Clostridium difficile Infection (CDI)
Surveillance Report: Saskatchewan 2016-17

Saskatchewan Infection Prevention and Control Program

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Government of Saskatchewan

The Saskatchewan Infection Prevention and Control Program is a collaboration among Regional Health Authorities (RHAs), the Ministry of Health, and other stakeholders. Its mandate is to ensure that all participants are aware of leading infection control practices and emerging standards.

Correspondence:

Patient Safety Unit
Saskatchewan Ministry of Health
3475 Albert Street
Regina, SK S4S 6X6
PatientSafety@health.gov.sk.ca

Infection Control Coordinators:
provincialinfectioncontrolgroup@saskatoonhealthregion.ca

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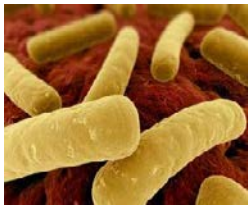
Erratum:

Please see updated Figure 8 (page 10). Legend labels for “Still in Facility” and “Discharged” were reversed in the original document.

Summary



CLOSTRIDIUM DIFFICILE INFECTION (CDI) IS A VIRULENT HEALTHCARE-ASSOCIATED INFECTION THAT IS EASILY SPREAD AMONG PATIENTS/RESIDENTS. **THE SEVERE CONSEQUENCES FOR THOSE WHO ACQUIRE IT DEMAND A RELIABLE SURVEILLANCE PROTOCOL IN ORDER TO SUPPORT OUTBREAK INVESTIGATIONS, MONITOR TRENDS, AND EVALUATE INTERVENTIONS AIMED AT REDUCING INCIDENCE**.

The Saskatchewan *Clostridium difficile* infection (CDI) surveillance program began on July 1, 2012. This annual report presents the cases of CDI reported in quarter 1 (Q1) through quarter 4 (Q4) of fiscal year (FY) 2016-17 (April 1, 2016 to March 31, 2017), with a focus on new healthcare-associated infections.

A total of 351 healthcare-associated *C. difficile* infections (HA-CDI) were reported in FY 2016-17. 323 (92.0%) of the HA-CDI cases were new or primary cases, and 28 (8.0%) were recurrences.

Of the primary HA-CDI cases, 265 (82.0%) were attributed to an acute care (AC) facility and 58 cases (18.0%) were attributed to a long-term care (LTC) facility. The annual 2016-17 infection rate was 2.8 per 10,000 patient days in acute care,[1] 0.2 in long-term care, and 0.8 per 10,000 patient days overall. These rates have been fairly stable over the past five years.

30% of those who developed HA- CDI had symptom onset in a community setting

4% of infected patients experienced a severe complication related to CDI (ICU admission, colectomy, death)

One of the 351 patients who developed HA-CDI over the surveillance period, four were admitted to an ICU and five required a total or partial colectomy as a result of the infection. At 30 days following diagnosis, 146 patients (41.6%) had been discharged, 93 (26.5%) were still in the facility, 33 (9.4%) had been transferred, and 41 (11.7%) were deceased.[2]

There was one outbreak of CDI reported in FY 2016-17 (in a LTC facility), resulting in the diagnosis and treatment of three residents with CDI. This was down from six outbreaks in the previous year.

[1] Canadian Nosocomial Infection Surveillance Program's (CNISP's) 2014 rate of primary HA-CDI associated with AC facilities for the western provinces (British Columbia, Alberta, Saskatchewan and Manitoba) was 4.0 per 10,000 patient days.
[2] The outcome for 38 patients at 30 days post diagnosis is unknown.

Introduction

Clostridium difficile Infection (CDI) is a virulent healthcare-associated infection that is easily spread among patients/residents. The severe consequences for those who acquire it demand a reliable surveillance protocol in order to support outbreak investigations, monitor trends, and evaluate interventions aimed at reducing incidence.

Since 2011, the Provincial Infection Control Network of Saskatchewan (PICNS), in collaboration with representatives from the thirteen provincial Regional Health Authorities (RHAs),[3] has been developing a standardized provincial surveillance system to monitor the incidence of CDI in Saskatchewan's healthcare facilities. This includes a standard case definition of CDI (see "About This Report"). The cases are then classified as healthcare-associated (HA) or community-associated (CA) according to the patient's healthcare encounter history. HA cases are further split into two categories: those infections associated with the reporting facility (HA-CDI-Y); and those infections associated with another facility, either in the same region or another region (HA-CDI-AF). A CDI case with a previous CDI episode within two to eight weeks is defined as a recurrence. Otherwise, it is classified as a primary case of CDI. Primary HA-CDI-Y cases in hospital (not LTC) are essentially consistent with the definition used for reporting by the Canadian Nosocomial Infection Surveillance Program (CNISP) with a few notable differences.[4] Since July 2012, every RHA has submitted CDI surveillance data to PICNS on a quarterly basis. This annual report presents the cases of CDI reported in quarter 1 (Q1) through quarter 4 (Q4) of fiscal year (FY) 2016-17.

Please note that the data in this report should be interpreted with caution. Comparison of the numbers of cases and rates among RHAs is not recommended. There are many factors that can affect the incidence and rate of CDI, including the health conditions and medical history of the population served, the proportion of the patient population older than 50, the complexity of the services offered, the size and physical layout of the facilities, 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 even slight changes in the number of cases can dramatically affect the rate and percentage. In addition, reference to healthcare-associated infections should not be interpreted as cases of infection acquired directly through healthcare services provided by the reporting facility or other healthcare facilities. Please see "About This Report" for other limitations.

This report aims to increase the understanding of the patterns and characteristics of CDI in Saskatchewan. The rates of CDI presented are not risk-adjusted, and are therefore not directly comparable across (RHAs).

[3] For the purposes of this report, Athabasca Health Authority (AHA) has been included under the classification of a Regional Health Authority (RHA).

[4] Saskatchewan's criteria for HA-CDI-Y in hospitals differ from CNISP's in several ways. First, due to limitations in some regional admissions databases, Saskatchewan includes cases from psychiatric units/wards. Since these patients typically do not have many of the risk factors for CDI (e.g. taking antibiotics) and represent a small fraction of total acute care days, it is unlikely that their inclusion affects regional or provincial rates. Second, although both Saskatchewan and CNISP exclude cases for children under one year of age, Saskatchewan only excludes newborns from its denominators. Since being a newborn is the most likely reason for admission during the first year of life, it is unlikely that this has a major effect on Saskatchewan's CDI rates. Finally, as of April 1, 2016, Saskatchewan began including patients who were discharged from a healthcare facility in the previous 4 weeks and returned to an outpatient unit/facility with a new onset of CDI. This inclusion likely has the largest impact on discrepancies in rates of HA-CDI reported to CNISP vs. Saskatchewan.

Surveillance Results

Classification of CDI Cases

Of the 351 HA-CDI cases, 323 (92.0%) were classified as <u>new or primary</u> infections associated with the reporting RHA, and 28 (8.0%) cases were deemed to be recurrences. Of the total HA-CDI infections, 247 (70.4%) had symptom onset while in a healthcare facility and 104 (29.6%) had symptom onset in an outpatient or community setting. 265 (82.0%) of the primary HA-CDI cases were attributed to an acute care (AC) facility, while 58 (18.0%) were attributed to a long-term care (LTC) facility (Figure 1).

