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

Clostridium difficile Infection (CDI) Surveillance Report

For the Fiscal Year 2013/2014
(April 1, 2013 to March 31, 2014)

Prepared by:

Provincial Infection Control Network of British Columbia (PICNet)

September 2014

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Acronyms

BC	British Columbia
CA	community-associated
CDI	*Clostridium difficile* infection
CI	confidence interval
FHA	Fraser Health Authority
FY	fiscal year
FQ	fiscal quarter
HA	health authority
HAI	healthcare-associated infection
HCA	healthcare-associated
ICP	Infection control practitioner
IHA	Interior Health Authority
IPC	infection prevention and control
NHA	Northern Health Authority
PHC	Providence Health Care
PHSA	Provincial Health Services Authority
PICNet	Provincial Infection Control Network of British Columbia
PCR	polymerase chain reaction
SSC	(PICNet's) Surveillance Steering Committee
VCHA	Vancouver Coastal Health Authority
VIHA	Island Health Authority

Summary

A total of 2,378 cases of *Clostridium difficile* infection (CDI) were reported during the fiscal year (FY) 2013/2014, which represents a 26.7% decrease from the previous year (FY 2012/2013) and the lowest number of CDI cases reported since the inception of the provincial CDI surveillance program in FY 2009/2010.

Of all CDI cases in FY 2013/2014, 1,679 (70.6%) were classified as healthcare-associated (HCA), and 699 (29.4%) were community-associated (CA) or of unknown association. Of the HCA cases, 1,311 (55.1% of total CDI cases) were new cases of CDI associated with the reporting facility.

The provincial annual rate of new cases of CDI associated with the reporting facility was 4.5 per 10,000 inpatient days [95% confidence interval (CI): 4.3-4.8] in FY 2013/2014. This was a statistically significant decrease compared to the past four years. At the provincial level, the downward trend in the quarterly rates was statistically significant from FY 2009/2010 to FY 2013/2014.

The decrease in the rate of new cases of CDI associated with the reporting facility in FY 2013/2014 was observed in all six health authorities (HAs) compared to the previous year (FY 2012/2013), with a statistically significant difference in FHA and VCHA. There was a continual decrease in the rates, year by year, in VCHA and VIHA during the past five years.

In FY 2013/2014, the rate of new cases of CDI associated with the reporting facility was still highest in those hospitals with 250 or more beds, tertiary/referral hospitals, and teaching hospitals. Compared to the rate in FY 2012/2013, there were statistically significant decreases across each category of hospital type.

Nineteen hospitals reported no cases of CDI associated with the reporting facility in FY 2013/2014. Compared to the annual rate in FY 2012/2013, the rate in FY 2013/2014 rate was significantly lower in five hospitals, and there was no significant change for the remaining hospitals.

Relapses accounted for 14.7% of the cases of HCA CDI in FY 2013/2014. There was no statistically significant change in the proportion of relapses at the provincial level compared to the previous years.

Five of six health authorities (the exception being PHSA) reported complications associated with CDI at 30 days post-diagnosis or up to the point of patient discharge or transfer (whichever comes first). There were 75 (3.2%) CDI cases admitted to ICU, 17 (0.7%) developed toxic megacolon, and 31 (1.3%) required entire or partial colectomy.

This annual report is based on the facility-aggregated data submitted to PICNet by each HA every fiscal quarter. The provincial CDI surveillance program includes all 80 acute care facilities across the province. The data are collected and managed by individual HAs. Variation exists among HAs in how the provincial CDI surveillance protocol has been applied. The laboratory testing methodology for detection of *C. difficile* differs by HA and has changed over time. The inpatient population's risk of acquiring CDI also varies by facility. In addition, the look-back period for healthcare exposure was modified from eight weeks to four weeks from FY 2010/2011. Furthermore, the rates of CDI in this report are not risk-adjusted. **Direct comparisons of the rates between HAs and between healthcare facilities should therefore not be made.**

Introduction

Clostridium difficile infection (CDI) is increasing in incidence and severity over the past decade [1]. Hospitalized patients are considered to be at especially high risk for infection [2]. After an outbreak of *CDI* in Quebec in 2003-2004, which may have killed as many as 2000 people [3], each province in Canada began requiring hospitals to report CDI cases [4]. In British Columbia (BC), all 80 acute care facilities across the province participate in the provincial CDI surveillance program using a standardized surveillance protocol, which was developed and is reviewed annually by the Surveillance Steering Committee (SSC) of the Provincial Infection Control Network of BC (PICNet) (See the section About the CDI surveillance program and Glossary for details). From April 2009, surveillance data have been submitted to PICNet by each health authority (HA) on a quarterly basis. The information is summarized and then reported to the Ministry of Health and the public. This report presents the cases of CDI identified in acute care facilities during the fiscal year (FY) 2013/2014 (April 1, 2013 to March 31, 2014) with a focus on *new* cases of CDI associated with the reporting facility. Comparisons with previous years are also presented.

Surveillance results

Population under surveillance

Inpatients older than one year who were admitted for acute care were under surveillance for CDI, with the exception of inpatients for mental health and extended care. Table 1 summarizes the characteristics of all 80 acute care facilities in BC in the FY 2013/2014, along with the estimated general population in each HA as at July 1, 2013.

Table 1. Summary of facilities participating in the provincial CDI surveillance program by health authority, fiscal year 2013/2014

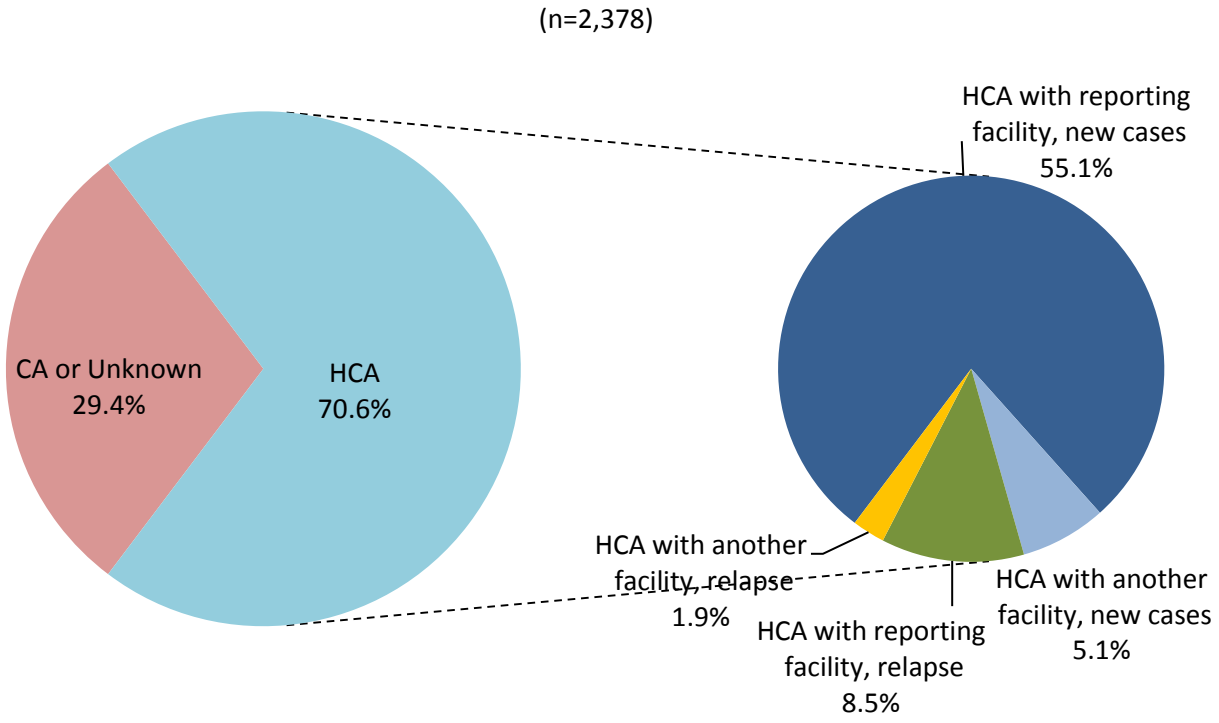
Health authority	IHA	FHA	VCHA[i]	VIHA	NHA	PHSA	Total
Total number of facilities	**22**	**14**	**11**	**13**	**18**	**2**	**80**
By hospital size[ii]							
1-50 beds	16	3	6	7	17	0	49
51-250 beds	5	7	2	3	1	2	20
>250 beds	1	4	3	3	0	0	11
By hospital category							
Community hospital	16	7	6	9	9	0	47
Regional 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	8	6	11	16	0	62
Teaching hospital	1	6	5	2	2	2	18
Total acute care beds[iii]	**1,192**	**2,602**	**1,760**	**1,381**	**552**	**195**	**7,681**
Total acute care admissions[iv]	**73,640**	**125,600[v]**	**89,351**	**67,435**	**28,284**	**13,426**	**397,736**
Total inpatient days[iv]	**447,049**	**1,032,994[v]**	**668,957**	**496,090**	**188,174**	**49,991**	**2,883,255**
Estimated general population in 2013[vi]	717,466	1,689,875	1,138,657	752,144	283,836	N/A	4,581,978

i. Includes acute care facilities of Providence Health Care (PHC).
ii. Based on the count of acute care beds in Q4 of FY 2013/2014; the same hereinafter. The number of beds may vary by quarter due to temporary closure of acute care beds by facilities.
iii. Average of quarterly counts of acute care beds in each health authority.
iv. Excludes inpatients less than one year old and inpatients for mental health and extended care.
v. Includes mental health inpatients.
vi. BC Stats. Population Estimates. http://www.bcstats.gov.bc.ca/

