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

Clostridium difficile Infection (CDI) Surveillance Report

Quarter 1 and Quarter 2, 2011/2012

Prepared by:

Provincial Infection Control Network of British Columbia (PICNet)

February 2012

fraserhealth
Better health. Best in health care.

northern health
the northern way of caring

Interior Health

VANCOUVER ISLAND health authority

Vancouver CoastalHealth
Promoting wellness. Ensuring care.

Provincial Health Services Authority
Province-wide solutions. Better health.

Provincial Infection Control Network of BC (PICNet)
555 West 12th Avenue, Suite 400 East Tower, Room 413/414
Vancouver, BC V5Z 3X7
www.picnet.ca
Tel: 604-707-2667
Fax: 604-707-2649
Email: picnet@phsa.ca

Table of Contents

Glossary of 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
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
SSC	PICNet's Surveillance Steering Committee
VCHA	Vancouver Coastal Health Authority
VIHA	Vancouver Island Health Authority

Summary

This semi-annual report presents the cases of *Clostridium difficile* infection (CDI) reported in quarter 1 (Q1) and quarter 2 (Q2) of fiscal year (FY) 2011/2012 (April 1, 2011 to September 15, 2011), with a focus on the *new* infections associated with the reporting facility.

A total of 1,496 cases of CDI were reported in Q1 and Q2 of FY 2011/2012, of which 887 cases (59.3%) were defined as new infections associated with the reporting facility.

The provincial rate of new infections associated with the reporting facility was 7.1 (95% confidence interval (CI): 6.4-7.8) per 10,000 inpatient days in Q1, and 7.7 (95% CI: 7.0-8.4) in Q2. Compared with the annual provincial rate of 8.3 (95% CI: 8.0-8.7) per 10,000 inpatient days in FY 2010/2011, this decrease was statistically significant in Q1, but not in Q2. The decreasing trend in the rate of new CDI was statistically significant from the first quarter of 2009/2010 ($p < 0.01$ for trend).

The rate of new infections associated with the reporting facility varied by Health Authority (HA). Compared with the annual rates of each HA in FY 2010/2011, the rates decreased for each HA except PHSA. The decrease was statistically significant for IHA; the increase for PHSA was not significant.

The rate of new infections associated with the reporting facility was lowest in those hospitals with 50 or fewer beds [2.7 (95% CI: 1.9-3.8) per 10,000 inpatient days] and highest in the hospitals with more than 250 beds [9.4 (95% CI: 8.7-10.2) per 10,000 inpatient days]. Compared with the annual rates in FY 2010/2011, the rates decreased in hospitals of all sizes, but the decrease was only significant for those hospitals with more than 250 beds in Q1.

For most large facilities, there were no significant changes in the rate for the combined period Q1 and Q2 of FY 2011/2012 when compared with the facilities' annual rate of the previous year, whereas the rates in the small facilities varied substantially from reporting period to reporting period due to the small denominators.

Relapses accounted for 15.5% of healthcare-associated CDI. Of all CDI cases, 66 (4.4%) were admitted to ICU, 16 (1.1%) developed toxic megacolon, and 18 (1.2%) required a total or partial colectomy.

This report aims to increase the understanding of the patterns and characteristics of CDI in BC. The rates of CDI presented are not risk-adjusted, and therefore not directly comparable between Health Authorities and facilities.

Introduction

Clostridium difficile infection (CDI) is a leading cause of healthcare-associated infectious diarrhea, and is associated with increased healthcare costs, prolonged hospitalization, and patient morbidity[1]. The disease can range from mild self-limited diarrhea to severe diarrhea, pseudomembranous colitis, toxic megacolon, and even death.

Since 2006, the Provincial Infection Control Network of BC (PICNet), in collaboration with representatives from Interior Health Authority (IHA), Fraser Health Authority (FHA), Vancouver Coastal Health Authority (VCHA), Providence Health Care (PHC), Vancouver Island Health Authority (VIHA), Northern Health Authority (NHA), and Provincial Health Services Authority (PHSA), has been developing a standardized provincial surveillance system to monitor the incidence of CDI in BC acute care facilities. A standard case definition of CDI and minimum surveillance datasets were developed by PICNet's Surveillance Steering Committee (SSC). The cases of CDI are classified as healthcare-associated (HCA) or community-associated (CA) according to the patient's healthcare encounter history[2]. The HCA cases are further classified into two categories: those infections associated with the reporting facility (nosocomial), and those infections associated with another facility. A CDI case with a previous CDI episode within two to eight weeks is defined as a relapse. Since April 2009, every Health Authority (HA) has submitted CDI surveillance data to PICNet on a quarterly basis. This semi-annual report presents the cases of CDI reported in quarter 1 (Q1) and quarter 2 (Q2) of fiscal year (FY) 2011/2012.