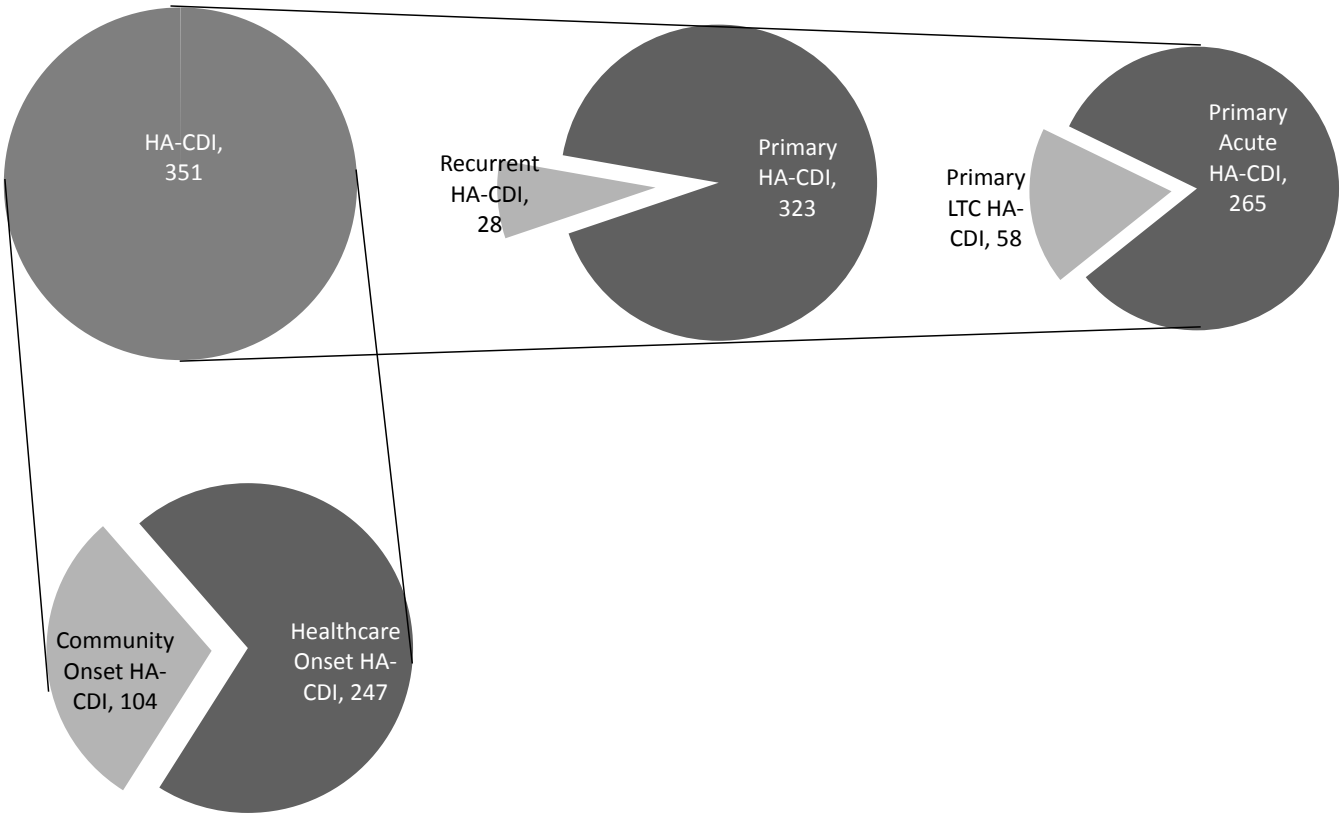
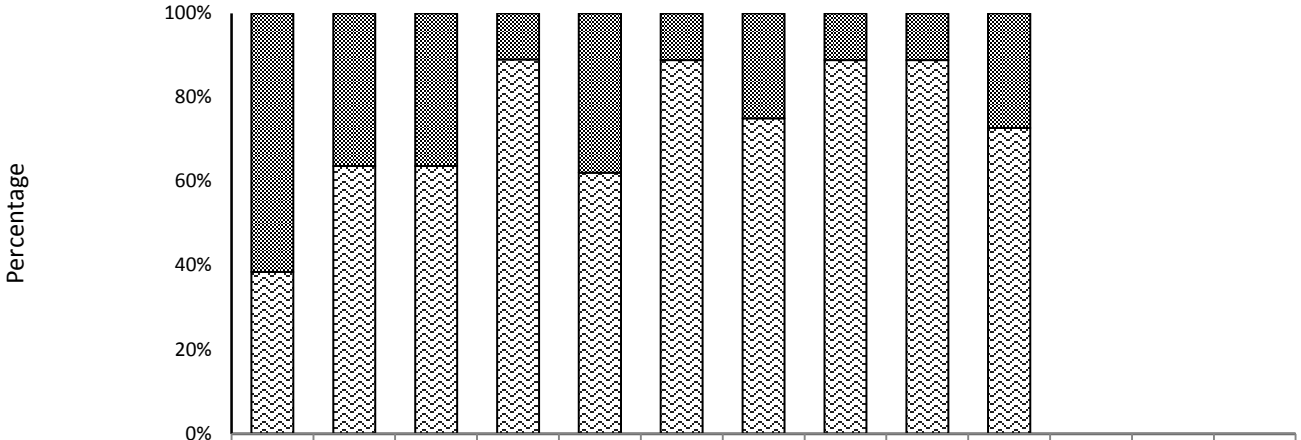


Figure 1: Raw numbers of cases, by location of onset and case definition 2016-17

Figure 2 shows the proportion of cases by RHA and exposure definition.

NOTE: Six (6) cases were found to be associated with an RHA other than the one that identified and reported them. In the counts of cases by region, these cases are counted in the region to which each case was <u>attributed</u> (Figures 2, 3 and Tables 1-3). However, the treatment and outcome for the HA-CDI case was assumed to have occurred, and was therefore counted, in the region where the case was <u>diagnosed</u> (Figures 6-8).

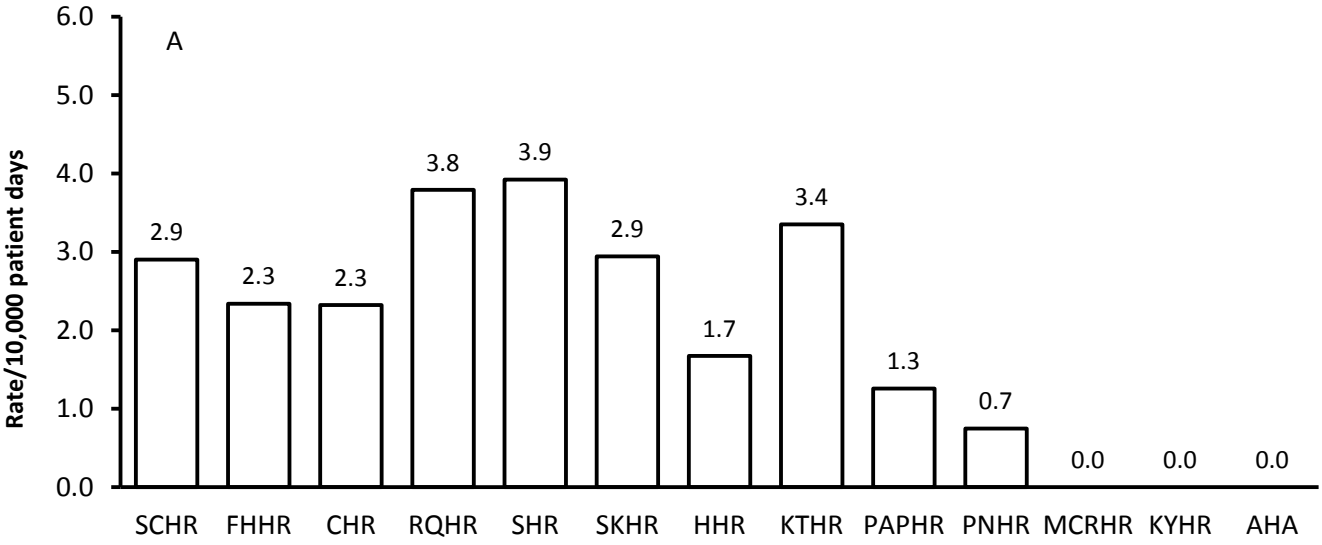


	SCHR	FHHR	CHR	RQHR	SHR	SKHR	HHR	KTHR	PAPHR	PNHR	MCRHR	KYHR	AHA
Primary LTC HA-CDI	8	4	4	12	11	13	1	1	1	3	0	0	0
Primary Acute HA-CDI	5	7	7	97	18	104	3	8	8	8	0	0	0

Figure 2: Proportion and number of primary HA-CDI, by RHA and facility type, 2016-17

Overview of HA-CDI Cases

A total of 323 primary cases of HA-CDI were reported in FY 2016-17. The regional rates of HA-CDI per 10,000 patient/resident days in acute care (A), long-term care (B) and in total (C) are presented in Figure 3, reflecting the variation in population served and healthcare services provided in each RHA.



