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 2018/19
(April 1, 2018 to March 31, 2019)

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.

Provincial Infection Control Network of BC (PICNet)
1001 West Broadway, Suite 504
Vancouver, BC V6H 4B1
Tel: 604-875-4844 x 22983
Fax: 604-875-4373
Website: www.picnet.ca
Email: picnet@phsa.ca

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Surveillance Steering Committee

PICNet's Surveillance Steering Committee consists of representatives from health authorities that participate in the provincial HAI surveillance programs and related organizations, and provides guidance to PICNet's surveillance programs and assists the PICNet Management Office in implementation within the participating health authorities. Following committee members contributed to and reviewed this report:

Joanne Archer	Acting Network Director	PICNet
Dr. Edith Blondel-Hill	Medical Microbiologist and Interim Medical Director of Infection Prevention and Control	IHA
Dr. Elizabeth Brodkin	Executive Medical Director	FHA
Alison Chant	Infection Control Practitioner	PHSA
June Chen Collet	Epidemiologist	PHSA
Kelly Dillon	Infection Control Practitioner	IHA
Dr. Randall Dumont	Pathologist	NHA
Aleksandra Gara	Epidemiologist	VCHA
Dr. Dave Goldfarb	Medical Microbiologist	PHSA
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
Dr. Christopher Lowe	Medical Microbiologist	PHC
Dr. Neil Mina	Medical Microbiologist	FHA
Dr. Julie Mori	Epidemiologist	IHA
Blair Ranns	Epidemiologist	VIHA
Azra Sharma	Epidemiologist	PHC
Katy Short	Senior Epidemiologist	FHA
Xuetao (Katherine) Wang	Epidemiologist	FHA
Dr. Titus Wong	Medical Microbiologist	VCHA
Valerie Wood	Director, Infection Prevention & Control	IHA

Abbreviations

BC	British Columbia
CA	Community-associated
CI	Confidence interval
CDI	*Clostridium difficile* infection
CPO	Carbapenemase-producing organisms
FHA	Fraser Health Authority
FQ	Fiscal quarter
FY	Fiscal year
HA	Health authority
HAI	Healthcare-associated infection
HCA	Healthcare-associated
HCC	Hand cleaning compliance
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
PHHWG	Provincial Hand Hygiene Working Group of British Columbia
SSC	PICNet's Surveillance Steering Committee
VCHA	Vancouver Coastal Health Authority
VIHA	Island Health Authority

Executive Summary

Provincial surveillance programs for healthcare-associated infections (HAI) in British Columbia (BC) monitor the occurrence and trends of *Clostridium difficile* infection (CDI) and methicillin-resistant *Staphylococcus aureus* (MRSA) in acute care facilities, carbapenemase-producing organisms (CPO) in acute care and community care settings, as well as hand cleaning compliance (HCC) among health care providers. Surveillance of laboratory-identified *Candida auris* cases was added in 2018/19. The table below summarizes key surveillance results for fiscal year 2018/19, and compares them to previous years when applicable.

Highlights of surveillance results in BC healthcare facilities, 2018/19

Indicators	2018/19	Previous year (2017/18)	Five-year trend (2014/15 – 2018/19)
Provincial rate of new CDI associated with the reporting facility per 10,000 inpatient days (and 95% confidence intervals)	3.4 (3.2-3.6)	3.8 (3.6-4.0)	⬇
Provincial rate of new MRSA associated with the reporting facility per 10,000 inpatient days (and 95% confidence intervals)	4.0 (3.7-4.2)	4.6 (4.4-4.9)	⬇
Total number of new cases of CPO identified	269	167	N/A*
Total number of new cases of *C. auris* identified	9	2	N/A*
Provincial hand cleaning compliance in acute care facilities	82.7%	84.1%	⬆
Provincial hand cleaning compliance in residential care facilities	86.7%	86.3%	⬆

Notes: ⬆⬇ statistically significant; ⇧⇩ statistically non-significant; N/A: not applicable

* The cases identified in the community care setting were included, for which the denominator data were unavailable, thus the provincial incidence rate could not be calculated and compared to previous years.

Key findings in 2017/18

- **CDI**: The provincial annual rate of new CDI associated with the reporting facility were the lowest in 2018/19 over the last five years, with an average annual decrease of 4.2%.
- **MRSA**: There was a significant decrease in the provincial rate of MRSA associated with the reporting facility in 2018/19 compared to the previous four years. The downward trend in the MRSA rates during 2014/15-2018/19 was statically significant, particularly among MRSA cases associated with current admission to the reporting facility.
- **CPO**: More and more cases of CPO have been newly identified from both acute care facilities and community care settings, with NDM as the predominant carbapenemase-resistant gene. Nearly 60% of reported cases in 2018/19 reported hospitalization or medical procedures outside Canada in the prior twelve months.
- ***C. auris***: Since the first case of *C. auris* was confirmed in BC in July 2017, 11 cases have been identified as of March 31, 2019.
- **HCC**: Compliance in both acute care facilities and residential care facilities surpassed the target performance of 80% for the fifth consecutive year.

Variations in screening policy, surveillance methods, and patient mix 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

A healthcare-associated infection (HAI) is an infection or colonization that occurs in a patient during the process of care in a hospital or other health care facility, which was not present or incubating at the time of admission [1]. HAIs are the most frequent adverse event during care delivery [1,2], causing increased morbidity and mortality, prolonged hospital stays, and extra costs. They can affect patients in any type of care settings where they receive care and can also appear after discharge [1].

HAIs are considered preventable complications of medical care and have received growing attention in recent years, propelled by an increased awareness of patient safety and potentially preventable harm [3-5]. Successful prevention programs require accurate and reproducible data regarding the occurrence of HAIs and tools to assess the effect of interventions, hence considerable surveillance efforts [5]. Surveillance and feedback of infection rates to clinicians and other stakeholders has been a cornerstone of quality improvement in HAI prevention programs [5].

In British Columbia (BC), various surveillance programs for HAIs have been established in health care facilities. From 2009, the BC Ministry of Health, the Provincial Infection Control Network of British Columbia (PICNet), health authorities (HAs), and related agencies have worked together to harmonize surveillance activities and monitor the occurrence of HAIs in BC health care facilities. Standard provincial surveillance protocols have been developed for *Clostridium difficile* infection (CDI), methicillin-resistant *Staphylococcus aureus* (MRSA), and carbapenemase-producing organisms (CPOs) over the years (for details of each surveillance protocol, including population under surveillance, case definitions and classification, please visit PICNet's website https://www.picnet.ca/surveillance/). Facility-aggregated data for CDI and MRSA and case-level data for CPO are submitted to PICNet on a quarterly basis. In addition, given the proven effectiveness of hand hygiene in preventing transmission of HAIs [6,7], hand cleaning compliance (HCC) among healthcare providers working in BC healthcare facilities is audited regularly, and the audit results are submitted to PICNet quarterly. The surveillance results at the provincial level have been released publicly each quarter. This report presents further analyses of surveillance data for CDI, MRSA, CPO, and HCC in the fiscal year 2018/19 (April 1, 2018 – March 31, 2019) and compares them to the previous fiscal year of 2017/18. Trend analysis is also presented for CDI, MRSA and HCC, with a focus on the rates over the last five years, from 2014/15 to 2018/19.

Recent emergence of a newly-identified species of yeast, *Candida auris*, has raised public health concerns worldwide due to its ability to cause nosocomial outbreaks in healthcare settings, its innate and emerging resistance to multiple antifungal drugs, and its resilience in the face of hygiene and infection control measures [8-10]. A laboratory-based, passive surveillance for *C. auris* commenced in September 2018 in BC. The results of laboratory confirmed *C. auris* cases are included in this report.

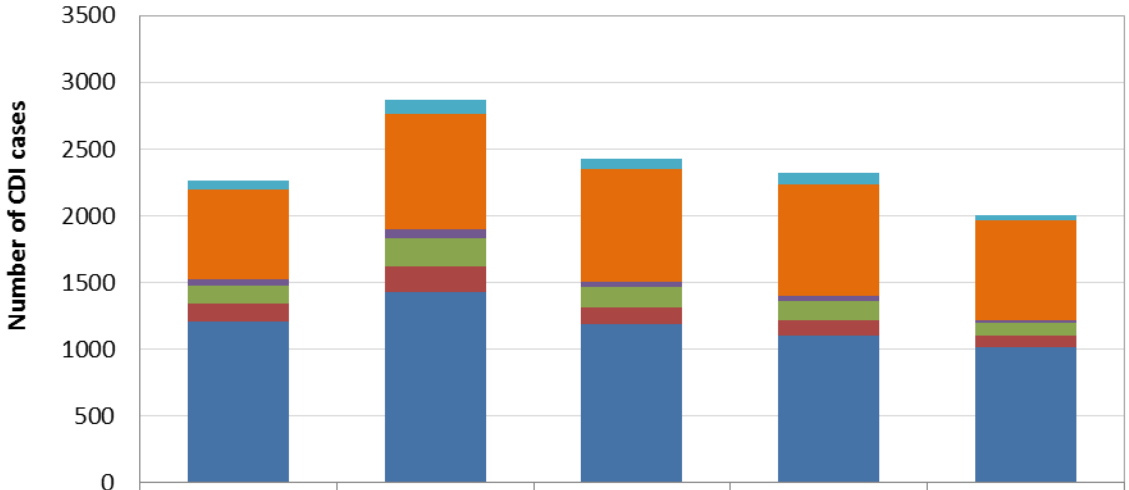
Clostridium difficile infection (CDI)

Overview of CDI cases identified in 2018/19

A total of 2,003 cases of CDI were identified among inpatients in BC acute care facilities in 2018/19. Of these, 1,220 cases (60.9%) were classified as healthcare-associated (HCA), 743 (37.1%) were community-associated (CA), and 40 (2.0%) were of unknown origin or undetermined. Among 1,220 HCA CDI cases, 1,012 (50.5% of total CDI cases) were new CDI associated with the reporting facility, 92 (4.6%) were new CDI associated with another facility, 92 (4.6%) were relapses of CDI associated with the reporting facility, and 24 cases (1.2%) were relapses of CDI associated with another facility (Figure 1).

Compared to the previous years, the numbers of total CDI cases, as well as HCA CDI and CA CDI, have decreased continuously from 2015/16 (Figure 1). The number of CDI cases identified in 2018/19 was the lowest for each classification of CDI, except CA, in the last five years.