Overview of CDI cases

A total of 2,378 cases of CDI were reported during FY 2013/2014. As per PICNet's provincial CDI surveillance protocol, 1,679 (70.6%) of those CDI cases were classified as healthcare-associated (HCA), and 699 (29.4%) were community-associated (CA) or of unknown association. Of the 1,679 HCA cases, 1,311 (55.1% of total CDI cases) were new cases of CDI associated with the reporting facility; 121 (5.1%) were new cases of CDI associated with another facility; 201 (8.5%) were relapses of CDI associated with the reporting facility; and 46 (1.9%) were relapses of CDI associated with another facility (Figure 1).

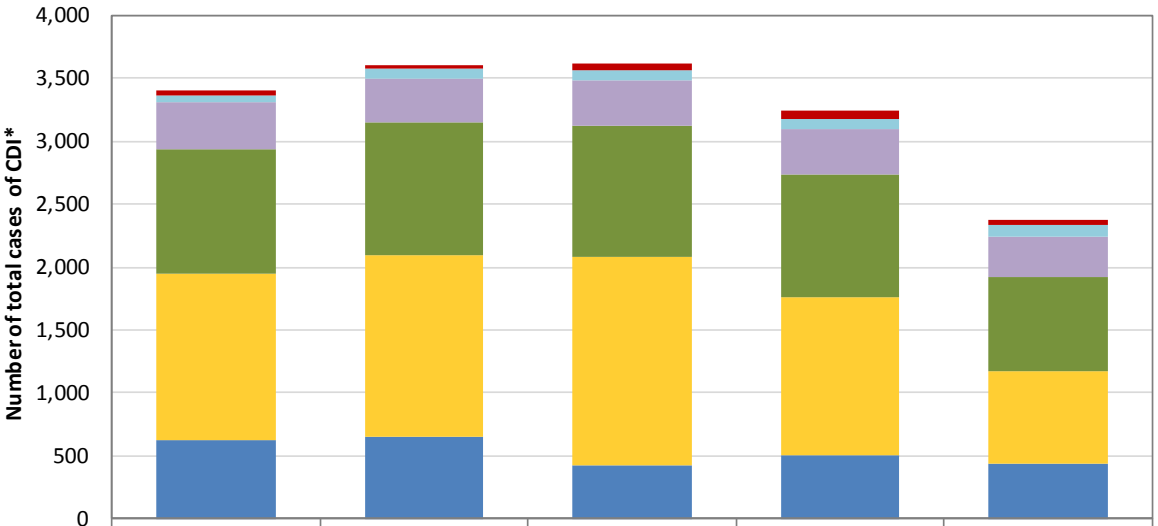
Figure 1. Classification of the CDI cases identified in BC acute care facilities, fiscal year 2013/2014



HCA: healthcare-associated, CA: community-associated

Compared with the number of total CDI cases reported in the previous years at the provincial level, the number of cases in FY 2013/2014 decreased by 26.7% from 3,246 in FY 2012/2013, and was the lowest number of CDI cases since the inception of provincial CDI surveillance program in FY 2009/2010.

Figure 2. Number of all cases of CDI identified in BC acute care facilities by health authority and fiscal year



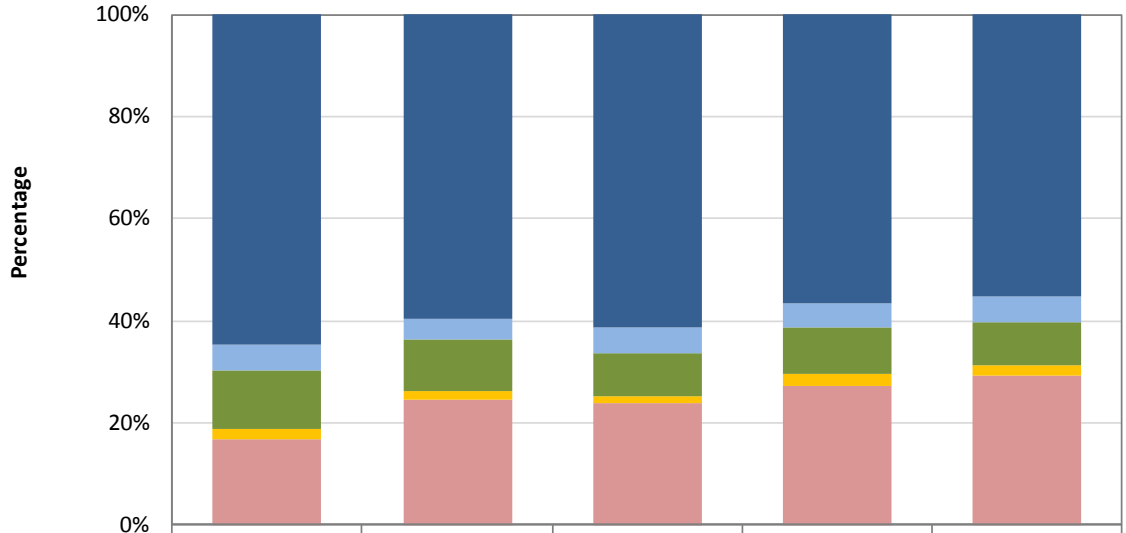
	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
PHSA	46	28	50	66	47
NHA	51	79	78	87	87
VIHA	384	349	367	353	323
VCHA	980	1,055	1,038	979	747
FHA	1,328	1,440	1,656	1,256	741
IHA	623	653	424	505	433
Total	3,412	3,604	3,613	3,246	2,378

* includes CDI cases of healthcare-associated (HCA), community-associated (CA) and of unknown association.

Note: Please see "Data limitations" in the section "About CDI surveillance program" for the modification in the case definition and classification, variations among health authorities how the surveillance protocol has been applied, and changes in the laboratory testing for detection of *C. difficile* over time. Direct comparison of the numbers of CDI cases between health authorities is not recommended.

There was a significant decrease in the number of cases for each category of CDI classification in FY 2013/2014 compared to FY 2012/2013 (Figure 3). The proportion of new CDI associated with the reporting facility continually decreased over the past five years, whereas the proportion of CA CDI or unknown increased. (Note: in FY 2013/2014, due to reduction in the total CDI cases, the *proportion* of CA or unknown increased, although the number of CA or unknown CDI cases decreased compared to FY 2012/2013).

Figure 3. Proportion of CDI cases identified in BC acute care facilities by case classification and fiscal year



	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
HCA with reporting facility, new cases	2,210	2,152	2,212	1,835	1,311
HCA with another facility, new cases	171	143	188	153	121
HCA with reporting facility, relapse	390	362	302	297	201
HCA with another facility, relapse	62	63	54	71	46
CA or Unknown	579	884	857	890	699
Total number of CDI cases	3,412	3,604	3,613	3,246	2,378

HCA: healthcare-associated, CA: community-associated.

