported a healthcare exposure outside Canada in the past twelve months. Other risk factors were identified among 19 cases (20.2%, including double counting when multiple risk factors were identified in one case). Twenty six cases (27.7%) had no known risk factors, meaning that possible source of their CPO transmission could not be identified.

Hand cleaning compliance (HCC)

Hand cleaning, i.e., washing hands with soap and water or sanitizing with alcohol-based hand rub, has long been considered an effective and simple way of preventing HAIs and limiting the transmission of pathogens (2,3). Healthcare providers working in BC acute care facilities are audited regularly to evaluate compliance with the hand hygiene policy, and the audit results have been reported to PICNet on a quarterly basis since 2010. In the fiscal year 2014/15, health authorities began reporting HCC for their residential care facilities. The following data present the percent compliance in 2015/16 from acute care facilities and residential care facilities that are owned or operated by HAs. A weighted provincial compliance for acute care facilities is also provided to reduce the impact of variations in the number of opportunities observed among HAs.

Hand cleaning compliance in 2015/16

The provincial annual compliance in 2015/16 was 83.2% for acute care facilities and 83.6% for residential care facilities, respectively (Table 6). Both surpassed the target performance of 80% set by the Provincial Hand Hygiene Working Group (PHHWG). Detailed compliance for each acute care facility is presented in Appendix D.

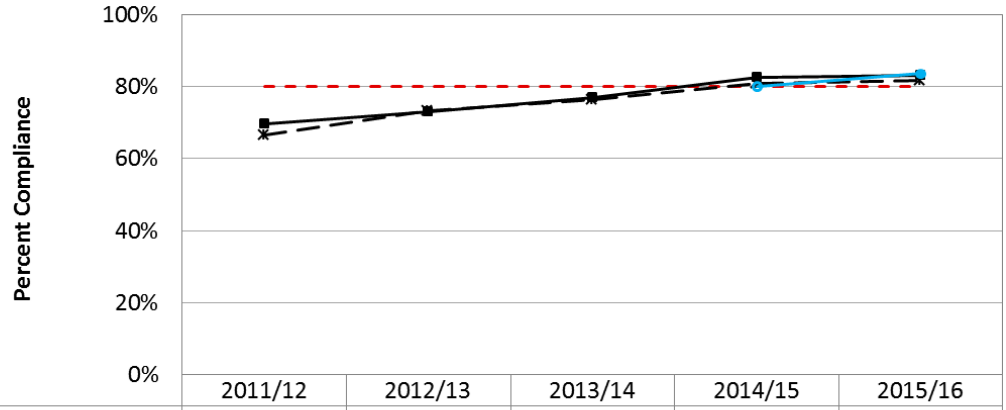
Table 6. Hand cleaning compliance by health authority, 2015/16

Health authority	Acute care facility		Residential care facility	
	Total observations	Percent compliance	Total observations	Percent compliance
IHA	27,788	77.9%	10,047	77.7%
FHA	113,527	87.4%	13,510	85.3%
VCHA	31,008	78.8%	5,732	85.5%
VIHA	24,433	78.3%	6,182	89.6%
NHA	14,754	75.9%	7,222	82.0%
PHSA	4,600	90.8%	N/A	N/A
Province	**216,110**	**83.2%**	**42,693**	**83.6%**

Note: the data for PHSA include observations in BC Cancer Agency. There are no residential care facilities in PHSA

After weighting by acute care inpatient days, the provincial compliance for acute care facilities in 2015/16 was 81.7% (Figure 11). Compared with previous years, the provincial annual compliance for acute care facilities, either un-weighted or weighted, has increased continuously from 2010/11 to 2015/16 (Figure 11). For residential care facilities, the provincial annual compliance increased from 80.1% in 2014/15 to 83.6% in 2015/16 (Figure 11).

Figure 11. Provincial annual hand cleaning compliance, 2011/12–2015/16



	2011/12	2012/13	2013/14	2014/15	2015/16
Target compliance	80%	80%	80%	80%	80%
Compliance in ACF	69.7%	72.9%	76.8%	82.6%	83.2%
Weighted compliance in ACF	66.5%	73.3%	76.4%	80.9%	81.7%
Compliance in RCF				80.1%	83.6%

Note: ACF: Acute care facility; RCF: Residential care facility

a. The provincial weighted compliance was calculated using the proportions of inpatient days in the health authorities as the weighting values.

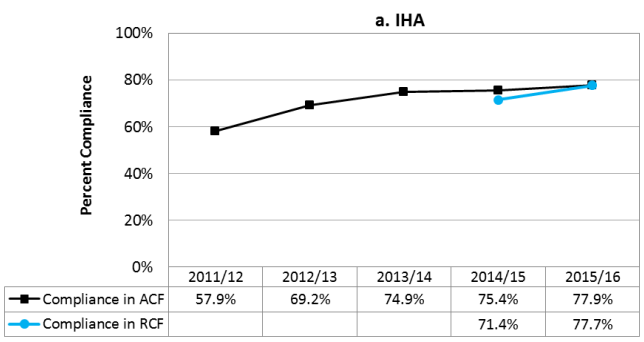
b. The provincial target, established by the Provincial Hand Hygiene Working Group (PHHWG), was to achieve 80% compliance by the end of fiscal year 2014/15 (March 31, 2015).