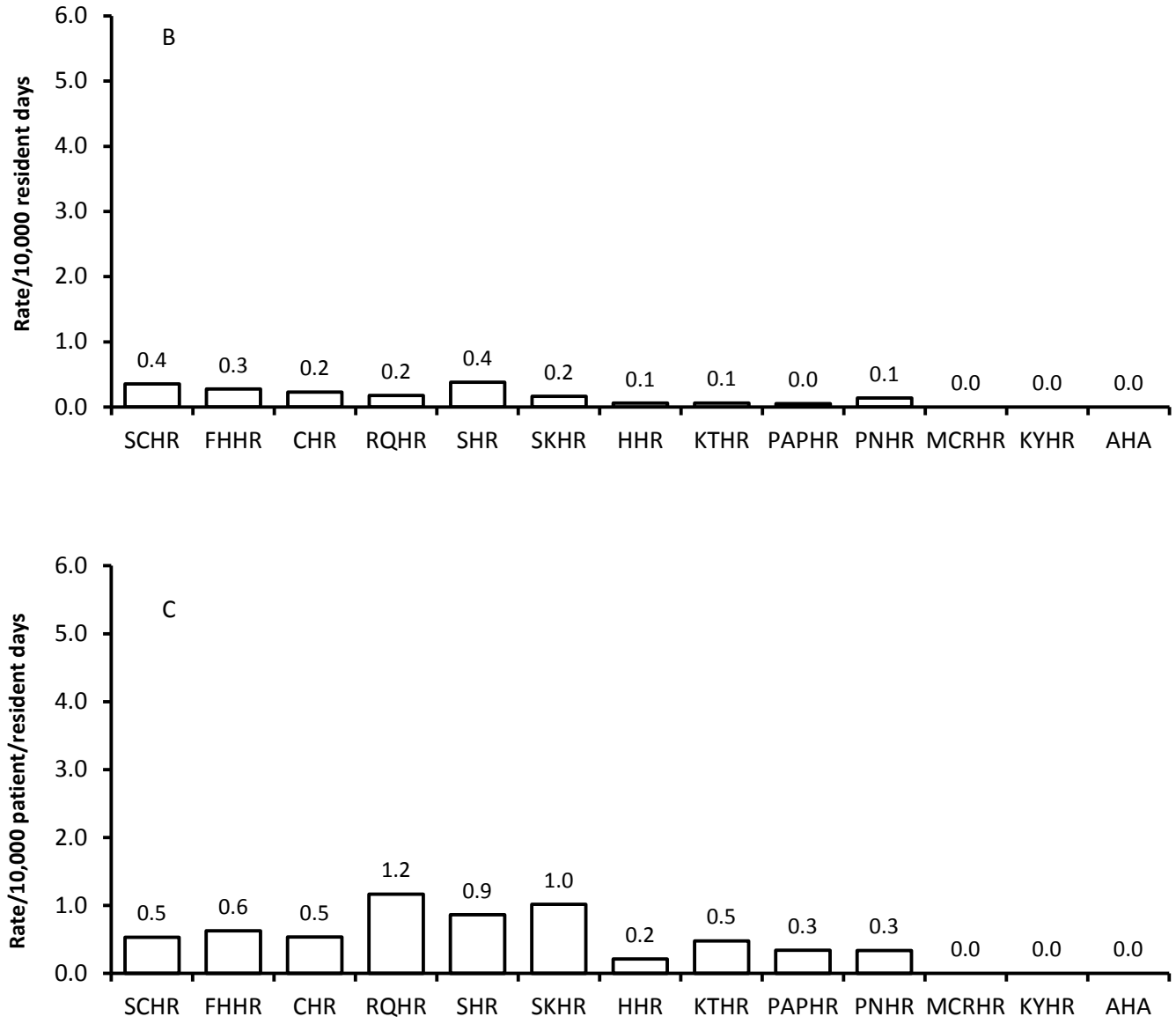


Figure 3: Rate of acute care HA-CDI (A), long-term care HA-CDI (B) and total HA-CDI (C), FY 2016-17 per 10,000 patient/resident days, by RHA

Regional Rates of Primary HA-CDI, by Service

The rates of primary HA-CDI cases by RHA, for each quarter and annually, are given in Tables 1 through 3. The wide 95% confidence intervals for some regions are due to small denominators. Rates in regions with smaller populations and days may vary substantially from reporting period to reporting period, and slight changes in the number of cases (even one case) can considerably affect the rate. Also, rates are not risk-adjusted, and therefore should not be used to make comparisons between regions.

There were no significant differences in the rates of HA-CDI in acute care (Table 1), long-term care (Table 2) or overall in the province (Table 3) across the reporting quarters. There was one outbreak in a LTC facility (SHR), resulting in the diagnosis and treatment of three patients for *C. difficile* infections.

Table 1: Rate of primary acute care HA-CDI per 10,000 patient days and 95% confidence interval (CI), by RHA and quarter

RHA	Q1	95% CI	Q2	95% CI	Q3	95% CI	Q4	95% CI	Annual	95% CI
SCHR	4.4	1.2-15.9	2.4	0.4-13.5	2.3	0.4-13.3	2.4	0.4-13.5	2.9	1.2-6.8
FHHR	1.3	0.2-7.6	1.3	0.2-7.6	2.7	0.7-9.8	4.0	1.4-11.8	2.3	1.1-4.8
CHR	0.0	0.0-6.0	3.6	1.2-10.5	1.2	0.2-6.8	4.3	1.4-12.5	2.3	1.1-4.8
RQHR	4.0	2.7-6.0	4.2	2.9-6.2	4.3	3.0-6.3	2.8	1.8-4.3	3.8	3.1-4.6
SHR	2.7	0.9-7.8	2.8	1.0-8.3	7.5	3.9-14.2	2.5	0.9-7.4	3.9	2.5-6.2
SKHR	3.1	2.1-4.4	2.0	1.3-3.2	3.9	2.8-5.4	2.8	1.9-4.2	2.9	2.4-3.6
HHR	0.0	0.0-8.6	0.0	0.0-8.6	2.2	0.4-12.6	4.5	1.2-16.3	1.7	0.6-4.9
KTHR	3.1	0.8-11.2	3.5	1.0-12.8	6.4	2.5-16.5	0.0	1.1-7.1	3.4	1.7-6.6
PAPHR	1.3	0.3-4.6	3.1	1.3-7.4	0.6	0.1-3.6	0.0	0.0-2.4	1.3	0.6-2.6
PNHR	0.0	0.0-1.4	1.5	0.6-3.9	1.1	0.4-3.3	0.4	0.1-2.1	0.7	0.4-1.5
MCRHR	0.0	0.0-38.3	0.0	0.0-38.3	0.0	0.0-38.3	0.0	0.0-38.3	0.0	0.0-9.6
KYHR	0.0	0.0-69.4	0.0	0.0-69.4	0.0	0.0-69.4	0.0	0.0-69.4	0.0	0.0-17.4
AHA	0.0	0.0-151.3	0.0	0.0-151.3	0.0	0.0-151.3	0.0	0.0-151.3	0.0	0.0-38.3
TOTAL	**2.6**	**2.1-3.4**	**2.7**	**2.1-3.5**	**3.5**	**2.8-4.3**	**2.4**	**1.9-3.1**	**2.8**	**2.5-3.2**

Table 2: Rate of primary long-term care HA-CDI per 10,000 resident days and 95% confidence interval (CI), by RHA and quarter

RHA	Q1	95% CI	Q2	95% CI	Q3	95% CI	Q4	95% CI	Annual	95% CI
SCHR	0.5	0.2-1.6	0.0	0.0-0.7	0.3	0.1-1.3	0.5	0.2-1.6	0.4	0.2-0.7
FHHR	0.0	0.0-1.1	0.0	0.0-1.1	0.8	0.3-2.4	0.3	0.0-1.6	0.3	0.1-0.7
CHR	0.0	0.0-0.9	0.0	0.0-0.9	0.2	0.0-1.3	0.7	0.2-2.0	0.2	0.1-0.6
RQHR	0.2	0.1-0.5	0.1	0.0-0.4	0.4	0.2-0.8	0.1	0.0-0.3	0.2	0.1-0.3
SHR	0.3	0.1-1.1	0.4	0.1-0.9	0.5	0.2-1.4	0.3	0.1-1.0	0.4	0.2-0.7
SKHR	0.3	0.1-0.7	0.2	0.1-0.5	0.1	0.1-0.4	0.0	0.0-0.2	0.2	0.1-0.3
HHR	0.0	0.0-0.9	0.0	0.0-0.9	0.0	0.0-0.9	0.2	0.0-1.3	0.1	0.0-0.3
KTHR	0.0	0.0-0.9	0.0	0.0-0.9	0.2	0.0-1.4	0.0	0.0-0.9	0.1	0.0-0.3
PAPHR	0.0	0.0-0.8	0.2	0.0-1.1	0.0	0.0-0.8	0.0	0.0-0.8	0.0	0.0-0.3
PNHR	0.2	0.0-0.9	0.0	0.0-0.7	0.2	0.0-1.1	0.2	0.0-1.1	0.1	0.0-0.4
MCRHR	0.0	0.0-26.4	0.0	0.0-26.4	0.0	0.0-26.4	0.0	0.0-26.4	0.0	0.0-6.6
KYHR	0.0	0.0-19.2	0.0	0.0-19.2	0.0	0.0-19.2	0.0	0.0-19.2	0.0	0.0-4.8
AHA	0.0	0.0-126.4	0.0	0.0-126.4	0.0	0.0-126.4	0.0	0.0-126.4	0.0	0.0-31.9
TOTAL	**0.2**	**0.1-0.3**	**0.1**	**0.1-0.2**	**0.3**	**0.2-0.4**	**0.2**	**0.1-0.3**	**0.2**	**0.1-0.2**

Table 3: Rate of total primary HA-CDI per 10,000 patient/resident days and 95% confidence interval (CI), by RHA and quarter