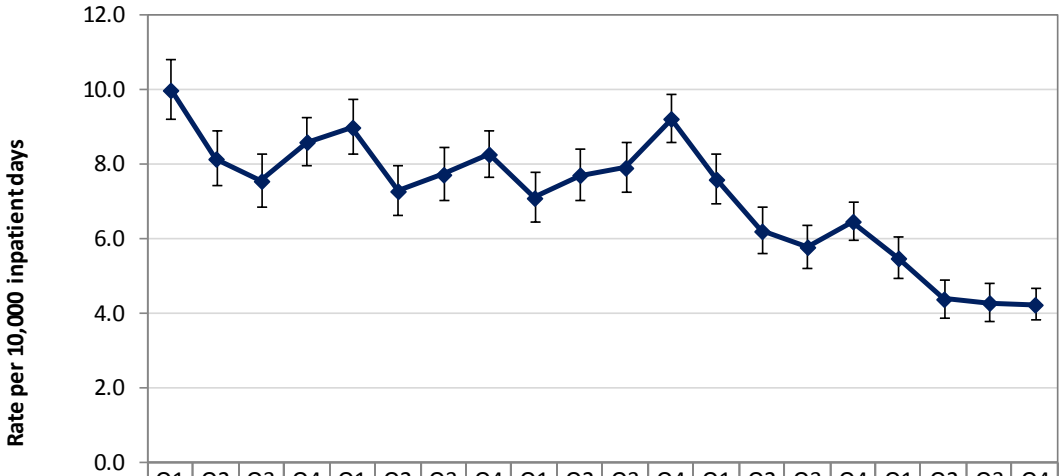
Note: Please see "Data limitations" in the section "About CDI surveillance program" for the modification in the case definition and classification, variations among health authorities how the surveillance protocol has been applied, and changes in the laboratory testing for detection of *C. difficile* over time.

Provincial rate of new cases of CDI associated with the reporting facility

The provincial annual rate of new cases of CDI associated with the reporting facility was 4.5 per 10,000 inpatient days [95% confidence interval (CI): 4.3-4.8] in FY 2013/2014, a statistically significant decrease from the past four years.

The quarterly provincial rate has deceased continually over the past two fiscal years, and the rate in Q4 of FY 2013/2014 was the lowest since the inception of provincial CDI surveillance (Figure 4). There is a statistically significant downward trend in the rate of CDI associated with the reporting facility (χ^2 for trend = 366.52, $p < 0.001$).

Figure 4. Provincial rate of new cases of CDI associated with the reporting facility per 10,000 inpatient days by fiscal quarter, from FY 2009/10 to FY 2013/14



	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	2009/2010				2010/2011				2011/2012				2012/2013				2013/2014			
Rate of new cases of CDI associated with reporting facility	10.	8.1	7.5	8.6	9.0	7.3	7.7	8.3	7.1	7.7	7.9	9.2	7.6	6.2	5.8	6.5	5.5	4.4	4.3	4.2
Number of new cases of CDI associated with reporting facility	611	476	450	673	557	438	473	684	431	464	509	808	480	390	377	588	351	285	286	389

Fiscal year and quarter*

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

Note: Please see "Data limitations" in the section "About CDI surveillance program" for the modification in the case definition and classification, variations among health authorities how the surveillance protocol has been applied, and changes in the laboratory testing for detection of *C. difficile* over time.

Rate of new cases of CDI associated with the reporting facility by health authority

The rate of new cases of CDI associated with the reporting facility in FY 2013/2014 decreased in each of the six HAs compared to the previous year (FY 2012/2013), with a statistically significant difference in FHA and VCHA. The decrease in other HAs was not statistically significant. Furthermore, there was a steady decrease in the rates, year by year, in VCHA and VIHA during the past five years. Please note that comparison of rates between HAs is not recommended.

Table 2. Rate of new cases of CDI associated with the reporting facility per 10,000 inpatient days and 95% confidential intervals by health authority and fiscal year

Health Authority	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
IHA	9.2 (8.4-10.2)	6.6 (5.8-7.4)	5.8 (5.1-6.6)	7.0 (6.2-7.8)	5.8 (5.2-6.6)
FHA	10.3 (9.6-11.0)	10.5 (9.8-11.1)	11.3 (10.7-12.0)	7.2 (6.7-7.8)	4.2 (3.8-4.6)
VCHA	10.0 (9.3-10.9)	9.9 (9.1-10.7)	9.2 (8.5-10.0)	8.4 (7.7-9.1)	6.0 (5.4-6.6)
VIHA	5.5 (4.9-6.2)	4.7 (4.1-5.3)	4.1 (3.6-4.7)	3.5 (3.0-4.1)	2.9 (2.5-3.5)
NHA	2.1 (1.5-2.8)	2.8 (2.1-3.7)	2.8 (2.2-3.7)	2.8 (2.1-3.6)	2.4 (1.8-3.2)
PHSA	7.2 (5.1-10.2)	3.9 (2.5-6.1)	7.1 (5.1-9.9)	7.2 (5.2-10.0)	5.2 (3.5-7.6)
Total	**8.6 (8.2-8.9)**	**8.1 (7.8-8.4)**	**8.1 (7.8-8.4)**	**6.5 (6.2-6.8)**	**4.5 (4.3-4.8)**

Note: Please see "Data limitations" in the section "About CDI surveillance program" for the modification in the case definition and classification, variations among health authorities how the surveillance protocol has been applied, and changes in the laboratory testing for detection of *C. difficile* over time. Direct comparison of the numbers of CDI rate between health authorities is not recommended.

Rate of new cases of CDI associated with the reporting facility by facility type

Similar to previous years, in FY 2013/2014 the rate of new cases of CDI associated with the reporting facility increased with hospital size, with the lowest rate in hospitals with 50 or fewer beds (3.2 cases per 10,000 inpatient days), and the highest rate in hospitals with more than 250 beds (4.8 cases per 10,000 inpatient days) (Table 3).

Compared to the annual rates in the previous four years, there was a significant decrease in the rate in FY 2013/2014 for each category of hospital size. The rate in hospitals with more than 250 beds decreased continually over the past five years (Table 3).

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

Hospital size	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
1-50 beds	3.9 (3.3-4.7)	4.1 (3.4-4.8)	3.7 (3.1-4.5)	4.9 (4.1-5.8)	3.2 (2.6-3.9)
51-250 beds	7.9 (7.3-8.4)	6.6 (6.2-7.1)	7.1 (6.6-7.6)	5.9 (5.4-6.3)	4.5 (4.1-5.0)
>250 beds	10.4 (9.8-11.0)	10.6 (10.0-11.2)	9.5 (9.0-10.0)	7.2 (6.8-7.6)	4.8 (4.5-5.2)
Total	**8.6 (8.2-8.9)**	**8.1 (7.8-8.4)**	**8.1 (7.8-8.4)**	**6.5 (6.2-6.8)**	**4.5 (4.3-4.8)**

The CDI rate also varied by hospital category. In FY 2013/2014, the annual rate was lowest in community hospitals (3.7 cases per 10,000 inpatient days) and highest in the tertiary/referral hospitals (4.9 cases per 10,000 inpatient days) (Table 4). The difference in rates was statistically significant between community hospitals and tertiary/referral hospitals in FY 2013/2014.

Compared to the annual rates in the previous four years, the rate in FY 2013/2014 was significantly lower in each hospital category (Table 4), and the rates have decreased statistically significantly in regional hospitals and tertiary/referral hospitals in the past three years.

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

Hospital category	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
Community hospital	6.5 (5.8-7.3)	6.5 (5.8-7.3)	6.0 (5.4-6.8)	5.5 (4.9-6.2)	3.7 (3.2-4.3)
Regional hospital	9.1 (8.5-9.8)	8.1 (7.5-8.8)	7.8 (7.2-8.4)	6.2 (5.7-6.8)	4.4 (4.0-4.9)
Tertiary/Referral hospital	9.0 (8.5-9.5)	8.6 (8.1-9.1)	9.0 (8.5-9.5)	7.0 (6.6-7.4)	4.9 (4.5-5.3)
Total	**8.6 (8.2-8.9)**	**8.1 (7.8-8.4)**	**8.1 (7.8-8.4)**	**6.5 (6.2-6.8)**	**4.5 (4.3-4.8)**

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

Similar to the past four fiscal years, the annual rate in FY 2013/2014 remained lower in non-teaching hospitals than in teaching hospitals; however, this difference was not statistically significant (Table 5).

Compared to the annual rates in the previous three years, the rate in FY 2013/2014 was significantly lower in both teaching hospitals and non-teaching hospitals (Table 5), and the rate in teaching hospitals decreased continually in the past five years.

