PERTUSSIS SURVEILLANCE PROTOCOL FOR ONTARIO HOSPITALS

Developed by the Ontario Hospital Association and
the Ontario Medical Association
Joint Communicable Diseases Surveillance Protocols Committee

Approved by
The OHA and the OMA Board of Directors
The Ministry of Health and Long-Term Care –
The Minister of Health and Long-Term Care

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This protocol was developed jointly by the Ontario Hospital Association and the Ontario Medical Association to meet the requirements of the *Public Hospitals Act 1990,* Revised Statutes of Ontario, Regulation 965. This regulation requires each hospital to have by-laws that establish and provide for the operation of a health surveillance program including a communicable disease surveillance program in respect of all persons carrying on activities in the hospital. The communicable disease program is to include the tests and examinations set out in any applicable communicable disease surveillance protocol. The regulation states that the communicable disease surveillance protocols that hospitals must adopt are those "published jointly by the Ontario Hospital Association (OHA) and the Ontario Medical Association (OMA) and approved by the Minister (of Health and Long-Term Care)."

This Protocol has been reviewed since the previous version; changes have been highlighted in yellow for easy identification. Protocols are reviewed on a regular basis, every two years or as required.

The protocol reflects clinical knowledge, current data and experience, and a desire to ensure maximum cost effectiveness of programs, while protecting health care workers and patients. It is intended as a minimum standard that is practical to apply in most Ontario hospital settings. It does not preclude hospitals from adopting additional strategies that may be indicated by local conditions.

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Rationale for Pertussis Surveillance Protocol

Pertussis (whooping cough) is a highly communicable infection of the respiratory tract caused by the bacterium *Bordetella pertussis* and spread by large respiratory droplets. Pertussis is primarily a toxin-mediated disease that can affect individuals of any age, although the severity is greatest among young infants who may experience complications such as pneumonia, seizures and encephalitis and who are at the greatest risk of dying.[1,2]

Pertussis is a vaccine preventable disease. With the introduction of whole cell adsorbed pertussis vaccine in 1943, rates of pertussis decreased over 90% in Canada. The greatest incidence remains among infants less than one year of age, and since the early 1990s, there has been an increased incidence among children aged 10 to 14 which has been partly attributable to waning vaccine immunity.[3] Acellular pertussis vaccine has replaced whole cell adsorbed vaccine and has been used since 1997.

In Canada and the United States, there has been a resurgence of pertussis, with the greatest relative increase in incidence noted among adolescents and adults. According to CDC reports there were 15,737 cases in 2016 (provisional) and 20,762 cases in 2015 in the US. There were 1,793 children hospitalized who were less than one year, with 44.5% under six month of age. There were seven deaths, six in children less than one year; and most less than three months old [5]. Increased rates in adolescents were again noted. The incidence rate of pertussis among babies exceeded that of all other age groups.

In 2012, 48,277 cases were reported in the US, exceeding levels observed since 1955. Levels remain significantly increased compared to those observed during the 1990s and early 2000s. Multiple factors have likely contributed to the increase including heightened provider and public awareness, improved diagnostic testing, waning immunity[6] from acellular pertussis vaccines [7] and possibly molecular changes within the pertussis bacterium. The incidence of pertussis remains highest among young infants.[1]

In Ontario, between 2000 and 2010, significant trends were observed in the annual incidence of pertussis as a result of changes in vaccine immunogenicity, laboratory testing, and reporting standards, so comparisons of annual rates should be interpreted with caution. There was an increase in incidence of pertussis in Canada observed in 2012 due to outbreaks in several jurisdictions across the country, including a large outbreak in an underimmunized religious community in Ontario.[8] Reasons for pertussis resurgence could include low vaccine coverage and waning immunity among young adolescents affected by the outbreak.[1]

In Canada, over the ten year period (2005–2015) there have been two outbreaks with 1,265 cases reported in 2006 and 1,044 cases in 2012. Since 2014 the incidence of pertussis has been on the rise with 700 cases reported in 2015. Among the 700 cases of pertussis in 2015, 5.1% (36 cases) were hospitalized; of these, 80.6% were less than five years of age.[9]