Please note that the data in this report should be interpreted with caution. Comparison of the numbers of cases and rates among Health Authorities (HA) and healthcare facilities is not recommended. There are many factors that can affect the incidence and rate of CDI, including the size of the facilities, health conditions and medical history of the population served, the complexity of the services offered, the physical layout of the facilities, the proportion of patient population older than 55, the strain of *C. difficile* identified, and the laboratory methods used for detection. Facilities with small numbers of cases may have unstable rates and percentages; therefore slight changes in the number of cases can dramatically affect the rate and percentage. To ensure patient confidentiality, facilities reporting case numbers less than 10 are reported as "<10". In addition, reference to healthcare-associated infections (HAI) should not be interpreted as cases of infection acquired directly through healthcare services provided by the reporting facility or other healthcare facilities. Please see the "About this report" section for other limitations.

[1] Ghantoji SS, et al (2010). Journal of Hospital Infection 74, 309-318
[2] See Glossary for definitions

Surveillance results

Population under surveillance

Patients who were admitted to BC acute care facilities for acute care were under surveillance for CDI. Table 1 summarizes the population under CDI surveillance for Q1 and Q2 of FY 2011/2012, and estimated population in each HA in 2011.

Table 1. Summary of population under surveillance by Health Authority, quarter 1 and quarter 2 of fiscal year 2011/2012

Health Authority	Number of acute care facilities[1]	Average acute care beds[2]	Total acute care admissions	Total acute care Inpatient Days	Estimated population in 2011[3]
IHA[4]	13	891	28,516	163,777	741,619[5]
1-50 beds	9	138	4,331	23,078	
51-250 beds	3	440	14,505	84,832	
>250 beds	1	313	9,680	55,867	
FHA	14	2,354	52,054	434,710	1,635,340
1-50 beds	4	107	2,402	20,129	
51-250 beds	6	836	17,561	150,622	
>250 beds	4	1,411	32,091	263,959	
VCHA[6]	11	1,769	36,700	281,261	1,151,320
1-50 beds	6	160	3,873	19,046	
51-250 beds	3	529	13,365	88,305	
>250 beds	2	1,080	19,462	173,910	
VIHA	13	1,332	29,606	214,404	765,849
1-50 beds	5	54	858	6,274	
51-250 beds	5	376	8,709	60,491	
>250 beds	3	902	20,039	147,639	
NHA[7]	18	552	13,814	83,048	289,974
1-50 beds	17	349	8,820	47,332	
51-250 beds	1	203	4,994	35,716	
PHSA	2	195	6,450	25,820	N/A
51-250 beds	2	195	6,450	25,820	
Total	**71**	**7,093**	**167,140**	**1,203,020**	**4,584,102**

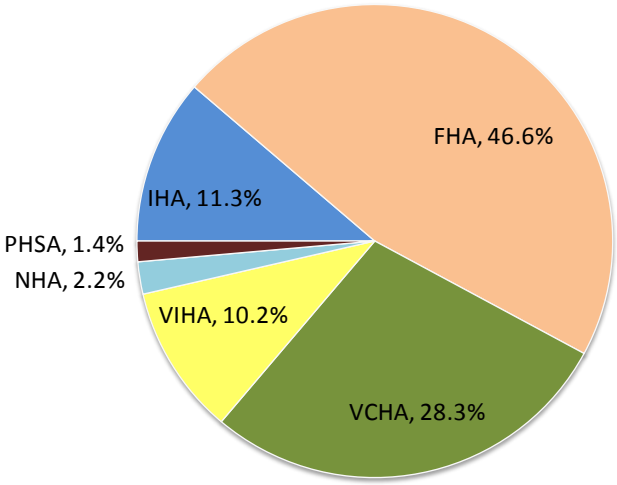
Note:

1. Number of beds varied by quarter due to temporary closure of acute care beds by facilities. The hospital size was based on the acute care beds in Q2 of FY 2011/2012.
2. Q1 and Q2 of FY 2011/2012 only
3. BC Stats. Population projections (P.E.O.P.L.E. 36). http://www.bcstats.gov.bc.ca/
4. Excluded from this report are nine facilities in IHA that did not have data available for Q1 and Q2 of FY 2011/2012 due to information system upgrades in progress.
5. Includes all estimated population within IHA
6. Includes PHC; the same hereinafter.
7. Acute care data for Q2 of FY 2011/2012 for NHA were estimated based on the Q1 data of the same year

Overview of CDI cases

A total of 1,496 cases of CDI were reported during this period. The distribution of CDI cases by HA is presented in Figure 1, reflecting the variation in population served and healthcare services provided in each HA.