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

Teaching status	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
Non-teaching hospital	6.6 (6.1-7.1)	5.9 (5.5-6.4)	6.0 (5.6-6.6)	5.4 (5.0-5.9)	4.2 (3.8-4.6)
Teaching hospital	9.7 (9.2-10.1)	9.3 (8.8-9.7)	9.2 (8.8-9.7)	7.2 (6.8-7.6)	4.8 (4.5-5.1)
Total	8.6 (8.2-8.9)	8.1 (7.8-8.4)	8.1 (7.8-8.4)	6.5 (6.2-6.8)	4.5 (4.3-4.8)

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

Please note that the hospital types are mutually exclusive within each group (i.e., <50 beds vs. 51-250 beds vs. >250 beds; or community hospital vs. regional hospital vs. tertiary/referral hospital; or teaching vs. nonteaching), but not exclusive between the groups. For example, larger hospitals tend to be tertiary/referral hospitals and also tend to be teaching hospitals. The latter are more likely to care for more severe and more vulnerable patients who are at higher risk for acquiring CDI.

Rate of new cases of CDI associated with the reporting facility by acute care facility

Table 6 below presents the rates of new cases of CDI associated with reporting facility over the past five fiscal years by individual hospital, listed in alphabetical order. The 95% CI for the rate is provided to show the reliability of the rates. The wider the range of CI, the less certainty in the accuracy of the rate; because there is a greater margin for random error. Smaller facilities with a low number of patient days may have a high rate but few cases, and a wide 95% CI range. Rates for these facilities may vary substantially from reporting period to reporting period, because slight changes in the number of cases – even one case – can considerably affect the rate. For this reason, a letter 'E' is denoted in the table below for the rate when the difference between the upper limit and lower limit of 95% CI was greater than twice the rate, indicating that the rate may not be reliable.

Example	In a facility with 30 acute care beds, if in FY 2010/2011 there were two new cases of CDI associated with the facility and 8,000 inpatient days, and in FY 2011/2012 three new cases of CDI associated with the facility and 6,000 inpatient days, the rates would be 2.5 and 5.0 per 10,000 inpatient days, respectively. As demonstrated in this example, the rate doubled, although the number of cases increased by only one case and the number of patient days decreased by 25%.

Please note that the rates in the table are not risk-adjusted, and should therefore not be used to make comparisons between individual facilities. The laboratory testing used to confirm CDI diagnosis differs between HAs and has changed over time within HAs (see "Data limitations" in the section "About CDI surveillance program"). These differences and changes in testing methods can significantly affect the identification of CDI. In addition, large hospitals usually serve as tertiary hospitals with specialty care, and may also provide teaching or training to medical and nursing students, and other healthcare professionals. These hospitals are more likely to admit patients with greater severity of illness, which may in turn increase the risk of acquiring CDI.

In FY 2013/2014, 19 hospitals reported no cases of CDI associated with reporting facility. The annual rate in FY 2013/2014 was higher than in the previous year (FY 2012/2013) in 25 hospitals, with none of the increases being statistically significant. The rate was lower in 46 hospitals, and the difference was statistically significant in five hospitals (Burnaby Hospital, Langley Memorial Hospital, Royal Columbian Hospital, Surrey Memorial Hospital, and Vancouver General Hospital). The rate did not change for the remaining hospitals in FY 2013/2014 compared to FY 2012/2013.

Table 6. Annual rate of new cases of CDI associated with the reporting facility per 10,000 in patient days and 95% confidence intervals, by acute care facility

Acute care facility	Facility type[i]	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
100 Mile District Hospital	S,C,N	0.0	1.5 (0.3-8.7)[E]	0.0	7.7 (3.0-19.8)[E]	5.9 (2.0-17.4)[E]
Abbotsford Regional Hospital	L,T,Y	3.8 (2.7-5.3)	4.3 (3.2-5.8)	4.6 (3.5-6.1)	3.9 (2.9-5.3)	3.2 (2.3-4.4)
Arrow Lakes Hospital[ii]	S,C,N	28.4 (11.0-72.7)[E]	0.0	0.0	8.3 (1.5-46.7)[E]	0.0
BC Children's Hospital	M,T,Y	14.7 (10.3-20.8)	6.4 (4.0-10.3)	13.4 (9.6-18.7)	13.0 (9.3-18.2)	8.9 (6.1-13.0)
BC Women's Hospital	M,T,Y	0.4 (0.1-2.5)[E]	0.9 (0.2-3.2)[E]	0.0	0.8 (0.2-3.1)[E]	0.0
Bella Coola General Hospital	S,C,N	0.0	0.0	5.0 (0.9-28.4)[E]	0.0	0.0
Boundary Hospital[ii]	S,C,N	14.1 (6.5-30.8)	5.2 (0.9-29.5)[E]	9.5 (2.6-34.5)[E]	0.0	5.3 (1.5-19.4)[E]
Bulkley Valley District Hospital	S,R,N	5.4 (1.8-15.8)[E]	0.0	0.0	0.0	0.0
Burnaby Hospital	L,R,Y	18.1 (15.7-20.9)	17.1 (14.8-19.7)	15.2 (13.1-17.6)	8.6 (7.1-10.5)	5.3 (4.2-6.8)
Campbell River & District General Hospital	M,C,N	1.2 (0.4-3.4)[E]	3.0 (1.5-5.9)	5.2 (3.0-8.9)	3.6 (1.9-6.6)	2.4 (1.2-5.0)
Cariboo Memorial Hospital and Health Centre	S,C,N	2.1 (0.6-7.7)[E]	6.1 (2.8-13.4)	6.1 (2.8-13.4)	31.4 (21.9-44.5)	13.2 (7.6-23.1)
Chetwynd General Hospital	S,C,N	0.0	0.0	0.0	21.7 (7.4-63.7)[E]	11.5 (3.2-41.9)[E]
Chilliwack General Hospital	M,C,Y	2.6 (1.5-4.4)	2.9 (1.8-4.6)	1.8 (1.0-3.2)	2.9 (1.8-4.6)	2.7 (1.6-4.4)
Cormorant Island Community Health Centre	S,C,N	0.0	0.0	0.0	0.0	0.0
Cowichan District Hospital	M,C,N	4.0 (2.3-6.8)	4.7 (2.9-7.5)	4.9 (3.1-7.8)	3.0 (1.7-5.4)	2.8 (1.6-5.0)
Creston Valley Hospital[iii]	S,C,N	12.0 (5.5-26.1)	6.7 (2.6-17.1)[E]	11.0 (3.8-32.4)[E]	8.0 (3.1-20.6)[E]	11.0 (5.0-23.9)
Dawson Creek And District Hospital	S,R,N	0.0	0.0	1.2 (0.3-4.4)[E]	0.6 (0.1-3.4)[E]	1.8 (0.6-5.3)[E]
Delta Hospital	M,C,N	4.7 (2.6-8.5)	9.5 (6.3-14.4)	9.2 (6.0-14.1)	2.9 (1.4-6.1)	2.5 (1.1-5.5)
Dr. Helmcken Memorial Hospital & Health Centre	S,C,N	8.5 (1.5-47.9)[E]	0.0	0.0	5.9 (1.0-33.3)[E]	6.7 (1.2-37.8)[E]
Eagle Ridge Hospital	M,C,N	13.3 (10.2-17.4)	10.7 (8.1-14.3)	10.7 (8.2-14.0)	8.3 (6.4-10.9)	4.9 (3.5-6.9)
East Kootenay Regional Hospital[iii]	M,R,N	11.1 (7.5-16.4)	7.4 (4.6-11.9)	10.5 (6.1-17.9)	10.3 (6.8-15.6)	11.1 (7.5-16.4)
Elk Valley Hospital[iii]	S,C,N	18.5 (9.7-35.2)	15.9 (8.1-31.3)	7.7 (2.1-28.0)[E]	15.7 (7.2-34.2)	0.0
Fort Nelson General Hospital	S,C,N	0.0	0.0	0.0	0.0	6.7 (1.8-24.4)[E]
Fort St. John General Hospital	S,R,N	1.3 (0.4-4.9)[E]	2.2 (0.8-6.5)[E]	0.7 (0.1-3.9)[E]	0.6 (0.1-3.6)[E]	0.6 (0.1-3.5)[E]
Fraser Canyon Hospital	S,C,N	7.5 (2.5-21.9)[E]	16.6 (7.6-36.1)	2.6 (0.5-14.9)[E]	0.0	0.0
G.R. Baker Memorial Hospital	S,R,Y	0.0	2.3 (0.8-6.8)[E]	2.2 (0.8-6.6)[E]	0.8 (0.1-4.4)[E]	2.2 (0.7-6.4)[E]
Golden & District General Hospital[iii]	S,C,N	0.0	0.0	0.0	0.0	9.7 (2.6-35.2)[E]