Figure 1. Number of CDI cases identified in BC acute care facilities by case classification, 2014/15 – 2018/19

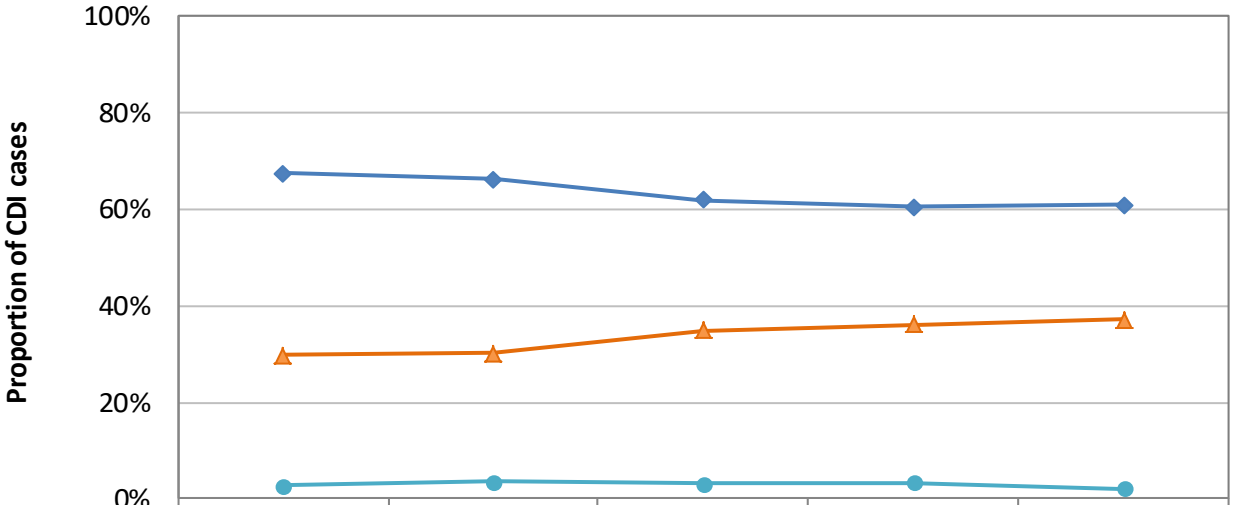


	2014/15	2015/16	2016/17	2017/18	2018/19
UNK	62	101	74	78	40
CA	674	866	846	835	743
HCA with another facility - relapses	47	72	42	47	24
HCA with reporting facility - relapses	139	209	145	136	92
HCA with another facility - new cases	132	195	126	116	92
HCA with reporting facility - new cases	1206	1423	1190	1104	1012
Total CDI cases	2260	2866	2423	2316	2003

CA: Community-associated; HCA: healthcare-associated; UNK: Unknown/Undetermined

The proportion of HCA CDI cases in 2018/19 (60.9%) was not significantly different from 2017/18 (60.6%) (Figure 2). However, there was a significant downward trend in the proportion of HCA CDI from 2014/15 (67.4%) to 2018/19. In contrast, the proportion of CA CDI increased continuously from 29.8% to 37.1% during the same period.

Figure 2. Proportion of CDI cases identified in BC acute care facilities by case classification, 2014/15 – 2018/19



	2014/15	2015/16	2016/17	2017/18	2018/19
CA	29.8%	30.2%	34.9%	36.1%	37.1%
HCA	67.4%	66.3%	62.0%	60.6%	60.9%
UNK	2.7%	3.5%	3.1%	3.4%	2.0%

CA: Community-associated; HCA: healthcare-associated; UNK: Unknown/Undetermined

Rate of new CDI associated with the reporting facility in 2018/19

The provincial annual rate of new CDI associated with the reporting facility in 2018/19 was 3.4 per 10,000 inpatient days, with a 95% confidence interval (CI) of 3.2 to 3.6. The provincial rate of CDI fluctuated greatly by quarter in 2018/19, with the lowest rate in the fiscal quarter 3 (Q3) of 2.7 per 10,000 inpatient days(95% CI: 2.3 – 3.1) and the highest in Q2 of 3.8 per 10,000 inpatient days (95% CI: 3.3 – 4.2). The difference in the rate between Q2 and Q3 was statistically significant. The CDI rate in Q3 2018/19 was the lowest quarterly rate since the commencement of the provincial CDI surveillance program in 2009/10.

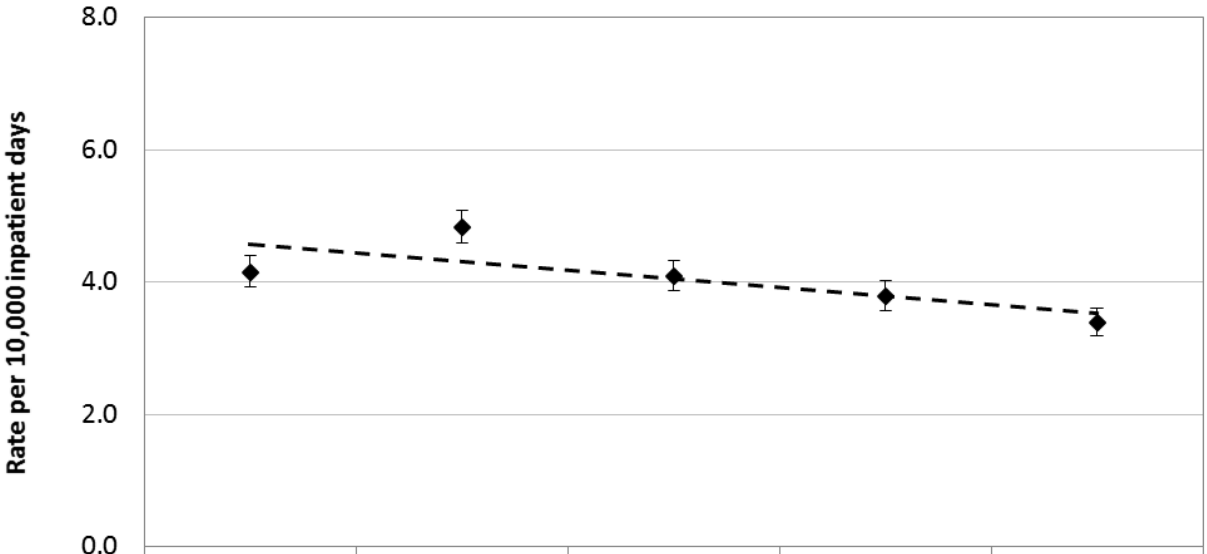
Detailed annual rate of CDI for the participating health authorities and acute care facilities in 2018/19 is presented in Appendix D.

Trends of new CDI associated with the reporting facility

The provincial annual rate of CDI associated with the reporting facility in 2018/19 was the lowest in the last five years. The annual rate in 2018/19 was significantly lower than each of the five preceding years from 2014/15 to 2017/18.

There has been a downward trend in the provincial rate of CDI during the time period from 2014/15 to 2018/19, which is statistically significant (Figure 3). On average, the provincial rate of CDI decreased by 4.2% annually over the last five years.

Figure 3. Provincial annual rate of new CDI associated with the reporting facility, 2014/15 – 2018/19



	2014/15	2015/16	2016/17	2017/18	2018/19
Rate	4.2	4.8	4.1	3.8	3.4
# of cases	1206	1423	1190	1104	1011

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

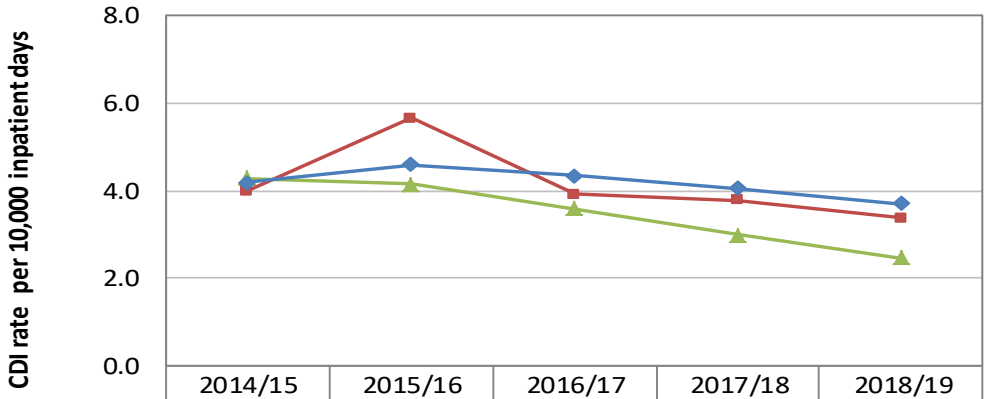
The trend of CDI rates was further analysed by aggregating by: facility type[1] (i.e. tertiary/referral hospital, regional hospital, and community hospital); facility size based on the counts of acute care beds (i.e. 1–50 beds, 51–150 beds, 151–250 beds, and >250 beds); and health authority.

[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 specialists 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.

The downward trend was statistically significant for each facility type, with the lowest annual rate in 2018/19 (Figure 4). In 2018/19, the CDI rate in community hospitals was significantly lower than in regional hospitals and tertiary/referral hospitals. The difference in the rates between regional hospitals and tertiary/referral hospitals was not statistically significant.

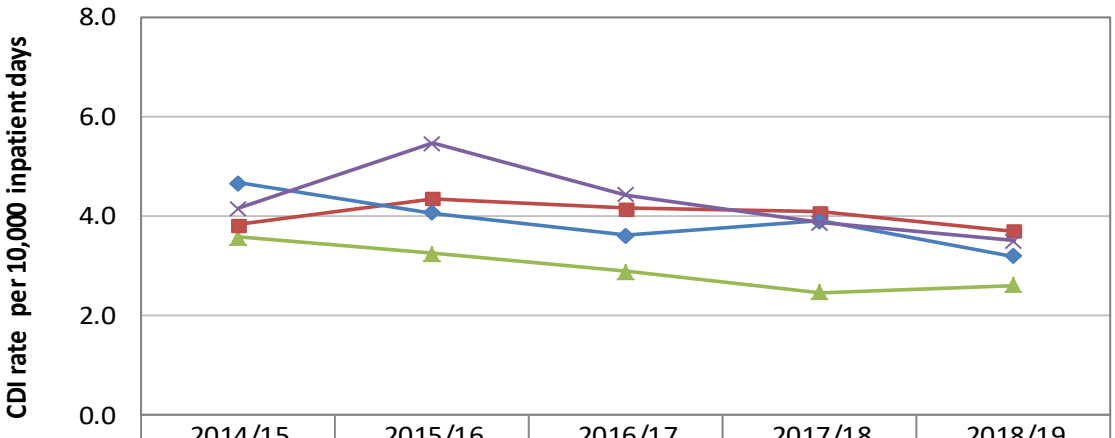
Figure 4. Annual rate of new CDI associated with the reporting facility by facility type, 2014/15 – 2018/19



	2014/15	2015/16	2016/17	2017/18	2018/19
Community hospital	4.3	4.2	3.6	3.0	2.5
Regional hospital	4.0	5.7	3.9	3.8	3.4
Tertiary/Referral hospital	4.2	4.6	4.3	4.1	3.7

Grouping facilities by count of acute care beds shows that CDI rates vary by facility size. The downward trend of CDI rates over the last five years was statistically significant for each facility size except for facilities with 51-150 beds, which did not change significantly from 2014/15 to 2018/19 (Figure 5). The CDI rate in facilities with 1-50 beds in 2017/18 was significantly lower than larger facilities with 51-150 beds and >250 beds, but was not significantly lower than the facilities with 151-250 beds. The differences in the CDI rates among facilities with 51-150 beds, 151-250 beds, and >250 beds in 2018/19 were not statistically significant.