c. Provincial reporting on hand cleaning compliance for their residential care facilities began from 2014/15

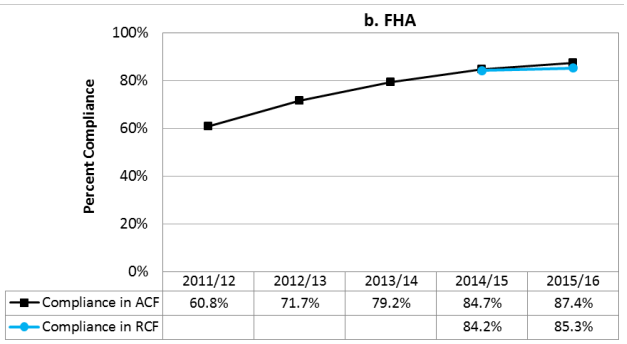
Hand cleaning compliance by health authority

The improvement in hand cleaning compliance for acute care facilities was observed in each HA[3], except in VIHA (Figure 12.d).

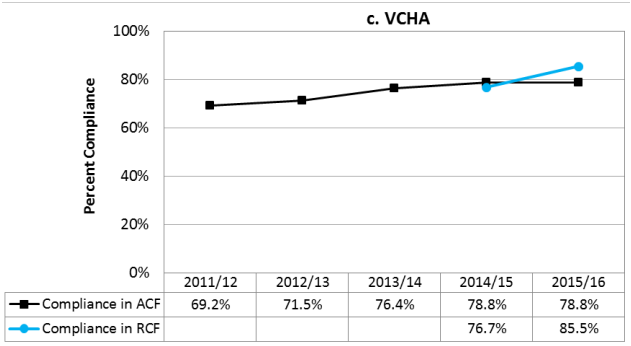
Figure 12. Hand cleaning compliance by health authority, 2011/12–2015/16



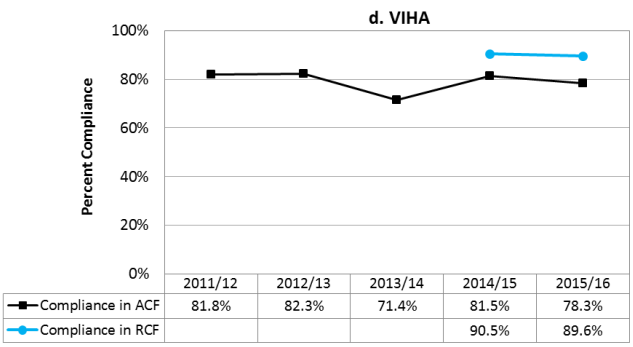
	2011/12	2012/13	2013/14	2014/15	2015/16
Compliance in ACF	57.9%	69.2%	74.9%	75.4%	77.9%
Compliance in RCF				71.4%	77.7%



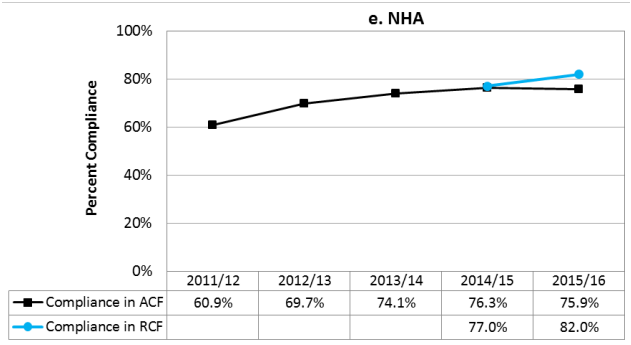
	2011/12	2012/13	2013/14	2014/15	2015/16
Compliance in ACF	60.8%	71.7%	79.2%	84.7%	87.4%
Compliance in RCF				84.2%	85.3%



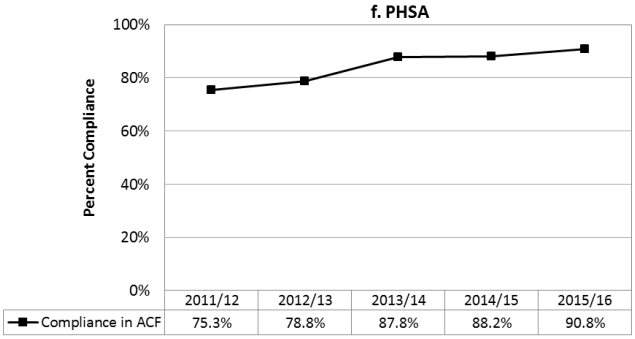
	2011/12	2012/13	2013/14	2014/15	2015/16
Compliance in ACF	69.2%	71.5%	76.4%	78.8%	78.8%
Compliance in RCF				76.7%	85.5%



	2011/12	2012/13	2013/14	2014/15	2015/16
Compliance in ACF	81.8%	82.3%	71.4%	81.5%	78.3%
Compliance in RCF				90.5%	89.6%



	2011/12	2012/13	2013/14	2014/15	2015/16
Compliance in ACF	60.9%	69.7%	74.1%	76.3%	75.9%
Compliance in RCF				77.0%	82.0%



	2011/12	2012/13	2013/14	2014/15	2015/16
Compliance in ACF	75.3%	78.8%	87.8%	88.2%	90.8%

Note: ACF: Acute care facility; RCF: Residential care facility. There are no residential care facilities in PHSA

[3] Variation exists among health authorities regarding audit methods and sampling strategy, see data limitations.