From 1991 to 2012, 30 deaths have been reported through the Canadian Immunization Monitoring Program Active (IMPACT). All deaths were reported in infants less than one

year of age, with the majority of deaths occurring in infants less than two months of age. Most children were previously healthy and had no history of immunization.[2,9]

Adults have been increasingly recognized as the main reservoir for pertussis infection, and numerous outbreaks of pertussis in health care facilities have been reported in the literature.[8] Adults are the primary source of pertussis for infants who are hospitalized. Infection in health care workers (HCWs) is of particular concern as they may put susceptible patients at risk for infection.[9,10] Mild and atypical manifestations of pertussis among infected persons and the lack of quick and accurate diagnostic tests can make pertussis outbreaks difficult to recognize and therefore difficult to control. Nosocomial acquisition of pertussis by HCWs has occurred during several outbreaks.[11] Asymptomatic transmission has been recognized as a factor in outbreaks.[12] Early recognition and treatment of pertussis in adults and adolescents may be helpful in limiting transmission to very young children.[13]

The goal of pertussis control is to decrease morbidity and mortality from pertussis across the entire life span through immunization of adolescents and adults for their own protection, as well as to reduce disease transmission. Both the National Advisory Committee on Immunization (NACI)[2] in Canada and the Advisory Committee on Immunization Practices (ACIP)[15] in the United States recommend a single booster dose of Tdap (diphtheria, tetanus and acellular pertussis) in adults. The adult dose is in addition to the routine adolescent booster dose.[2,14,15]

Prevention is always the primary goal and HCWs should protect themselves and their patients by being vaccinated. It is also important to recognize early or atypical symptoms of disease to be able to implement recommendations and protocols for the management of pertussis in health care facilities.

The incubation period is commonly 7-10 days, with a range of 4-21 days. The clinical course is divided into three stages. Persons with pertussis are most infectious during the first stage, known as the Catarrhal Stage, characterized by mild upper respiratory tract symptoms with a mild occasional cough that lasts approximately 1-2 weeks. The second stage is the Paroxysmal Stage which presents as 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 where the high pitched inspiratory whoop may occur commonly followed by vomiting; fever is absent or minimal. The third stage known as the Convalescent Stage, begins a gradual recovery period where the cough becomes less paroxysmal and disappears. This may take weeks to months to resolve.

At present, the most effective control of transmission of pertussis in hospital settings includes isolation of suspected or known infected patients using droplet precautions, provision of post-exposure prophylaxis for asymptomatic exposed HCWs as indicated, evaluation of all symptomatic HCWs for pertussis, and provision of appropriate therapy and exclusion of all symptomatic HCWs during the first 5 days of their therapy.[11,15]

It is important to remember to perform hand hygiene before and after patient contact and use appropriate personal protective equipment (i.e. droplet precautions) including mask and eye protection.

This protocol is only one component of an infection prevention and control program; HCWs must consistently adhere to Routine Practices.

Pertussis Surveillance Protocol for Ontario Hospitals

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I. Purpose

The purpose of this protocol is to provide direction to hospitals to prevent the transmission of *Bordetella pertussis* (pertussis, whooping cough) among health care workers (HCWs) and patients. This protocol provides the minimum standard required under the Ontario Public Hospitals Act, Regulation 965.

II. Applicability

This protocol applies to **all persons carrying on activities in the hospital**, including but not limited to employees, physicians, nurses, contract workers, students, post-graduate medical trainees, researchers and volunteers. The term health care worker (HCW) is used in this protocol to describe these individuals. This protocol does not apply to patients or residents of the facility, or to visitors.

When training students or hiring contract workers, the hospital must inform the school/supplying agency that the school/agency is responsible for ensuring that their student/contractors are managed according to this protocol.

This protocol is for the use of the Occupational Health Service (OHS) in hospitals. It is expected that OHS collaborate with Infection Prevention and Control and other departments, as appropriate.

III. Pre-placement

At the time of pre-placement, pertussis immunization status of all HCWs should be determined and recorded in the HCW's OHS record. All adult HCWs, regardless of age, should receive a single dose of tetanus diphtheria acellular pertussis vaccine (Tdap) for pertussis protection if not previously received in adulthood. The adult dose is in addition to the routine adolescent booster dose.