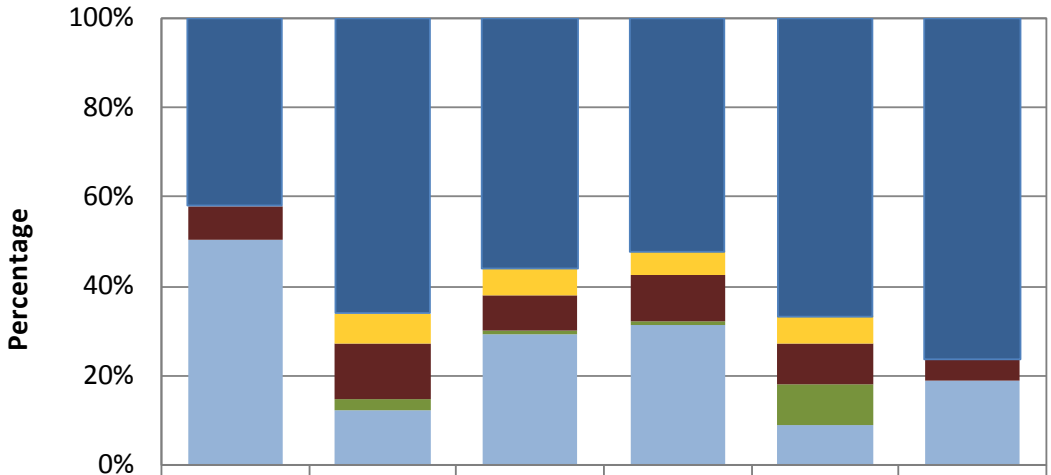
Figure 1. Distribution of CDI cases by Health Authority, quarter 1 and quarter 2 of fiscal year 2011/2012



Classification of CDI cases

Standard surveillance case definition was developed by the SSC, and despite some variation in how CDI cases were classified by HA (See Glossary and the "Limitations" in the "About this report" section), the definition of *new* CDI cases associated with the reporting facility was comparable across all HAs. Of all 1,496 cases of CDI reported, 887 were classified as new infections associated with the reporting facility (59.3%). The percentage of new infections associated with the reporting facility over the total number of CDI cases varied by HA (Figure 2).

Figure 2. Proportion of CDI cases by case classification and Health Authority, quarter 1 and quarter 2 of fiscal year 2011/2012



	IHA	FHA	VCHA	VIHA	NHA	PHSA
New Infection associated with reporting facility	42.0%	66.1%	56.0%	52.3%	66.7%	76.2%
New Infection associated with another facility	N/A[1]	6.6%	5.9%	5.2%	6.1%	N/A[2]
Relapse associated with reporting facility	7.7%	12.3%	8.0%	10.5%	9.1%	4.8%
Relapse associated with another Facility	N/A[1]	2.6%	0.7%	0.7%	9.1%	N/A[2]
Community-associated/ Unknown	50.3%	12.3%	29.3%	31.4%	9.1%	19.0%

Health Authority

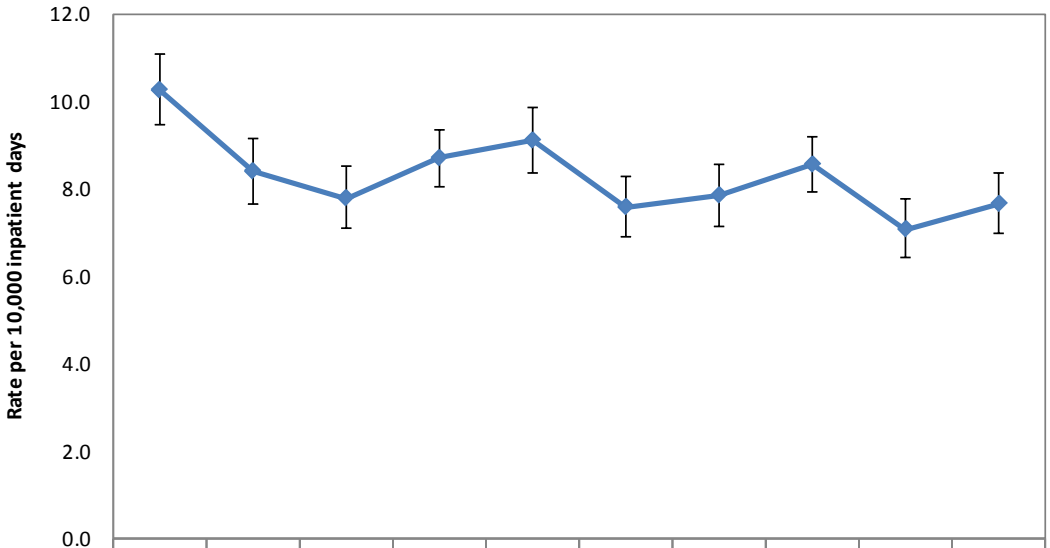
Note:

1. IHA classified the cases other than those associated with reporting facilities as "Community-associated"
2. PHSA classified the cases other than those associated with reporting facilities as "Community-associated/Unknown"

