Appendix A: Disease-Specific Chapters

Chapter: *Clostridium difficile* Infection (CDI) outbreaks in public hospitals

[Known as *Clostridium difficile* associated disease (CDAD) in the regulations under the HPPA]

Revised January 2014

Ontario

Clostridium difficile Infection (CDI) outbreaks in public hospitals

☒ Communicable

☐ Virulent

Health Protection and Promotion Act:
Ontario Regulation 558/91 – Specification of Communicable Diseases

Health Protection and Promotion Act:
Ontario Regulation 559/91 – Specification of Reportable Diseases

1.0 Aetiologic Agent

Clostridium difficile is a Gram-positive, spore-forming, anaerobic bacillus. It is widely distributed in the environment and colonizes up to 3-5% of adults without causing symptoms. Some strains can produce two toxins that are responsible for diarrhea: toxin A and toxin B.[1]

2.0 Case Definition

2.1 Surveillance Case Definition

See Appendix B.

2.2 Outbreak Case Definition

See Annex C of the PIDAC-IPC Routine Practices and Additional Precautions.[1]

3.0 Identification

3.1 Clinical Presentation

Symptoms of CDI include:[2]

- Diarrhea (as defined in Appendix B)
- Fever
- Loss of appetite
- Nausea and
- Abdominal pain or tenderness

Complications include dehydration and colitis,[2] and may also lead to life threatening systemic toxicity requiring surgical intervention and may also lead to death.[1]

Recurrence of CDI is common and occurs in about 30% of cases.[1]

3.2 Diagnosis

See Appendix B for diagnostic criteria relevant to the Case Definition.

For additional information, please consult the following issues of Labstract, a publication of Public Health Ontario (PHO):

Clostridium difficile toxin testing: specimen acceptance criteria.[3]

Clostridium difficile: specimen acceptance during outbreaks.[4]

4.0 Epidemiology

4.1 Occurrence

Since 2000, there has been an increase in the rates of *C. difficile* in some health care settings. In some of these settings, this increase has been associated with the appearance of an epidemic strain of *C. difficile* typed the NAP1 by pulsed field gel electrophoresis (otherwise identified as the BI or 027 strain). Some characteristics of the NAP1 strain include the presence of binary toxin, increased resistance to clindamycin, fluoroquinolones and increased morbidity and mortality. This strain has been associated with outbreaks in Europe, the United States and Canada.[1]

From 2009 to 2011, 75 confirmed hospital outbreaks of CDI have been reported in Ontario. The majority of these outbreaks have occurred in acute teaching or community hospitals, and have primarily affected older individuals.

Mandatory public reporting of nosocomial CDI began in public hospitals in Ontario in September 2008. Initially, there was a reduction in CDI rates after the introduction of mandatory reporting. The most current data, however, shows that rates of CDI associated with reporting facilities have increased 13%, from 0.30 per 1000 patient days in 2009 to 0.34 per 1000 patient days in 2011. Higher rates of CDI were observed in Acute Teaching and Large Community Hospitals. This is likely due to a larger proportion of at-risk patients and the increased complexity of care provided in these hospital types. Over the 3-year period, a 55% increase in the number of CDI cases associated with non-health care facilities or unknown sources was also observed.

For more information on infectious diseases activity in Ontario, refer to the current versions of the Ontario Annual Infectious Diseases Epidemiology Reports and the Monthly Infectious Diseases Surveillance Report.[5,6]

4.2 Reservoir

C.difficile bacteria are found in feces of humans.[2]

4.3 Modes of Transmission

C.difficile is widely distributed in the environment. It produces spores that survive for longer periods of time and are resistant to destruction by environmental factors (e.g. temperature, humidity), including standard cleaning agents.[7] In an effort to protect itself from undesirable environmental conditions, it assumes its spore form.

C. difficile is spread through the fecal-oral route of transmission. *C.difficile* can be acquired in both hospital and community settings.[3] *C.difficile* can be transmitted and/or acquired by patients through contact with contaminated surfaces (including both vegetative cells and spores).