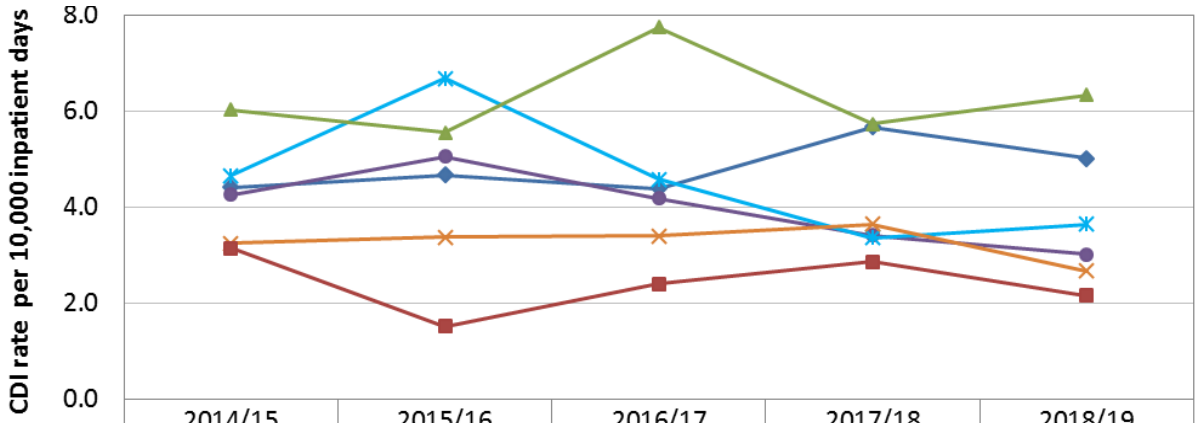
Figure 5. Annual rate of new CDI associated with the reporting facility by facility size, 2014/15 – 2018/19



	2014/15	2015/16	2016/17	2017/18	2018/19
1-50 beds	3.6	3.3	2.9	2.5	2.6
51-150 beds	3.8	4.4	4.2	4.1	3.7
151-250 beds	4.7	4.1	3.6	3.9	3.2
>250 beds	4.2	5.5	4.4	3.9	3.5

Figure 6 presents overall trend of CDI rates in each HA. There was a significant downward trend in two HAs (FHA and VCHA). An upward trend was observed in IHA. There was no statistically significant trend in the other HAs (VIHA, NHA, and PHSA). Please refer to the section on Data Limitations in Appendix A.

Figure 6. Annual rate of new CDI associated with the reporting facility by health authority, 2014/15 – 2018/19

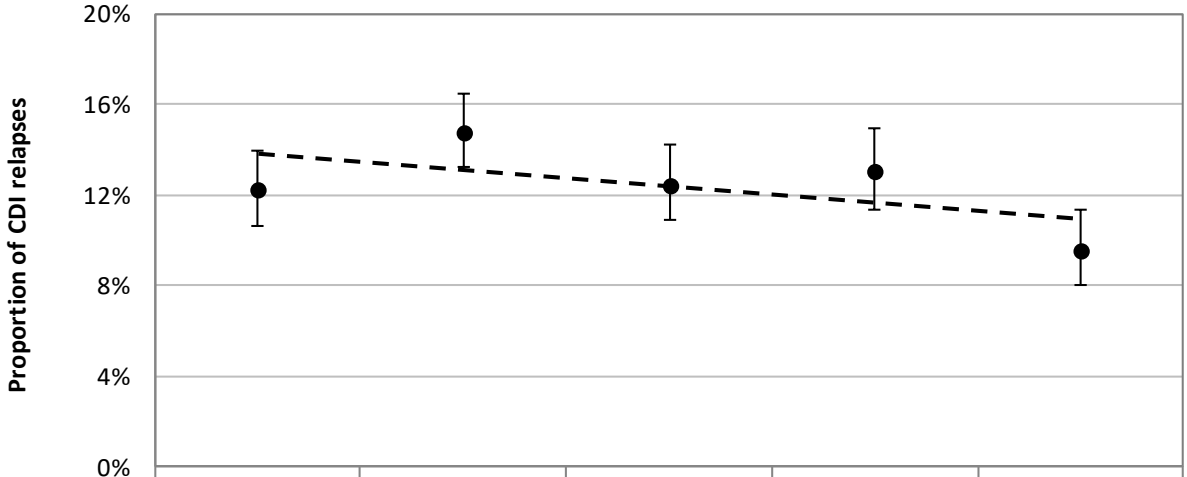


	2014/15	2015/16	2016/17	2017/18	2018/19
IHA	4.4	4.7	4.4	5.7	5.0
FHA	4.3	5.1	4.2	3.4	3.0
VCHA	4.7	6.7	4.6	3.4	3.6
VIHA	3.3	3.4	3.4	3.6	2.7
NHA	3.1	1.5	2.4	2.9	2.2
PHSA	6.0	5.5	7.7	5.7	6.3

Relapse of healthcare-associated CDI

The cases of CDI were classified as relapses if the episode of CDI reoccurred between two and eight weeks following a previous CDI. Of all 1,220 HCA CDI cases reported in 2018/19, 116 cases were relapses (9.5%, 95% CI: 8.0%–11.3%). Compared to the previous years, the proportion of relapses in 2018/19 was significantly lower than in 2017/18. There was a statistically significant downward trend in the proportion of relapses among HCA CDI from 2014/15 to 2018/19 (Figure 7), with an average annual decrease by 4.2%.

Figure 7. Proportion of relapses among healthcare-associated CDI cases, 2014/15 – 2018/19



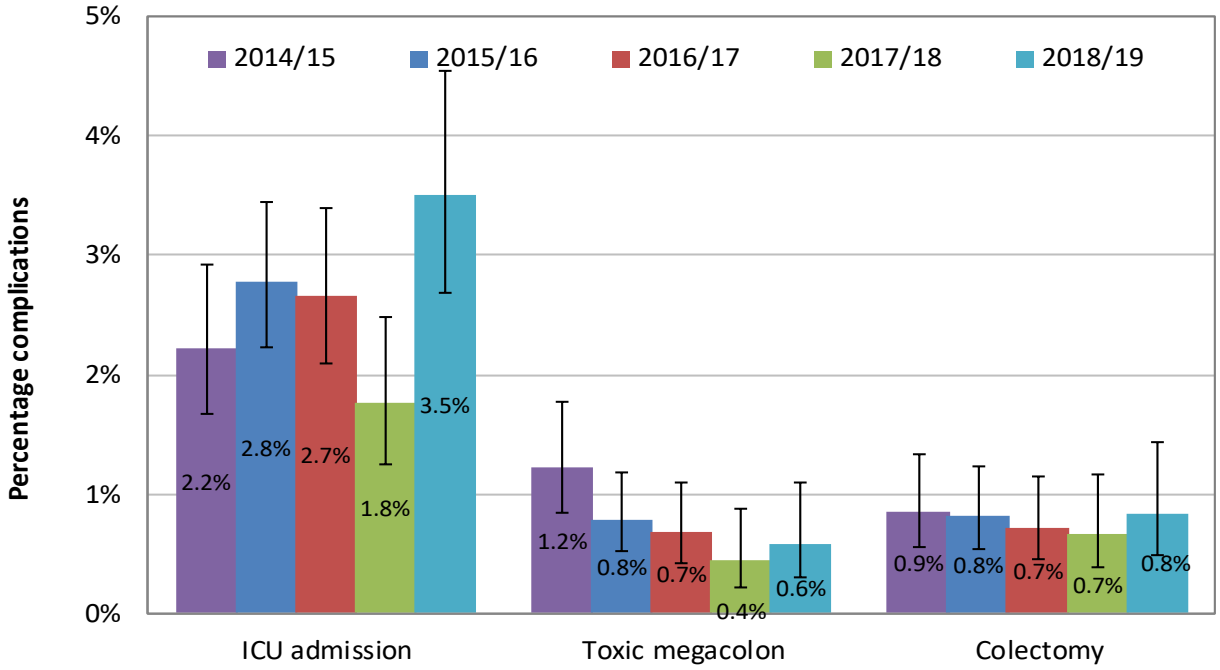
	2014/15	2015/16	2016/17	2017/18	2018/19
Relapse of CDI	12.2%	14.8%	12.4%	13.0%	9.5%

Note: Vertical bars on the line represent the 95% confidence interval of the percentages, and the dashed line represents the linear trend 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), developed toxic megacolon, or required partial or entire colectomy due to CDI. During 2018/19, 1,544 cases of CDI were followed up. Of them, 54 (3.5%) were admitted to ICU, 9 (0.6%) developed toxic megacolon, and 13 (0.8%) required partial or entire colectomy. Compared to the previous year of 2017/18, the percentage of ICU admissions was significantly higher in 2018/19, but the percentage of toxic megacolon, and colectomy did not change significantly (Figure 8).

Figure 8. CDI-associated complications within 30 days of diagnosis, 2014/15 – 2018/19



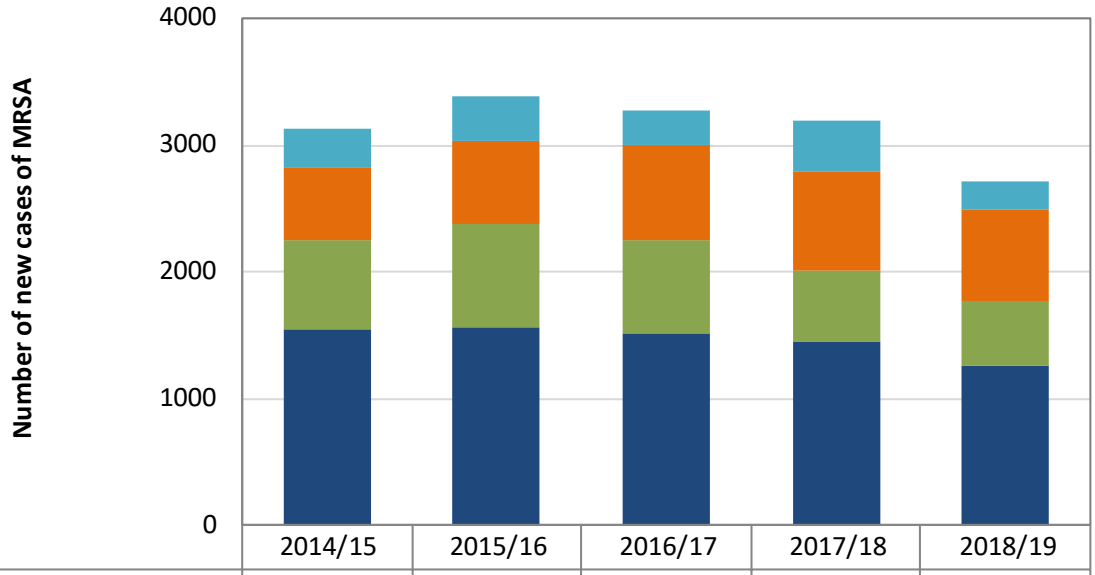
Note: Vertical bars on the line represent the 95% confidence interval of the percentage

Methicillin-resistant *staphylococcus aureus* (MRSA)

Overview of MRSA newly identified in 2018/19

There were 2,709 cases of MRSA newly identified among inpatients in BC acute care facilities in 2018/19. Of these, 1,263 (46.6%) were classified as HCA with the reporting facility, 499 (18.4%) were HCA with another facility, 727 (26.8%) were CA, and 220 (8.1%) were of unknown origin (Figure 9).