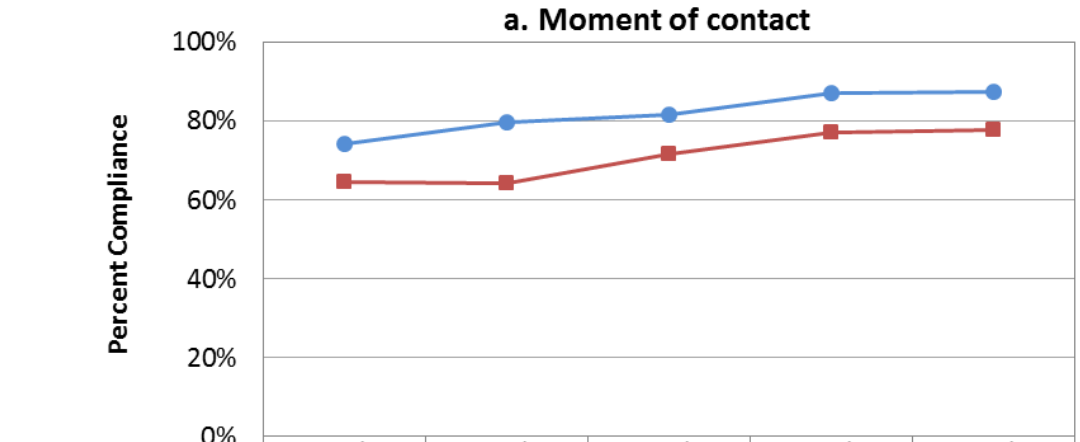
Hand cleaning compliance by moment of contact and healthcare providers

Hand cleaning compliance for acute care facilities was further broken down by moment of contact and by healthcare provider. Compliance has improved continuously from 2011/12 to 2015/16, both before and after contact with a patient or patient's immediate environment (Figure 13.a), and among all healthcare providers working in acute care facilities (Figure 13.b).

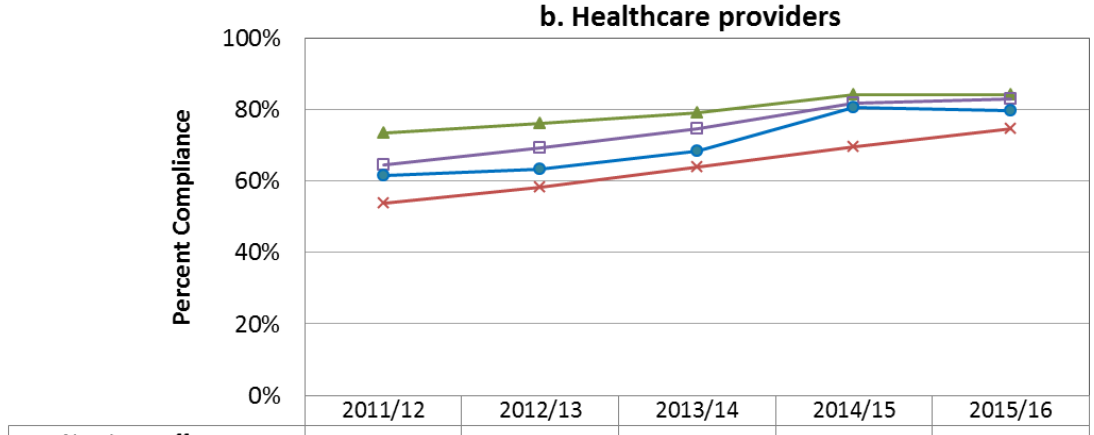
However, compliance before contact was still significantly lower than compliance after contact (Figure 13.a), indicating that healthcare providers are less vigilant with hand cleaning before contact with patients.

Nursing staff consistently had the highest hand cleaning compliance among all healthcare providers and physicians had the lowest compliance (Figure 13.b).

Figure 13. Provincial hand cleaning compliance by moment of contact and healthcare provider in acute care facilities, 2011/12–2015/16



	2011/12	2012/13	2013/14	2014/15	2015/16
Before contact	64.5%	64.2%	71.7%	77.0%	77.8%
After contact	74.0%	79.5%	81.5%	87.0%	87.3%



	2011/12	2012/13	2013/14	2014/15	2015/16
Nursing staff	73.4%	76.0%	79.3%	84.1%	84.3%
Physician	53.7%	58.3%	64.0%	69.7%	74.6%
Clinical support services	64.6%	69.3%	74.6%	81.9%	83.1%
Other	61.4%	63.2%	68.5%	80.6%	79.7%

Conclusion

This report provides overall analyses of CDI, MRSA, CPO, and hand cleaning compliance in BC health care facilities, based on the data submitted quarterly by the health authorities. The year 2015/16 has seen a significant increase of CDI in acute care facilities for the first time after continuously significant decreases in the previous four years. The rate of MRSA associated with the reporting facility did not change significantly in the last three years; however, the total MRSA cases identified in acute care facilities continued to increase over the past six years. More CPO cases have been identified in the healthcare setting, as well as in the community, especially among those who had travelled to endemic regions or had healthcare exposure abroad. These challenges will continue to affect patient safety and care quality. Encouragingly, hand hygiene, an important prevention measure for HAI, has improved significantly among healthcare providers.