C. difficile infection (CDI) may occur when antibiotics kill normal bowel bacteria and allow the *C. difficile* to grow. When *C. difficile* grows, it may produce toxins, which can damage the bowel and may cause diarrhea.[8]

4.4 Incubation Period

The incubation period of *C. difficile* following acquisition has not been clearly defined. Studies have determined that onset of infection can occur within 48 hours after exposure and up to 3 months post exposure.[9, 10]

4.5 Period of Communicability

Precise period of communicability is unknown; it may vary depending on the amount of toxin in the stool, which can vary from very small to large spores and are very difficult to eliminate from surfaces and objects. Cytotoxins may persist in stool for weeks.[1]

4.6 Risk Factors for acquisition of CDI

Risk Factors associated with CDI include:[1]

- a history of antibiotic usage, particularly broad spectrum antibiotics that affect the normal gut bacterial flora, such as fluoroquinolones
- immunosuppressive therapy post-transplant
- proton pump inhibitors
- bowel disease and bowel surgery
- chemotherapy
- hospitalization

Additional risk factors that predispose some people to develop more severe disease include:

- history of CDI
- increased age
- immunosuppressive therapy
- recent surgery
- CDI with the hypervirulent strain of *C. difficile*.

5.0 Reporting Requirements

Mandatory patient safety reporting and patient-level reporting of *C. difficile* outbreak related cases is in effect for all Ontario hospitals to monitor rates, establish trends and inform best practices to help the health care system reduce the risk and prevent the spread of the disease.

5.1 To local Board of Health

Since September 1, 2008, *Clostridium difficile* infection (CDI) outbreaks and outbreak associated cases in hospitals have been reportable as per changes to regulation O. Reg. 559/91 under the *Health Protection and Promotion Act*, R.R.O. 1990 (HPPA).[11] Hospitals exceeding notification thresholds should consult with their local public health unit. The consultation may result in the declaration of an outbreak.

5.2 To the Ministry of Health and Long-Term Care (the ministry) or Public Health Ontario (PHO), as specified by the ministry

All CDI cases in hospitals are reportable to the Ministry of Health and Long-Term Care (MOHLTC) under the *Public Hospitals Act* as part of the mandatory patient safety reporting requirements.

Patient-level reporting of CDI cases associated with a CDI outbreak is required as part of the outbreak.

CDI outbreaks and outbreak associated cases in hospitals meeting the reportable definitions shall be reported using the integrated Public Health Information System (iPHIS), or any other method specified by the ministry **within one (1) business day of receipt of initial notification** as per iPHIS Bulletin Number 17: Timely Entry of Cases and Outbreaks.[12]

The minimum data elements to be reported for each case is specified in the following sources:

- *Ontario Regulation 569* (Reports) under the HPPA;[13]
- The iPHIS User Guides published by PHO; and,
- Bulletins and directives issued by PHO.

Note: All outbreaks of CDI in institutions, other than hospitals under the *Public Hospitals Act*, shall be reported in iPHIS under "Gastroenteritis, institutional outbreaks", selecting *Clostridium difficile*/*C.difficile* as the "causative agent".

6.0 Prevention and Control Measures

6.1 Personal Prevention Measures

Effective hand hygiene is essential to limit the spread of C. difficile:

a) Observe meticulous hand hygiene with either alcohol-based hand rub (ABHR) or soap and water;

b) Soap and water is theoretically more effective in removing spores than ABHR; however, the use of gloves for care of clients/ patients/ residents with CDI minimizes hand contamination and has been shown to reduce transmission of C. difficile;

c) When a dedicated hand washing sink is immediately available, hands should be washed with soap and water after glove removal;

d) When a dedicated hand washing sink is not immediately available, hands should be cleaned using an ABHR, after glove removal;

e) Hand hygiene should not be carried out at a patient sink as this will re-contaminate the health care worker's hands;

f) Education should be provided to the client/patient/resident on the need and procedure to be used for hand hygiene; and,

g) Clients/patients/residents who are unable to perform hand hygiene independently should be assisted by the health care provider.[1]