Figure 9. Number of newly identified MRSA cases in BC acute care facilities, 2014/15 – 2018/19



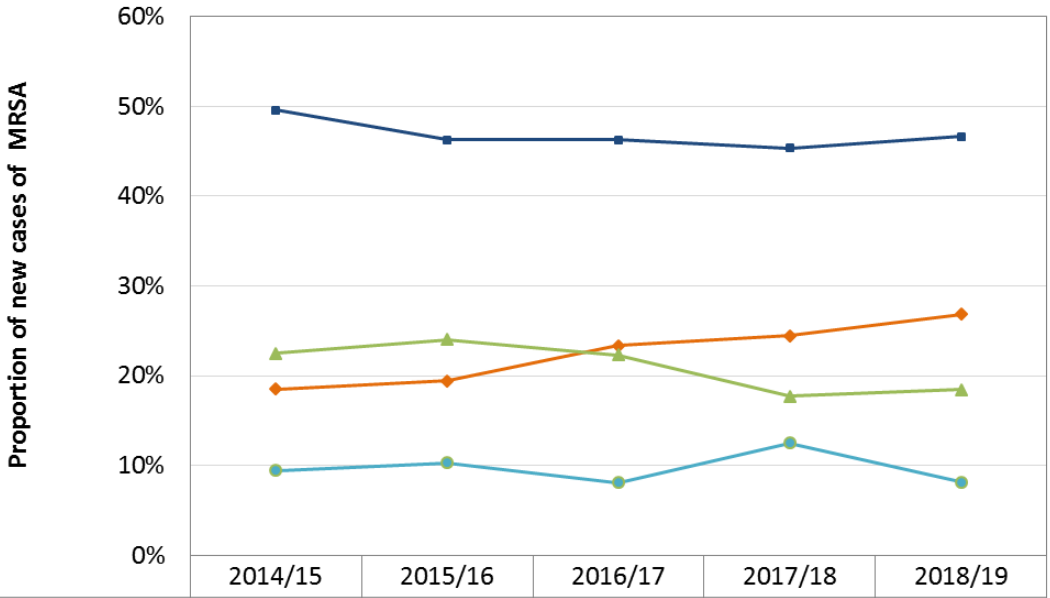
	2014/15	2015/16	2016/17	2017/18	2018/19
UNK	294	349	265	398	220
CA	579	657	764	780	727
HCA with another facility	702	812	729	566	499
HCA with the reporting facility	1549	1565	1513	1447	1263
Total MRSA	3124	3383	3271	3191	2709

HCA: healthcare-associated; CA: community-associated; UNK: Unknown/Undetermined

Compared to the previous years, 2018/19 reported the lowest number of new MRSA cases in the last five years. HCA MRSA, including HCA with both the reporting facility and another facility, decreased continuously since 2015/16.

There were significant downward trends in the proportion of HCA MRSA cases associated with both the reporting facility and another facility from 2014/15 to 2018/19, whereas the proportion of CA MRSA increased significantly during the same time period (Figure 10).

Figure 10. Proportion of MRSA cases in BC acute care facilities by MRSA classification, 2014/15 – 2018/19

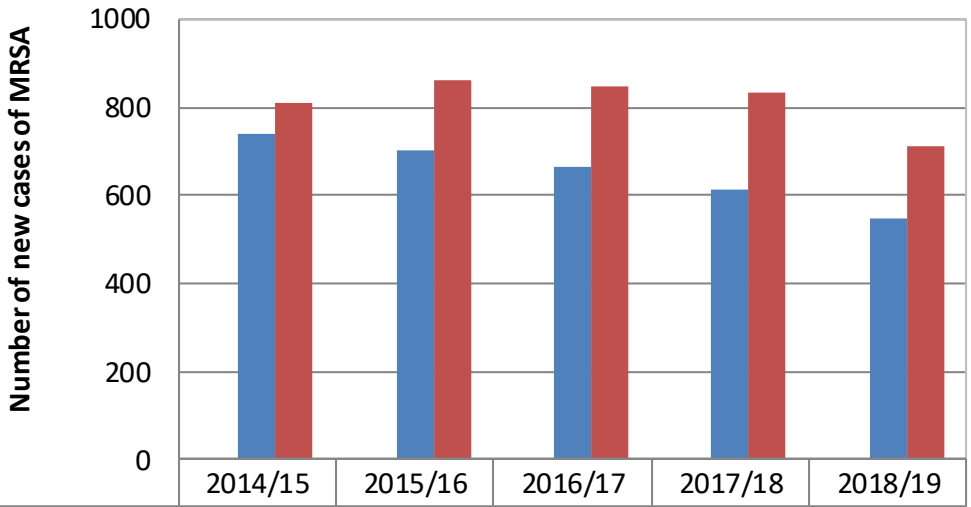


	2014/15	2015/16	2016/17	2017/18	2018/19
UNK	9.4%	10.3%	8.1%	12.5%	8.1%
CA	18.5%	19.4%	23.4%	24.4%	26.8%
HCA with another facility	22.5%	24.0%	22.3%	17.7%	18.4%
HCA with the reporting facility	49.6%	46.3%	46.3%	45.3%	46.6%

The cases of MRSA associated with the reporting facility were further examined for whether they were associated with the current admission to the reporting facility or a previous encounter with the reporting facility in the previous twelve months. Among the 1,263 cases associated with the reporting facility in 2018/19, 550 (20.3% of all MRSA cases) were associated with the current admission to the reporting facility and 713 (26.3%) were associated with a previous encounter with the reporting facility (Figure 11).

Compared to previous years, the number of MRSA cases associated with current admission decreased continuously during the last five years, while the number of MRSA cases associated with a previous encounter were relatively stable from 2015/16 to 2017/18, then decreased in 2018/19 (Figure 11).

Figure 11. Number of MRSA cases associated with the reporting facility, 2014/15 – 2018/19



	2014/15	2015/16	2016/17	2017/18	2018/19
HCA with the reporting facility	1549	1565	1513	1447	1263
HCA with current admission to reporting facility	740	705	666	613	550
HCA with a previous encounter with reporting facility	809	860	847	834	713

Rate of new MRSA associated with the reporting facility in 2018/19

The provincial annual rate of MRSA associated with the reporting facility in 2018/19 was 4.0 per 10,000 inpatient days (95% CI: 3.7 – 4.2). The provincial rate did not change statistically significantly by quarter in 2018/19, with the lowest rate in Q4 (3.4 per 10,000 inpatient days, 95% CI: 3.0 – 3.8) and the highest rate in Q2 (4.1 per 10,000 inpatient days, 95% CI: 3.7 – 4.6).

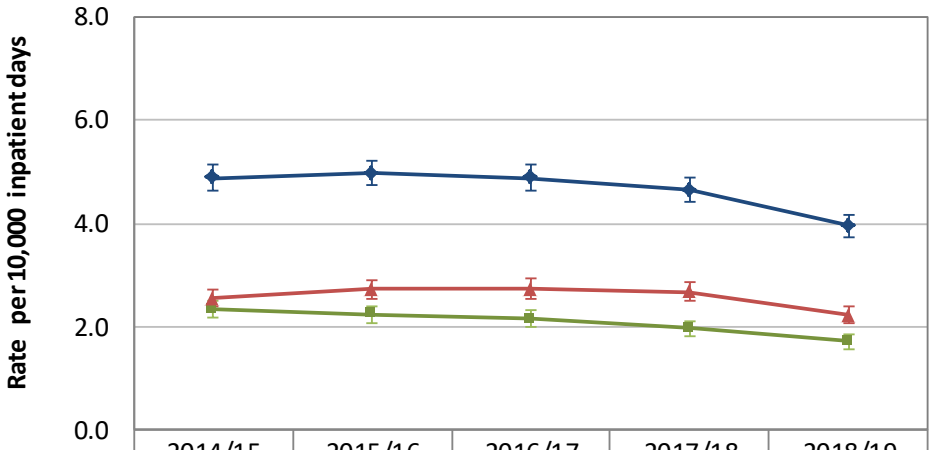
The annual rate of MRSA for the participating health authorities and acute care facilities in 2018/19 is presented in Appendix D.

Trends of new MRSA associated with the reporting facility

The provincial rate of new MRSA associated with the reporting facility in 2018/19 showed a significant decrease, by 13.0% compared to 4.6 per 10,000 inpatient days (95% CI: 4.4 – 4.9) in the previous year 2017/18, and was significantly lower than any of previous four years.

The significant decrease in the MRSA rate in 2018/19 substantially affected the overall trend of MRSA for the last five years from 2014/15 to 2018/19, which showed a significant downward trend (Figure 12). The downward trend was particularly noticeable for MRSA cases associated with current admission to the reporting facility, which declined continuously year by year. At the same time, the rate of MRSA associated with a previous encounter was relatively stable from 2014/15 to 2017/18, then decreased significantly in 2018/19 (Figure 12). The year 2018/19 represents the lowest rate of MRSA associated with both current admission and a previous encounter with the reporting facility.

Figure 12. Annual rate of new MRSA associated with the reporting facility, 2014/15 – 2018/19

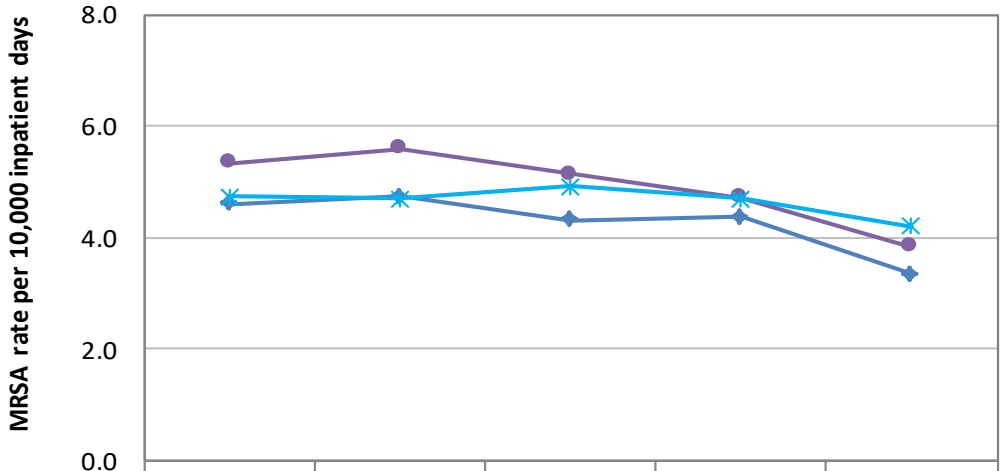


	2014/15	2015/16	2016/17	2017/18	2018/19
HCA with the reporting facility	4.9	5.0	4.9	4.6	4.0
HCA with current admission to reporting facility	2.3	2.2	2.1	2.0	1.7
HCA with a previous encounter with reporting facility	2.6	2.7	2.7	2.7	2.2

Further analyses show that the downward trend in the rate of MRSA associated with the reporting facility persisted among different facility types and sizes, as well as among the health authorities.