RHA	Q1	95% CI	Q2	95% CI	Q3	95% CI	Q4	95% CI	Annual	95% CI
SCHR	0.8	0.3-1.9	0.2	0.0-0.9	0.5	0.2-1.4	0.7	0.3-1.7	0.5	0.3-0.9
FHHR	0.2	0.0-1.3	0.2	0.0-1.3	1.1	0.5-2.7	0.9	0.4-2.3	0.6	0.3-1.1
CHR	0.0	0.0-0.8	0.6	0.2-1.7	0.4	0.1-1.4	1.1	0.5-2.5	0.5	0.3-1.0
RQHR	1.2	0.8-1.7	1.2	0.8-1.7	1.4	1.0-2.0	0.9	0.6-1.3	1.2	1.0-1.4
SHR	0.7	0.3-1.5	0.7	0.3-1.4	1.5	0.9-2.6	0.6	0.3-1.4	0.9	0.6-1.2
SKHR	1.1	0.8-1.6	0.8	0.5-1.2	1.3	0.9-1.8	0.9	0.6-1.3	1.0	0.8-1.2
HHR	0.0	0.0-0.8	0.0	0.0-0.8	0.2	0.0-1.2	0.6	0.2-1.9	0.2	0.1-0.5
KTHR	0.4	0.1-1.5	0.4	0.1-1.6	1.1	0.4-2.5	0.0	0.0-0.8	0.5	0.3-0.9
PAPHR	0.3	0.1-1.1	0.9	0.4-2.0	0.2	0.0-0.9	0.0	0.0-0.6	0.3	0.2-0.6
PNHR	0.1	0.0-0.6	0.5	0.2-1.3	0.5	0.2-1.3	0.2	0.1-0.9	0.3	0.2-0.6
MCRHR	0.0	0.0-15.7	0.0	0.0-15.7	0.0	0.0-15.7	0.0	0.0-15.7	0.0	0.0-3.9
KYHR	0.0	0.0-15.0	0.0	0.0-15.0	0.0	0.0-15.0	0.0	0.0-15.0	0.0	0.0-3.8
AHA	0.0	0.0-69.4	0.0	0.0-69.4	0.0	0.0-69.4	0.0	0.0-69.4	0.0	0.0-17.4
TOTAL	**0.8**	**0.6-1.0**	**0.7**	**0.6-0.9**	**1.0**	**0.8-1.2**	**0.7**	**0.5-0.9**	**0.8**	**0.7-0.9**

Provincial Rate of Primary HA-CDI, by Service

There were 62 HA-CDI cases reported as primary infections associated with acute care (AC) facilities in Q1 of FY 2016-17, 62 cases in Q2, 83 cases in Q3, and 58 cases in Q4. There were 15 primary HA-CDI cases associated with long-term care (LTC) facilities in Q1, 10 cases in Q2, 21 cases in Q3, and 12 cases in Q4. The provincial rate of primary HA-CDI associated with AC facilities was 2.6 (95% confidence interval (CI): 2.1-3.4) per 10,000 patient days in Q1, 2.7 (95% CI: 2.1-3.5) in Q2, 3.5 (95% CI: 2.8-4.3) in Q3, and 2.4 (95% CI: 1.9-3.1) in Q4. The provincial rate of primary HA-CDI associated with LTC facilities was 0.2 (95% CI: 0.1-0.3) per 10,000 resident days in Q1, 0.1 (95% CI: 0.1-0.2) in Q2, 0.3 (95% CI: 0.2-0.4) in Q3 and 0.2 (95% CI: 0.1-0.3) in Q4. Over the four surveillance quarters, the rates of primary HA-CDI in both acute and long-term care settings remained relatively stable, with no statistically significant increases or decreases (Figure 4). The values shown in Figure 4 are the mean rate/10,000 patient/resident days (95% confidence interval) for each quarter and the annual rate for all quarters. The annual rate was 2.8 (95% CI: 2.5-3.2) in acute care, 0.2 (95% CI: 0.1-0.2) in long-term care, and 0.8 (95% CI: 0.7-0.9) per 10,000 patient/resident days overall.

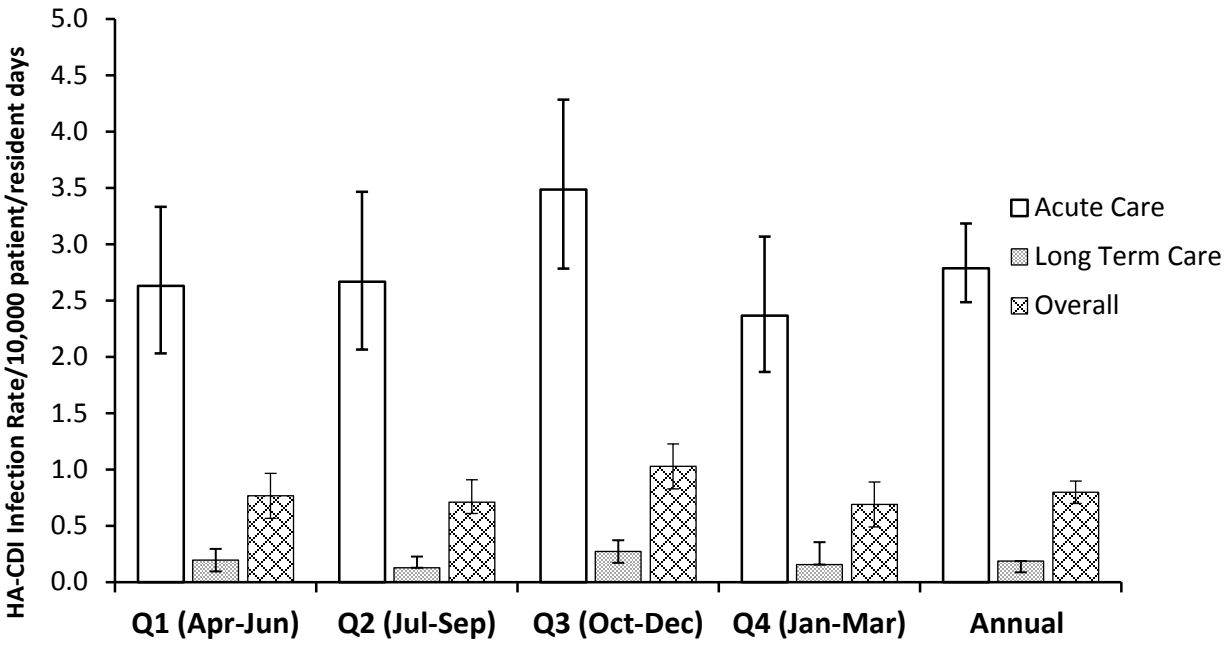


Figure 4: Provincial healthcare-associated CDI rates 2016-17, by service type and quarter

Provincial Descriptive Statistics

There were a total of 351 cases of HA-CDI reported in Saskatchewan in FY 2016-17. The breakdown into case definitions and location of onset for 2016-17 is shown in Table 4.

Table 4: Raw case numbers by case definition and location of onset, 2016-17

Case Definition	Location of Onset		Total
	Healthcare Onset (HO)	Community Onset (CO)	
Primary HA-CDI	231	92	323
Recurrent HA-CDI	16	12	28
Total # of cases	**247**	**104**	**351**

Characteristics of Primary HA-CDI Cases

Of the total 323 primary healthcare-associated CDI cases, 265 were in AC. Of those, 150 (56.6%) were in female patients and 115 (43.4%) were in males. The majority of the female and male patients were between 50 and 75 years of age (Figure 5A).

Of the total 323 primary healthcare-associated CDI cases, 58 were in LTC. Of those, 25 (43.1%) were in female patients and 33 (56.9%) were in males. As expected, the majority of female and male patients in this setting were over 75 years of age (Figure 5B).

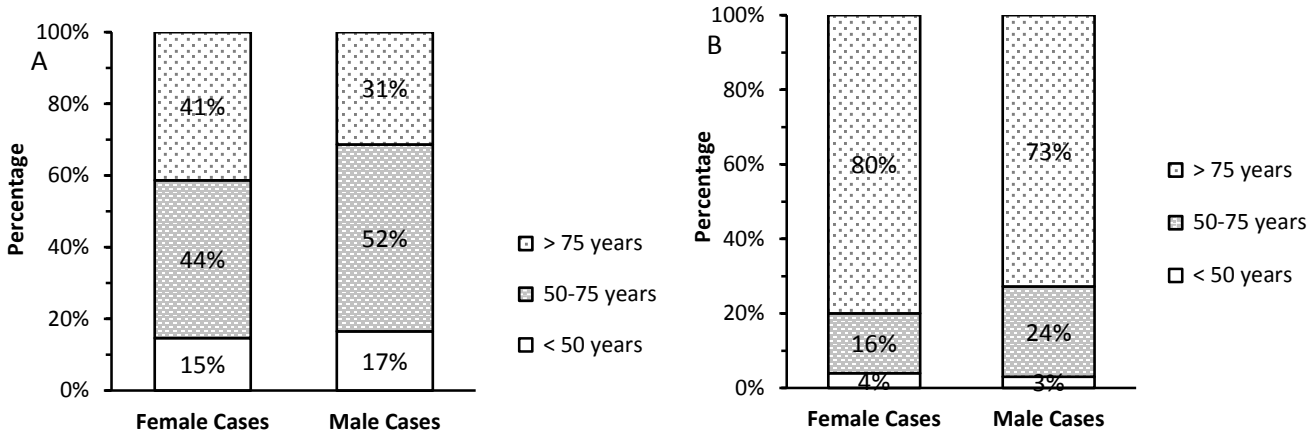


Figure 5: Proportion of primary HA-CDI cases in acute care (A) and LTC (B), by age and sex

All RHAs reported that the majority of primary cases were given some form of treatment following initial diagnosis (Figure 6). In all quarters, RHAs reported that the most common initial treatment was prescription of oral metronidazole (Flagyl) (Figure 7).