Provincial rate of new CDI associated with the reporting facility

There were 428 CDI cases reported as new infection associated with the reporting facility in Q1 of FY 2011/2012, and 459 in Q2. The provincial rate of new infections associated with the reporting facility per 10,000 inpatient days was 7.1 (95% confidence interval (CI): 6.4-7.8) for Q1 and 7.7 (95% CI: 7.0-8.4) for Q2. Compared with the annual provincial rate of 8.3 (95% CI: 8.0-8.7) in FY 2010/2011, the rate decreased in both Q1 and Q2 of FY 2011/2012. This decrease was significant for Q1. The decreasing trend in the rate of new CDI was statistically significant from the first quarter of 2009/2010 ($p < 0.01$ for trend) (Figure 3).

Figure 3. Provincial rate of new infections associated with the reporting facility per 10,000 inpatient days and 95% confidence interval by fiscal year and quarter*



	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
	2009/2010				2010/2011				2011/2012	
Provincial rate of new infection associated with reporting facility	10.3	8.4	7.8	8.7	9.1	7.6	7.9	8.6	7.1	7.7

Fiscal year and quarter*

Note: * 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"). The same hereinafter.

CDI rate by Health Authority

The rate of new infections associated with the reporting facility varied by HA (Table 2). For each HA, there were no significant changes in the rate between Q1 and Q2. Compared with the annual rate of each HA for FY 2010/2011, the rates decreased for each HA except PHSA. The decrease was statistically significant in IHA, while the increase for PHSA was not significant.

Table 2. Rate of new infections associated with the reporting facility per 10,000 inpatient days and 95% confidence interval by Health Authority

Health Authority	Fiscal year 2011/2012			Fiscal year 2010/2011
	Q1	Q2	Total	
IHA	4.0 (2.9-5.6)	4.6 (3.4-6.3)	4.3 (3.4-5.4)	6.6 (5.8-7.4)
FHA	10.6 (9.3-12.0)	10.6 (9.3-12.1)	10.6 (9.7-11.6)	11.2 (10.6-11.9)
VCHA	7.5 (6.2-9.1)	9.3 (7.9-11.1)	8.4 (7.4-9.6)	9.9 (9.1-10.7)
VIHA	3.7 (2.7-5.1)	3.7 (2.7-5.1)	3.7 (3.0-4.6)	4.6 (4.0-5.2)
NHA	2.6 (1.5-4.7)	2.6 (1.5-4.7)	2.6 (1.7-4.0)	2.8 (2.1-3.7)
PHSA	4.6 (2.1-10.1)	7.8 (4.2-14.3)	6.2 (3.8-10.1)	3.9 (2.5-6.0)
Total	**7.1 (6.4-7.8)**	**7.7 (7.0-8.4)**	**7.4 (6.9-7.9)**	**8.3 (8.0-8.7)**

CDI rate by hospital size

The rate of new infections associated with the reporting facility was lowest in those hospitals with 50 or fewer beds, and highest in those hospitals with more than 250 beds (Table 3). There were no significant changes in the rate between Q1 and Q2 for each category of hospital size. Compared with the annual rate for FY 2010/2011, the rate decreased for each category of hospital size in both Q1 and Q2 of FY 2011/2012, especially in Q1 for hospitals with more than 250 beds, where the decrease was statistically significant.

Table 3. Rate of new infections associated with the reporting facility per 10,000 inpatient days and 95% confidence interval by hospital size

Hospital size (beds)	Fiscal year 2011/2012				Fiscal year 2010/2011	
	Number of facilities*	Q1	Q2	Total	Number of facilities*	Annual rate
1-50	41	3.5 (2.2-5.3)	1.9 (1.0-3.4)	2.7 (1.9-3.8)	50	3.8 (3.2-4.6)
51-250	20	5.6 (4.7-6.6)	5.8 (4.9-6.9)	5.7 (5.0-6.4)	22	6.7 (6.2-7.2)
>250	10	8.8 (7.9-9.9)	10.0 (8.9-11.1)	9.4 (8.7-10.2)	8	11.0 (10.4-11.6)
Total	**71**	**7.1 (6.4-7.8)**	**7.7 (7.0-8.4)**	**7.4 (6.9-7.9)**	**80**	**8.3 (8.0-8.7)**

* For Q2 of FY 2011/2012 and Q2 of FY 2010/2012, respectively. The number of beds varied by quarter due to temporary closure of acute care beds by facilities.

CDI rate by acute care facility

The rates of new cases of CDI associated with the reporting facility are displayed in Table 4. The wide range of 95% CI for some facilities is due to small denominators, and should be interpreted with caution, as slight changes in the number of cases — even one case — can considerably affect the rate; therefore the rates in small facilities may vary substantially from reporting period to reporting period. There were no significant differences for most large facilities between the rates of combined Q1 and Q2 of FY 2011/2012 and the facility's annual rate of the previous year. **The rates are not risk-adjusted, and therefore should not be used to make comparisons between individual facilities.** Please refer to the cautionary note in the "Introduction" section, and limitations in the "About this report" section. Facilities are listed in alphabetical order.

