Philippine Society for Microbiology and Infectious Diseases

GUIDANCE ON THE PREVENTION AND POST-EXPOSURE MANAGEMENT OF PERTUSSIS AMONG HEALTHCARE WORKERS

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I. Introduction

A. What is Pertussis?

Pertussis is a respiratory infection that is highly contagious. The disease is also called whooping cough, and is caused by a bacterium named *Bordetella pertussis*. Pertussis occurs worldwide, where it is endemic, but with epidemics that come every 2–5 years.

B. pertussis is a gram-negative bacteria that is fastidious, needing special media to grow on culture. The bacteria attaches to the respiratory epithelial cells, called cilia. The toxins produced by the bacteria paralyze the cilia, cause respiratory tract inflammation, and interfere with the clearing of respiratory secretions. *B. pertussis* produces many antigens and other products such as:

- Pertussis toxin
- Filamentous hemagglutinin (FHA)
- Agglutinogens
- Adenylate cyclase
- Pertactin
- Tracheal cytotoxin

The actions of all the above lead to the clinical features of this toxin-mediated disease. And after the infection, the resultant immune response results in immunity.

Pertussis is a disease of humans only. It is most dangerous in infants, causing significant morbidity and mortality in this age group. Initial symptoms usually appear 7 to 10 days after being infected, which include mild fever, rhinorrhea and cough, typically developing into a hacking cough followed by a whoop. The cough of classic pertussis may last for many weeks. Pneumonia is a common complication, while seizures and brain disease are rare events.

The incubation period of pertussis is commonly between 5 to 10 days, to as long as 3 weeks after being exposed. The disease has 3 stages: catarrhal, paroxysmal, and convalescent.

- Stage 1 is the catarrhal stage (first 1-2 weeks of infection), and the symptoms are runny nose, low-grade fever, and mild coughing. Patients are highly contagious in this stage.
- Stage 2 is the paroxysmal stage (occurring 1-6 weeks after, and may last up to 10 weeks) characterized by episodic rapid coughing, which can be followed by the typical “whoop” sound, and possibly post-tussive vomiting.
- Stage 3 is the convalescent stage (2-3 weeks), when gradual recovery occurs (improvement of cough and less coughing fits).

B. Case Definition

Case Classification	Case Definition
Suspected Case	Any person with cough lasting at least 2 weeks with at least one of the following: • Paroxysms (i.e. fits) of coughing • Inspiratory "whooping" • Post-tussive vomiting (i.e. vomiting immediately after coughing) without other apparent cause • Apnea, with or without cyanosis (for infants < 1 year old)
Confirmed Case	• A suspect case that is laboratory confirmed or epidemiologically linked to a laboratory-confirmed case • Laboratory criteria for diagnosis: Isolation of Bordetella pertussis from clinical specimen

Source: Philippine Integrated Surveillance and Response (PIDSR) Case Investigation Form for Pertussis Version 2019

C. Mode of transmission

Pertussis spreads from person to person very easily through droplets produced during coughing or sneezing. Silent transmission has been known to occur in humans.

D. Period of communicability

Patients are contagious from the onset of the first symptoms until at least 2 weeks after the coughing begins, even up to 3 weeks after. Many children who get infected may have coughing spells up to 4 to 8 weeks.

Because of its infectivity, up to 90% of household contacts, and around 50% to 80% of classroom contacts become infected after they have been exposed.

People of all ages are susceptible. Before the vaccination era, almost all children were infected. The disease is particularly dangerous in young infants, who are at high risk for hospitalization and death, but the disease is particularly bothersome at any age. Important to highlight is the fact that the clinical presentation in adults and adolescents may be less severe and so the diagnosis may be missed.

Taking an antibacterial (e.g., macrolide) early in the disease course may shorten the duration of the disease's communicability, and sometimes lessen severity.

Patients who receive effective antibacterial treatment for pertussis are considered no longer contagious after 5 days of the medication.

E. Definition of significant exposure to a pertussis patient

Quantifying the risk of getting pertussis in health workers is difficult because exposure is not well-defined. The *B. pertussis* bacteria are present in respiratory, oral, or nasal secretions from infected source patients, and their deposition onto the mucous membranes of a susceptible health worker may lead to infection.