Acronyms

ACF	Acute care facilities
ARO	Antimicrobial-resistant organism
BC	British Columbia
CA	Community-associated
CI	Confidence interval
CDI	*Clostridium difficile* infection
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
HCC	Hand cleaning compliance
HH	Hand hygiene
ICP	Infection control practitioner
IHA	Interior Health Authority
MRSA	Methicillin-resistant *Staphylococcus aureus*
NHA	Northern Health Authority
PCR	polymerase chain reaction
PHC	Providence Health Care
PHSA	Provincial Health Services Authority
PICNet	Provincial Infection Control Network of British Columbia
PHHWG	Provincial Hand Hygiene Working Group of British Columbia
RCF	Residential care facilities
SSC	PICNet's Surveillance Steering Committee
VCHA	Vancouver Coastal Health Authority
VIHA	Island Health Authority

Acknowledgements

PICNet wishes to thank all participants in each health authority and their affiliated care facilities for their ongoing support and participation in the provincial HAI surveillance program. We also thank the infection control practitioners and epidemiologists, and other healthcare providers who collect and report the surveillance data to the health authorities and PICNet.

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

Surveillance Steering Committee

PICNet's Surveillance Steering Committee consists of representatives from each health authority and related organization, and provides guidance to PICNet's surveillance programs and assists the PICNet Management Office in implementation within the participating health authorities. The committee members during fiscal year 2015/16 were:

Dr. Elizabeth Bryce	Medical Microbiologist	VCHA
June Chen Collet	Epidemiologist	PHSA
Kelly Dillon	Infection Control Practitioner	IHA
Tara Donovan	Epidemiologist/Managing Consultant	FHA
Dr. Randall Dumont	Pathologist	NHA
Leslie Forrester	Epidemiologist	VCHA
Bruce Gamage	Manager	PICNet
Diana George	Epidemiologist	BCCDC
Dr. Guanghong Han	Epidemiologist	PICNet
Lisa Harris	Infection Control Practitioner	VCHA
Deanna Hembroff	Infection Control Regional Manager	NHA
Dr. Linda Hoang	Medical Microbiologist	BCCDC
Dr. Pamela Kibsey	Medical Microbiologist	VIHA
Kelsi Laporte	Infection Control Practitioner	PHC
Tony Leamon	Epidemiologist	VIHA
Dr. Christopher Lowe	Medical Microbiologist	PHC
Dr. Neil Mina	Medical Microbiologist	FHA
Dr. Julie Mori	Epidemiologist	IHA
David Puddicombe	Epidemiologist	PHC
Sean Shakeraneh	Epidemiologist	PHC
Dr. Elisa Lloyd-Smith	Epidemiologist	PHC
Dr. Peter Tilley	Medical Microbiologist	PHSA
Dr. Bing Wang	Medical Microbiologist	IHA
Louis Wong	Epidemiologist	FHA
Dr. Titus Wong	Medical Microbiologist	VCHA

Appendices

Appendix A. Methods

Surveillance populations

All patients who were admitted to an acute care facility in BC were under surveillance for CDI, MRSA, and CPO. This included 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, and patients in labour and delivery beds. Outpatient visits to acute care facilities, patients in extended care, and short-time admissions to emergency room were excluded, with an exception in CPO surveillance, which includes hemodialysis patients visiting renal clinics in acute care facilities, and other patients that were deemed high risk for CPO. Patients under one year of age were excluded from CDI surveillance because asymptomatic carriage of *C. difficile* is very frequent, and *C. difficile*-associated diarrheal illness is exceedingly rare before twelve months of age (10,11).

For hand cleaning compliance, auditing takes place among all healthcare providers working at both acute care facilities and residential care facilities. The healthcare providers in acute care facilities are grouped into four categories by HA when reporting audit results: 1) nursing staff, including nurses, midwives, care aides, nursing students, etc.; 2) physicians, including medical doctors, residents, and medical students; 3) clinical support services, such as occupational therapists, physiotherapists, respiratory therapists, speech therapists, social workers, dieticians, psychologists, audiologists, porters, pastoral care, radiologists, laboratory and electrocardiogram technicians, etc.; and 4) others, such as housekeeping, food services, clerk, volunteer, security, etc.

Data collection and reporting

CDI and MRSA

Provincial surveillance data for CDI and MRSA were collected according to the provincial surveillance protocols, which were developed by PICNet's Surveillance Steering Committee (SSC) and are reviewed annually. CDI cases include new infections as well as relapses from previous infections. MRSA surveillance focuses on incidence cases, which are newly identified colonization or infection with MRSA among inpatients. All CDI and MRSA cases were laboratory confirmed, and classified as either healthcare-associated (HCA), community-associated (CA), or unknown, based on the patient's healthcare encounter in the last four weeks (for CDI) or twelve months (for MRSA) before identification. For detailed case definition and classification for CDI and MRSA, please visit PICNet website: https://www.picnet.ca/surveillance. Information on individual cases of CDI and MRSA were collected daily by infection control practitioners (ICPs) and managed by the respective health authority. After the end of each fiscal quarter, CDI and MRSA cases were aggregated by facility and classification using templates for data submission. These data were then submitted to PICNet. Total inpatient days (denominators) were collected from the patient information systems by HA.

