Ministry of Health

Ontario Public Health Standards:
Requirements for Programs, Services and Accountability

Infectious Disease Protocol

Appendix 1: Case Definitions and Disease-Specific Information

Disease: Pertussis (Whooping Cough)

Effective: May 2022

Ontario

Pertussis (Whooping Cough)

☒ Communicable
☐ Virulent

Health Protection and Promotion Act (HPPA)
Ontario Regulation (O. Reg.) 135/18 (Designation of Diseases)

Provincial Reporting Requirements

☒ Confirmed case
☒ Probable case

As per Requirement #3 of the "Reporting of Infectious Diseases" section of the *Infectious Diseases Protocol, 2018* (or as current), the minimum data elements to be reported for each case are specified in the following:

- O. Reg. 569 (Reports) under the HPPA;[4]
- The Case and Contact Management (CCM) software guides;
- For certain vaccines, information to be entered into the applicable provincial inventory system; and
- Bulletins and directives issued Public Health Ontario (PHO).

Type of Surveillance

Case-by-case

Case Definition

Confirmed Case

Laboratory confirmation of infection: Isolation of *Bordetella pertussis (B. pertussis)* from an appropriate clinical specimen (e.g., nasopharyngeal swabs)

OR

Detection of *B. pertussis* deoxyribonucleic acid (DNA) by nucleic acid amplification test (NAAT) from an appropriate clinical specimen (e.g., nasopharyngeal swabs) AND one or more of the following:

- cough lasting 2 weeks or longer
- paroxysmal cough of any duration
- cough with inspiratory "whoop"
- cough ending in vomiting or gagging, or associated with apnea

OR

Epidemiologic link to a laboratory-confirmed case AND one or more of the following for which there is no other known cause:

- paroxysmal cough of any duration
- cough with inspiratory "whoop"
- cough ending in vomiting or gagging, or associated with apnea

Probable Case

Cough lasting 2 weeks or longer in the absence of appropriate laboratory tests and not epidemiologically linked to a laboratory-confirmed case for which there is no other known cause AND one or more of the following, with no other known cause:

- paroxysmal cough of any duration
- cough with inspiratory "whoop"
- cough ending in vomiting or gagging, or associated with apnea

Outbreak Case Definition

The outbreak case definition varies with the outbreak under investigation. Please refer to the *Infectious Diseases Protocol, 2018* (or as current) for guidance in developing an outbreak case definition as needed.

The outbreak case definitions are established to reflect the disease and

circumstances of the outbreak under investigation. The outbreak case definitions should be developed for each individual outbreak based on its characteristics, reviewed during the course of the outbreak, and modified, if necessary, to ensure that the majority of cases are captured by the definition. The case definitions should be created in consideration of the outbreak definitions.

Outbreak cases may be classified by levels of probability (i.e., confirmed and/or probable).

Clinical Information

Clinical Presentation

The clinical course of pertussis is divided into three stages:

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.
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 that has the most serious complications. Pertussis presentation may be atypical in adults or among persons previously immunized.

Laboratory Evidence

Laboratory Confirmation

Any of the following will constitute a confirmed case of pertussis:

- Positive *B. pertussis* culture
- Positive NAAT for *B. pertussis*

Approved/Validated Tests

- Standard culture for *B. pertussis*
- NAAT for *B. pertussis*

Indications and Limitations:

- NAAT assays for *B. pertussis* are available as either in-house or commercial assays and are highly sensitive. These assays must be interpreted along with clinical and epidemiological data.
- Detection of *B. pertussis* by culture has a high specificity and a limited/low sensitivity. This may result in under-reporting of cases.

Laboratory test results should be interpreted in the context of the clinical and epidemiological presentation of the patient.

Laboratory testing, using nasopharyngeal swabs, should only be performed on patients with appropriate clinical signs and symptoms. The positive predictive value of the NAAT assay is low in cases which do not fit the clinical and epidemiological picture.