Education for staff, patients, visitors/families, should include, but is not limited to:[1]

- What is CDI; transmission; contact precautions, cleaning practices, etc.
- Reinforce that health care providers are not at risk of acquisition with consistent use of routine practices
- Reinforce safe work practices- no eating or drinking in patient/resident care areas

Patients with CDI are permitted to have visitors, provided visitors understand how they can protect themselves.[1]

Messaging to visitors should be written in clear language and include the following:

- What is CDI and what the visitor's risk of acquiring it is
- How to properly clean their hands (and its importance)
- When PPE is needed and how to put on and take off
- Measures to take when providing direct care to the patient/or having significant contact with the patient's environment (i.e. wear gown and gloves)
- Instructions to only use visitor washrooms and where these are located
- Instructions to visit their significant other in isolation last if they are visiting more than one person in the hospital

6.2 Infection Prevention and Control Strategies

Prevention Strategies in institutions include:[1]

- early identification and testing of patients with symptoms
- empowering front-line staff to institute additional precautions at onset of symptoms
- daily surveillance reporting to Infection Prevention and Control program staff

In addition to Routine Practices, Contact Precautions should be initiated by any regulated health care provider (e.g., physician, nurse) at onset of diarrhea and prior to receipt of *C. difficile* test results.

Contact Precautions should also be initiated when:

- there is a suspected or confirmed case of CDI
- there is toxic megacolon or pseudomembranous colitis.

Ideally, patients should be placed on precautions in a single room with dedicated toileting facilities. When that is not possible the decision regarding placement should be based on the criteria outlined in PIDAC-IPC's Annex C: Testing Surveillance and Management of *Clostridium difficile*.[1]

More detailed information is available in the Provincial Infectious Diseases Advisory Committee's *Annex C: Testing, Surveillance and Management of Clostridium difficile*.[1]

6.3 Management of Cases

Individual cases will be managed as per individual facility protocols.

The following recommendations may be considered when treating CDI patients:[1]

- Cessation of antibiotic therapy, if possible. Consult an ID physician if this is not possible.
- Rehydration of the patient.

- Avoid antimotility agents (e.g. loperamide).

For more information on recommended therapies, please refer to the Provincial Infectious Diseases Advisory Committee's *Annex C: Testing, Surveillance and Management of Clostridium difficile*.[1]

6.4 Management of Contacts

Not applicable.

6.5 Management of Outbreaks

As per the *Infectious Diseases Protocol*, 2008 (or as current), in addition to the recommended management of patients/ residents with CDI, the following measures should be implemented:

- Reinforce implementation of Contact Precautions as soon as possible for all patients/ residents at onset of unexplained diarrhea.
- Dedicate equipment to patients/ residents with CDI.
- Clean entire unit with a sporicidal disinfectant, including patient care equipment, high-touch items at nursing stations, carts (medication, isolation) and other areas touched by health care providers.
- Audit compliance with hand hygiene, Routine Practices, Additional Precautions and environmental cleaning.

More detailed information is available in the Provincial Infectious Diseases Advisory Committee's *Annex C: Testing, Surveillance and Management of Clostridium difficile*.[1]

The decision to close the unit to admissions should take into consideration:

- burden of CDI on the unit at the time of the outbreak
- ability to cohort patients/residents

The criteria for declaring an outbreak over should be determined collaboratively by the facility and the local public health unit as part of the outbreak management team process.

Factors to consider in declaring an outbreak over should include:

- Control measures have been implemented and validated through an audit process.
- There has been a return to unit/ ward or facility baseline for nosocomial CDI. For a facility-wide outbreak, this should be a minimum period of one month.
- Reservoir of colonized patients/ residents in the facility has been discharged.
- Facility's past experience with CDI outbreaks demonstrates ability to bring them under control.

