Appendix A: Disease-Specific Chapters

Chapter: Pertussis (Whooping Cough)

Revised December 2014

Ontario

Pertussis (Whooping Cough)

☒ 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

Pertussis is caused by, a Gram-negative, bacillus, *Bordetella pertussis, (B. pertussis)*.[1, 2]

2.0 Case Definition

2.1 Surveillance Case Definition

See Appendix B

2.2 Outbreak Case Definition

The outbreak case definitions are established to reflect the disease and circumstances of the outbreak under investigation. The outbreak case definitions should be created in consideration of the provincial surveillance case definition. For example, confirmed outbreak cases must at a minimum meet the criteria specified for the provincial surveillance confirmed case classification. Consideration should also be given to the following when establishing outbreak case definitions:

- Clinical and/or epidemiological criteria;
- The time frame for occurrence (i.e., increase in endemic rate);
- A geographic location(s) or place(s) where cases live or became ill/exposed;
- Special attributes of cases (e.g., age, underlying conditions); and
- Outbreak cases may be classified by levels of probability (i.e., confirmed, probable and/or suspect).

3.0 Identification

3.1 Clinical Presentation

The clinical course of pertussis is divided into three stages.[2]

1. Catarrhal Stage is characterized by mild upper respiratory tract symptoms with a mild occasional cough that lasts approximately 1-2 weeks and then progresses to the next stage;
2. Paroxysmal Stage presents with an increase in the severity and frequency of the cough which can last 1 to 2 months and sometimes longer; paroxysms are characterized by

repeated violent coughs and this is where the high pitched inspiratory whoop may occur commonly followed by vomiting; fever is absent or minimal, and

3. Convalescent Stage is the gradual recovery period where the cough becomes less paroxysmal and disappears. This may take weeks to months.

The clinical course varies with age. In young infants, who are at the highest risk, clinical symptoms are frequently atypical and it is this group who has the most serious complications.[2] Pertussis presentation may also be atypical in adults or among persons previously immunized.

3.2 Diagnosis

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

For further information about human diagnostic testing, contact the Public Health Ontario Laboratories or refer to the Public Health Ontario Laboratory Services webpage: http://www.publichealthontario.ca/en/ServicesAndTools/LaboratoryServices/Pages/default.aspx

4.0 Epidemiology

4.1 Occurrence

Pertussis outbreaks tend to be cyclical in nature with increased disease activity approximately every 4 - 6 years.[3] Protection against pertussis is not lifelong and wanes after 7-20 years of natural infection and approximately 4-12 years after immunization with either whole cell or acellular pertussis vaccine (varies with age).[4] Pertussis tends to be under-diagnosed, particularly among adolescents and adults. Young infants (< 6 months of age) have the highest risk of death and this risk is greatest before they are eligible to receive the vaccine or before completion of their primary vaccine series.

Between 2007 and 2011, an average of 512 cases per year were reported in Ontario. Two provincial outbreaks in south-western Ontario that primarily affected an under-immunized religious community contributed to a significant increase in cases in 2011.

Please refer to the Public Health Ontario Monthly Infectious Diseases Surveillance Reports and other infectious diseases reports for more information on disease trends in Ontario.[5, 6]

http://www.publichealthontario.ca/en/DataAndAnalytics/Pages/DataReports.aspx

4.2 Reservoir

Humans are the only known reservoir; adolescents and adults are often the source for infants.[2]

4.3 Modes of Transmission

Transmission occurs by direct contact with discharges from respiratory secretions of infected persons via droplets.[1]

4.4 Incubation Period

Usually 9-10 days, can range from 6-20 days.[1, 2]

4.5 Period of Communicability

Highly communicable in the early catarrhal stage and beginning of the paroxysmal stage (first 2 weeks) and then communicability gradually decreases and becomes negligible in about 3 weeks.[1]

No longer communicable after 5 days of effective treatment.[1]

4.6 Host Susceptibility and Resistance

Non-immunized or partially immunized individuals are susceptible to pertussis. Previously immunized adolescents and adults (due to waning immunity) may also be susceptible. Infection does not induce long term immunity. Secondary attack rates can occur, of up to 90% in non-immune household contacts.[1]

5.0 Reporting Requirements

5.1 To local Board of Health

Individuals who have or may have pertussis shall be reported as soon as possible to the medical officer of health by persons required to do so under the *Health Protection and Promotion Act*, R.S.O. 1990 (HPPA).[7]

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

Report only case classifications specified in the case definition.