Testing asymptomatic persons who are household contacts of a person with pertussis should be avoided as the NAAT assay is very sensitive and will detect very low levels of the target DNA (e.g., including DNA from non-viable bacteria located in the nasopharynx). The positive predictive value of the test will be low in this situation. Therefore, asymptomatic close contacts of confirmed cases should not be tested and testing of contacts should not be used for post-exposure prophylaxis decisions.

- Optimal timing for using NAAT assays for the detection of *B. pertussis* is within 3 weeks of cough onset when bacterial DNA is present in the nasopharynx.
- NAAT testing following antibiotic therapy is NOT recommended, as the exact duration of positivity is not well understood.
- There is no benefit in using NAAT as a test of cure after 5 days of antibiotic treatment, as the result may remain positive at this time.

For further information about human diagnostic testing, contact the Public Health Ontario Laboratories.

Case Management

In addition to the requirements set out in the Requirement #2 of the "Management of Infectious Diseases – Sporadic Cases" and "Investigation and Management of Infectious Diseases Outbreaks" sections of the *Infectious Diseases Protocol, 2018* (or as current), the board of health shall investigate cases to determine the source of infection. Refer to Provincial Reporting Requirements above for relevant data to be collected during case investigation.

Investigate risk factors for disease transmission including:

- work with vulnerable populations;
- child care 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 Pertussis Surveillance Protocol for Ontario Hospitals when dealing with cases that work in health care settings.[8]

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]

Contact Management

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:

- household contacts (including attendees at home child care settings) 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; and
- 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.[3]

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.[3,9]

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.[10]

Outbreak Management

Please see the *Infectious Diseases Protocol, 2018* (or as current) for the public health management of outbreaks or clusters in order to identify the source of illness, manage the outbreak and limit secondary spread.

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]

Prevention and Control Measures

In the event that publicly funded vaccine doses are needed for case and contact management, the board of health should contact the Ministry of Health's (ministry) immunization program at vaccine.program@ontario.ca as soon as possible.

Personal Prevention Measures

Immunize as per the current *Publicly Funded Immunization Schedules for Ontario*.[5]

In Ontario, the *Immunization of School Pupils Act* (ISPA) is the legislation that governs the immunization of school pupils for the designated diseases that are included in the Act. All students without a valid exemption must have documented receipt of pertussis containing vaccine according to the specified schedule.[6]

In Ontario, the *Child Care and Early Years Act, 2014* (CCEYA) is the legislation that governs licensed child care settings. Pursuant to O. Reg. 137/15 under the CCEYA, children who are not in school and who are attending licensed child care settings must be immunized as recommended by the local medical officer of health prior to being admitted. Under the CCEYA parents can provide a medical reason as to why the child should not be immunized or object to immunization on religious/conscience grounds.[7]

The current schedule for acellular pertussis vaccine is 2, 4, 6, and 18 months, and booster doses at 4-6 years, and 14-16 years. 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] Refer to the current Publicly Funded Immunization Schedules for Ontario for more information on adult immunization with the tetanus-diphtheria-acellular pertussis (Tdap) vaccine.[5] 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; coughing into tissues and sleeves and about proper hand hygiene.

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 health care workers (HCW) 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.[8]

Refer to PHO's website to search for the most up-to-date information on Infection Prevention and Control (IPAC).

Disease Characteristics

Aetiologic Agent - Pertussis is caused by, a gram-negative, bacillus, Bordetella pertussis, (B. pertussis).[1,2]

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

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

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]

Reservoir - Humans are the only known reservoir; siblings and parents are an important source of pertussis transmission to young infants.[2]

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 of up to 90% can occur in non-immune household contacts.[1]

Please refer to PHO's Reportable Disease Trends in Ontario reporting tool for the most up-to-date information on infectious disease trends in Ontario.

For additional national and international epidemiological information, please refer to the Public Health Agency of Canada and the World Health Organization.

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Document History

Revision Date	Document Section	Description of Revisions
April 2022	Entire Document	New template. Appendix A and B merged. No material content changes.
April 2022	Epidemiology: Occurrence section	Removed.
April 2022	ICD Codes	Removed.