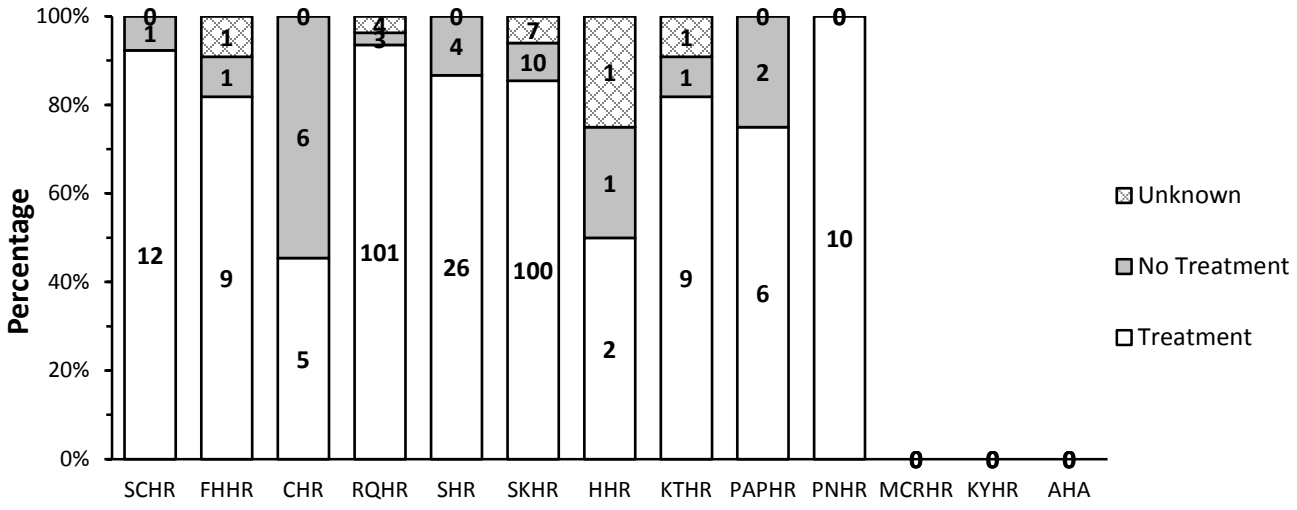


Figure 6: Proportion of primary HA-CDI cases receiving treatment following initial diagnosis, by RHA

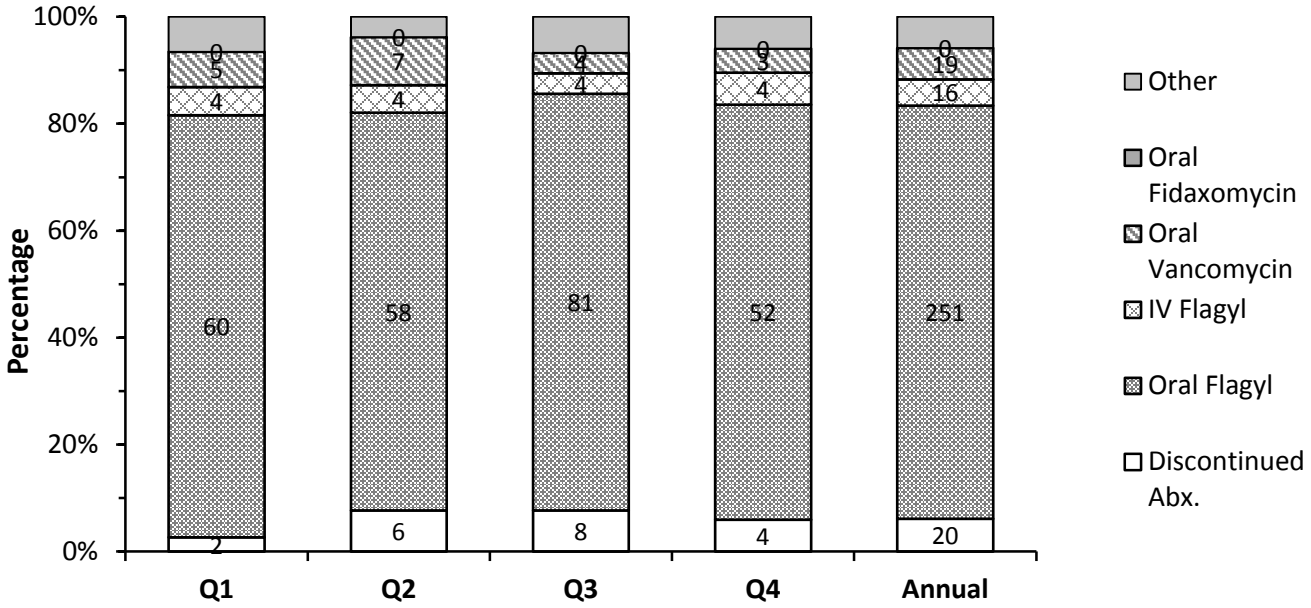


Figure 7: First reported method of treatment following diagnosis of primary HA-CDI

Patient Complications and Outcomes

Four (1.1%) of primary and recurrent HA-CDI cases required an ICU admission and five (1.4%) required a colectomy due to complications of CDI. The majority (41.6%) of all HA-CDI cases (146 cases) had been discharged 30 days following initial diagnosis. 93 patients (26.5%) were still in the facility, 33 (9.4%) had been transferred and 41 (11.7%) were deceased. The outcome of 38 patients (10.8%) after 30 days was unknown (Figure 8).

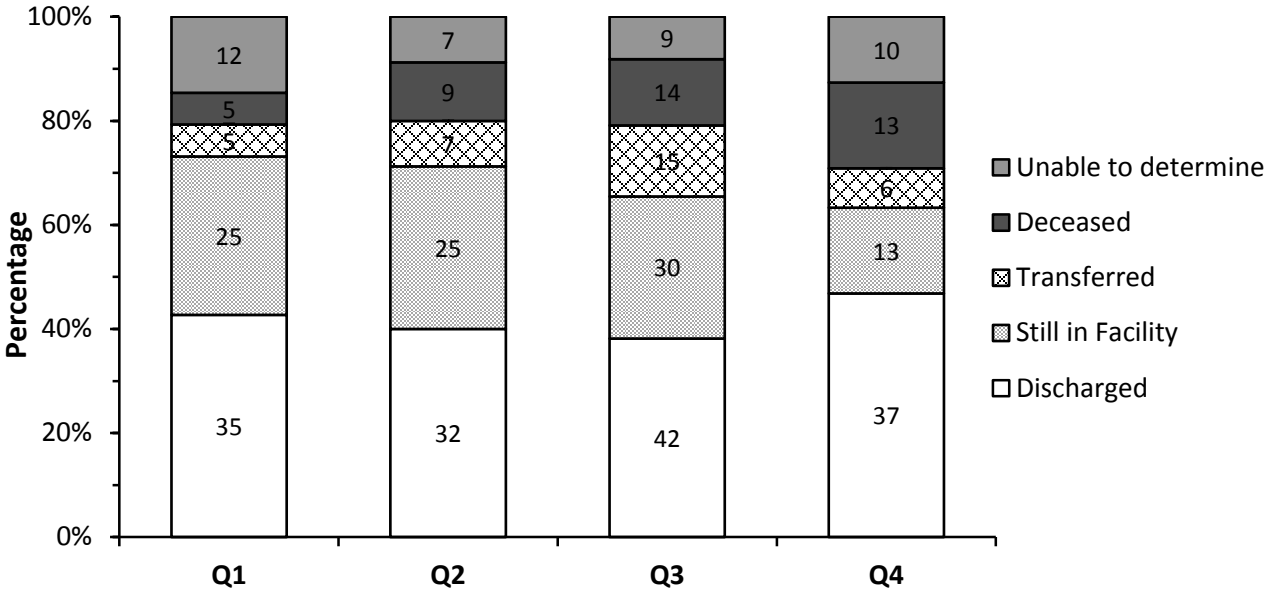


Figure 8: Patient outcome at 30 days, primary and recurrent HA-CDI

Trends in HA-CDI Rates

Trends in HA-CDI rates since provincial CDI surveillance data submission began in July 2012 are shown in Figure 9. The provincial acute care, LTC and overall rates of HA-CDI have remained stable, with the exception of a significant increase in HA-CDI rates in acute care in 2014-15, and a significant decrease in long-term care rates in the same year (compared to other years). Trends in overall RHA HA-CDI rates since 2012 are shown in Figure 10.