Table 4. 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[1]	Hospital size (beds)[2]	Rate of combined Q1 and Q2, Fiscal year 2011/2012	Annual rate, Fiscal year 2010/2011
100 Mile District Hospital	1-50	0.0	1.5 (0.3-8.7)
Abbotsford Regional Hospital	>250	4.3 (2.8-6.7)	4.2 (3.1-5.7)
BC Children's Hospital	51-250	12.8 (7.9-20.8)	6.8 (4.3-10.8)
BC Women's Hospital	51-250	0.0	0.8 (0.2-2.9)
Bella Coola General Hospital	1-50	0.0	0.0
Bulkley Valley District Hospital	1-50	0.0	0.0
Burnaby Hospital	>250	14.5 (11.5-18.1)	18.5 (16.2-21.2)
Campbell River & District General Hospital	51-250	3.6 (1.4-9.2)	1.9 (0.8-4.4)
Cariboo Memorial Hospital and Health Centre	1-50	0.0	6.1 (2.8-13.4)
Chetwynd General Hospital	1-50	0.0	0.0
Chilliwack General Hospital	51-250	2.0 (0.9-4.7)	3.0 (1.9-4.9)
Cormorant Island Community Health Centre	1-50	0.0	0.0
Cowichan District Hospital	51-250	3.7 (1.7-8.0)	4.7 (2.9-7.5)
Dawson Creek And District Hospital	1-50	0.0	0.0
Delta Hospital	1-50	8.1 (4.1-16.0)	8.6 (5.6-13.3)
Dr. Helmcken Memorial Hospital & Health Centre	1-50	0.0	0.0
Eagle Ridge Hospital	51-250	13.9 (9.5-20.4)	11.1 (8.3-14.8)
Fort Nelson General Hospital	1-50	0.0	0.0
Fort St. John General Hospital	1-50	1.4 (0.3-8.1)	2.2 (0.8-6.5)
Fraser Canyon Hospital	1-50	0.0	5.1 (1.4-18.5)
GR Baker Memorial Hospital	1-50	1.9 (0.3-10.9)	2.3 (0.8-6.8)
Kelowna General Hospital	>250	7.0 (5.1-9.5)	10.0 (8.4-12.0)
Kitimat General Hospital	1-50	6.3 (1.7-23.1)	1.5 (0.3-8.3)
Lady Minto Gulf Islands Hospital	1-50	3.4 (0.6-19.1)	4.9 (1.7-14.4)
Lakes District Hospital and Health Centre	1-50	0.0	0.0
Langley Memorial Hospital	51-250	11.6 (8.4-16.0)	15.8 (13.2-18.9)
Lillooet Hospital and Health Centre	1-50	0.0	0.0
Lion's Gate Hospital	51-250	3.0 (1.7-5.2)	6.8 (5.3-8.7)
Mackenzie and District Hospital	1-50	0.0	0.0
Masset Hospital	1-50	32.3 (5.7-180.4)	0.0
Matsqui Sumas Abbotsford	1-50	7.0 (2.4-20.5)	1.2 (0.2-6.6)
McBride and District Hospital	1-50	0.0	0.0