The rate of MRSA in 2018/19 was significantly lower than in 2017/18 in each facility type and the downward trends were all statistically significant (Figure 13).

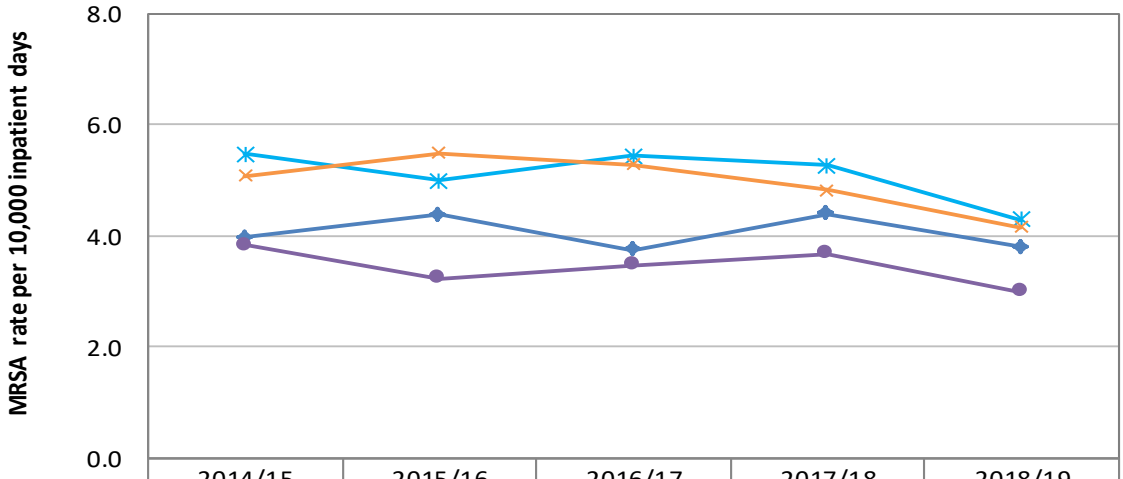
Figure 13. Annual rate of new MRSA associated with the reporting facility by facility type, 2014/15 – 2018/19



	2014/15	2015/16	2016/17	2017/18	2018/19
Community hospital	4.6	4.7	4.3	4.4	3.3
Regional Hospital	5.3	5.6	5.1	4.7	3.8
Tertiary/Referral Hospital	4.7	4.7	4.9	4.7	4.2

The downward trend of the MRSA rate was statistically significant for facilities with 151-250 beds and >250 beds, but was not significant for facilities with 1-50 and 51-150 beds (Figure 14).

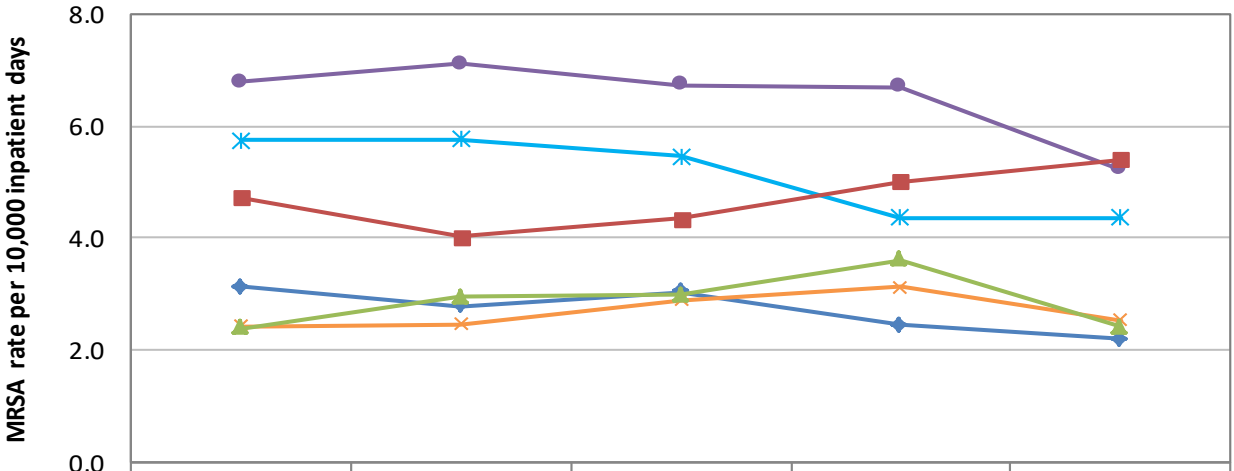
Figure 14. Annual rate of new MRSA associated with the reporting facility by facility size, 2014/15 – 2018/19



	2014/15	2015/16	2016/17	2017/18	2018/19
1-50 Beds	4.0	4.4	3.7	4.4	3.8
51-150 Beds	3.8	3.2	3.5	3.7	3.0
151-250 Beds	5.5	5.0	5.4	5.3	4.3
>250 Beds	5.1	5.5	5.3	4.8	4.2

The rate of MRSA varied significantly by health authority (see data limitations in Appendix A). The overall trend of MRSA from 2014/15 to 2018/19 was significantly downward in IHA, FHA, and VCHA, and was not statistically significant in VIHA, NHA, and PHSA (Figure 15).

Figure 15. Annual rate of new MRSA associated with the reporting facility by health authority, 2014/15 – 2018/19



	2014/15	2015/16	2016/17	2017/18	2018/19
IHA	3.1	2.8	3.0	2.5	2.2
FHA	6.8	7.1	6.7	6.7	5.2
VCHA	5.7	5.8	5.5	4.4	4.4
VIHA	2.4	2.5	2.9	3.1	2.5
NHA	4.7	4.0	4.4	5.0	5.4
PHSA	2.4	2.9	3.0	3.6	2.4

Carbapenemase-producing organisms (CPOs)

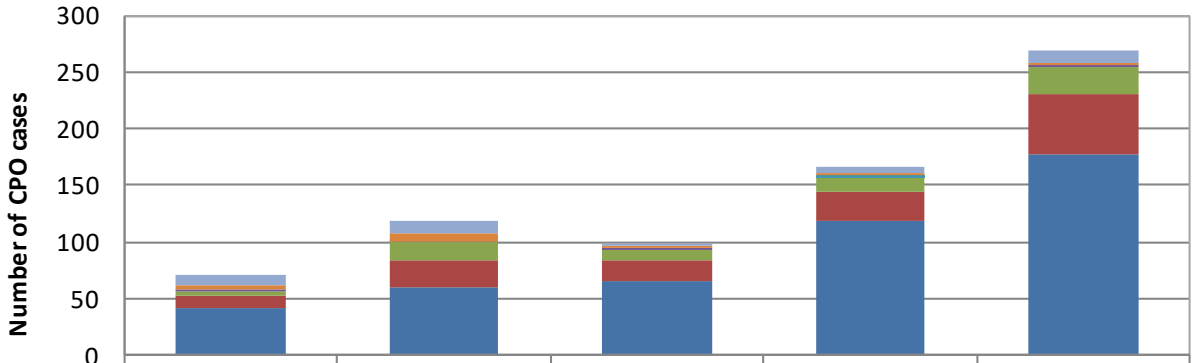
New cases of CPO identified in 2018/19

A mandatory provincial CPO surveillance program was introduced to BC acute care facilities in July 2014. CPOs were further made reportable in BC in December 2016, which required that new cases identified in community care settings be reported to PICNet from December 2017.

During the fiscal year 2018/19, a total of 269 cases of CPO were newly confirmed from 252 patients in BC. Of the 252 patients, 235 patients harboured a single carbapenemase gene, and 17 patients harboured two different carbapenemase genes – each carbapenemase gene identified for the first time in a given patient is counted as a new case of CPO.

Among the new cases of CPO identified in 2018/19, NDM continued to be predominant carbapenemase identified, accounting for 66.2% of CPO cases, followed by OXA-48 (19.7%), KPC (8.9%), VIM (0.4%), SME (0.7%), and "other' carbapenemase genes (4.1%), including OXA-51, OXA-23, OXA-24 (Figure 16).

Figure 16. Number of cases of CPO newly identified in BC by carbapenemase gene, 2014/15 – 2018/19



	2014/15*	2015/16	2016/17	2017/18	2018/19
Other	9	11	2	6	11
SME	3	6	1	2	2
IMP				1	
VIM	1	1	2	1	1
KPC	4	16	10	12	24
OXA-48	12	24	18	27	53
NDM	41	60	65	118	178
Total	70	118	98	167	269

Note: The number of CPO cases includes CPO identified in both healthcare facilities and community care settings.
* From July 18, 2014 to March 31, 2015 only

There was a notable increase in the number of new cases of CPO identified in 2018/19 since mandatary CPO surveillance commenced in July 2014[2]. NDM has consistently been the predominant carbapenemase-resistance gene identified in BC (Figure 16).

[2] One health authority expanded CPO screening criteria from fiscal year 2017/18.

Surveillance information of new CPO cases

A total of 200 new cases of CPO were reported to PICNet with surveillance information during 2018/19. Of these, 142 (71.0% of reported cases) were identified in acute care facilities in FHA, 42 cases (21.0%) were in acute care facilities in VCHA, three cases (1.5%) each were in acute care facilities in IHA and PHSA, and ten cases (5.5%) were reported from community care settings. No CPO cases were identified in acute care facilities in VIHA and NHA during 2018/19 (Table 1).

Table 1. Number of new cases of CPO reported in BC by health care setting, 2018/19

Health care setting	Number of cases	Percent
Acute care facilities	**190**	**95.0%**
IHA	3	1.5%
FHA	142	71.0%
VCHA	42	21.0%
VIHA	0	0.0%
NHA	0	0.0%
PHSA	3	1.5%
Community care settings	**10**	**5.0%**
Total	**200**	**100%**

New CPO cases were investigated for risk factors that may have contributed to CPO acquisition in the previous 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; and transfer from a unit or facility which was under investigation for CPO transmission. Of the 200 reported cases of CPO, 108 (59.0%) reported an overnight stay of hospitalization or medical/surgical procedure outside Canada in the previous twelve months, and 47 cases (23.5%) were identified with at least one other risk factor listed in the provincial surveillance protocol. In addition, some HAs collected information about travel to endemic regions. Nine cases reported travel to endemic countries without healthcare encounter. Thirty-nine cases (19.5%) in 2018/19 reported no risk factor listed in the provincial surveillance protocol.

Candida auris

Candida auris is an emerging yeast species that was first described in 2009. This ascomycetous yeast is notable for resistance to azole antifungal agents, for environmental persistence, and for its ability to contaminate health care environments, resulting in patient colonization and nosocomial infections [9]. Since then, invasive *C. auris* infections and outbreaks have been reported in more than 30 countries on six continents [8]. Overall mortality of *C. auris* infections ranged from 28% to 60% due in part to the severe underlying conditions of the patients and the multidrug-resistant nature of this pathogen [10,12]. *C. auris* exhibits all the characteristics of a pathogen of public health concern, comparable to multidrug-resistant bacteria such as MRSA or CPO. It is the first fungal pathogen categorized as a public health threat [8,12].