CPO

The provincial surveillance protocol for CPO was developed by the provincial CPO Working Group in May 2014. Since July 18, 2014, the microbiology laboratories in BC healthcare facilities are required to submit all isolates suspected of harbouring a carbapenemase gene to the Public Health Laboratory at the BC Center for Disease Control for confirmatory testing and genotyping analysis. If an isolate is recovered from a patient in an acute care facility and identified with a carbapenemase gene for the first time or with a new carbapenemase gene, regardless of the organism/species identified, it is considered to be a new case of CPO, and reported to PICNet. The ICPs collect surveillance information regarding the new

case and submit this information to PICNet via their health authority. PICNet further links the new cases to the laboratory testing data and patient information collected by the laboratory for the provincial surveillance report.

Hand Cleaning Compliance

The methodology for the provincial hand hygiene audits was adapted by the Provincial Hand Hygiene Working Group (PHHWG) from the World Health Organization's guidelines for hand hygiene, which describe direct observation as the gold standard methodology for assessing hand hygiene (12). During the auditing process, trained auditors directly observe a sample of healthcare workers in acute care facilities across BC. The auditors record the number of hand cleaning events they observe (i.e., when healthcare workers clean their hands), as well as the number of hand cleaning opportunities (i.e., when healthcare workers should clean their hands). This includes opportunities before contact with a patient or the patient's immediate environment (such as around the patient's bedside) and after contact with a patient or the patient's immediate environment. The minimum requirement is 200 observations per quarterly audit cycle for each facility with 25 or more beds. For facilities with fewer than 25 beds, the audit data are aggregated into the overall health authority data. The audit data are collected and managed by each HA, then aggregated by facility and submitted to PICNet at the end of each quarter.

Data analysis

The quarterly data were verified before data analysis. After the end of each fiscal year (FY), all quarterly submitted data were reviewed with the health authorities and updated if there were any changes.

The CDI and MRSA surveillance data were merged by PICNet into respective databases and then grouped by HA, size of facility, and type of facility. The rate of HCA CDI or MRSA was calculated using the total number of new cases of HCA CDI or MRSA associated with the reporting facility as numerators divided by the total inpatient days during the same period as denominators, then multiplying 10,000 as a rate by per 10,000 inpatient days. The 95% confidence intervals (CI) of the rate were calculated by the Wilson score method and were used to determine whether the difference between the rates was statistically significant. If the ranges of 95% CI do not overlap, the difference in the two rates is considered statistically significant.

The HCC percentage was the number of compliant opportunities over the total opportunities observed, and further grouped by moment of before contact and after contact, and by healthcare worker group. To reduce the impact of variations in the opportunities observed by HA, total inpatient days in each HA was used to weight opportunities observed during the same period and the weighted provincial compliance was calculated for each auditing quarter.

The overall trend of annual rates from the beginning of the provincial surveillance data collection to 2015/16 was analyzed using Cochrane-Armitage test for linear trend at a statistically significant level of $p < 0.05$.

CPO were presented by the number of cases in this report. The rate was not calculated because CPO is still rare in most BC facilities, and therefore only high-risk patients are screened for CPO (including all inpatients, hemodialysis patients, and other patients who are deemed at high risk for CPO transmission by each individual HA). It is difficult to track all patients who were screened (denominator) in a manner that allows the precise calculation of a provincial rate for CPO.

Data limitations

Although standard provincial surveillance protocols have been developed and reviewed annually to reflect the advances of scientific research and surveillance practice, there are noted variations in how

the case definitions and inclusion/exclusion criteria were applied by the HAs and healthcare facilities. For example, in defining a CDI case, FHA and PHSA began to apply the frequency of documented diarrheal episodes stringently with chart review since 2012, while other HAs continued to define CDI based on positive laboratory testing from diarrhea specimens. In addition, from 2012 IHA and FHA require resolution of diarrhea from a previous CDI episode for a period of >24 hours (IHA) or >72 hours (FHA) before applying the period of two to eight weeks for defining a relapse of CDI. No health authorities reported significant changes in the application of the protocol after 2012.

Variation also exists among the HAs in how MRSA case definition and classification is applied. A twelve-month look-back period for healthcare encounter history 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 >72 hours after admission.

Laboratory practice and methodology may vary among the microbiology laboratories, and may change over time. From 2008 to 2012, more sensitive and faster testing for detecting *C. difficile* was gradually introduced into the microbiology laboratories across the province, which may result in more specimens being identified positive with *C. difficile* by the laboratory, and thus more CDI cases diagnosed. There is no evidence that the microbiology practice has changed significantly for MRSA after provincial surveillance started.

Infection prevention and control practices also vary across HAs and healthcare facilities, which can also affect identification of MRSA and CDI. For example, facilities that conduct more intense screening of patients (such as universal admission screening, periodic screening of certain units and/or high-risk patients) may identify more MRSA cases than those which screen patients in specific situations only. Intensive testing of diarrheal specimens may result in more CDI reported.

