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AT A GLANCE

Public Health Management Considerations for Pertussis

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This document outlines considerations for the public health management of pertussis. It is intended for use by public health unit (PHU) staff to supplement, and not replace Appendix 1 of Ontario's Infectious Disease Protocol.

If you have questions about this document, please contact the Immunization and Vaccine Preventable Diseases (IVPD) team of Public Health Ontario (PHO) at ivpd@oahpp.ca.

For additional information about pertussis including immunization, surveillance and laboratory testing please visit PHO's pertussis webpage.

Background

Pertussis, or whooping cough, is an acute infection of the respiratory tract caused by the gram-negative bacterium *Bordetella pertussis*. Pertussis is transmitted by the respiratory route (person-to-person) through contact with respiratory droplets.[1] Pertussis is an endemic disease common to children, especially young children.[1] Pertussis is highly communicable, with high attack rates among susceptible household contacts,[1] particularly infants under 1 year of age, who consistently have the highest reported rates of confirmed infection,[2] severe disease (i.e., hospitalizations, ICU admissions),[2,3] and mortality.[2,3] The incidence of pertussis, hospitalization and death risk are highest in very young infants below 2 to 3 months of age, before they are eligible to initiate their primary vaccine series.[2-4] Pertussis may be milder in adolescents and adults and is often an unrecognized cause of cough persisting for over two weeks among adolescents and adults.[1,5]

Protection against pertussis is not lifelong. There is waning of immunity after both natural infection and vaccination.[6-9] Although there has been an overall decline in reported disease with the introduction of routine pertussis vaccination programs, pertussis remains an endemic disease in Ontario, with increases in disease incidence approximately every 2 to 5 years.[1,2] Since 2011, there has been cyclical variation in pertussis activity in Ontario, with incidence rates peaking in 2012 due to a prolonged outbreak that originated in an under-immunized community,[10] and reaching very low levels of reported disease during the COVID-19 pandemic in 2020 and 2021.[11,12]

Diagnosis of pertussis

Due to the relatively non-specific nature of the clinical presentation of pertussis, the disease tends to be under-diagnosed.[1,2,13] Pertussis should be considered in individuals presenting with clinically compatible signs and symptoms.

Clinically compatible signs and symptoms

Symptoms of pertussis usually develop 9 to 10 days after exposure to the bacteria (the incubation period can range from 6-20 days).[1]

Among children and adults, pertussis illness progresses through three stages. The initial catarrhal stage is characterized by mild upper respiratory symptoms (e.g., runny nose, sneezing), low-grade fever and a mild, occasional dry cough; the illness is often indistinguishable from a common cold.[1,14] The coughing spells progress over 1 to 2 weeks into prolonged cough episodes, known as the paroxysmal stage.[1,14] During this distinctive stage, severe bursts (paroxysms) of coughing develop and result in a long series of coughs with little or no inspiratory effort in between, and may end with an inspiratory whoop and/or post-tussive vomiting.[1,14] The paroxysmal stage lasts from 1 to 6 weeks but may persist for up to 10 weeks.[1,14] In the final convalescent stage, there is gradual recovery that make take weeks to months as the cough subsides, becoming milder and less frequent.[1,14] Other respiratory tract infections that occur during the convalescent phase may trigger or worsen episodic coughing.[14]

Clinically compatible signs or symptoms of pertussis include any of the following:[14,15]

- paroxysmal cough of any duration (i.e., bursts or rapid coughing fits with little or no inspiratory effort)
- cough ending in vomiting or gagging, or associated with apnea
- cough with inspiratory “whoop” sound
- any cough illness lasting two weeks or longer

In infants under age 12 months, clinical symptoms are frequently atypical, as the whoop or post-tussive vomiting may be absent.[1,14,15] Infants may require hospitalization due to respiratory distress, pneumonia, apnea, seizures, encephalopathy, hypotension and shock.[3,14,16] Often a close contact of an infant case will be found to have a history of prolonged cough and no fever.[16] Adults, adolescents and individuals previously immunized may also present with atypical symptoms or mild respiratory disease.[1,14,15]

Diagnostic laboratory testing

Diagnostic laboratory testing consists of *Bordetella pertussis* detection by polymerase chain reaction (PCR). Refer to Public Health Ontario’s Bordetella – Respiratory test information sheet for comprehensive information on specimen collection and submission.