The first case of *C. auris* in BC was confirmed by BC Center for Disease Control's Public Health Laboratory (PHL) in July 2017 [13]. Given the emerging nature of this infectious disease, the BC Provincial Health Officer designated it as a reportable condition on September 10, 2018 and the surveillance of laboratory-identified *C. auris* cases commenced immediately in the province. PICNet was assigned to manage annual public reporting of the number of *C. auris* cases identified in the province.

By the end of fiscal year 2018/19 (March 31, 2019), a total of 11 cases of *C. auris* were confirmed by PHL: two cases were identified in 2017/18, which were the first cases confirmed in BC, and nine cases in 2018/19. Of them, eight cases were identified from clinical samples and three cases were from screening samples.

Hand cleaning compliance (HCC)

Overall hand cleaning compliance in 2018/19

Overall provincial hand cleaning compliance in 2018/19 was 82.7% in acute care facilities and 86.7% in residential care facilities, respectively, both surpassing the target performance of 80% set by the Provincial Hand Hygiene Working Group (PHHWG).

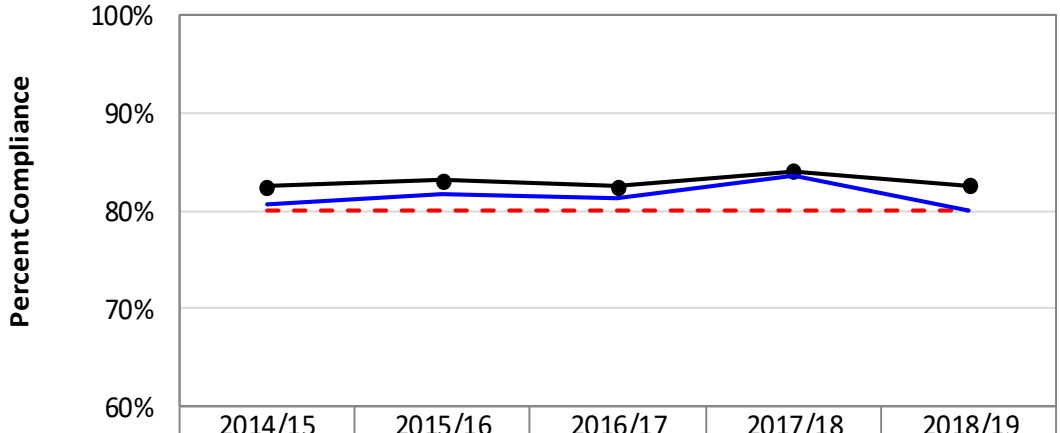
Compliance for the participating health authorities and acute care facilities with more than 200 observations in 2018/19 is presented in Appendix D.

Hand cleaning compliance in acute care facilities

Audits of hand cleaning compliance in acute care facilities are administrated by HA, which vary in their auditing methods and number of opportunities observed. To reduce the impact of variation in the number of observations among HAs, the provincial compliance for acute care facilities was weighted by acute care inpatient days. The weighted provincial compliance for acute care facilities in 2018/19 was 80.2%, which still exceeds the 80% of target performance.

The provincial HCC in acute care facilities, whether un-weighted or weighted, has been consecutively over the target performance from 2014/15 – 2018/19. The provincial overall compliance appears to have plateaued over the last five years (Figure 17).

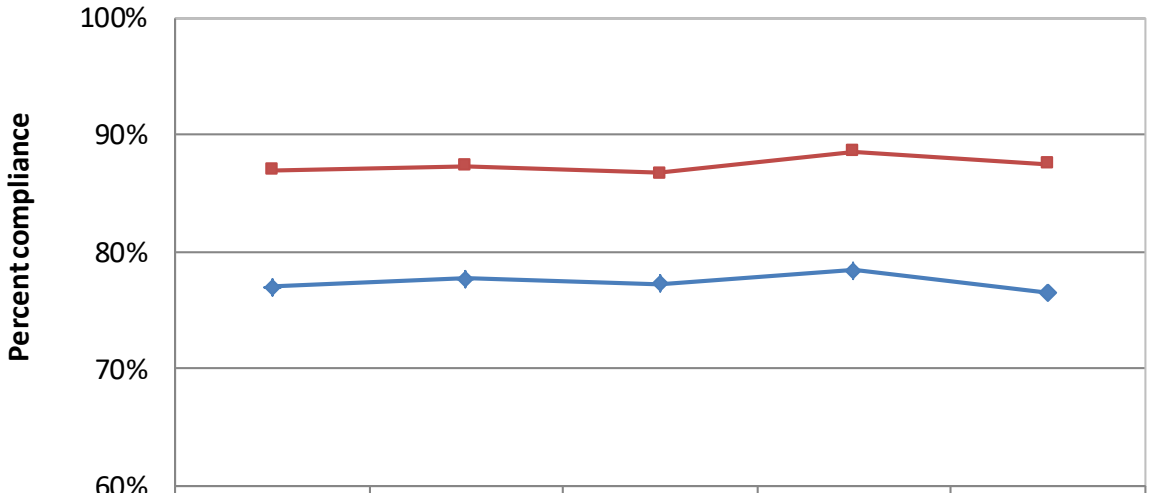
Figure 17. Provincial annual hand cleaning compliance in acute care facilities, 2014/15 – 2018/19



	2014/15	2015/16	2016/17	2017/18	2018/19
Target compliance	80%	80%	80%	80%	80%
Compliance, unweighted	82.6%	83.2%	82.5%	84.1%	82.7%
Compliance, weighted	80.8%	81.8%	81.4%	83.7%	80.2%

Hand cleaning compliance for acute care facilities was further analysed by moment of contact with a patient or patient's environment and by healthcare provider group. HCC before contact has been below 80%, whereas the HCC after contact has been over 80% in each of the last five years. The difference in HCC between before contact and after contact has been statistically significant (Figure 18).

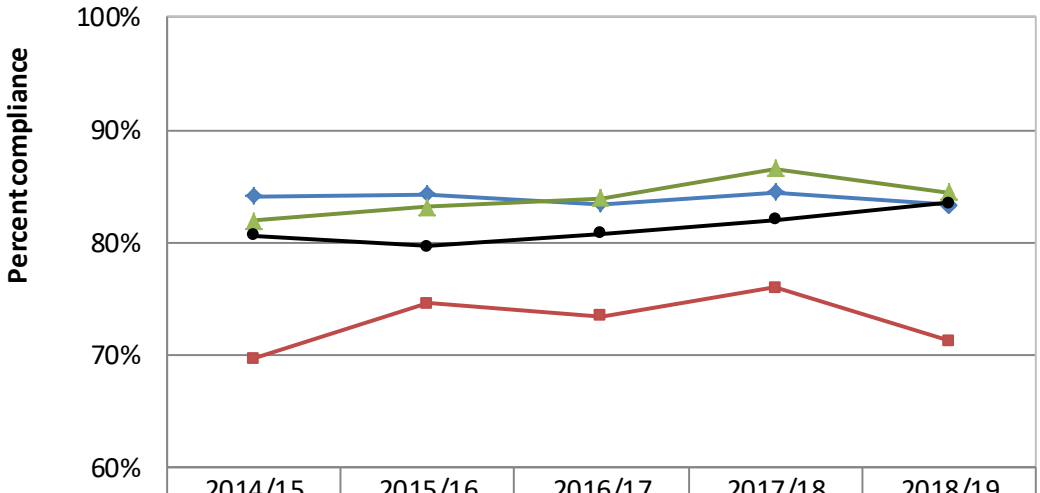
Figure 18. Provincial hand cleaning compliance in acute care facilities by moment of contact, 2014/15 – 2018/19



	2014/15	2015/16	2016/17	2017/18	2018/19
Before contact	77%	78%	77%	78%	77%
After contact	87%	87%	87%	89%	88%

HCC among nursing staff, clinical support services, and other healthcare providers has reached or been over 80% of target performance consistently from 2014/15 to 2018/19, whereas HCC among physicians has remained below 80% during the same time period and was the lowest among all healthcare provider groups (Figure 19).

Figure 19. Provincial hand cleaning compliance in acute care facilities by health care provider group, 2014/15 – 2018/19



	2014/15	2015/16	2016/17	2017/18	2018/19
Nursing staff	84%	84%	83%	84%	83%
Physicians	70%	75%	73%	76%	71%
Clinical support services	82%	83%	84%	87%	84%
Other healthcare providers	81%	80%	81%	82%	84%

HCC varied among HAs and from year to year (Table 2), which may be due to different audit strategies and changes in the auditing methods, target care units and health care providers by the health authorities (see data limitations in Appendix A), thus it is not recommended to compare HCC directly between HAs or year over year. Instead, the compliance data presented here are to show commitment to continuous improvement in the quality of care.

Table 2. Hand cleaning compliance in acute care facilities by health authority, 2014/15 – 2018/19

Health authority	2014/15	2015/16	2016/17	2017/18	2018/19
IHA	75.4%	77.9%	78.7%	80.1%	87.5%[a]
FHA	84.7%	87.4%	85.9%	87.3%	82.0%[b]
VCHA	78.8%	78.8%	78.5%	87.0%	83.3%
VIHA	81.5%	78.3%	77.6%	76.1%	77.3%
NHA	76.3%	75.9%	78.3%	82.5%	86.2%
PHSA	88.2%	90.8%	93.8%	93.1%	92.7%
Province	**82.6%**	**83.2%**	**82.5%**	**84.1%**	**82.7%**

a. Auditing data were unavailable for some facilities during Q2-Q3 2018/19 due to upgrades of hand hygiene auditing system.
b. The date included audits by site auditors during Q1 2018/19. FHA modified the reporting of audit data from Q2 2018/19 and onward, such that only observations performed by regional hand hygiene auditors in acute care facilities were included and the audit data by site auditors were not reported to PICNet.

Hand cleaning compliance in residential care facilities

HCC in HA-owned/operated residential care facilities was most commonly assessed by the facility itself (self-auditing), except for facilities in IHA and Providence Health Care (PHC), where infection control practitioners or co-op medical students conducted the audits. Compliance varied significantly by health authority and higher compliance was reported among the health authorities that employed more self-auditing (Table 3).

Table 3. Hand cleaning compliance in health authority-owned/operated residential care facilities by health authority, 2014/15 – 2017/18

Health authority[a]	2014/15	2015/16	2016/17	2017/18	2018/19
IHA	71.4%	77.7%	76.8%	79.8%	78.9%[b]
FHA	84.2%	85.0%	87.4%	89.4%	90.3%[c]
VCHA	76.7%	86.0%	88.6%	91.8%	90.4%
VIHA	90.5%	89.6%	87.6%	84.8%	88.7%
NHA	77.0%	82.0%	82.4%	80.0%	80.9%
Province	**80.1%**	**83.6%**	**85.0%**	**86.3%**	**86.7%**

a. There are no residential care facilities owned or operated by PHSA.
b. Only data for Q1 2018/19 were included. The data for Q2-Q4 2018/19 were unavailable due to upgrades of hand hygiene auditing system.
c. Only data for Q1 2018/19 were included. FHA modified the reporting of audit data from Q2 2018/19 and onward such that compliance data in all residential care facilities, which were audited by site auditors, were not reported to PICNet.