An unprotected health worker (e.g., no facemask), who was in close proximity and had face-to-face contact with an infectious pertussis patient, or had contact with their secretions may be considered "significantly exposed." The performance of physical examination on, feeding, or bathing a patient; doing bronchoscopy; performing intubation; or the administration of bronchodilators are all considered close contact, among others.

Determining close contact becomes even more important in those exposed persons who have increased risk for severe pertussis. They are as follows:

- Household contacts of a pertussis patient (even if they were immunized).
- Infants (particularly those under 12 months of age, and most especially in the under 4 months of age)
- Women in the third trimester of pregnancy
- Those with pre-existing health conditions that may be exacerbated by contracting pertussis (e.g., immunocompromised patients, those with moderate to severe asthma)

II. Infection Control Procedures

A. Transmission-based Precautions

Standard and droplet precautions are implemented for patients known or suspected to be infected with agents transmitted by close respiratory or mucous membrane contact with respiratory droplets, as pertussis, that are generated by a patient when coughing, sneezing or talking. Isolation precautions shall be implemented until 5 days after initiation of effective antibiotic therapy or, if not treated, until 21 days after the onset of cough.

Certain risk-prone procedures for droplet transmission in hospitals can occur and include:

- Coughing up or inducing sputum production for laboratory tests; collecting of throat swabs
- Endotracheal suctioning (open and closed) of ventilated patients
- Chest physiotherapy
- Taking chest X-rays from patients who are coughing, especially with poor cough etiquette
- Bronchoscopy
- Re-use of ventilator circuits and respiratory equipment
- Washing and cleaning respiratory ventilation equipment in clinical areas without adequate protection

B. Guidelines for droplet precautions

Patient placement

• Place patient in single room with bathroom. Preferably keep the door closed.
• When single-patient rooms are in short supply, the following principles apply in decision-making on patient placement:
  a. prioritize patients who have excessive cough and sputum production for single-patient room placement
  b. consider patients ability to perform hand hygiene and follow appropriate cough etiquette
  c. place together in the same room (cohort) patients who are infected with the same pathogen and are suitable roommates
• If it becomes necessary to place patients who require droplet precautions in a room with a patient who does not have the same infection:
  a. avoid placing patients on droplet precautions in the same room with patients who have conditions that may increase the risk of adverse outcomes from infection or that may facilitate transmission (e.g. those who are immunocompromised, have anticipated prolonged lengths of stay, have cardiac conditions or muscular dystrophy)
  b. ensure that patients are physically separated (> one meter apart) from each other and draw the privacy curtain between beds to minimize opportunities for close contact.
• Place clean, unused PPE outside patient room
• Clinical notes should stay outside patient area

Hand Hygiene (HH)
• Perform HH according to the WHO 5 Moments of HH • HH has to be performed before donning and after removal of PPE
Respiratory or cough etiquette
• Cover your mouth and nose with a tissue when you cough or sneeze. Put your used tissue in the garbage • Cough or sneeze into your upper sleeve or elbow (not your hands) if you don't have a tissue.
Personal protective equipment (PPE)
• Surgical mask is to be worn before entering the patient room, with hand hygiene practiced before putting on the mask and after taking off the mask. • Surgical masks are single-use items and must be discarded after removal, just before leaving the isolation area. • Replace damp, soiled or contaminated masks immediately • An N95 respirator must be used if patient will undergo an aerosol generating procedure for the duration of the procedure. The procedure should be undertaken in a treatment room, away from other patients (if the patient is cohorted with others). • Additional PPE like gloves and apron might be indicated, depending on the nature of the patient interaction.
Maintenance of a clean environment
B. pertussis may survive for 3–5 days on inanimate dry surfaces; 5 days on clothes, 2 days on paper, and 6 days on glass, so appropriate cleaning is critical.

B. pertussis has been shown to be sensitive to glutaraldehyde; most vegetative bacteria are susceptible to low concentrations of chlorine, 70% ethanol, or phenolics.