7.0 References

1 Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. Annex C – testing, surveillance and management of *Clostridium difficile*. Annexed to: routine practices and additional precautions in all health care settings. Toronto, ON: Queen's Printer for Ontario; 2013 [cited 2013 Aug 27]. Available from:

http://www.publichealthontario.ca/en/eRepository/PIDAC-IPC_Annex_C_Testing_SurveillanceManage_C_difficile_2013.pdf

2 Health Canada; Public Health Agency of Canada. *C. difficile* (*Clostridium difficile*). It's Your Health. Ottawa, ON: Her Majesty the Queen in Right of Canada, represented by the Minister of Health ; 2006 [cited 2013 Aug 27]. Available from: http://www.hc-sc.gc.ca/hl-vs/alt_formats/pacrb-dgapcr/pdf/iyh-vsv/diseases-maladies/cdifficile-eng.pdf.

3 Ontario Agency for Health Protection and Promotion (Public Health Ontario). Labstract. *Clostridium difficile* toxin testing: specimen acceptance criteria. Toronto, ON: Queen's Printer for Ontario; 2008 [cited 2013 Aug 27]. Available from: http://www.publichealthontario.ca/en/eRepository/LAB_SD_002_Clostridium_difficile_toxin_acceptance_criteria.pdf

4 Ontario Agency for Health Protection and Promotion (Public Health Ontario). Labstract. *Clostridium difficile*: specimen acceptance and testing during outbreaks. Toronto, ON: Queen's Printer for Ontario; 2008 [cited 2013 Aug 27]. Available from: http://web.archive.org/web/20110827183143/http://www.oahpp.ca/resources/documents/labstracts/LAB-SD-045-000_C_diff_outbreaks_with_revisions_drp2.pdf

5 Ontario. Ministry of Health and Long-Term Care. Ontario annual infectious diseases epidemiology report, 2009. Toronto, ON: Queen's Printer for Ontario; 2009 (or as current) [cited 2013 Aug 27]. Available from: http://www.health.gov.on.ca/en/common/ministry/publications/reports/epi_reports/epi_report_2009.aspx.

6 Ontario Agency for Health Protection and Promotion (Public Health Ontario). Monthly infectious diseases surveillance report. Toronto, ON: Queen's Printer for Ontario; 2013. Available from: http://www.publichealthontario.ca/en/ServicesAndTools/SurveillanceServices/Pages/Monthly-Infectious-Diseases-Surveillance-Report.aspx

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8 Wiström J, Norrby SR, Myhre EB, Eriksson S, Granstrom G, Lagergren L, et al. Frequency of antibiotic-associated diarrhoea in 2462 antibiotic-treated hospitalized patients: a prospective study. J Antimicrob Chemother. 2001;47(1):43-50.

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10 Wilkins TD, Lyerly DM. *Clostridium difficile* testing: after 20 years, still challenging. J Clin Microbiol. 2003;41(2):531-4.

11 *Specification of Reportable Diseases*, O. Reg. 559/91. Available from: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_910559_e.htm

12 Ontario. Ministry of Health and Long-Term Care. Timely entry of cases and outbreaks. iPHIS bulletin. Toronto, ON: Queen's Printer for Ontario; 2012:17 (or as current).

13 *Reports*, R.R.O. 1990, Reg. 569. Available from: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_900569_e.htm

8.0 Additional Resources

Association of Medical Microbiology and Infectious Disease Canada; Public Health Agency of Canada. Canadian Nosocomial Infection Surveillance Program: surveillance for *Clostridium difficile* associated diarrhea (CDAD): preliminary results from January 1st to April 30th, 2007. Ottawa, ON: Her Majesty the Queen in Right of Canada; 2007[cited 2013 Aug 27]. Available from: http://web.archive.org/web/20130522001750/http://www.phac-aspc.gc.ca/nois-sinp/projects/pdf/cdad_e.pdf

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Hospital Management, R.R.O. 1990, Reg. 965. Available from: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_900965_e.htm.