Adolescent volunteers in health care settings should receive their routine booster dose of Tdap vaccine.[2] The interval between the last tetanus-diphtheria booster and the Tdap vaccine does not matter.[16] The long-term effectiveness of a single dose of acellular pertussis vaccine is unknown at this time.

Previous immunization against pertussis or a history of natural pertussis infection does not provide lifelong immunity. There is no routine antibody testing available to determine immune status to pertussis.

Immunization with Tdap is safe and effective in pregnant women, and allows for high levels of antibody in newborns during the first two months of life, when morbidity and mortality from pertussis infection is the highest. “All pregnant women at or after 26 weeks of pregnancy who have not received a dose of pertussis-containing vaccine in adulthood should be encouraged to do so.” [2,17]

IV. Continuing Surveillance

No routine continuing surveillance of any persons carrying on activities in the hospital is required for pertussis. Contact tracing is conducted for active cases only.

There should be a routine internal reporting process in OHS for HCWs to report occurrence of and absences for respiratory infection. When there is an outbreak of pertussis in the hospital, OHS will follow-up contacts of cases and absences of HCWs with respiratory symptoms who work in the affected area(s).

V. Exposure

Exposure is defined as:

- **Unprotected** direct face-to-face contact (<2 metres) for a period (not defined) with a case-patient who is symptomatic (i.e. in the catarrhal or paroxysmal period of illness)
- Direct contact with respiratory, oral, or nasal secretions from a symptomatic case- patient (e.g. an explosive cough or sneeze in the face, mouth-to-mouth resuscitation, performing examination of the nose and throat without appropriate personal protective equipment; sharing food or utensils).

Management of Exposed HCWs

The primary objective of post-exposure chemoprophylaxis is to prevent death and serious complications from pertussis. Newborns whose mothers contract pertussis two to three weeks prior to their delivery are at high risk for severe pertussis disease and its complications.

For all exposed HCWs:

- HCWs who have not received an adult dose of acellular pertussis (Tdap) should be immunized
- Educate asymptomatic exposed HCWs about the symptoms of pertussis (see Glossary); early symptoms mimic the “common cold”
- Nasopharyngeal (NPS) swabs should not be done on asymptomatic exposed HCWs as they are not useful for outbreak control or for assessing the need for chemoprophylaxis

- Advise HCW to inform OHS as soon as any symptoms develop and ensure HCW is medically assessed and tested for *B. pertussis* as the most infectious stage is the first stage

Chemoprophylaxis:

Routine chemoprophylaxis of exposed HCWs who are not considered high-risk contacts is not recommended as there is no evidence that it changes the epidemic course of pertussis in the community. Decision for use of chemoprophylaxis can be made on a case by case basis for those HCWs who are not high-risk contacts.

Chemoprophylaxis is recommended for all exposed HCWs who are considered high-risk contacts, regardless of immunization status. Immunization against pertussis is not fully protective, thus immunized individuals can still acquire and transmit *B. pertussis*. To be effective, chemoprophylaxis must be started as soon as possible after the contact.[18]

All exposed HCWs defined as high-risk contacts of a confirmed pertussis case should receive chemoprophylaxis regardless of immunization status.

High-Risk HCW Contacts are defined as:

- **HCW having household contact** with infants less than 1 year of age, **or** with a woman who is 26 or more weeks pregnant; **or** who may expose these high-risk patient populations (e.g. hospitalized infants, pregnant women);

or

- **HCW who is 26 or more weeks pregnant**

Acellular pertussis vaccine has been used for the control of pertussis outbreaks in defined populations, such as hospitals, although data supporting its effectiveness are lacking. In an outbreak setting, public health may recommend that pregnant women of 26 weeks gestation or more be offered Tdap, regardless of their immunization status.[2,17]

Work Restrictions

Exclusion of asymptomatic contacts from any setting is not indicated.

VI. Acute Disease

OHS should collaborate with Infection Prevention and Control in order to identify patient contacts of symptomatic HCWs. Symptomatic HCWs must be assessed by their personal health care provider for treatment of acute disease. A medical examination and NPS for *B pertussis* should be done prior to the start of antibiotics. NPS may be performed or arranged through the OHS if clinically indicated. Ensure correct sampling technique and transport medium is used.