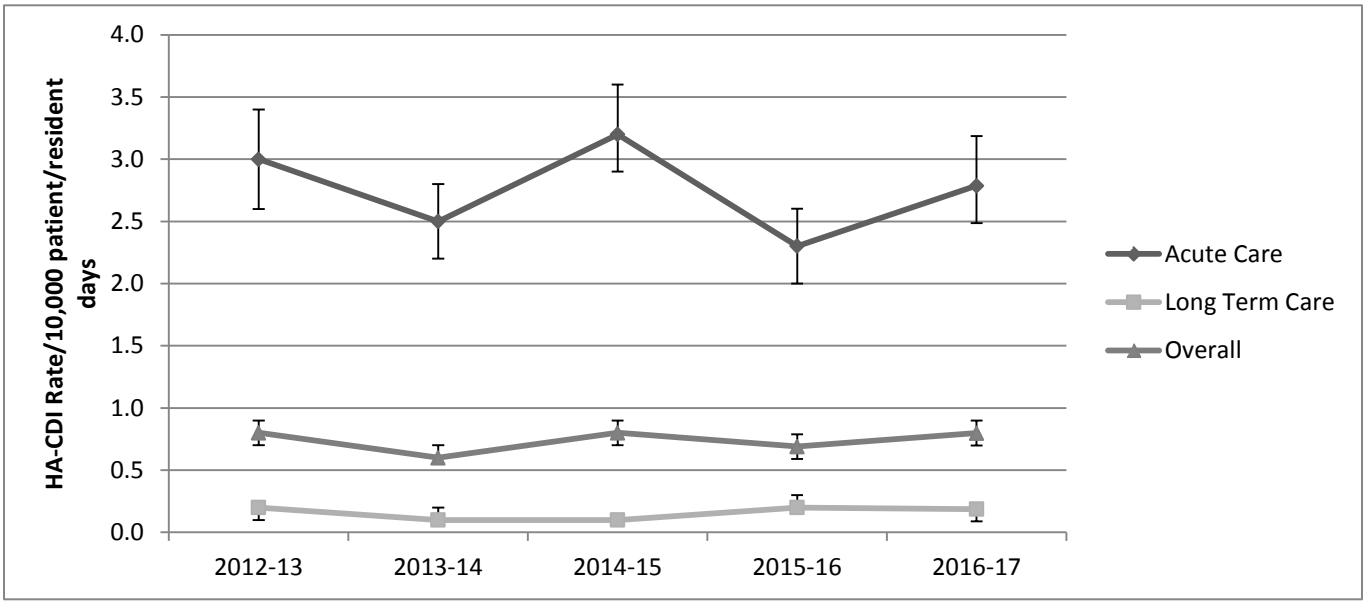


Figure 9: 2012-2017 Trends in provincial healthcare-associated CDI rates, by service type and year

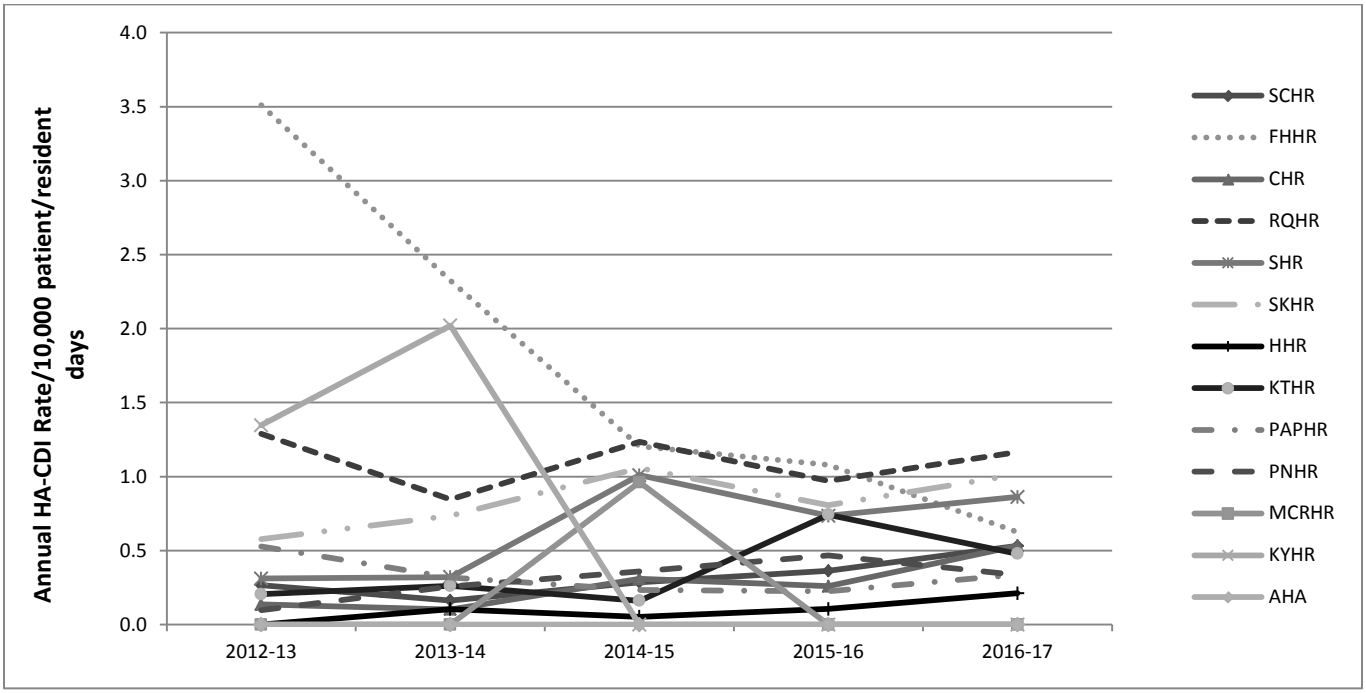


Figure 10: 2012-2017 Trends in overall healthcare-associated CDI rates, by RHA and year

CDI Outbreaks

A summary of the CDI outbreaks reported in FY 2016-17 is shown in Figure 11. There was one outbreak of CDI reported to the Ministry of Health (in a LTC facility), resulting in the diagnosis and treatment of three residents. The number of CDI outbreaks in Saskatchewan healthcare facilities by fiscal year is shown in Figure 12.