Conclusion

Surveillance networks serve as a valuable framework for collecting and interpreting HAI data for action [5]. The surveillance results from the provincial surveillance programs for HAI in BC have been shared with stakeholders and reported publicly on a quarterly basis. This annual report provides in-depth analyses on annual data in 2018/19 and overall trends over the last five years to reflect recent infection prevention and control practice.

Both *C. difficile* and MRSA are common pathogens of HAIs in acute care facilities. The surveillance data in BC demonstrate that the rates of both healthcare-associated CDI and MRSA have declined significantly in the last five years. At the same time, there has been little or no decline in community-associated CDI and MRSA, which CDI or MRSA were already present or incubating at the time of admission and the patient had no recent healthcare encounter. The increasing spread of CDI and MRSA in the community [14-16] presents a challenge for the infection prevention and control programs, which focus on healthcare facilities.

Emergence of new multi-drug resistant organisms such as CPO and *C. auris* are another challenge faced by the infection prevention and control programs. Since the commencement of CPO surveillance program in BC, more and more cases of CPO have been identified from both healthcare facilities and community settings. While *C. auris* cases have also been identified in BC, it remains very rare. More information and investigation are needed to better understand their epidemiology and intervention strategies in the province.

Provincial hand cleaning compliance has surpassed the target performance for five consecutive years. However, the compliance is not evenly achieved among all healthcare providers and moments of contact. Some health authorities have modified hand hygiene campaign and auditing strategies with more focus on target care units and healthcare providers, in order to improve hand cleaning compliance and data quality.

This report was based on the quarterly data submission of CDI, MRSA, and HCC and case reports of CPO by HA. The classification of CDI and MRSA cases as either healthcare-associated (HCA), community-associated (CA), or of unknown origin is based on the availability of patient's healthcare encounter history in the patient information system. Classifying a case of CDI or MRSA as healthcare-associated 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 [14] and more than 8% of admitted patients are carriers of toxinogenic *C. difficile* without symptoms [15,16]. There may be variations in screening policy for antibiotic resistant organisms, application of the provincial surveillance protocols, and patient mix among health authorities, which impact data quality and comparison. In addition, the rates of CDI, MRSA, and HCC in this report are not risk-adjusted, thus direct comparison is not recommended. They are provided to show the progress of infection prevention and control practice and overall trends over time in the province, rather than for comparison between HAs or between health care facilities.

Appendices

Appendix A. Methods

Surveillance populations

All patients who were admitted to an acute care facility in BC were included in 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 departments were excluded from CDI and MRSA. 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 [17,18]. In addition, the CPO surveillance also included hemodialysis patients visiting renal clinics in acute care facilities, and other patients that were deemed high risk for CPO by the health authority. After CPO was designated as a reportable condition in December 2016, the provincial CPO surveillance program further expanded to outpatient clinics, residential care facilities, assisted living houses, and other community care settings from December 2017.

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 colonizations or infections with MRSA among inpatients. All CDI and MRSA cases were laboratory confirmed and classified as either healthcare-associated (HCA), or community-associated (CA), or unknown origin 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 acute care admissions and inpatient days (denominators) were collected from the patient information systems by the respective HA.

CPO

The provincial surveillance protocol for CPO was first developed by the provincial CPO Working Group in May 2014 and reviewed and updated annually by SSC. Since July 18, 2014, all microbiology laboratories in BC healthcare facilities or communities are required to submit the isolates suspected of harbouring a carbapenemase-resistant 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. From December 2017, new cases of CPO identified in the community care settings were required to report to PICNet by physician or care provider. PICNet further links the new cases to the laboratory testing data and patient information collected by the laboratory for the provincial surveillance report. For the latest provincial surveillance protocol for CPO in BC, please visit https://www.picnet.ca/surveillance.

C. auris

All isolates suspected with *C. auris* suspect are required to be submitted to PHL for confirmatory testing. The data for this report were provided by PHL from *C. auris* testing results. Reporting of case investigation and surveillance information to PICNet is not required at this moment.

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 [19]. 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 total of 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, 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, facility size and type. 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 by 10,000 to calculate a rate per 10,000 inpatient days. The 95% confidence intervals (CI) of the rates 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 did not overlap, the difference in the two rates was considered statistically significant.

The HCC percentage was the number of compliant opportunities over the total opportunities observed, and further grouped by moment 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.

Trend analysis was limited to annual rates of CDI, MRSA, and HCC in the last five years from 2013/14 to 2017/18, with a statistically significant level of $p < 0.05$ using Cochrane-Armitage test for linear trend.

CPO were presented by the number of cases in this report. The rate was not calculated because the new cases of CPO in this report includes CPO identified in both acute care facilities and community care settings. Particularly, CPO is still rare in most BC facilities. Only high-risk patients are screened for CPO (including inpatients, hemodialysis patients, and other patients who are deemed at high risk for CPO transmission by each individual HA). The numbers of patients who were screened (denominator) were not collected in a manner that allows the precise calculation of a provincial rate for CPO.

Data limitations

The provincial HAI surveillance programs are collaborations between PICNet and participating health authorities. Care services provided and patient populations served differed from HA to HA and from facility to facility. HA may extend or end the surveillance in their healthcare facilities over time. FHA merged the surveillance data from one acute care facility into another facility in 2015/16 and further expanded provincial surveillance programs to a new acute care site during Q4 2017/18 and another one in Q4 2018/19. VIHA included two new hospitals opened during Q3 of 2017/18, with two hospitals closed at the same time. BC Cancer -Vancouver Center participated in the provincial surveillance programs for CDI and MRSA from Q1 2018/19. HCC auditing data were unavailable for some facilities in IHA during Q2-Q3 2018/19 due to upgrades of hand hygiene auditing system.

Although standard provincial surveillance protocols were developed at the beginning of each program and reviewed annually to reflect advances of scientific research and surveillance practice, there are noted variations in how 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 CDI 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 participating HAs except PHC and FHA, which use >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 detection of *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. VIHA introduced a new and more sensitive multiplex testing for C. *difficile* during Q3 of 2017/18 and onwards. There is no evidence that the laboratory testing for MRSA has changed significantly after provincial surveillance started.

Infection prevention and control practices 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. In addition, current screening policy for CPO focuses on the patients with a hospitalization or medical/surgical procedure outside Canada in the last twelve months, accordingly most cases of CPO reported such a history outside Canada. Furthermore, Fraser Health expended CPO screening to all patients reporting any healthcare encounter outside of Canada as well as travellers returning from three countries in Southern Asia.

The patient's encounter history with healthcare has been used to determine whether a case of CDI and MRSA was healthcare-associated. Facilities in PHSA and PHC are unable to check patient healthcare history outside their health authority, and thus did not report cases that were associated with another facility.

In hand cleaning 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. Auditors varied by facility and over time. Observer and selection bias are inevitable [20]. Self-auditing tends to report higher compliance than dedicated auditors. The audits in facilities in IHA, PHC, and PHSA were conducted by ICPs or co-op medical students. FHA, VCHA (except PHC), VIHA, and NHA employed ICPs, or dedicated auditors for auditing large acute care facilities, whereas the compliance in the remaining acute care facilities and all residential care facilities were assessed by self-auditing. VIHA employed more dedicated auditors from 2015/16. VCH (except PHC) modified their hand hygiene auditing monitoring program from Q1 2017/18 to focus more on "in the-moment" feedback and quality improvement. Observations performed following feedback in the same fiscal period were not included. FHA modified the reporting of audit data from Q2 of 2018/19: only observations performed by regional hand hygiene auditors in acute care facilities were included. Audit data by site auditors in acute care facilities and all residential care facilities were not reported to PICNet from Q2 of 2018/19 and onward. In addition, direct observation may introduce 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 [21,22].

Finally, the rates in this report were not adjusted by any risk factors; 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 2018/19

Summary of acute care facilities participating in the provincial surveillance program, fiscal year 2018/19

Health authority	IHA	FHA[a]	VCHA[b]	VIHA	NHA	PHSA[c]	Total
Total number of facilities[d]	**22**	**15**	**11**	**13**	**18**	**3**	**82**
By facility type							
Community hospital	16	8	6	9	9	0	48
Regional hospital	4	4	3	2	8	0	21
Tertiary/referral hospitals	2	3	2	2	1	3	13
By facility size[d]							
1–50 beds	16	4	5	5	17	1	48
51–150 beds	3	3	2	5	0	2	15
151 – 250 beds	1	4	2	0	1	0	8
>250 beds	2	4	2	3	0	0	11
Acute care beds[d]	**1,414**	**2,823**	**1,894**	**1,704**	**555**	**268**	**8,658**
Total acute care admissions[e]	**79,310**	**145,069**	**87,532**	**83,886**	**29,195**	**28,541**	**453,533**
Total inpatient days[e]	**496,905**	**1,068,357**	**646,997**	**665,228**	**222,042**	**95,584**	**3,195,113**

Notes:

a. FHA expanded provincial surveillance programs to a new acute care site in 2018/19
b. Includes acute care facilities of Providence Health Care (PHC)
c. Includes BC Children's Hospital, BC Women's hospital, and BC Cancer – Vancouver Center.
d. Based on the counts of acute care beds in quarter 4 (Q4) of 2018/19. The number of beds may vary by quarter due to temporary closure of acute care beds by facilities.
e. Patients less than one year old were excluded from CDI surveillance

Appendix C. Start and end date for quarters in 2018/19

Start and end date of quarters in 2018/19

Quarter code	Fiscal quarter		Calendar quarter	
	Start date	End date	Start date	End date
Q1	01-Apr-2018	28-Jun-2018	01-Apr-2018	30-Jun-2018
Q2	29-Jun-2018	20-Sep-2018	01-Jul-2018	30-Sep-2018
Q3	21-Sep-2018	13-Dec-2018	01-Oct-2018	31-Dec-2018
Q4	14-Dec-2018	31-Mar-2019	01-Jan-2019	31-Mar-2019

Appendix D. Annual rate of new CDI and MRSA associated with the reporting facility and hand cleaning compliance by acute care facility, 2018/19