9.0 Document History

Table 1: History of Revisions

Revision Date	Document Section	Description of Revisions
January 2014	General	New template. Title of Section 5.2 changed from "To Public Health Division (PHD)" to "To the Ministry of

Revision Date	Document Section	Description of Revisions
		Health and Long-Term Care (the ministry) or Public Health Ontario (PHO), as specified by the ministry" Section 9.0 Document History added.
	1.0 Aetiologic Agent	Changed from "*Clostridium difficile* (*C.difficile*) is a spore-forming gram-positive anaerobic bacillus that produces two exotoxins: toxin A and toxin B. It is present in the environment and can colonize in up to three to five per cent of adults in the community without causing symptoms" to "*Clostridium difficile* is a Gram-positive, spore-forming, anaerobic bacillus. It is widely distributed in the environment and colonizes up to 3-5% of adults without causing symptoms. Some strains can produce two toxins that are responsible for diarrhea: toxin A and toxin B."
	2.2 Outbreak Case Definition	Changed from "See Appendix B" to "See Annex C of the PIDAC-IPC Routine Practices and Additional Precautions."
	4.1 Occurrence	The following paragraph was deleted "*C.difficile* infection (CDI) has been associated with infectious diarrhea in health care settings for about 30 years and can be acquired in both hospital and community settings (3). It may occur when antibiotics kill normal bowel bacteria and allow the *C. difficile* to grow. When *C. difficile* grows, it may produce toxins, which can damage the bowel and may cause diarrhea. *C. difficile* infection is usually mild but sometimes can be more severe. In severe cases, surgery may be needed, and in extreme cases *C. difficile* may cause death." Second, third and fourth paragraphs added.
	4.3 Modes of Transmission	Third paragraph added.
	4.6 Risk Factors for acquisition of CDI	Section title changed from "Susceptibility and Resistance" to "Risk Factors for acquisition of CDI". Risk factors updated.

Revision Date	Document Section	Description of Revisions
	5.0 Reporting Requirements	Changed from "Mandatory and standardized reporting of C. difficile has been introduced for all Ontario hospitals to monitor rates…" to "Mandatory patient safety reporting and patient-level reporting of C. difficile outbreak related cases is in effect for all Ontario hospitals to monitor rates…".
	5.2 To the Ministry of Health and Long-Term Care (the ministry) or Public Health Ontario (PHO), as specified by the ministry	Entire section revised, reporting requirements updated.
	6.1 Personal Prevention Measures	Additional information about effective hand hygiene added to first paragraph.
	6.2 Infection Prevention and Control Strategies	Control measures revised, changed from "Control Strategies in institutions include (3):In addition to routine practices, initiate contact precautions, which include signage for contact precautions, use of gloves and gown upon entering room, use of dedicated patient care equipment including bedpans and commodes, Isolate patients in private rooms or cohort patient(s) if necessary, Discontinue antibiotic therapy and commence treatment if applicable, Appropriate environmental cleaning practices, Reinforce hand hygiene practices" to "In addition to Routine Practices, Contact Precautions should be initiated by any regulated health care provider (e.g., physician, nurse) at onset of diarrhea and prior to receipt of C. difficile test results. Contact Precautions should also be initiated when: there is a suspected or confirmed case of CDI, there is toxic megacolon or pseudomembranous colitis. Ideally, patients should be placed on precautions in a single room with dedicated toileting facilities. When that is not possible the decision regarding placement should be based on the criteria outlined in PIDAC-IPC's Annex C: Testing Surveillance and Management of Clostridium difficile".
	6.5 Management of Outbreaks	Entire section revised.

Revision Date	Document Section	Description of Revisions
	7.0 References	Updated.
	8.0 Additional Resources	Updated.