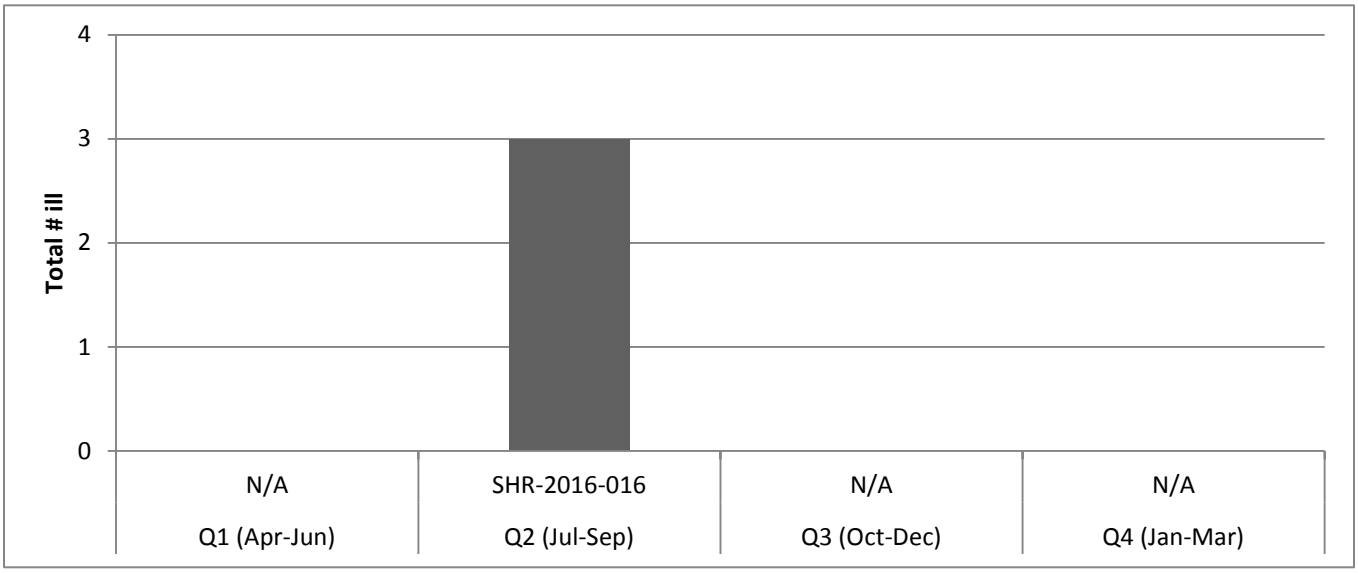


Figure 11: CDI outbreak case numbers, by quarter and outbreak number, FY 2016-17

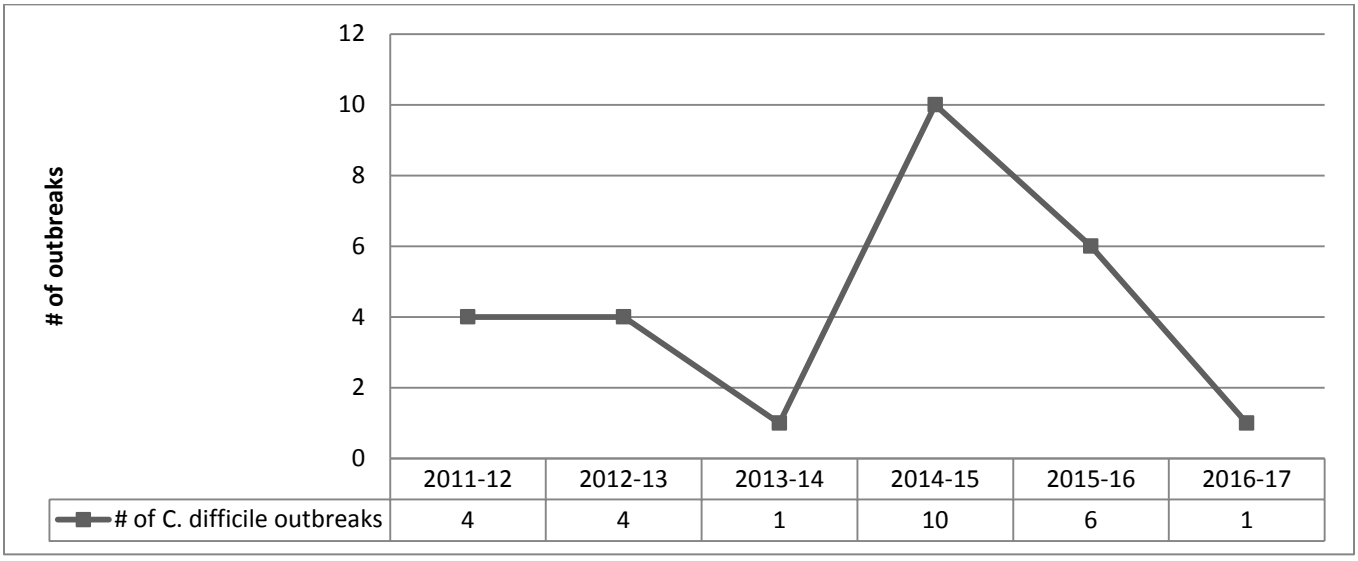


Figure 12: Number of annual healthcare facility CDI outbreaks in Saskatchewan, FY 2011-2017

Discussion

The provincial rates of HA-CDI have remained relatively stable over the past five years (see Figure 9).

As discussed in the introduction, there are many factors that can affect the incidence and rate of CDI and, since the rates presented in this report are not risk-stratified, direct comparisons between RHAs is not recommended. Nevertheless, variances are likely based not only on real differences in the numbers of cases of the disease, but also on several factors related to how cases are identified and information about them shared within each region. This report is based on CDI cases reported (usually by local or provincial laboratories) to regional infection control professionals (ICPs), who then investigate and submit results to the provincial Infection Control Coordinators (ICCs). Effective November 12, 2014, CDI became a Category I communicable disease in the Saskatchewan Disease Control Regulations and it became mandatory for all *C. difficile* positive lab reports to be forwarded to the regional ICPs. Effective November 5, 2015, the Saskatchewan Disease Control Laboratory (SDCL) began forwarding all positive *C. difficile* lab reports directly to the regional ICPs. While it is still not guaranteed that all cases of CDI in the population under surveillance were reported to the regional ICPs, reporting accuracy has undoubtedly improved over the last few years, leading to increased confidence in the rates and trends that are described in this report.

While the rates of HA-CDI in acute care, LTC and overall did not significantly change compared to last year, there was a slight increase in acute care and overall rates and a very slight decrease in LTC rates. Beginning in April 1, 2016, inclusion criteria for the Saskatchewan surveillance protocol were expanded to capture those patients with HA-CDI who experienced symptom onset in the community. Although not a significant increase, this likely resulted in the capture of more HA-CDI cases compared to last year. The very slight decrease in LTC rate may have been due to a decrease in the number of CDI outbreaks declared in 2016-17, compared to the previous years.

Recent studies suggest that the epidemiology of HA-CDI is changing. Although CDI continues to be a healthcare-associated infection, with 94% of all CDI being related to a recent healthcare exposure, location of onset of these infections has begun to shift from acute care hospitals to long-term care (LTC) facilities or outpatient settings. It is possible that the epidemiology of HA-CDI in Saskatchewan is also changing and that we will see a decrease in the rates of HA-CDI presenting in acute care, but an increase in rates reported in LTC and outpatient settings. The revisions to Saskatchewan's CDI surveillance protocol, launched April 1, 2016, have attempted to capture more information about cases in these settings.

With the approval of the Saskatchewan *Clostridium difficile* management guidelines in 2011 (updated in 2015), the surveillance protocol in 2012 (updated in 2016), improved ICP access to lab results from the provincial lab, and with the addition of CDI as a Category I communicable disease in the provincial disease control regulations, it is believed that some of the inter-regional discrepancies in testing, reporting and case management have begun to diminish, and a clearer picture of the burden of CDI in Saskatchewan is emerging. A better understanding of CDI in Saskatchewan will help us to reduce infection rates.

About This Report

CDI Surveillance System

The provincial HA-CDI surveillance system involves the participation of all 13 health regions across Saskatchewan. The objectives of the system are to monitor the incidence of healthcare-associated CDI, and to describe characteristics of CDI in Saskatchewan acute and long-term care facilities. Working with each RHA, PICNS collects and manages CDI surveillance data at the provincial level. This report presents the cases of CDI reported in Q1-Q4 of FY 2016-17.

1. Population Under Surveillance

Only patients or residents admitted into a hospital or long-term care facility at the time the CDI diagnosis is made, **OR** who had been acute care inpatients/long-term care residents in the 4 weeks prior to diagnosis are included for surveillance.

Saskatchewan CDI surveillance inclusion criteria include:[5]

- ONE year of age and older;
- admitted to an acute care unit (this includes patients awaiting placement on acute care units, patients admitted to your facility but who remain in the emergency room once admitted, 'outpatients' in ER who have been there for >3 days, and patients who are discharged after the date of diagnosis, but before the laboratory results are received);
- in a mental health inpatient ward/unit;
- residents in long-term care facilities; and
- patients who were discharged from a healthcare facility in the previous 4 weeks and return to an outpatient* unit/facility with a new onset of CDI.

  *Outpatient units may include, but are not limited to, the following:

  - Cancer Centre
  - Dialysis Unit
  - Emergency Room (not admitted)
  - Physician Clinic or Office

2. Case Definition for Surveillance and Reporting CDI

A patient is identified as a CDI case if:[6]

- s/he has diarrhea, or fever, abdominal pain and/or ileus, **AND** a laboratory confirmation of a positive toxin assay or PCR positive for *C. difficile*; **OR**
- s/he has a diagnosis of pseudomembranes on sigmoidoscopy or colonoscopy, or has a histological/pathological diagnosis of CDI; **OR**
- s/he has a diagnosis of toxic megacolon.

[5] CNISP, "2015-2017 Surveillance for *Clostridium difficile* infection (CDI)", 6.

[6] CNISP, "2015-2017 Surveillance for *Clostridium difficile* infection (CDI)", 3-4.

Diarrhea (watery or unformed stool that takes the shape of the specimen collection container) is defined as one of the following:

- 3 or more unformed stools in a 24-hour period for at least 1 day and new or unusual for the patient;
- 6 or more watery stools in a 36-hour period; or
- 8 or more unformed stools over 48 hours.

NOTE: If the information about the frequency and consistency of diarrhea is not available, a toxin-positive stool is considered as a case.

Primary Case:[7]

- A new CDI diagnosis **OR** a CDI diagnosis > 8 weeks after the first toxin-positive assay.

Recurrent CDI:[8]

- A new CDI diagnosis that occurs > 2 weeks and ≤ 8 weeks after being diagnosed with CDI **AND** symptoms from the previous CDI episode completely resolved with or without therapy.[9]

3. Clostridium difficile Infection Defined by Exposure[10,11]

A CDI case is classified as either healthcare-associated (HA-CDI) or community-associated (CA-CDI) based on the symptom onset and the patient's healthcare encounter history in the last four (4) weeks.