Health care professionals can optimize the use of PCR testing for pertussis by avoiding common pitfalls that might lead to false-positive or false-negative results:

- Laboratory testing should only be done on patients with clinical signs and symptoms of pertussis.[15,17]
- Asymptomatic testing of household contacts of confirmed cases should be avoided. Testing of contacts should not guide post-exposure prophylaxis decisions.[15,17]

- Optimal timing for PCR testing for pertussis is within three weeks of cough onset when bacterial DNA is still present in the nasopharynx.[15,17] After the fourth week of cough, the amount of bacterial DNA rapidly diminishes, which increases the risk of obtaining falsely-negative results.[17]

- PCR testing following appropriate antibiotic therapy is unlikely to be of benefit and is not recommended.[15,17]

- *Bordetella* PCR testing at PHO requires a special specimen collection kit which must be ordered from PHO (item #390052). Collection of specimens in other, non-validated media may result in false-negatives.

- Specimens should be collected using nasopharyngeal (NP) swabs included in the kit.

PCR results should be interpreted in conjunction with the presence of clinically compatible signs and symptoms and available epidemiological information (i.e., exposure to pertussis).

Public health management of pertussis

Case Management

Treatment should be based on clinically compatible signs and symptoms of pertussis. Treatment is most effective when given early during the course of illness and is unlikely to be beneficial if more than 21 days have passed since the onset of cough.[18] For information on antimicrobial treatment for pertussis, refer to the *Anti-Infective Guidelines for Community-acquired Infections* (Orange Book)[19] or the American Academy of Pediatrics *Red Book: 2021-2024 Report on the Committee of Infectious Diseases.*[20]

Early treatment can also reduce the risk of transmission to others, as cases are most infectious in the catarrhal stage and during the first two weeks of the paroxysmal stage.[1,14] Cases are not considered infectious after five days of treatment with appropriate antibiotic treatment[14,18] or 21 days after the onset of cough in the absence of treatment.[14,15] Cases should be counseled to avoid contact with infants, young children, and pregnant individuals in their third trimester of pregnancy until they are no longer considered infectious.[15]

Contact Management

Chemoprophylaxis should be offered as soon as possible after exposure. It is not likely to be beneficial after 21 days following exposure to pertussis.[15,18,19]

Chemoprophylaxis is only recommended for the following contacts of confirmed pertussis cases:[15,18]

- Household contacts (including attendees at family daycare centres) where there is an infant less than one year of age (regardless of vaccination status) and/or a pregnant individual in the third trimester of pregnancy.

- For out-of-household exposures: vulnerable persons, defined as infants less than one year of age (regardless of vaccination status) and pregnant individuals in the third trimester who have had face-to-face exposure and/or have shared confined air for greater than one hour.

For information on antimicrobials used for chemoprophylaxis, refer to the Ministry of Health Infectious Disease Protocol – Pertussis *Table 1: Antimicrobials indicated for chemoprophylaxis among people without contraindications.*

Pertussis immunization considerations

It is important that individuals of all ages are immunized according to Ontario's Publicly Funded Immunization Schedules.

The current schedule for acellular pertussis-containing vaccines starting in infancy is 2, 4, 6 and 18 months (DTaP-IPV-Hib), 4 to 6 years (Tdap-IPV), 14 to 16 years (Tdap), and a single dose in adulthood (Tdap).[21] In addition, to protect young infants from pertussis, Tdap vaccine should be offered in every pregnancy (irrespective of previous Tdap immunization history) ideally between 27 and 32 weeks gestation, but can be considered between 13 weeks gestation until time of delivery.[21,22]

- Acellular pertussis-containing vaccines are safe and effective. Redness, swelling and pain at the injection site are the most common adverse reactions to acellular pertussis-containing vaccines.[1]
- Periods of increased pertussis activity provide an opportunity to update the vaccination status of contacts and encourage those who are not vaccinated to receive the vaccine.[1,18]
- On-time administration of the 2, 4 and 6-month doses of acellular pertussis vaccine is effective in reducing hospitalization rates and infant mortality from pertussis.[1]
- Tdap immunization in pregnancy can prevent an estimated 70-90% of pertussis disease[1,4] and up to 90% of pertussis hospitalizations in infants less than 3 months of age.[4]
- Although cases may occur in vaccinated individuals due to waning of immunity, vaccinated individuals are less likely to experience severe illness or be hospitalized,[23] may have reduced illness duration,[24] and are less likely to transmit disease to vaccinated contacts.[1]

Provincial surveillance and case definitions for pertussis

The provincial surveillance case definitions for pertussis are found in Appendix 1 of Ontario's Infectious Disease Protocol. For guidance on how to enter cases into the integrated Public Health Information System (iPHIS), please refer to the iPHIS User Guide for Vaccine Preventable Diseases.

In the event of an outbreak or cluster of pertussis cases, PHUs may wish to consider developing an outbreak case definition as part of the public health response. The outbreak case definition 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.

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