Work Restrictions

HCWs with symptoms of pertussis must be excluded from work anywhere in the hospital for the first 5 days of antimicrobial treatment (See Appendix). Antimicrobial therapy should be started as soon as possible after onset of illness. There is no time limit for initiation of antibiotic treatment following onset of symptoms in cases of laboratory confirmed or epidemiologically linked clinical cases of pertussis.

HCWs with symptoms of pertussis who cannot or refuse to take antimicrobial therapy must be excluded from work for 21 days from onset of cough.[20] The use of a surgical/procedure mask by a HCW is not sufficient protection for patients and other staff during this time.[15]

VII. Reporting

Suspect or confirmed pertussis (as per Ontario Reg 559/91 and amendments under the Health Protection and Promotion Act) must be reported to the local Medical Officer of Health.

In accordance with the Occupational Health and Safety Act and its regulations, an employer must provide written notice within 4 days of being advised that a worker has an occupational illness, including an occupationally-acquired infection, or has filed a claim with the Workplace Safety and Insurance Board (WSIB) with respect to an occupational illness, to the:

- Ministry of Labour,
- Joint Health and Safety committee (or health and safety representative), and
- trade union, if any.

Occupationally-acquired illnesses are reportable to the WSIB.

VIII. Glossary

Ontario MOHLTC Surveillance Case Definition for Pertussis[21]

Confirmed Case:

Laboratory confirmation of infection: Isolation of *Bordetella 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.

Clinical Course of Pertussis (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. [21]

   Note: Symptoms of pertussis in adults may be mild and/or atypical; cough may persist for several weeks, without the characteristic whoop. Recognition of pertussis in adults may be difficult due to the nonspecific symptoms.

Exposure Definition

- **Unprotected** direct face-to-face contact (<2 metres) for a period (not defined) with a case-patient who is symptomatic (i.e., in the catarrhal or paroxysmal period of illness)
- Direct contact with respiratory, oral, or nasal secretions from a symptomatic case-patient (e.g., an explosive cough or sneeze in the face, mouth-to-mouth resuscitation, performing a full medical exam including examination of the nose and throat, without appropriate personal protective equipment; sharing food or eating utensils during a meal).

High-Risk HCW Contacts

- **HCW having household contact** with infants less than 1 year of age, **or** with a woman who is 26 or more weeks pregnant; **or** who may expose these high-risk patient populations (e.g. hospitalized infants, pregnant women);

  or

- **HCW who is 26 or more weeks pregnant**

Appendix: Recommended Antimicrobial Treatment of Pertussis and Postexposure Chemoprophylaxis of Pertussis Contacts[22]

Any of the following drug regimens can be used for either treatment or chemoprophylaxis: (Choice based on cost, contraindications, side effects, etc.)

DOSAGE	CONTRAINDICATIONS*	COMMON SIDE-EFFECTS *	NOTES
ERYTHROMYCIN: 500 mg po qid for 14 days	Allergy to erythromycin or other macrolides Estolate salt should not be given during pregnancy	Nausea, vomiting diarrhea, abdominal pain	Avoid estolate salt in those with hepatic dysfunction
AZITHROMYCIN: 500 mg po once for 1 day, THEN 250 mg po once daily for 4 days	Allergy to azithromycin or other macrolides Safety during pregnancy has not been established	Nausea, vomiting diarrhea, abdominal pain	Use with caution in those with hepatic dysfunction Do not take with aluminum or magnesium containing antacids.
CLARITHROMYCIN : 500 mg. po bid for 7 days	Allergy to clarithromycin or other macrolides Pregnancy	Nausea, vomiting diarrhea, abdominal pain	Use with caution in those with hepatic or renal impairment
Alternate agent (if allergic to macrolides):			
Trimethoprim/ Sulfamethoxazole DS (double strength) 1 tab po bid for 14 days	Allergy to trimethoprim or sulfonamides Pregnancy or lactation Severe renal impairment	Nausea, vomiting, skin rash	

*Consult the Compendium of Pharmaceutical and Specialties (CPS) for a complete listing of contraindications and side-effects.

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