The patient's encounter history with healthcare has been used to determine whether the case of CDI and MRSA was healthcare-associated. Various "look-back" periods were employed by HAs in the first year(s), and were consolidated to four weeks for CDI from FY 2010/11 and twelve months for MRSA from FY 2012/13. In addition, the facilities in PHSA and PHC are unable to check the patient healthcare history outside their health authority, and thus did not report cases that were associated with another facility.

In hand hygiene audits, auditing might be performed by auditors who work in the same unit or small facility as the healthcare workers they are observing (self-auditing); conversely, it might be performed by external auditors such as infection control practitioners (ICPs), dedicated auditors, medical students, or members of the healthcare quality department of the hospital or HA. Observer and selection bias are inevitable (13). Self-auditing tends to report high compliance than dedicated auditors. The audits in IHA, PHC, and PHSA were conducted by dedicated auditors, while FHA, VCHA (except PHC), VIHA, and NHA included both self-auditing and by dedicated auditors. Auditors also varied over time. VIHA recruited dedicated auditors to conduct auditing in some large facilities from 2013/14. In addition, direct observation induces a phenomenon referred to as the Hawthorne Effect, i.e. the tendency of individuals to change their behavior when they know they are being watched (14, 15).

Finally, patient populations may differ from facility to facility, and over time. The rates in this report were not adjusted by any risk factors, and therefore direct comparison of the rates of CDI and MRSA, or the HCC percentage, between HAs or healthcare facilities is not recommended.

Appendix B. Acute care facilities participating in the provincial surveillance program in 2015/16

Summary of acute care facilities participating in the provincial surveillance program, fiscal year 2015/16

Health authority	IHA	FHA[a]	VCHA[b]	VIHA	NHA	PHSA[c]	Total
Total number of facilities	**22**	**13**	**11**	**13**	**18**	**2**	**79**
By facility size[d]							
1–50 beds	16	1	5	5	17	0	44
51–250 beds	5	8	3	5	1	2	24
>250 beds	1	4	3	3	0	0	11
By facility type							
Community hospital	16	6	6	9	9	0	46
Regional hospital	4	4	3	2	8	0	21
Tertiary/Referral hospital	2	3	2	2	1	2	12
By teaching status							
Non-teaching hospital	21	7	6	11	16	0	61
Teaching hospital	1	6	5	2	2	2	18
Acute care beds[d]	**1,348**	**2,916**	**2,023**	**1,534**	**555**	**249**	**8,624**
Total acute care admissions[e]	**72,312**	**144,558**	**87,158**	**77,542**	**28,404**	**26,889**	**436,863**
Total inpatient days[e]	**494,954**	**1,127,448**	**676,337**	**598,271**	**191,554**	**81,393**	**3,169,957**

Notes:

a. The data from Matsqui Sumas Abbotsford Hospital and Abbotsford Regional Hospital in FHA were grouped together for surveillance purpose in 2015/16
b. Includes acute care facilities of Providence Health Care (PHC)
c. Excludes BC Cancer Agency, which was included for hand cleaning compliance audits only.
d. Based on the average of quarterly counts of acute care beds in FY 2015/16. The number of beds may vary by quarter due to temporary closure of acute care beds by facilities.
e. The patients less than one year old were excluded from CDI surveillance

Appendix C. Start and end date for quarters in 2015/16

Start and end date of quarters in 2015/16

Quarter code	Fiscal quarter		Calendar quarter	
	Start date	End date	Start date	End date
Q1	01-Apr-2015	19-Jun-2015	01-Apr-2015	30-Jun-2015
Q2	20-Jun-2015	11-Sep-2015	01-Jul-2015	30-Sep-2015
Q3	12-Sep-2015	05-Dec-2015	01-Oct-2015	31-Dec-2015
Q4	06-Dec-2015	31-Mar-2016	01-Jan-2016	31-Mar-2016

Appendix D: Annual rate of new CDI and MRSA associated with the reporting facility per 10,000 inpatient days and 95% confidence interval, and hand cleaning compliance by acute care facility, 2015/16