Health authority and acute care 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 Authority (IHA) [b]	**229**	**5.0 (4.4-5.7)**	**109**	**2.2 (1.8-2.6)**	**18,090** [f]	**87.5%**
100 Mile District Hospital	*	8.1 (3.5-19.0)	*	4.9 (1.7-14.3)	**	**
Arrow Lakes Hospital	*	23.0 (7.8-67.3)	0	0.0	**	**
Boundary Hospital	*	4.8 (1.3-17.3)	0	0.0	**	**
Cariboo Memorial Hospital and Health Centre	*	2.7 (0.9-8.0)	*	4.5 (1.9-10.5)	**	**
Creston Valley Hospital	*	1.8 (0.3-10.1)	0	0.0	**	**
Dr. Helmcken Memorial Hospital & Health Centre	0	0.0	0	0.0	**	**
East Kootenay Regional Hospital	19	7.9 (5.1-12.4)	*	1.8 (0.8-4.3)	1,140	86.8%
Elk Valley Hospital	*	9.4 (3.6-24.0)	0	0.0	**	**
Golden & District General Hospital	0	0.0	0	0.0	**	**
Invermere & District Hospital	0	0.0	0	0.0	**	**
Kelowna General Hospital	78	5.6 (4.5-7.0)	32	2.0 (1.4-2.9)	5,814	88.9%
Kootenay Boundary Regional Hospital	13	6.0 (3.5-10.3)	*	2.3 (1.1-5.1)	907	85.6%
Kootenay Lake Hospital	*	0.9 (0.2-5.3)	*	0.9 (0.2-5.3)	713	87.9%
Lillooet Hospital and Health Centre	0	0.0	*	19.4 (5.3-70.3)	**	**
Nicola Valley Health Centre	*	16.5 (6.4-42.3)	*	4.1 (0.7-23.3)	**	**
Penticton Regional Hospital	24	6.1 (4.1-9.0)	*	2.0 (1.1-3.8)	2,094	86.8%
Princeton General Hospital	*	5.4 (1.0-30.5)	*	5.4 (1.0-30.5)	**	**
Queen Victoria Hospital and Health Centre	*	4.7 (0.8-26.8)	0	0.0	**	**
Royal Inland Hospital	47	5.0 (3.8-6.7)	25	2.6 (1.7-3.8)	3,498	89.3%
Shuswap Lake General Hospital	*	1.2 (0.3-4.3)	*	3.6 (1.6-7.8)	980	90.3%
South Okanagan General Hospital	0	0.0	0	0.0	**	**
Vernon Jubilee Hospital	21	3.6 (2.3-5.4)	13	2.0 (1.2-3.4)	2,101	82.6%
Fraser Health Authority (FHA) [b]	**308**	**3.0 (2.7-3.4)**	**559**	**5.2 (4.8-5.7)**	**57,727** [g]	**82.0%**
Abbotsford Regional Hospital/ Matsqui Sumas Abbotsford	45	3.8 (2.8-5.1)	81	6.4 (5.2-8.0)	7,365	82.5%
Burnaby Hospital	26	2.7 (1.9-4.0)	35	3.5 (2.5-4.9)	8,174	86.1%
Carelife Fleetwood Care Center [c]	0	0.0	0	0.0	**	**
Chilliwack General Hospital	25	4.3 (2.9-6.3)	34	5.7 (4.1-7.9)	3,782	81.3%
Delta Hospital	*	1.2 (0.4-3.6)	23	9.4 (6.3-14.1)	1,988	78.2%
Eagle Ridge Hospital	*	1.4 (0.7-2.7)	24	3.8 (2.6-5.6)	3,596	79.1%

Health authority and acute care facility	CDI		MRSA		HCC	
	Number of new cases	Rate (95% CI) [a]	Number of new cases	Rate (95% CI) [a]	Total observations	Percent compliance
Fellburn Care Center	0	0.0	*	4.5 (1.5-13.3)	250	88.0%
Fraser Canyon Hospital	0	0.0	0	0.0	573	79.2%
Langley Memorial Hospital	27	3.7 (2.5-5.4)	30	3.9 (2.7-5.6)	3,494	79.8%
Mission Memorial Hospital	*	4.4 (2.3-8.4)	*	3.9 (2.0-7.7)	1,577	87.5%
Peace Arch Hospital	*	0.9 (0.4-2.0)	37	5.5 (4.0-7.5)	4,550	84.5%
Queen's Park Hospital	*	1.7 (0.7-4.5)	12	5.2 (3.0-9.1)	753	80.3%
Ridge Meadows Hospital	26	4.2 (2.9-6.2)	30	4.8 (3.3-6.8)	3,885	82.4%
Royal Columbian Hospital	42	2.7 (2.0-3.7)	61	3.7 (2.9-4.8)	7,554	79.7%
Surrey Memorial Hospital	86	3.5 (2.8-4.3)	181	6.8 (5.9-7.8)	10,111	80.7%
Vancouver Coastal Health Authority (VCHA) [b]	**234**	**3.6 (3.2-4.1)**	**283**	**4.4 (3.9-4.9)**	**12,322**	**83.3%**
Bella Coola General Hospital	0	0.0	0	0.0	**	**
Lions Gate Hospital	22	2.9 (1.9-4.3)	37	4.5 (3.3-6.2)	1,362	83.8%
Mount Saint Joseph Hospital	12	3.7 (2.1-6.4)	*	1.8 (0.8-4.0)	1,020	69.6%
Powell River General Hospital	*	3.2 (1.2-8.3)	*	4.7 (2.1-10.2)	580	79.5%
Richmond Hospital	33	6.4 (4.6-9.0)	29	3.9 (2.7-5.6)	1,304	89.4%
RW Large Hospital	0	0.0	0	0.0	**	**
Sechelt Hospital	*	1.3 (0.5-3.0)	*	3.4 (1.6-7.0)	203	94.6%
Squamish General Hospital	0	0.0	0	0.0	**	**
St. Paul's Hospital	43	2.8 (2.1-3.8)	77	4.9 (4.0-6.2)	3,284	77.8%
UBC Hospital	0	0.0	*	2.2 (0.8-6.5)	338	87.3%
Vancouver General Hospital	115	4.6 (3.8-5.5)	118	4.8 (4.0-5.8)	3,607	89.9%
Island Health Authority (VIHA) [b]	**158**	**2.7 (2.3-3.1)**	**169**	**2.5 (2.2-3.0)**	**31,508**	**77.3%**
Campbell River General Hospital	*	1.7 (0.8-3.5)	11	2.6 (1.4-4.6)	1,459	77.0%
Comox Valley Hospital	11	2.1 (1.2-3.8)	*	1.2 (0.6-2.5)	1,843	70.2%
Cormorant Island Community Health Centre	0	0.0	0	0.0	**	**
Cowichan District Hospital	*	1.7 (0.8-3.3)	17	2.3 (1.4-3.7)	3,306	80.9%
Lady Minto Gulf Islands Hospital	*	5.5 (1.9-16.2)	0	0.0	231	85.3%
Nanaimo Regional General Hospital	41	3.5 (2.6-4.7)	58	4.4 (3.4-5.7)	4,806	74.5%
Port Hardy Hospital	0	0.0	*	4.8 (0.8-26.9)	**	**
Port McNeill and District Hospital	0	0.0	*	7.2 (1.3-40.4)	**	**
Royal Jubilee Hospital	47	3.1 (2.3-4.1)	41	2.7 (2.0-3.6)	9,133	75.5%
Saanich Peninsula Hospital	12	4.9 (2.8-8.6)	*	0.8 (0.2-3.0)	1,376	91.8%
Tofino General Hospital	*	5.3 (0.9-29.9)	*	5.2 (0.9-29.6)	**	**
Victoria General Hospital	25	2.0 (1.3-2.9)	27	1.8 (1.2-2.6)	8,033	78.0%
West Coast General Hospital	*	1.8 (0.6-5.3)	*	1.6 (0.5-4.6)	1,024	77.2%

Health authority and acute care facility	CDI		MRSA		HCC	
	Number of new cases	Rate (95% CI) [a]	Number of new cases	Rate (95% CI) [a]	Total observations	Percent compliance
Northern Health [b]	**48**	**2.2 (1.6-2.9)**	**120**	**5.4 (4.5-6.5)**	**21,373**	**86.2%**
Bulkley Valley District Hospital	0	0.0	*	2.9 (0.8-10.6)	834	76.4%
Chetwynd General Hospital	0	0.0	0	0.0	**	**
Dawson Creek Hospital	*	2.6 (1.1-6.0)	16	8.2 (5.1-13.3)	941	70.1%
Fort Nelson General Hospital		0.0	*	3.1 (0.6-17.7)	482	82.2%
Fort St. John General Hospital	*	2.1 (0.8-5.4)	*	3.7 (1.8-7.6)	1,293	77.0%
G.R. Baker Memorial Hospital	*	1.3 (0.3-4.6)	*	3.8 (1.7-8.3)	375	64.0%
Kitimat General Hospital	0	0.0	*	2.8 (0.8-10.0)	942	93.4%
Lakes District Hospital	0	0.0	*	2.4 (0.4-13.4)	**	**
Mackenzie and District Hospital	0	0.0	*	6.8 (1.2-38.6)	1,300	87.0%
McBride and District Hospital	0	0.0	*	8.4 (1.5-47.3)	1,357	95.2%
Mills Memorial Hospital	*	1.6 (0.5-4.7)	18	9.6 (6.1-15.2)	1,076	83.6%
Northern Haida Gwaii Hospital	0	0.0	*	7.0 (1.2-39.4)	1,299	98.9%
Prince Rupert Regional Hospital	*	3.8 (1.5-9.8)	*	4.7 (2.0-11.1)	1,052	76.7%
Queen Charlotte Islands Hospital	0	0.0	*	5.1 (0.9-28.9)	**	**
St. John Hospital	0	0.0	*	1.4 (0.2-7.8)	674	86.6%
Stuart Lake Hospital	*	5.1 (0.9-28.7)	0	0.0	**	**
University Hospital of Northern BC	28	2.9 (2.0-4.2)	53	5.6 (4.3-7.3)	9,222	88.7%
Wrinch Memorial Hospital	*	2.1 (0.4-11.6)	*	8.2 (3.2-21.1)	196	73.5%
Provincial Health Services Authority [b]	**35**	**6.3 (4.6-8.8)**	**23**	**2.4 (1.6-3.6)**	**3,852**	**92.7%**
BC Cancer - Vancouver Center [e]	*	4.6 (1.3-16.7)	0	0.0	740	93.4%
BC Children's Hospital	33	12.5 (8.9-17.6)	*	1.5 (0.6-3.5)	1,920	93.3%
BC Women's Hospital	0	0.0	18	3.1 (2.0-4.9)	1,192	91.2%
Total [b]	**1,012**	**3.4 (3.2-3.6)**	**1,263**	**4.0 (3.7-4.2)**	**144,872**	**82.7%**

Notes:

* represents the number of cases of CDI or MRSA that was less than ten

** represents the number of observations that was less than 200 opportunities in 2017/18

a. Per 10,000 inpatient days

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

c. Participated in the provincial surveillance programs during Q4 2018/19

d. Included data from Yale Road Care Center for Q1 - Q3 2018/19

e. Participated in the provincial surveillance programs for CDI and MRSA from Q1 2018/19

f. HCC auditing data were unavailable for some facilities during Q2-Q3 2018/19 due to upgrades of hand hygiene auditing system.

g. The date included audits by site auditors during Q1 2018/19. FHA modified the reporting of audit data from Q2 2018/19 and onward, such that only observations performed by regional hand hygiene auditors in acute care facilities were included and the audit data by site auditors were not reported to PICNet.

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