Acute care facility	Facility type[i]	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
Invermere & District Hospital[iii]	S,C,N	10.8 (3.7-31.6)[E]	11.0 (3.7-32.2)[E]	0.0	22.4 (9.6-52.3)	0.0
Kelowna General Hospital	L,T,Y	13.7 (11.8-15.9)	10.0 (8.4-12.0)	8.5 (7.0-10.2)	7.0 (5.7-8.6)	5.3 (4.2-6.7)
Kitimat General Hospital	S,R,N	3.1 (0.8-11.1)[E]	1.5 (0.3-8.3)[E]	2.7 (0.8-10.0)[E]	3.3 (0.9-12.1)[E]	3.7 (1.0-13.4)[E]
Kootenay Boundary Regional Hospital[ii]	M,R,N	10.0 (6.7-15.1)	5.2 (2.2-12.2)	7.4 (3.9-14.1)	7.9 (5.0-12.5)	4.1 (2.1-7.8)[E]
Kootenay Lake Hospital[ii]	S,C,N	8.8 (5.0-15.3)	13.9 (7.0-27.4)	3.2 (0.9-11.7)[E]	9.7 (5.5-16.9)	3.5 (1.3-8.9)
Lady Minto Gulf Islands Hospital	S,C,N	3.4 (0.9-12.4)[E]	4.9 (1.7-14.4)[E]	3.1 (0.8-11.2)[E]	8.9 (3.8-20.8)	1.8 (0.3-10.0)[E]
Lakes District Hospital and Health Centre	S,C,N	4.8 (1.3-17.6)[E]	0.0	3.2 (0.6-18.1)[E]	7.9 (2.7-23.1)[E]	0.0
Langley Memorial Hospital	M,R,Y	15.3 (12.6-18.5)	13.7 (11.3-16.6)	16.5 (13.9-19.7)	11.6 (9.4-14.2)	4.9 (3.6-6.7)
Lillooet Hospital and Health Centre	S,C,N	12.7 (3.5-46.0)[E]	0.0	0.0	0.0	6.7 (1.2-37.9)[E]
Lions Gate Hospital	L,R,Y	9.2 (7.4-11.4)	6.8 (5.3-8.7)	3.5 (2.5-4.9)	6.1 (4.7-7.9)	4.9 (3.7-6.5)
Mackenzie and District Hospital	S,C,N	0.0	0.0	0.0	0.0	0.0
Matsqui Sumas Abbotsford	S,C,N	2.2 (0.6-7.8)[E]	2.3 (0.6-8.5)[E]	6.4 (2.9-13.9)	4.5 (1.7-11.5)[E]	0.0
McBride and District Hospital	S,C,N	0.0	0.0	0.0	0.0	9.8 (1.7-55.5)[E]
Mills Memorial Hospital	S,R,N	0.6 (0.1-3.6)[E]	1.3 (0.4-4.7)[E]	4.4 (2.1-9.0)	4.8 (2.4-9.5)	0.0
Mission Memorial Hospital	S,C,N	2.3 (0.6-8.5)[E]	6.2 (3.0-12.8)	15.8 (10.1-24.7)	7.1 (3.9-13.2)	6.3 (3.3-12.0)
Mount Saint Joseph Hospital	M,C,Y	15.3 (11.9-19.8)	19.3 (15.3-24.3)	12.6 (9.5-16.7)	9.4 (6.8-13.1)	6.2 (4.1-9.3)
Nanaimo Regional General Hospital	L,R,N	7.3 (5.7-9.2)	9.6 (7.8-11.8)	6.4 (4.9-8.2)	5.3 (4.1-7.0)	2.9 (2.0-4.2)
Nicola Valley Health Centre	S,C,N	3.3 (0.6-18.6)[E]	0.0	12.1 (4.7-31.0)[E]	3.0 (0.5-16.9)[E]	8.5 (2.9-24.9)[E]
Northern Haida Gwaii Hospital[iv]	S,C,N	0.0	0.0	11.9 (2.1-66.9)[E]	0.0	0.0
Peace Arch Hospital	M,R,N	9.0 (7.0-11.6)	6.8 (5.2-9.0)	9.5 (7.5-11.9)	5.4 (3.9-7.3)	4.8 (3.5-6.6)
Penticton Regional Hospital	M,R,N	4.1 (2.6-6.4)	5.6 (3.8-8.1)	4.3 (2.8-6.6)	5.0 (3.4-7.5)	5.0 (3.3-7.5)
Port Hardy Hospital	S,C,N	0.0	0.0	6.5 (1.8-23.5)[E]	6.3 (1.7-23.1)[E]	0.0
Port McNeill and District Hospital	S,C,N	0.0	3.9 (0.7-22.1)[E]	0.0	5.2 (0.9-29.6)[E]	5.4 (1.0-30.5)[E]
Powell River General Hospital	S,C,N	0.0	1.0 (0.2-5.7)[E]	2.0 (0.6-7.3)[E]	1.8 (0.5-6.5)[E]	1.7 (0.5-6.0)[E]
Prince Rupert Regional Hospital	S,R,N	1.2 (0.2-6.6)[E]	2.3 (0.6-8.4)[E]	1.1 (0.2-6.2)[E]	1.0 (0.2-5.5)[E]	3.1 (1.0-9.0)[E]
Princeton General Hospital	S,C,N	0.0	11.8 (3.2-42.9)[E]	6.4 (1.1-36.4)[E]	11.5 (3.2-42.0)[E]	6.2 (1.1-34.9)[E]
Queen Charlotte Islands General Hospital	S,C,N	0.0	0.0	0.0	0.0	0.0
Queen Victoria Hospital and Health Centre	S,C,N	10.0 (3.4-29.4)[E]	3.0 (0.5-16.9)[E]	0.0	0.0	3.3 (0.6-18.9)[E]
Queens Park Hospital	M,C,N	14.1 (9.8-20.4)	9.9 (6.7-14.6)	9.4 (6.7-13.1)	4.9 (3.0-7.8)	3.3 (1.8-5.9)