Health authority and facility	CDI		MRSA		HCC	
	Number of new cases	Rate (95% CI) [a]	Number of new cases	Rate (95% CI) [a]	Total observations	Percent compliance
Interior Health [b]	**210**	**4.7 (4.1-5.3)**	**138**	**2.8 (2.4-3.3)**	**27,788**	**77.9%**
100 Mile District Hospital	0	0.0	*	14.0 (7.1-27.5)	245	70.2%
Arrow Lakes Hospital	0	0.0	0	0.0	**	**
Boundary Hospital	*	2.6 (0.5-14.6)	*	5.2 (1.4-18.9)	293	75.4%
Cariboo Memorial Hospital and Health Centre	*	4.9 (2.1-11.6)	*	2.9 (1.0-8.4)	246	75.0%
Creston Valley Hospital	*	1.8 (0.3-10.2)	*	1.8 (0.3-10.1)	254	75.4%
Dr. Helmcken Memorial Hospital & Health Centre	*	6.1 (1.1-34.7)	0	0.0	**	**
East Kootenay Regional Hospital	*	3.5 (1.8-6.8)	10	3.7 (2.0-6.8)	1,727	71.5%
Elk Valley Hospital	*	8.6 (3.3-22.1)	*	6.3 (2.2-18.6)	252	68.7%
Golden & District General Hospital	*	5.1 (0.9-28.8)	0	0.0	**	**
Invermere & District Hospital	0	0.0	*	4.2 (0.7-23.5)	**	**
Kelowna General Hospital	73	5.4 (4.3-6.8)	33	2.1 (1.5-3.0)	7,507	78.3%
Kootenay Boundary Regional Hospital	16	7.8 (4.8-12.7)	*	3.2 (1.6-6.3)	1,613	81.6%
Kootenay Lake Hospital	*	6.1 (3.0-12.6)	*	2.6 (0.9-7.5)	954	81.8%
Lillooet Hospital and Health Centre	*	7.2 (1.3-40.8)	0	0.0	**	**
Nicola Valley Health Centre	0	0.0	*	3.9 (0.7-22.0)	**	**
Penticton Regional Hospital	32	6.9 (4.9-9.7)	14	2.7 (1.6-4.5)	2,981	74.2%
Princeton General Hospital	*	5.2 (0.9-29.5)	0	0.0	**	**
Queen Victoria Hospital and Health Centre	*	3.4 (0.6-19.3)	*	10.1 (3.4-29.6)	**	**
Royal Inland Hospital	25	2.8 (1.9-4.1)	30	3.2 (2.3-4.6)	4,812	79.7%
Shuswap Lake General Hospital	*	5.4 (2.8-10.3)	*	4.8 (2.4-9.4)	1,938	84.3%
South Okanagan General Hospital	*	1.5 (0.3-8.5)	*	3.0 (0.8-11.0)	269	76.0%
Vernon Jubilee Hospital	23	4.3 (2.9-6.4)	*	1.3 (0.7-2.6)	3,606	76.0%
Fraser Health [b]	**545**	**5.1 (4.6-5.5)**	**801**	**7.1 (6.6-7.6)**	**113,527**	**87.4%**
Abbotsford Regional Hospital[c]	76	6.1 (4.9-7.7)	85	6.5 (5.3-8.0)	11,435	85.8%
Burnaby Hospital	101	8.7 (7.2-10.6)	126	10.5 (8.8-12.5)	21,223	87.2%
Chilliwack General Hospital	50	8.8 (6.6-11.5)	26	4.4 (3.0-6.5)	4,345	91.5%
Delta Hospital	13	5.0 (2.9-8.6)	*	1.9 (0.8-4.5)	2,548	91.2%
Eagle Ridge Hospital	18	2.6 (1.6-4.1)	60	8.6 (6.7-11.1)	5,776	90.1%
Fraser Canyon Hospital	*	13.1 (5.6-30.7)	*	5.3 (1.4-19.2)	930	95.6%

Health authority and facility	CDI		MRSA		HCC	
	Number of new cases	Rate (95% CI) [a]	Number of new cases	Rate (95% CI) [a]	Total observations	Percent compliance
Langley Memorial Hospital	17	2.3 (1.4-3.7)	39	5.1 (3.7-6.9)	6,788	89.1%
Mission Memorial Hospital	12	7.1 (4.1-12.5)	15	8.9 (5.4-14.7)	1,829	79.8%
Peace Arch Hospital	29	3.9 (2.7-5.6)	26	3.4 (2.3-5.0)	4,294	85.5%
Queen's Park Hospital	*	2.1 (1.0-4.2)	22	6.5 (4.3-9.8)	612	92.3%
Ridge Meadows Hospital	34	5.2 (3.7-7.2)	61	9.1 (7.1-11.6)	9,751	86.8%
Royal Columbian Hospital	45	2.7 (2.0-3.6)	109	6.1 (5.0-7.3)	29,940	87.9%
Surrey Memorial Hospital	138	5.5 (4.7-6.5)	225	8.4 (7.4-9.6)	14,056	85.3%
Vancouver Coastal Health [b]	**456**	**6.8 (6.2-7.4)**	**382**	**5.6 (5.1-6.2)**	**30,990**	**78.8%**
Bella Coola General Hospital	0	0.0	0	0.0	547	71.7%
Lion's Gate Hospital	102	11.1 (9.1-13.4)	87	9.1 (7.4-11.2)	4,059	75.1%
Mount Saint Joseph Hospital	32	7.9 (5.6-11.1)	14	3.4 (2.1-5.8)	997	82.5%
Powell River General Hospital	*	1.1 (0.2-6.4)	*	3.3 (1.1-9.7)	523	77.6%
Richmond Hospital	54	7.7 (5.9-10.0)	51	6.9 (5.2-9.1)	4,363	73.8%
RW Large Hospital	0	0.0	0	0.0	**	**
Sechelt Hospital[d]	*	4.3 (2.2-8.5)	*	2.6 (1.1-6.2)	466	88.6%
Squamish General Hospital	*	3.8 (1.0-13.8)	*	1.8 (0.3-10.1)	561	90.7%
St. Paul's Hospital	99	5.9 (4.9-7.2)	43	2.6 (1.9-3.4)	3,145	83.0%
UBC Hospital	*	0.9 (0.2-5.3)	*	0.9 (0.2-5.3)	1,205	81.1%
Vancouver General Hospital	157	6.1 (5.2-7.1)	177	7.0 (6.1-8.2)	12,863	78.9%
Island Health [b]	**177**	**3.4 (2.9-3.9)**	**147**	**2.5 (2.1-2.9)**	**24,433**	**78.3%**
Campbell River & District General Hospital	*	3.2 (1.6-6.4)	15	4.7 (2.9-7.8)	1,219	83.7%
Cormorant Island Community Health Centre	0	0.0	0	0.0	**	**
Cowichan District Hospital	14	3.4 (2.0-5.7)	12	2.5 (1.4-4.4)	1,049	83.5%
Lady Minto Gulf Islands Hospital	*	1.9 (0.3-10.9)	*	1.9 (0.3-10.9)	**	**
Nanaimo Regional General Hospital	46	4.4 (3.3-5.9)	47	4.0 (3.0-5.3)	4,025	73.6%
Port Hardy Hospital	*	5.1 (0.9-28.7)	0	0.0	213	87.3%
Port McNeill and District Hospital	*	1.6 (0.3-8.8)	0	0.0	**	**
Royal Jubilee Hospital	55	4.0 (3.0-5.2)	30	1.8 (1.2-2.5)	7,493	81.1%
Saanich Peninsula Hospital	*	2.5 (1.1-5.9)	*	1.5 (0.5-4.5)	1,038	85.2%
St. Joseph's General Hospital	10	3.5 (1.9-6.5)	13	3.0 (1.7-5.1)	484	89.7%
Tofino General Hospital	*	1.1 (0.2-6.3)	*	5.6 (1.0-31.8)	**	**
Victoria General Hospital	30	2.5 (1.7-3.6)	16	1.2 (0.7-1.9)	8,101	75.0%
West Coast General Hospital	*	3.2 (1.4-7.4)	*	4.1 (2.2-7.8)	422	73.0%