Cases 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.[8]

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

- *Ontario Regulation 569* (Reports) under the *Health Protection and Promotion Act* (HPPA);[9, 7]
- The disease-specific User Guides published by PHO; and,
- Bulletins and directives issued by PHO.

6.0 Prevention and Control Measures

6.1 Personal Prevention Measures

Immunize as per the current *Publicly Funded Immunization Schedules for Ontario*.[10] According to the *Immunization of School Pupils Act*, all students must have documented receipt of pertussis containing vaccine.[11] Children attending day nurseries should, at a

minimum, be immunized according to the current *Publicly Funded Immunization Schedules for Ontario*.[10]

The on time administration of the 2, 4 & 6 month doses of acellular pertussis vaccine are most critical in reducing infant mortality and hospitalization rates from pertussis.[1, 2] Up to date vaccine status would vary with age. Current schedule for acellular pertussis vaccine is 2, 4, 6, and 18 months, 4-6 years, and 14-16 years. Refer to the current *Publicly Funded Immunization Schedules for Ontario* for more information on adult immunization with the tetanus-diphtheria-acellular pertussis (Tdap) vaccine.[10] Tdap can be safely administered regardless of the interval from the last tetanus-diphtheria booster.[2]

Provide education to the public about the risk of pertussis infection especially to infants and educate the public about respiratory etiquette that is, coughing into tissues and sleeves and about proper hand hygiene.

6.2 Infection Prevention and Control Strategies

At present, the most effective control of transmission of pertussis in hospital settings includes isolation using droplet precautions.

Evaluation of all symptomatic HCWs for pertussis and provision of appropriate therapy and exclusion during the first 5 days of their therapy is recommended. In addition, HCW should ensure they are up to date with pertussis vaccinations.[12]

Refer to Public Health Ontario's website at www.publichealthontario.ca for the most up-to-date Provincial Infectious Diseases Advisory Committee (PIDAC) best practices on Infection Prevention and Control (IPAC). PIDAC best practice documents can be found at: http://www.publichealthontario.ca/en/BrowseByTopic/InfectiousDiseases/PIDAC/Pages/PIDAC_Documents.aspx.

6.3 Management of Cases

Refer to *Regulation 569* under the HPPA for relevant data to collect including the following:[9, 7]

- Clinical: symptoms and date of symptom onset, complications, outcome;
- Immunization history of the reported case, specifically dates of vaccination with pertussis-containing vaccines;
- Laboratory: specimen type and result; and
- Epidemiologic: identifying the possible source of infection and, identify vulnerable contacts (see definition below).

Investigate risk factors for disease transmission including:

- work with vulnerable populations;
- daycare attendees or workers;
- health care providers, and
- those who have direct contact with infants less than one year of age and pregnant women in their third trimester.

Provide education about transmission of infection and proper respiratory etiquette. Advise cases to avoid contact with young children, infants, and women in their third trimester of pregnancy, until the completion of 5 days of appropriate antibiotic therapy or 21 days post cough onset. Advise symptomatic individuals to remain at home until they are well.

Refer to the OHA/OMA Surveillance Protocol on pertussis when dealing with cases that work in health care settings.[12]

Exclusion is not a proven effective strategy; however, in high-risk situations (where there are vulnerable persons) exclusion until five days after the start of antibiotic therapy, or if no treatment is given, until after 21 days with negative results from culture or PCR, should be at the discretion of the medical officer of health.[3]

6.4 Management of Contacts

There is no evidence that antibiotic chemoprophylaxis of contacts changes the epidemic course of pertussis in the community, therefore, it is only recommended for the following contacts of confirmed pertussis cases who are:[3]

- household contacts (including attendees at home day care) where there is a vulnerable person defined as an infant < 1 year of age [immunized or not] or a pregnant woman in the third trimester
- for out of household exposures, vulnerable persons, defined as infants less than one year of age regardless of immunization status and pregnant women in their third trimester who have had face-to-face exposure and/or have shared confined air for > 1 hour

Chemoprophylaxis:

Macrolide antibiotics such as azithromycin and erythromycin may prevent or moderate clinical pertussis when given during the incubation period or in the early catarrhal stage. During the paroxysmal phase of the disease, antibiotics may not shorten the clinical course but may reduce the possibility of complications. Antibiotics eliminate the organism after a few days of use and thus reduce transmission.