Acute care facility	Facility type[i]	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
Richmond Hospital	M,R,Y	6.5 (4.8-8.9)	7.5 (5.6-9.9)	6.8 (5.1-9.1)	7.8 (6.0-10.2)	6.4 (4.8-8.5)
Ridge Meadows Hospital	M,R,N	3.3 (2.1-5.3)	3.4 (2.2-5.3)	8.4 (6.4-11.0)	4.2 (2.9-6.1)	2.9 (1.9-4.5)
Royal Columbian Hospital	L,T,Y	7.9 (6.6-9.5)	12.6 (11.0-14.5)	12.9 (11.3-14.8)	9.7 (8.3-11.3)	5.2 (4.2-6.4)
Royal Inland Hospital	M,T,N	2.5 (1.6-3.9)	2.3 (1.5-3.6)	4.3 (3.1-6.0)	5.5 (4.1-7.3)	6.2 (4.8-8.1)
Royal Jubilee Hospital	L,T,Y	7.9 (6.5-9.7)	4.3 (3.3-5.7)	4.5 (3.5-5.9)	3.7 (2.8-4.9)	4.6 (3.5-5.9)
RW Large Hospital	S,C,N	0.0	0.0	0.0	0.0	0.0
Saanich Peninsula Hospital	M,C,N	11.2 (7.4-17.0)	1.3 (0.5-3.9)[E]	2.6 (1.2-5.7)	2.3 (1.0-5.5)	3.2 (1.5-7.0)
Shuswap Lake General Hospital	S,C,N	4.0 (1.8-8.7)	6.3 (3.4-11.5)	5.6 (2.9-10.6)	3.8 (1.7-8.2)	5.5 (2.9-10.4)
South Okanagan General Hospital	S,C,N	5.3 (1.8-15.5)[E]	6.1 (2.4-15.8)[E]	0.0	3.3 (0.9-11.9)[E]	3.3 (0.9-11.9)[E]
Squamish General Hospital	S,C,N	4.4 (1.2-16.0)[E]	0.0	7.5 (2.9-19.2)[E]	1.9 (0.3-10.7)[E]	3.9 (1.1-14.4)[E]
St. John Hospital	S,C,N	0.0	5.0 (1.7-14.6)[E]	0.0	4.3 (1.4-12.5)[E]	0.0
St. Joseph's General Hospital	M,R,N	5.3 (3.2-8.7)	2.6 (1.3-5.0)	4.0 (2.3-6.8)	4.1 (2.4-6.9)	2.4 (1.2-4.8)
St. Mary's Hospital	S,C,N	3.4 (1.5-8.0)	5.4 (2.7-10.6)	4.9 (2.4-10.1)	5.1 (2.5-10.5)	0.0
St. Paul's Hospital	L,T,Y	9.9 (8.4-11.6)	10.2 (8.7-11.9)	10.1 (8.6-11.9)	9.1 (7.6-10.7)	6.9 (5.7-8.4)
Stuart Lake Hospital	S,C,N	0.0	0.0	0.0	0.0	0.0
Surrey Memorial Hospital	L,T,Y	14.1 (12.5-16.0)	13.1 (11.6-14.8)	14.4 (12.9-16.1)	8.2 (7.0-9.5)	3.9 (3.1-4.8)
Tofino General Hospital	S,C,N	0.0	0.0	0.0	0.0	18.8 (5.2-68.3)[E]
UBC Hospital	S,R,Y	0.9 (0.2-5.2)[E]	2.9 (1.0-8.4)[E]	0.0	0.0	2.0 (0.5-7.2)[E]
University Hospital of Northern BC	M,T,Y	3.5 (2.4-5.2)	4.8 (3.4-6.7)	4.3 (3.1-6.0)	3.5 (2.4-5.1)	3.1 (2.1-4.6)
Vancouver General Hospital	L,T,Y	12.1 (10.7-13.6)	11.4 (10.1-12.9)	12.0 (10.7-13.5)	9.8 (8.7-11.1)	6.5 (5.6-7.6)
Vernon Jubilee Hospital	M,R,N	15.5 (12.4-19.4)	6.6 (4.7-9.2)	3.3 (2.1-5.3)	5.4 (3.7-7.7)	5.4 (3.8-7.8)
Victoria General Hospital	L,T,Y	3.0 (2.2-4.2)	2.9 (2.1-4.1)	2.1 (1.4-3.1)	1.8 (1.1-2.7)	1.3 (0.8-2.2)
West Coast General Hospital	M,C,N	3.2 (1.5-7.0)	4.7 (2.5-9.0)	1.6 (0.5-4.7)[E]	1.9 (0.8-5.0)[E]	2.9 (1.3-6.4)
Wrinch Memorial Hospital	S,R,N	0.0	3.9 (0.7-21.9)[E]	3.0 (0.5-17.2)[E]	6.1 (1.7-22.1)[E]	9.6 (3.3-28.3)[E]

i. Letter in the hospital type represents: S: hospital with 1-50 beds, M: hospital with 51-250 beds, L: hospital with >250 beds, C: Community hospital, R: Regional hospital, T: Tertiary/Referral hospital, N: Non-teaching hospital, Y: Teaching hospital.

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

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

iv. Formerly known as Masset Hospital.

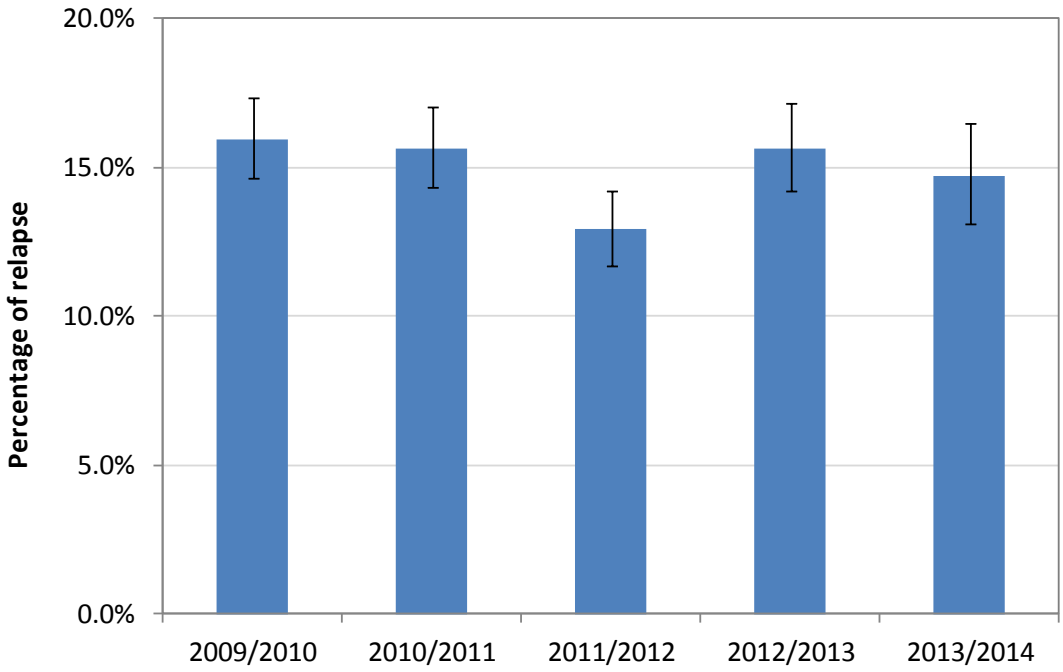
E. Indicates an estimated rate that the difference between the upper limit and lower limit of 95% CI was greater than twice the rate, thus the rate may not be reliable.

Notes: Please see "Data limitations" in the section "About CDI surveillance program" for the changes in the case definition and identification over time, and the variations among health authorities in the laboratory testing for detection of *C. difficile* and how the surveillance protocol has been applied. Direct comparison of the numbers of CDI rate between individual hospitals is not recommended.

Relapse of healthcare-associated CDI

Of the 1,679 HCA CDI cases reported in FY 2013/2014, 368 cases were relapses (14.7%). There was no statistically significant change in the proportion of relapses in FY 2013/2014 at the provincial level compared with the previous four fiscal years (Figure 5). The proportion of relapses did not differ significantly by hospital size, hospital category, or teaching status. Please note that variations existed in applying the definition of relapse CDI among HAs: four of six HAs defined a relapse as recurrence of CDI within two to eight weeks from the previous CDI diagnosis with or without treatment, while the other two HAs applied a condition that the diarrhea related to prior CDI must be resolved for a certain period, i.e. a symptom-free period before applying the period of two-eight weeks for defining relapse of CDI (see "Data limitations" in the section "About CDI surveillance program").

Figure 5. Proportion of relapses among healthcare-associated CDI cases by fiscal year



Note: The bars in the chart represent 95% confidence intervals of the percentage.

Complications within 30 days of diagnosis

CDI cases are evaluated at 30 days post-diagnosis or up to the point of patient discharge or transfer (whichever comes first) for CDI-associated complications, which include admission to the intensive care unit (ICU), toxic megacolon, and entire or partial colectomy due to CDI. Among the 2,331 CDI cases reported in FY 2013/2014 (excluding 47 cases from PHSA, which stopped collecting CDI-associated complications from FY 2013/2014), 75 (3.2%) were admitted to ICU, 17 (0.7%) developed toxic megacolon, and 31 (1.3%) required entire or partial colectomy. Table 7 shows the details of CDI-associated complications by HA. Please note that variations may exist in how the criteria for CDI-associated complications, especially CDI-associated ICU admissions, were applied in each HA and healthcare facility. For example, the admissions to ICU due to other medical conditions than CDI, or CDI developed during the patient's stay in ICU may be included in some facilities.