Northern Health [b]	29	1.5 (1.1-2.2)	77	4.0 (3.2-5.0)	14,754	75.9%
Bulkley Valley District Hospital	0	0.0	*	3.4 (0.9-12.2)	795	73.7%
Chetwynd General Hospital	0	0.0	*	8.0 (1.4-45.4)	259	76.1%
Dawson Creek Hospital	*	1.2 (0.3-4.4)	*	4.2 (2.0-8.7)	921	91.0%
Fort Nelson General Hospital	0	0.0	*	17.9 (8.2-39.1)	325	
Fort St. John General Hospital	*	0.6 (0.1-3.4)	*	1.2 (0.3-4.4)	948	77.8%
G.R. Baker Memorial Hospital	*	1.4 (0.4-5.1)	*	3.5 (1.5-8.2)	998	60.7%
Kitimat General Hospital	*	3.2 (0.9-11.6)	*	1.6 (0.3-9.0)	1,553	86.8%
Lakes District Hospital	0	0.0	*	3.2 (0.6-17.9)	**	**
Mackenzie and District Hospital	0	0.0	0	0.0	**	**
McBride and District Hospital	0	0.0	*	19.1 (5.2-69.3)	**	**
Mills Memorial Hospital	*	1.3 (0.4-4.9)	*	6.0 (3.2-11.5)	1,083	77.2%
Northern Haida Gwaii Hospital	0	0.0	0	0.0	729	87.8%
Prince Rupert Regional Hospital	*	7.6 (3.7-15.7)	*	4.3 (1.7-11.2)	1,182	78.6%
Queen Charlotte Islands Hospital	*	6.5 (1.2-37.0)	*	6.5 (1.2-37.0)	565	82.5%
St. John Hospital	0	0.0	*	6.4 (2.5-16.4)	**	**
Stuart Lake Hospital	0	0.0	*	9.1 (1.6-51.6)	658	96.4%
University Hospital of Northern BC	10	1.2 (0.6-2.2)	29	3.5 (2.4-5.0)	3,809	64.5%
Wrinch Memorial Hospital	*	5.6 (1.5-20.3)	*	5.6 (1.5-20.3)	657	76.1%
Provincial Health Services Authority [b]	**26**	**5.6 (3.8-8.1)**	**24**	**2.9 (2.0-4.4)**	**4,600**[e]	**90.8%**
BC Children's Hospital	26	10.4 (7.1-15.3)	16	4.8 (3.0-7.9)	2,000	92.8%
BC Women's Hospital	0	0.0	*	1.7 (0.8-3.3)	1,400	87.6%
Total [a]	**1,443**	**4.9 (4.6-5.1)**	**1,569**	**4.9 (4.7-5.2)**	**216,110**	**83.2%**

Notes: * represents the number of cases of CDI or MRSA that was less than ten cases; ** represents the number of observations that was less than 200 opportunities in 2015/16

a. per 10,000 inpatient days

b. The total in each health authority includes the numbers masked by * or ** in their facilities

c. includes data from Matsqui Sumas Abbotsford Hospital

d. formerly known as St. Mary's Hospital

e. includes observations in BC Cancer Agency - Vancouver Center

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