NOTE: The term "healthcare" applies to both hospital (acute care) and long-term care facilities.

Healthcare-associated CDI YOUR Facility (HA-CDI-Y):

- The patient's CDI symptoms began ≥ 3 days after admission to the reporting healthcare facility; **OR**
- The patient's symptoms began in the community or < 3 days after admission to the reporting facility, **AND** the patient was admitted to the reporting facility for a period of ≥ 3 days in the past 4 weeks.

Healthcare-associated CDI ANOTHER Facility (HA-CDI-AF):

- The patient's CDI symptoms began in the community or < 3 days after admission to the reporting healthcare facility, **AND** the patient had been admitted to **ANOTHER** healthcare facility in your (or another) health region for a period of ≥ 3 days within the previous 4 weeks.

The purpose of capturing **HA-CDI-AF** is that hospitalization carries an independent risk of acquiring CDI. The use of this definition will help to distinguish true community onset cases from cases discharged from a healthcare facility in the previous 4 weeks.[12] **HA-CDI-AF** cases are attributed to

[7] CNISP, "2015-2017 Surveillance for *Clostridium difficile* infection (CDI)", 3.

[8] CNISP, "2015-2017 Surveillance for *Clostridium difficile* infection (CDI)", 5.

[9] APIC, "Guide to the Elimination of *Clostridium difficile* in Healthcare Settings", 20.

[10] Provincial Infection Control Network of British Columbia (PICNet), **"**PICNet Surveillance Protocol for *Clostridium difficile* Infection (CDI) in BC Acute Care Facilities", 5.

[11] CNISP, "2015-2017 Surveillance for *Clostridium difficile* infection (CDI)", 4.

[12] McDonald, Coignard, Dubberke et al., 144.

the facility from which the patient was last discharged. This information is captured by the CDI Electronic Report Form (Appendix A) in the 'Patient History' section.

The appropriate follow-up by the ICP with a potential **HA-CDI-AF** case is to contact the ICP from the previous healthcare facility and/or region where the patient was admitted. However, to prevent duplication, data entry into the CDI Electronic Report Form will be performed ONLY by the ICP in the facility/health region where the person was diagnosed.

Community-associated CDI (CA-CDI):[13]

- CDI symptoms began in the community or < 3 days after admission to a healthcare facility, provided that symptom onset was > 4 weeks after the patient was discharged from any healthcare facility.

NOTE: CA-CDI cases do NOT need to be entered into the CDI Electronic Report Form. However, if entered, the CDI Exposure Definition will be displayed as 'CA-CDI', and further data entry will be disabled (i.e. will skip to bottom of the form for initials of data entry clerk).

4. Healthcare-Associated CDI Defined by Location of Onset[14]

CDI case patients with HA-CDI are further defined by the location of symptom onset (or specimen collection), as follows:

Healthcare facility-onset (HO):

- The patient's CDI symptoms began ≥ 3 days after admission to a healthcare facility.

Community-onset (CO):

- The patient's symptoms began in the community or < 3 days after admission to any healthcare facility, provided that symptom onset was < 4 weeks from the patient having an admission to the reporting facility for a period of ≥ 3 days.

Data Sources

This report incorporates the data collected from all acute and long-term care facilities in the 13 RHAs in Saskatchewan. The CDI case data are collected daily based on the infection criteria defined in the provincial CDI surveillance protocol, and managed by each RHA, using EpiData software that has been installed locally. Six weeks following the end of each quarter, regional ICPs export the data from EpiData to Excel and send it to the ICCs by email. No patient identifiers are provided. Facility-specific denominator data (estimated from other provincial data sources) is provided to regional ICPs. ICPs may change these numbers if they are not reflective of the current situation (e.g. due to bed closures), or if the ICP is able to refine the estimate provided.

Limitations

There may be variations in case finding strategies and data collection methodologies across healthcare facilities and RHAs in Saskatchewan.

Case definitions: The patient's healthcare encounter history is reviewed to determine whether the infection is healthcare-associated. The ability to determine healthcare encounter history depends on

[13] CNISP, "2015-2017 Surveillance for *Clostridium difficile* infection (CDI)", 4.

[14] McDonald, Coignard, Dubberke et al., 144.

the patient information system used in each hospital and RHA. Some misclassification of association of CDI is inevitable.

Denominator data: The appropriate denominator used to determine CDI rates is 'patient/resident days'. Denominator data (estimated from other provincial data sources) is provided to regional ICPs. ICPs may change these numbers if they are not reflective of the current situation (e.g. due to bed closures), or if the ICP is able to refine the estimate provided. Some ICPs have submitted exact denominator data for their region and others have allowed the estimated provincial data to be used. However, given that the denominator is based on 10,000 patient days, the discrepancy between the actual denominator and the estimate would have to be fairly large to make a significant difference in the rate.

Laboratory methodologies: A variety of laboratory methods are used in Saskatchewan to confirm CDI cases, including Enzyme-linked Immunosorbent Assay (EIA), Toxin Assays, and Polymerase Chain Reaction (PCR). The sensitivity and specificity of these methods are different, and vary from site to site. PCR testing is up to 35% more sensitive than the traditional method of toxin EIA testing for *C. difficile.*[15]

[15] 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 Saskatchewan.

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.[16]

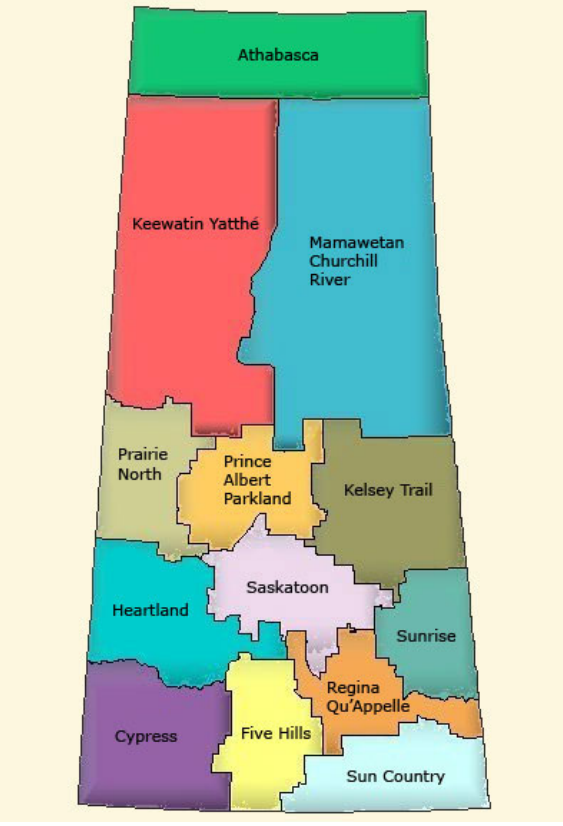
Fiscal Year (FY)

Fiscal year is a term used to differentiate a budget or financial year from the calendar year. Saskatchewan's fiscal year runs from April 1 of the initial year through March 31 of the next year. For example, FY 2016-17 is from April 1, 2016 to March 31, 2017.

Regional Health Authority (RHA) or Health Region (HR)

Regional health authorities manage and deliver healthcare services. For the purposes of this report, Athabasca Health Authority (AHA) has been included as though it were an RHA. The thirteen (13) RHAs in Saskatchewan are:

- Sun Country Health Region (SCHR)
- Five Hills Health Region (FHHR)
- Cypress Health Region (CHR)
- Regina Qu'Appelle Health Region (RQHR)
- Sunrise Health Region (SHR)
- Saskatoon Health Region (SKHR)
- Heartland Health Region (HHR)
- Kelsey Trail Health Region (KTHR)
- Prince Albert Parkland Health Region (PAPHR)
- Prairie North Health Region (PNHR)
- Mamawetan Churchill River Health Region (MCRHR)
- Keewatin Yatthé Health Region (KYHR)
- Athabasca Health Authority (AHA)



[16] Agresti A and Coull BA (1998). The American Statistician 52:119-12.

Patient/Resident Day

A patient/resident day is 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 patient days. This report uses patient days as the denominator to calculate the rate of CDI. This was chosen because increased length of stay has been shown to increase the risk of acquiring C. difficile infection.[17]

Nosocomial Infection

A nosocomial (healthcare-associated) infection, or HAI, is one associated with admission to a healthcare facility or service. In other words, it is an infection that was not present or incubating at the time of admission to the hospital or long-term care facility.

Rate per 10,000 patient/resident days

$$\text{Rate per 10,000 patient/resident days} = \frac{\text{\# of CDI cases in a defined period}}{\text{Total patient/resident days during that same period}} \times 10{,}000$$

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

Statistical Significance

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

[17] Dubberke, Gerding, Classen et al., S81-S82.

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