Table 7. Number and percentage of CDI-associated complications within 30 days of diagnosis by health authority and fiscal year

Complications	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
ICU admission					
IHA	33 (5.3%)	37 (5.7%)	8 (1.9%)	26 (5.1%)	20 (4.6%)
FHA	108 (8.1%)	94 (6.5%)	124 (7.5%)	108 (8.6%)	37 (5.0%)
VCHA	8 (0.8%)	12 (1.1%)	8 (0.8%)	5 (0.5%)	4 (0.5%)
VIHA	23 (6.0%)	7 (2.0%)	6 (1.6%)	3 (0.8%)	4 (1.2%)
NHA	2 (3.9%)	6 (7.6%)	3 (3.8%)	3 (3.4%)	10 (11.5%)
PHSA	1 (2.2%)	0 (0.0%)	0 (0.0%)	1 (1.5%)	N/A*
Toxic megacolon					
IHA	6 (1.0%)	8 (1.2%)	2 (0.5%)	2 (0.4%)	6 (1.4%)
FHA	20 (1.5%)	31 (2.2%)	29 (1.8%)	15 (1.2%)	7 (0.9%)
VCHA	2 (0.2%)	4 (0.4%)	6 (0.6%)	2 (0.2%)	1 (0.1%)
VIHA	7 (1.8%)	5 (1.4%)	2 (0.5%)	3 (0.8%)	3 (0.9%)
NHA	1 (2.0%)	0 (0.0%)	1 (1.3%)	0 (0.0%)	0 (0.0%)
PHSA	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.5%)	N/A*
Entire or partial colectomy					
IHA	7 (1.1%)	7 (1.1%)	2 (0.5%)	6 (1.2%)	11 (2.5%)
FHA	25 (1.9%)	13 (0.9%)	23 (1.4%)	43 (3.4%)	14 (1.9%)
VCHA	5 (0.5%)	10 (0.9%)	10 (1.0%)	0 (0.0%)	1 (0.1%)
VIHA	7 (1.8%)	2 (0.6%)	4 (1.1%)	2 (0.6%)	5 (1.5%)
NHA	1 (2.0%)	0 (0.0%)	1 (1.3%)	0 (0.0%)	0 (0.0%)
PHSA	1 (2.2%)	0 (0.0%)	0 (0.0%)	1 (1.5%)	N/A*

* PHSA stopped collecting and submitting the data of CDI-associated complication from FY 2013/2014

Discussion

There has been a dramatic change in the epidemiology of CDI since the turn of the 21st century, noted by a marked increase in incidence and severity, and occurring at a disproportionately higher frequency in older patients [2,5]. Recent studies reported that after steady increases over the past decade, the rate of HCA CDI appears to have plateaued or even fallen in recent years [6-9]. This has been largely attributed to stricter guidelines on antibiotic use, case management, and environmental cleaning [10]. However, it is not entirely clear whether the decreased incidence is due to the success of expanded prevention and control efforts, changes in the prevalence of epidemic strains (i.e., ribotype 027), or perhaps a combination of factors [5].

A number of jurisdictions in Canada [7], the United States [8], and the United Kingdom [9] have reported reductions in the rates of CDI after mandatory public reporting of hospital-acquired infections was introduced. An overall downward trend in CDI rate in BC acute care facilities has been observed since the inception of provincial CDI surveillance program with public reporting the provincial results. Especially in the past two years, the CDI rate decreased remarkably in some large acute care facilities. It is likely that public reporting elevated *CDI* to greater prominence on hospital quality improvement agendas, and motivated hospitals to adhere more closely to best practices in *CDI* prevention.

Another notable change in the epidemiology of CDI in the past decade has been the apparent increased incidence among populations in the community that were historically considered to be at low risk, such as healthy peripartum women, children, antibiotic-naive patients, and those with minimal or no recent health care exposure [5]. Data from North America and Europe suggested that approximately 20% to 27% of all CDI cases are community associated, with an incidence of 20 to 30 per 100,000 population [11]. The proportion of CDI classified as community-associated has also increased in BC acute care facilities over the past 5 years. However, the data in this report represent CDI cases that were identified in the acute care facilities only, and therefore likely underestimate the incidence of community-associated CDI and the total burden of CDI on the overall healthcare system.

Direct comparisons between HAs and between healthcare facilities should not be made. The rates of CDI in this report were not risk adjusted. Laboratory testing methodology and at-risk populations also varied by HA. In addition, this report is subject to the data limitations described below in the "About CDI surveillance program" section. Due to the unique circumstances and challenges faced, each HA is in the best position to respond to the incidence of CDI in its region and in its affiliated healthcare facilities.

Acknowledgements

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

About the CDI surveillance program

Purpose of CDI surveillance

The provincial *Clostridium difficile* infection (CDI) surveillance program is a collaboration between PICNet and all the health authorities in BC, and includes all 80 acute care facilities across the province. The main purpose of this CDI surveillance program is to collect data on CDI incidence for monitoring the rates and trends of healthcare-associated CDI in BC acute care facilities, and providing the baseline information for CDI intervention programs in BC.

Population under surveillance

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

Outpatient visits to acute care facilities, patients in extended care and psychiatric beds housed in the acute care facilities, and short-term emergency room admissions are excluded. Patients under one year of age are also excluded from this surveillance.

Data collection and reporting

The definitions of CDI cases and core data elements for provincial surveillance were developed by PICNet's Surveillance Steering Committee (SSC) based on the surveillance protocol for CDI within healthcare institutes developed by the Canadian Nosocomial Infection Surveillance program (CNISP). The protocol is reviewed annually. Each HA incorporated the core data elements into their CDI surveillance form and database to standardize data collection. Data on individual cases of CDI are collected daily by infection control practitioners (ICP) and managed at the HA level. After the end of each fiscal quarter, HAs aggregate their CDI cases by facility and CDI classification, and submit the data to PICNet, along with facility-specific denominators. PICNet then consolidates the aggregated data for provincial analysis and reporting. At the end of each fiscal year (FY), the HAs provide updates on their quarterly data submission. The data are analyzed quarterly and annually for public reporting. Data updated after the data submission deadline may not be reflected in each quarterly report, but will be presented in the next report.

Data limitations

Although the standard surveillance protocol was developed by PICNet's Surveillance Steering Committee, variations exist in the methodologies of CDI identification and inclusion criteria for case definition and classification among the acute care facilities and HAs.

Laboratory detection of *C. difficile*: Various laboratory testing methods have been used by BC laboratories to confirm CDI diagnosis, including enzyme immunoassay (EIA), cell culture cytotoxicity, toxigenic culture, and polymerase chain reaction (PCR). The sensitivity and specificity of these methods varies greatly, from <50% to >99%[9]. In particular, the recently developed PCR testing, which has sensitivity as much as twice the toxin EIA for detection of *C. difficile*, was introduced into BC laboratories by the HAs to enhance CDI diagnosis. The start date of implementing PCR testing or

including PCR testing as part of a two-step testing algorithm varied by HA and facility: VCHA implemented PCR testing on June 27, 2008; PHC on August 2, 2010; FHA on October 26, 2011 in four facilities and on March 19, 2012 for the remaining facilities; and PHSA in November 2011. IHA introduced PCR testing to one facility in September 2009 and the two-step algorithm to the remaining facilities next year. VIHA introduced the two-step algorithm on April 1, 2011. NHA started two-step algorithm in October 5, 2012. Shifting to PCR testing or including PCR as part of a two-step algorithm testing from conventional toxin EIA may result in more specimens being identified positive with *C. difficile* by the laboratory, and thus more CDI cases diagnosed. The intensity of specimen screening in each facility can also affect the case identification.

Case definition and classification: Review of medical charts is required to confirm CDI cases and apply classification, which is based on the symptom onset of CDI and patient's healthcare encounter history. The quality of the medical chart documentation varies by facility and by healthcare provider, and the ability to determine healthcare encounter history depends on the availability and accessibility of the patient information system used in each hospital or HA, which will affect classification of the case as either healthcare-associated or community-associated.

The "look-back" period for healthcare encounter history was eight weeks in FY 2009/2010 with all HAs with the exception of PHC, which used a four-week period. From FY 2010/2011, the look-back period was modified to four weeks, in alignment with the changes made by the Canadian Nosocomial Infection Surveillance Program (CNISP), for all HAs except IHA, which continues to use an eight-week period. FHA applied the four-week look-back period retrospectively to their cases in FY 2009/2010. The change in the "look-back" period from eight weeks to four weeks may result in a decrease in the number of cases classified as HCA and an increase in CA. An evaluation in one HA found that change may affect about 2% of cases in their classification.

There are variations among HAs in how strictly CDI case definitions are applied, especially the frequency of episodes of diarrhea, which was defined as three or more loose stools within a 24-hour period. It was assumed that any stool sent to the laboratory for *C. difficile* testing was from a patient that has had at least three episodes of loose stools in a 24-hour period. From 2012, FHA and PHSA began to apply the frequency of documented diarrheal episodes stringently with chart review in defining their cases. In addition, IHA and FHA require resolution of diarrhea from 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.

Variation also exists in CDI case classification. IHA put all CDI cases (both new cases and relapses) that were not associated with the reporting facility under the category "Community-associated" before 2010/11. From 2011/2012, IHA began to assign the cases of healthcare-associated CDI that were associated with another acute care facility within IHA to the appropriate facility, the cases that were associated with the facilities out of IHA as "healthcare-associated with another facility", and the remaining cases as "Community-associated". FHA includes CDI cases identified among mental health inpatients occupying acute care beds, while the other HAs exclude these. PHC defines another facility as a facility that is within PHC, and classifies the cases of CDI that were not associated with PHC facilities as "Not-PHC-associated"; the latter were merged into the "Unknown" category in this report. PHSA classifies all CDI cases other than those associated with the reporting facility as "Community-associated" or "Unknown", including the cases which may be associated with another healthcare facility. In addition, the community-associated (termed as not-healthcare-associated in FY 2010/2011) CDI cases are no longer further classified into new cases or relapses since FY 2011/2012.