A. Concurrent cleaning
   - Wear appropriate PPE
   - Use dedicated cleaning equipment
   - Clean all surfaces daily with detergent and water and then disinfect using 70% alcohol or hypochlorite solution 1000 ppm

B. Terminal cleaning
   - Remove bed linen and privacy/ inter-bed curtains and place in yellow bag and send to the laundry
   - Upon discharge clean and disinfect all equipment in the room before taking it to the storage area.
   - Clean all surfaces, including walls to hand height with soap and water and then disinfect using 70% alcohol or hypochlorite solution 1000 ppm
   - Remove PPE and perform HH after completion of the task

Patient care equipment

- Dedicated equipment is preferred. Using equipment between patients poses a risk of transmission.
- Clean shared equipment (if any) after patient use.

Correct management of used linen

- Treat all linen as contaminated and infectious
- Place in yellow plastic bag inside room, seal and place in linen bag dedicated for contaminated/infected linen
- Ensure prompt removal
- Double bag, if leakage hazard exists and ensure safe transportation
- Attach list of contents to outside of bag

Patient transport

- Limit movement outside of room
- Patient should wear surgical mask when leaving the room for another department or for procedures
- Inform receiving department in advance of the infectious status of the patient and maintain precautions
- Inform the theatre if the patient is scheduled for surgery
- The patients must be last on the theatre list to ensure for adequate cleaning/disinfection and ventilation of the environment
- Theatre staff has to wear N95 respirators if patient has concomitant infections such as influenza, SARS or TB.

Visitors

Visitors should:

- Always announce themselves to the person in charge of the unit
- Be informed of the reason for isolation
- Be restricted. Preferably no children, immunocompromised visitors or those not previously exposed as a close contact of the patient

• Adhere to the prescribed PPE • Wear a surgical mask before entering • Perform HH before and after leaving the room
Discontinue isolation precautions
• According to diagnosis and infectious period for the condition, immunocompetence and clinical improvement of patient • Decision made in collaboration with the IPC practitioner/team and clinical team

C. Immunization as Routine Prevention Activity

Vaccination is the best way to help protect against pertussis. A vaccine combination of tetanus-diphtheria-acellular pertussis (Tdap) specifically developed for adults is widely available. It protects against tetanus, diphtheria and pertussis and it is underutilized.

Recommendations:

1. All eligible healthcare worker/s (HCW/HCWs) should receive one dose of Tdap vaccine. This may be given anytime.

   For pregnant HCWs, a single dose of Tdap should be given during each pregnancy, preferably at 27 to 36 weeks AOG, for the protection of both the mother and the baby. This timing was recommended because of rapid waning of anti-pertussis antibodies and optimal timing of placental antibody transfer. Please see Figure 1.