Acute care facility[1]	Hospital size (beds)[2]	Rate of combined Q1 and Q2, Fiscal year 2011/2012	Annual rate, Fiscal year 2010/2011
Mills Memorial Hospital	1-50	2.8 (0.8-10.1)	1.3 (0.4-4.7)
Mission Memorial Hospital	1-50	7.2 (2.5-21.2)	8.5 (4.1-17.4)
Mount Saint Joseph Hospital	51-250	8.7 (5.3-14.4)	19.3 (15.3-24.3)
Nanaimo Regional General Hospital	>250	5.7 (3.8-8.5)	9.3 (7.5-11.5)
Nicola Valley Health Centre	1-50	6.8 (1.2-38.3)	0.0
Peace Arch Hospital	51-250	7.6 (5.1-11.2)	6.5 (4.9-8.6)
Penticton Regional Hospital	51-250	2.2 (0.9-5.2)	5.6 (3.8-8.1)
Port Hardy Hospital	1-50	7.6 (1.3-42.8)	0.0
Port McNeill and District Hospital	1-50	0.0	0.0
Powell River General Hospital	1-50	0.0	1.0 (0.2-5.7)
Prince Rupert Regional Hospital	1-50	0.0	2.3 (0.6-8.4)
Princeton General Hospital	1-50	13.3 (2.3-74.9)	11.8 (3.2-42.9)
Queen Charlotte Islands General Hospital	1-50	0.0	0.0
Queen Victoria Hospital and Health Centre	1-50	0.0	3.0 (0.5-16.9)
Queen's Park Care Centre	51-250	10.9 (6.9-17.2)	10.7 (7.2-15.9)
Richmond Hospital	51-250	6.2 (4.0-9.7)	7.5 (5.6-9.9)
Ridge Meadows Hospital	51-250	7.4 (4.7-11.5)	4.3 (2.9-6.4)
Royal Columbian Hospital	>250	12.0 (9.7-14.7)	13.8 (12.1-15.8)
Royal Inland Hospital	51-250	3.0 (1.7-5.3)	2.3 (1.5-3.6)
Royal Jubilee Hospital	>250	3.6 (2.4-5.5)	4.3 (3.3-5.7)
RW Large Hospital	1-50	0.0	0.0
Saanich Peninsula Hospital	51-250	1.0 (0.2-5.5)	1.3 (0.5-3.9)
Shuswap Lake General Hospital	1-50	4.0 (1.4-11.8)	6.3 (3.4-11.5)
South Okanagan General Hospital	1-50	0.0	6.1 (2.4-15.8)
Squamish General Hospital	1-50	8.7 (2.4-31.6)	0.0
St. John Hospital	1-50	0.0	5.0 (1.7-14.6)
St. Joseph's General Hospital	51-250	4.1 (1.9-8.9)	2.6 (1.3-5.0)
St. Mary's Hospital	1-50	1.6 (0.3-9.3)	5.4 (2.7-10.6)
St. Paul's Hospital	>250	9.6 (7.5-12.3)	10.2 (8.7-11.9)
Stuart Lake Hospital	1-50	0.0	0.0
Surrey Memorial Hospital	>250	14.5 (12.2-17.1)	14.0 (12.4-15.8)
Tofino General Hospital	1-50	0.0	0.0
UBC Hospital	1-50	0.0	2.9 (1.0-8.4)
University Hospital of Northern BC[3]	51-250	4.2 (2.5-6.9)	4.8 (3.4-6.7)
Vancouver General Hospital	>250	11.5 (9.7-13.7)	11.4 (10.1-12.9)
Vernon Jubilee Hospital	51-250	4.4 (2.4-8.2)	6.6 (4.7-9.2)
Victoria General Hospital	>250	2.9 (1.8-4.9)	3.0 (2.1-4.2)
West Coast General Hospital	51-250	2.5 (0.7-9.1)	4.7 (2.5-9.0)
Wrinch Memorial Hospital	1-50	0.0	3.9 (0.7-21.9)

Note:

1. The data were not available for the Arrow Lakes Hospital, Boundary Hospital, Kootenay Boundary Regional Hospital, and Kootenay Lake Hospital from Q3 of FY 2010/2011 to Q2 of FY 2011/2012, and Creston Valley Hospital, East Kootenay Regional Hospital, Elk Valley Hospital, Golden & District General Hospital, Invermere & District Hospital for Q1 and Q2 of FY 2011/2012 due to information system upgrades in progress.
2. Based on the acute beds for Q2 of 2011/2012
3. Formerly known as Prince George Regional Hospital

Relapse of healthcare-associated CDI

Of the 1,146 HCA CDI cases reported in Q1 and Q2, 178 were relapses (15.5%). There was no significant difference in the percentage of relapses among HAs (Table 5). Compared with the percentage of relapses in FY 2010/2011, the difference was not statistically significant for each HA in FY 2011/2012.

Table 5. Number and percentage of relapses among healthcare-associated CDI cases by Health Authority

Health Authority	Combined Q1 and Q2, Fiscal year 2011/2012		Percentage of relapses (95% CI) Fiscal year 2010/2011
	Number of Relapses	Percentage of relapses (95% CI)	
IHA	13	15.5% (9.3%-24.7%)	24.4% (20.3%-29.1%)
FHA	104	17.0% (14.2%-20.2%)	16.0% (14.1%-18.1%)
VCHA	37	12.4% (9.1%-16.6%)	17.7% (14.7%-21.1%)
VIHA	17	16.2% (10.4%-24.4%)	17.0% (13.0%-22.0%)
NHA	< 10	20.0% (9.5%-37.3%)	14.8% (8.0%-25.7%)
PHSA	<10	5.9% (1.0%-27.0%)	16.7% (6.7%-35.9%)
Total	**178**	**15.5% (13.6%-17.7%)**	**17.5% (16.1%-18.9%)**

The percentage of relapse was higher in those hospitals with 50 or fewer beds than those with more than 50 beds; however the difference was not statistically significant (Table 6). Compared with FY 2010/2011 results, the percentage of relapses did not change significantly for each category of hospital size in FY 2011/2012.