Chemoprophylaxis is only recommended in the above identified **contacts**, even in communities that refuse immunization. It should be implemented as soon as possible after exposure as efficacy is related to early implementation. It is not likely to be beneficial after 21 days since the first contact.[3]

There is little or no protection 24-48 hours after the last dose of chemoprophylaxis. In particular situations, if a high-risk contact refuses immunization and a further exposure occurs after the cessation of prophylaxis, re-offering chemoprophylaxis based on the nature of their exposure and risk of infection may be considered, based on expert opinion.

Laboratory diagnostic testing of contacts should not be done to guide decisions around who should receive chemoprophylaxis.

The following antimicrobials are indicated for chemoprophylaxis among people without contraindications (as per the Health Canada. *National consensus conference on pertussis.* Canada Communicable Disease Report 2003; Vol 29S3: 1-39) and the "*Recommended antimicrobial agents for the treatment and postexposure prophylaxis of pertussis: 2005 CDC Guidelines*. MMWR. 2005;54(RR14):1-16.[3, 13]

Table 1: Antimicrobials indicated for chemoprophylaxis among people without contraindications

Age	Drug	Dosage
Infants (< 1 month)	Azithromycin	10 mg/kg once daily in a single dose for 5 days
	Erythromycin	Not preferred
	Clarithromycin	Not recommended
Infants (1 – 5 months)	Azithromycin	As per < 1 month
	Erythromycin	40 mg/kg po (maximum 1 gm) in 3 doses for 7 days
	Clarithromycin	15 mg/kg/day po (maximum 1 gm/day) in 2 divided doses for 7 days
Infants (≥ 6 months and children)	Azithromycin	10 mg/kg po (maximum 500 mg) once for 1 day, then 5 mg/kg po (maximum 250 mg) once daily for 4 days
	Erythromycin	As per 1 – 5 months
	Clarithromycin	As per 1 – 5 months
Adults	Azithromycin	500 mg po once for 1 day then 250 mg po once for 4 days
	Erythromycin	As per 1 – 5 months
	Clarithromycin	1 gm/day in 2 divided doses for 7 days (**Not recommended in pregnancy**)

Azithromycin is the preferred antimicrobial for infants < 1 month of age. Clarithromycin is not recommended during pregnancy as it is classified as a Category C drug. Pregnancy is not a contraindication to azithromycin or erythromycin; both are classified as Category B drugs.[14]

6.5 Management of Outbreaks

An outbreak is defined by the usual epidemiological principles of a greater than expected number of cases that are spatially and temporally linked.

Outbreaks provide the opportunity to update the immunization status of contacts if required and to recommend immunization to all those who are not up to date in their pertussis immunization.[2, 3]

As per this protocol, outbreak management shall comprise but not be limited to the following general steps:

- Confirm diagnosis and verify the outbreak;
- Establish an outbreak team;

- Develop an outbreak case definition. These definitions should be reviewed during the course of the outbreak, and modified if necessary, to ensure that the majority of cases are captured by the definitions;
- Implement prevention and control measures;
- Implement and tailor communication and notification plans depending on the scope of the outbreak;
- Conduct epidemiological analysis on data collected;
- Conduct environmental inspections of implicated premise where applicable;
- Coordinate and collect appropriate clinical specimens where applicable;
- Prepare a written report; and
- Declare the outbreak over in collaboration with the outbreak team.

7.0 References

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8.0 Additional Resources

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Gregg MB, editor. Field epidemiology. 2nd ed. New York, NY: Oxford University Press; 2002.