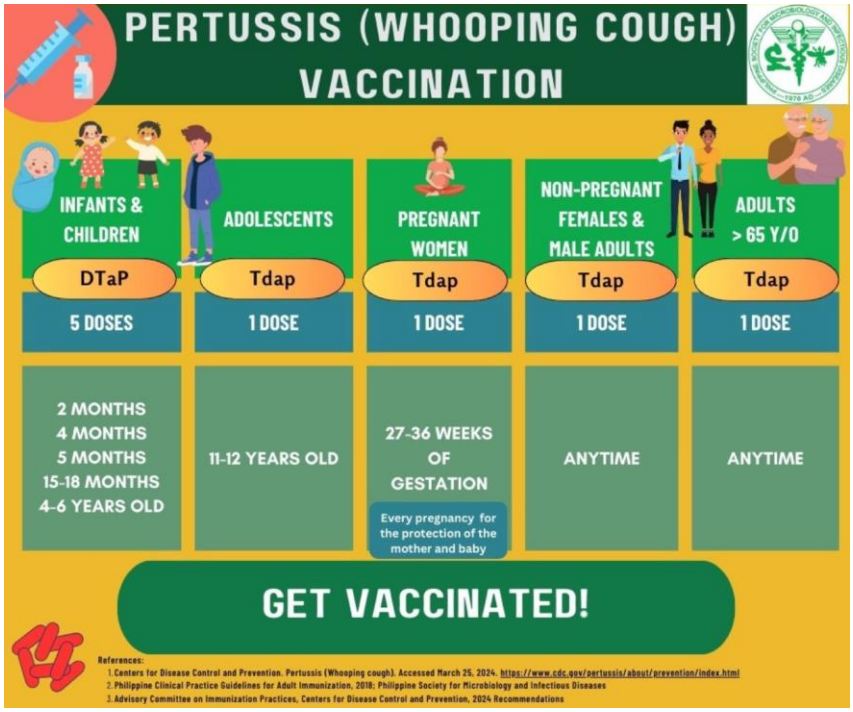

Figure 1. Pertussis Vaccination

2. Vaccination should be given to eligible HCWs but prioritization according to the following grouping should be considered if there are limited stocks of the vaccine:

- Priority group 1: HCWs with regular and close clinical contact with severely ill young infants* and women in the last month of pregnancy. This includes:
    - clinical staff working with women in the last month of pregnancy (for example midwifery, obstetrics and maternity settings)
    - neonatal and pediatric intensive care staff who are likely to have close and or prolonged clinical contact with severely ill young infants
    - HCWs assigned to the emergency room

    **Young infants are considered those under 3 months of age*

- Priority group 2: HCWs with regular clinical contact with young unimmunized infants in hospital or community settings. This includes:
    - general pediatric staff
    - pediatric cardiology staff
    - pediatric surgery staff
    - health visitor staff

- Priority group 3: HCWs with intermittent clinical contact with young unimmunized infants in the community. This includes HCWs in general practice.

III. Post-exposure management

A. Post exposure prophylaxis (PEP)

The use of PEP is highly recommended for HCWs fulfilling the criteria for high-risk exposure or close contact:

1. All asymptomatic HCWs with household exposure to a pertussis patient within 21 days of the onset of cough of the index patient
2. High risk HCWs who belong to the following groups and are exposed within 21 days to a pertussis case:
    - Women in their 3rd trimester of pregnancy
    - HCWs with pre-existing health conditions (eg., immunocompromised, moderate to severe asthma etc.) that may be exacerbated by pertussis infection
    - HCWs who have a high probability of having close contact with high risk individuals
    - HCWs in high risk settings who will have close contact with infants under 12 months of age or women in the 3rd trimester of pregnancy (eg, neonatal intensive care units, child care setting, maternity wards)

The antibiotics recommended for post-exposure prophylaxis include:

- azithromycin 500mg on day 1, followed by 250mg on days 2-5 or
- clarithromycin 500mg 2x a day for 7 days or
- erythromycin 500mg 4x a day for 14 days
- alternative: TMP-SMX 160/800mg 2x a day for 14 days

In HCWs who are pregnant, azithromycin is the preferred agent. TMP-SMX can be used as an alternative agent to macrolides for HCWs who are allergic to macrolides, who cannot tolerate macrolides, or who are exposed to a rare macrolide-resistant strain of *Bordetella pertussis*.

Because Tdap coverage may be suboptimal among HCWs, and the duration of protection afforded by Tdap is unknown or may wane over time, vaccination status does not change the need for postexposure prophylaxis in exposed HCWs.

B. Work restriction for exposed and symptomatic HCWs

Advise the exposed HCW, especially those with incomplete vaccination history, to monitor for signs and symptoms of pertussis until 21 days after the last exposure. Laboratory testing is not required for exposed and asymptomatic HCWs. No work restriction is needed for asymptomatic HCWs. HCWs should observe infection control procedures as discussed in Section II of this document.

If a HCW develops symptoms after a known or suspected pertussis exposure, he should be excluded from work from the beginning of catarrhal stage until the third week after onset of symptoms (if untreated) or until 5 days after effective antimicrobial therapy.

C. Vaccination

Vaccination can be given to eligible HCW but prioritization should be considered if there are limited stocks of the vaccine as recommended above (see Section II.C.2).

Tdap booster vaccination is appropriate even for HCWs who have had a recent clinical episode of pertussis. Tdap may be administered regardless of the interval since the last dose of Td. If it is not possible to determine whether a HCW has had a Tdap booster, it is prudent to administer a dose and ensure that it is properly documented.

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