Table 6. Number and percentage of relapses among healthcare-associated CDI cases by hospital size

Hospital size (beds)	Combined Q1 and Q2, Fiscal year 2011/2012		Percentage of relapses (95% CI) Fiscal year 2010/2011
	Number of Relapses	Percentage of relapses (95% CI)	
1-50	<10	20.0% (10.9%-33.8%)	26.6% (20.8%-33.2%)
51-250	51	15.7% (12.1%-20.0%)	18.3% (16.1%-20.8%)
>250	118	15.2% (12.9%-17.9%)	15.9% (14.3%-17.8%)
Total	**178**	**15.5% (13.6%-17.7%)**	**17.5% (16.1%-18.9%)**

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 and outcomes. The complications examined include admission to the intensive care unit (ICU), toxic megacolon, and total or partial colectomy. Among all 1,496 CDI cases reported in Q1 and Q2 of FY 2011/2012, 66 were admitted to ICU (4.4%), 16 developed toxic megacolon (1.1%), and 18 required total or partial colectomy (1.2%). The percentage of each complication was similar to the previous year. Please note that CDI may not be the sole reason for ICU admission.

Discussion

Despite variations in CDI classification by HA and changes in the data collection and submission processes, the definition of new CDI cases associated with the reporting facility is considered comparable across all HAs. Overall, the provincial rate of new CDI cases associated with the reporting facility decreased in the first two quarters of FY 2011/2012, especially for those hospitals with more 250 beds in Q1. The decrease in rate was observed for all HAs except PHSA, where the rate increased non-significantly, and for all sizes of hospitals. This decreasing trend in the rate of new infections associated with the reporting facility has been statistically significant from 2009/2010. The reason for this decrease may be partially attributed to the changes in case definitions in 2010/2011, when the look-back period was modified from eight weeks to four weeks; however, the rate in the first two quarters of FY 2011/2012 continued to decrease, suggesting additional reasons for the decrease. In addition, IHA, FHA, and PHC have used the same look-back periods since 2009/2010.

The hospitals with more than 250 beds still had the highest rate of new CDI cases, although the rate in these large hospitals decreased significantly compared with FY 2010/2011. The rate of new infections continued to demonstrate significant increase with increasing hospital size. One reason for this may be that the larger hospitals are more likely to offer comprehensive specialty care to patients with greater severity of illness, whereas the smaller hospitals usually transfer the sicker patients to the larger facilities. Severe underlying illness has been determined to be an independent risk factor for CDI[3], which means that the larger hospitals may have more patients at higher risk for CDI. In addition, those patients may stay longer in the hospitals, increasing the risk of acquiring HCA CDI.

The CDI surveillance system was established to monitor the patterns and trends of CDI in BC acute care facilities. This report aims to increase the understanding of the patterns and characteristics of HCA CDI. However, the data in this report may not represent the true number of cases of CDI due to the methodologies used for case finding and data collection (see the “About this report” section). In addition, the rates of CDI were not adjusted by known risk factors, and therefore comparisons between health authorities and between facilities should not be made.

Acknowledgements

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

[3] Poutanen SM and Simor AE (2004). Canadian Medical Association Journal;171(1):51-58

About this report

CDI surveillance system

The provincial HCA CDI surveillance system involves the voluntary participation of all 80 acute care facilities across British Columbia. The objectives of the system are to monitor the incidence of HCA CDI, and to describe characteristics of CDI in BC acute care facilities. The PICNet Surveillance Steering Committee determines the minimal dataset for the provincial CDI surveillance. Working with each Health Authority, PICNet collects and manages the CDI surveillance data at the provincial level. This report presents the cases of CDI reported in Q1 and Q2 of FY 2011/2012.

Population under surveillance

The population under surveillance includes inpatients admitted to BC acute care facilities. 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 beds housed in acute care facilities, patients in psychiatric beds, and short-term emergency room admissions are excluded. Infants under one year of age are also excluded from this surveillance.

Data sources

This report incorporates the data collected from all acute care facilities in IHA, FHA, VCHA, PHC, VIHA, NHA, PHSA, and their affiliated hospitals.

The CDI case data are collected daily based on the minimal dataset as defined by the PICNet Surveillance Steering Committee, and managed by each HA. The cases data were then submitted to PICNet by HA on a quarterly basis using PICNet's web portal up until Q1 of FY 2011/2012. As of Q2 of 2011/2012, HAs submitted facility aggregated data to PICNet. The facility-specific denominators are also provided quarterly by HA. All data were aggregated by fiscal quarter for each HA except PHSA, which aggregated the data by calendar quarter. Updates and modifications submitted after the data submission due dates may not be reflected in this report, but will be presented in future reports.

Limitations

There are variations in case finding strategies and data collection methodologies across acute care facilities and Health Authorities in BC.