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9.0 Document History

Table 2: History of Revisions

Revision Date	Document Section	Description of Revisions
December 2014	General	New template. Title of Section 4.6 changed from "Susceptibility and Resistance" to "Host Susceptibility and Resistance". Title of Section 5.2 changed from "To Public Health Division (PHD)" to "To the Ministry of Health and Long-Term Care (the ministry) or Public Health Ontario (PHO), as specified by the ministry". Section 9.0 Document History added.
December 2014	1.0 Aetiologic Agent	Removal of "pleomorphic" as characteristic of the bacillus.
December 2014	2.2 Outbreak Case Definition	Entire section revised.
December 2014	3.1 Clinical Presentation	First paragraph: Changed from "This acute bacterial infection attacks the tracheobronchial tree of the respiratory tract. It is…" to "The clinical course of pertussis is…" Second bullet: length of cough "and can last 1 to 2 months" moved from end of bullet to beginning "which can last 1 to 2 months and sometimes longer". Paragraph removed "Complications among adolescents and adults include…" and replace with new paragraph "The clinical course varies with age. In young infants..."
December 2014	3.2 Diagnosis	Addition of "for diagnostic criteria relevant to the case definition." Addition of direction to contact Public Health Ontario Laboratories or PHO website for additional information on human diagnostic testing.
December 2014	4.1 Occurrence	Entire section revised.
December 2014	4.2 Reservoir	Change from "…considered to play a major role in the transmission of infection to infants and children" to "often the source for infants".

Revision Date	Document Section	Description of Revisions
December 2014	4.4 Incubation Period	Changed from "Usually 7-10 days, can range from 5-21 days" to "Usually 9-10 days, can range from 6-20 days".
December 2014	4.6 Host Susceptibility and Resistance	Deletion of sentence: "These individuals often are a source of infection for young children".
December 2014	5.1 To Local Board of Health	The following was deleted: "Confirmed and suspected cases shall be reported to the medical officer of health by persons required to do so under the *Health Protection and Promotion Act*, R.S.O. 1990". And replaced with: "Individuals who have or may have pertussis shall be reported as soon as possible to the medical officer of health by persons required to do so under the *Health Protection and Promotion Act*, R.S.O. 1990 (HPPA)".
December 2014	5.2 To the Ministry of Health and Long-Term Care (the ministry) or Public Health Ontario (PHO), as specified by the ministry	Deletion of "to PHD" from the end of the first sentence. Under the third paragraph the end of the second and third bullets changed from: "...by the ministry" to "…by PHO".
December 2014	6.1 Personal Prevention Measures	Entire section revised.
December 2014	6.2 Infection Prevention and Control Strategies	Entire section revised.
December 2014	6.3 Management of Cases	"ON Regulation 569" changed to "*Regulation 569*". "…and ensure to include the following" changed to "…including the following". New bullet added: "Clinical: symptoms and date of symptom onset, complications, outcome." Addition to end of bullet regarding immunization history: "Specifically dates of vaccination with pertussis-containing vaccines." New bullet added: "Laboratory: specimen type

Revision Date	Document Section	Description of Revisions
		and result". Two bullets regarding source of infection and vulnerable contacts merged into one new bullet: "Epidemiologic…." Paragraph deleted: "Apply case definition to confirm the report". Second paragraph; fourth (last) bullet changed: "Those who have direct contact with ~~**immunocompromised patients and**~~ **(deleted)** infants less than one year of age **and pregnant women in their third trimester (added)**". Deletion of paragraph: "Treatment with antibiotics and follow up is under the direction of the attending health care provider…." Deletion: "Advise cases to avoid contact with young children, infants and women in their 3rd trimester of pregnancy, ~~**especially those who have not been immunized**~~ **(deleted)**, until…."
December 2014	6.4 Management of Contacts	"Prophylaxis" changed to "Chemoprophylaxis". Entire section revised and provides more details on chemoprophylaxis and updates the antimicrobials to align with current guidelines and include infants.
December 2014	6.5 Management of Outbreaks	The following was deleted: "Vaccination is not recommended for outbreak management, but the opportunity should be taken to update the immunization status of contacts if required. As well, recommend immunization to all those who are not up to date in their pertussis immunization." And replaced with: "Outbreaks provide the opportunity to update the immunization status of contacts if required and to recommend immunization to all those who are not up to date in their pertussis immunization." Addition to end of bullet on the development of an outbreak definition: "These definitions should be reviewed during the course of the outbreak, and modified if necessary, to ensure that the majority of cases are captured by the

Revision Date	Document Section	Description of Revisions
		definitions".
December 2014	7.0 References	Updated.
December 2014	8.0 Additional Resources	Updated.