Denominator data: Acute care inpatient days are used as the denominator to calculate the CDI rates at the provincial, HA, and healthcare facility level. These data are collected by each HA from their information systems. There was some variation in what was included in the inpatient days due to the inability of some HAs to separate the patients under surveillance from other patients in their denominator dataset. In addition, VCHA (except PHC) include patients less than one year of age in their inpatient days, and FHA includes psychiatric inpatient days in their denominator.

Variations may also exist in the clinical practice and healthcare services provided by each healthcare facility, as well as population served, which may affect the incidence of CDI in the facility.

Glossary

Acute care facility

Acute care is a branch of healthcare where a patient receives active but short-term treatment for a severe injury or episode of illness, an urgent medical condition, or during recovery from surgery or specialist diagnostic procedures. In this report, acute care facility refers to the hospitals in BC that provide acute care to the patients who are admitted to a care unit(s) in the facility for a short period of time, e.g. at least overnight stay or ≥24 hours. The patient is discharged as soon as their medical condition is stable.

Clostridium *difficile* Infection (CDI)

CDI, under PICNet CDI surveillance, is defined as:

- presence of diarrhea* or toxic megacolon without other known etiology, AND laboratory confirmation of the presence of *C. Difficile* toxin A and/or B (positive toxin, or culture with evidence of toxin production, or detection of toxin genes)

OR

- diagnosis of typical pseudo-membranous colitis on sigmoidoscopy or colonoscopy

OR

- histological/pathological diagnosis of CDI with or without diarrhea

** Diarrhea is defined as persistent liquid or loose stools (e.g. passing liquid or loose stools three or more times per day for more than 24 hours), or more frequently than is normal for the patient. It is assumed that any stool sent to the laboratory for C. difficile testing is from a patient that has had at least three episodes of loose stools in a 24-hour period.*

Community-associated (CA) CDI

A CDI case (as defined above) with symptom onset in the community or three calendar days or less after admission to a healthcare facility, provided that symptom onset was more than four weeks after the last discharge from a healthcare facility.

Complications

Complications under PICNet's CDI surveillance include ICU admission, toxic megacolon, and entire or partial colectomy due to CDI. Other complications associated with CDI are excluded from the surveillance. Relapses are included in the CDI surveillance, but are reported separately.

Confidence interval (CI)

A confidence interval gives an estimated range of values which is likely to include an unknown population parameter to indicate the reliability of an estimate. The 95% CI of the rate and proportion in this report are calculated using Wilson score intervals[10].

Fiscal quarter and calendar quarter

Fiscal quarter (FQ) is a specified period within a budget or financial year. There are four FQs in a fiscal year. Start and end dates of each FQ vary from year to year. Calendar Quarter is a period of

three consecutive months starting on the first day of January, April, July or October. Below is the start and end date of each quarter for the fiscal year from 2009/2010 to 2011/2012:

Start and end date of quarters for this report

Fiscal year	Quarter code	Fiscal quarter		Calendar quarter	
		Start date	End date	Start date	End date
2009/2010	**Q1**	01-Apr-2009	25-Jun-2009	01-Apr-2009	30-Jun-2009
	Q2	26-Jun-2009	17-Sep-2009	01-Jul-2009	30-Sep-2009
	Q3	18-Sep-2009	10-Dec-2009	01-Oct-2009	31-Dec-2009
	Q4	11-Dec-2009	31-Mar-2010	01-Jan-2010	31-Mar-2010
2010/2011	**Q1**	01-Apr-2010	24-Jun-2010	01-Apr-2010	30-Jun-2010
	Q2	25-Jun-2010	16-Sep-2010	01-Jul-2010	30-Sep-2010
	Q3	17-Sep-2010	09-Dec-2010	01-Oct-2010	31-Dec-2010
	Q4	10-Dec-2010	31-Mar-2011	01-Jan-2011	31-Mar-2011
2011/2012	**Q1**	01-Apr-2011	23-Jun-2011	01-Apr-2011	30-Jun-2011
	Q2	24-Jun-2011	15-Sep-2011	01-Jul-2011	30-Sep-2011
	Q3	16-Sep-2011	08-Dec-2011	01-Oct-2011	31-Dec-2011
	Q4	09-Dec-2011	31-Mar-2012	01-Jan-2012	31-Mar-2012
2012/2013	**Q1**	01-Apr-2012	21-Jun-2012	01-Apr-2012	30-Jun-2012
	Q2	22-Jun-2012	13-Sep-2012	01-Jul-2012	30-Sep-2012
	Q3	14-Sep-2012	06-Dec-2012	01-Oct-2012	31-Dec-2012
	Q4	07-Dec-2012	31-Mar-2013	01-Jan-2013	31-Mar-2013
2013/2014	**Q1**	01-Apr-2013	20-Jun-2013	01-Apr-2013	30-Jun-2013
	Q2	21-Jun-2013	12-Sep-2013	01-Jul-2013	30-Sep-2013
	Q3	13-Sep-2013	05-Dec-2013	01-Oct-2013	31-Dec-2013
	Q4	07-Dec-2013	31-Mar-2014	01-Jan-2014	31-Mar-2014

Fiscal year (FY)

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

Healthcare-associated (HCA) with the reporting facility

- A CDI case occurring more than three calendar days after admission to an acute care facility, where the CDI was reported, AND the case has not had CDI in the past eight weeks,

  OR

- A *CDI* case with symptom onset in the community or three calendar days or less after admission to an acute care facility where the CDI was reported, provided that symptom onset was less than four weeks after the last discharge from that acute care facility.

Healthcare-associated (HCA) with another healthcare facility

A case with symptom onset three calendar days or less after admission to an acute care facility; AND the case was admitted to another healthcare facility (including acute care and long-term care facilities either within or outside the health authority) for a period of at least overnight within the last four weeks; AND the case has not had CDI in the past eight weeks.

Health authority (HA)

A health authority manages and delivers healthcare services. There are five regional Health Authorities in BC which govern, plan, and coordinate services regionally within sixteen health service delivery areas, and the Provincial Health Services Authority, which coordinates and/or provides provincial programs and specialized services.

The six HAs in BC are:

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

Hospital category

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

- Tertiary/referral hospital refers to a major hospital that provides a wide range of acute in-patient and out-patient specialist services together with the necessary support systems for the patients across the health authority, 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.

Inpatient day

An accounting unit used by healthcare facilities and healthcare planners. Each day represents a unit of time during which the services of the institution or facility are used by a patient; thus 50 patients in a hospital for 1 day would represent 50 inpatient days. The report uses the inpatient days as denominator to calculate the rate of CDI.

New cases of CDI

- A CDI case without previous history of CDI

  OR

- *A* CDI *case that has not had an episode of CDI in the previous eight weeks*

Nosocomial infection

Infection associated with admission to the reporting healthcare facility.

Polymerase chain reaction (PCR)

A laboratory testing method used to detect *C. difficile* toxin genes from the samples.

Rate per 10,000 inpatient days

$$\text{Rate per 10,000 inpatient days} = \frac{\text{Number of CDI cases in a defined period}}{\text{Total inpatient days during the same period}} \times 10{,}000$$

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

Relapse of CDI

Recurrence of CDI episode within two to eight weeks after previous CDI diagnosis (as determined by the date of specimen collection or diagnosis by endoscopy or pathological specimen) provided that CDI symptoms from the earlier episode resolved with or without treatment. A relapse is to be attributed to the association of the original infection (i.e., healthcare-associated or community-associated).

Note: Recurrence of CDI episode less than two weeks from the previous CDI diagnosis is considered to be a continuation of the previous episode, and not a relapse. The recurrence of CDI after eight weeks is considered as a new case of CDI.

Statistical significance

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

Teaching hospital

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

Trend test

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

$p < 0.05$ of a two-tailed test.

Unknown association

A CDI case where there is insufficient information on healthcare admission and/or discharge to classify whether it is healthcare-associated or not.

Surveillance Steering Committee

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

PICNet's **Surveillance Steering Committee** 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 2013/2014 were:

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

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A program of the Provincial Health Services Authority

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Province-wide solutions. Better health.