Case definitions: The patients' healthcare encounter history is reviewed to determine whether the infections were healthcare-associated. The availability to determine healthcare encounter history depends on the patient information system used in each hospital and HA. Some misclassification of association of CDI is inevitable. In addition, an eight week "look-back" period was used in FY 2009/2010 by all HAs with the exception of PHC, which used a four week period. In FY 2010/2011,

the look-back period was modified to four weeks for all HAs, with the exception of IHA and FHA, which continued to use an eight week period. This modification from eight weeks to four may result in a decrease in the number of healthcare-associated infections reported.

In addition, FHA has included CDI cases among psychiatric patients in acute care beds. IHA and PHSA classify 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. The CA (not-healthcare-associated) CDI cases were no longer further classified as new infections or relapses in FY 2011/2012. The cases of CA and unknown association were combined for this report.

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 denominator among HAs due to the inability to separate them from their total denominator. FHA and VCHA (except PHC) include patients less than one year of age in their inpatient days, and FHA also includes psychiatric inpatient days in their denominator. For NHA, the denominators of each facility for Q2 of 2011/2012 were estimated based the Q1 data due to information system issues.

Laboratory methodologies: A variety of laboratory methods are used in BC to confirm CDI cases, including Enzyme-linked Immunosorbent Assay (EIA), Toxin Assays, and Polymerase Chain Reaction (PCR).[4] The sensitivity and specificity of these methods are different, and vary from site to site. In particular, the PCR testing is more sensitive than traditional method of toxin EIA testing for *C. difficile* by as much as 35%[5], resulting in an increase in identifying CDI cases. The HAs are currently in various stages of implementing molecular testing methods to confirm CDI cases. VCHA implemented PCR testing in FY 2009/2010 and PHC in FY 2010/2011. IHA brought PCR testing into some facilities in FY 2010/2011.

This report is based on the CDI cases reported to PICNet. It is not guaranteed that all cases of CDI among the population under surveillance are identified. Variation in surveillance intensity and case identification methodology affects the number of cases identified. In addition, each healthcare facility has unique challenges and different at-risk populations. Each HA is best situated to respond to the incidence of CDI in their region and the affiliated healthcare facilities.

[4] British Columbia Association of Medical Microbiologists, 2006
[5] Chapin KC et al (2011). Journal of Molecular Diagnosis 13: 395-400

Glossary

Acute care facility

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

***Clostridium difficile* Infection (CDI)**

CDI, under PICNet CDI surveillance, is defined as:

- Acute onset of diarrhea (three or more loose stools within a 24-hour period) without another etiology (loose stool is defined as that which takes the shape of the container that holds it).

  AND one or more of the following:

- Laboratory confirmation (positive toxin, or culture with evidence of toxin production, or detection of toxin genes)

  OR

- Diagnosis of typical pseudo-membranes on sigmoidoscopy or colonoscopy or histological/pathological diagnosis of CDI

  OR

- Diagnosis of toxic megacolon.

Note: It is assumed that any stool sent to the laboratory for *C. difficile* testing is from a patient that has had a least three episodes of loose stools in a 24-hour period. It is accepted that the surveillance protocol may overestimate the number of cases as some patients may have had only one or two loose stools prior to a specimen being collected.

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 total or partial colectomy. 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.[6]

Fiscal and Calendar Quarter

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

Start and end date of quarters for this report

Fiscal year	Quarter code	Fiscal quarter		Calendar quarter	
		Start date	End date	Start date	End date
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

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.

[6] Agresti A and Coull BA (1998). The American Statistician 52:119-126

Healthcare-associated (HCA) with 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 had an encounter with another healthcare facility, either as an inpatient (including Acute Care and Long Term Care), or an outpatient (including emergency care and clinics), 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 health care services. There are five regional Health Authorities in BC which govern, plan, and coordinate services regionally within 16 health service delivery areas, and a 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)
- Vancouver Island Health Authority (VIHA)
- Provincial Health Services Authority (PHSA)

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 infection

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.

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

A CDI case with recurrence of diarrhea within two to eight weeks of a previous CDI episode (as determined by the date of a previous lab test, chart note 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: a case with recurrence of diarrhea less than two weeks from the previous episode is considered to be a continuation of the previous episode, and not a relapse.

Statistical significance

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

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 $p < 0.05$.

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

- Anne Marie Locas, Interior Health Authority
- Jun Chen Collet, Provincial Health Services Authority
- David Crawford, Interior Health Authority
- Tara Donovan, Fraser Health Authority
- Leslie Forrester, Vancouver Coastal Health Authority
- Bruce Gamage (Chair), PICNet
- Dr. Guanghong Han, PICNet
- Deanna Hembroff, Northern Health Authority
- Dr. Bonnie Henry, Provincial Health Services Authority
- Dr. Linda Hoang, Provincial Health Services Authority
- Anthony Leamon, Vancouver Island Health Authority
- Dr. Elisa Lloyd-Smith, Providence Health Care

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

Provincial Health Services Authority
Province-wide solutions. Better health.