Chapter 11 — Definitions

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CDC/CSTE CASE DEFINITION

The following case definition for pertussis was approved by the Council of State and Territorial Epidemiologists (CSTE) in June 1997.[1]

Clinical Case Definition

- A cough illness lasting at least 2 weeks with one of the following: paroxysms of coughing, inspiratory "whoop," or post-tussive vomiting, and without other apparent cause (as reported by a health professional).

Laboratory Criteria for Diagnosis

- Isolation of *B. pertussis* from a clinical specimen, or
- Positive polymerase chain (PCR) reaction assay for *B. pertussis*.

Case Classification

- **Confirmed**
  - an acute cough illness of any duration associated with *B. pertussis* isolation, or
  - a case that meets the clinical case definition and is confirmed by PCR, or
  - a case that meets the clinical definition and is epidemiologically-linked directly to a case confirmed by either culture or PCR.
- **Probable**
  - Meets the clinical case definition, is not laboratory confirmed, and is not epidemiologically-linked to a laboratory confirmed case.

Comment. The clinical case definition is appropriate for endemic or sporadic cases. Both probable and confirmed cases should be reported to the National Notifiable Disease Surveillance System. Occasionally, patients with an acute cough illness lasting <14 days but who are culture-positive are detected as part of household investigations. Such cases should be reported as confirmed cases of pertussis. Because PCR is less specific than culture, PCR positive cases with <14 days of cough should not be considered confirmed. In an outbreak, one or more cases should be confirmed to be pertussis by positive culture results because of the lack of specificity of PCR (see **Chapter 2: Diagnosis and Laboratory Methods**). For a case that meets the clinical case definition to be confirmed by epidemiologic linkage, the epidemiologic link must be directly to a case confirmed by either culture or PCR (i.e., a first generation contact).

The clinical case definition for pertussis was intended to provide increased sensitivity for detecting pertussis cases in situations where the disease was clinically compatible with pertussis but where confirmatory laboratory testing was not available or was negative. Information on paroxysms of cough, whoop, and post-tussive vomiting should be

routinely sought as part of case investigations. In an outbreak investigation in Missouri, a case definition of cough illness with whoop lasting ≥14 days was found to have a sensitivity of 81% and a specificity of 58% for identifying children with culture-confirmed pertussis.[2] In other outbreaks in 1985 and 1986, a surveillance case definition of cough illness lasting for ≥14 days was found to be 84% sensitive and 63% specific for detecting culture-positive pertussis cases.[3] However, in Illinois, during a concurrent outbreak of pertussis and *Mycoplasma pneumoniae* a case definition of cough illness lasting for ≥14 days was found to be sensitive but not specific (100% sensitive, 20% specific).[4] In this Illinois outbreak, a cough of ≥14 days and whoop and/or post-tussive vomiting was shown to be 90% sensitive and 80% specific for culture-confirmed pertussis.[4] If it is not possible to collect information on paroxysms, whoop, and post-tussive vomiting, information on duration of cough (< or ≥14 days) should be obtained in the course of the case investigation of each and every case of suspected pertussis. If the case investigation is done in the early stage onset of the disease, the case-patient should be contacted later to determine if duration of cough was at least 14 days.

OTHER DEFINITIONS

Index Case

- The case that is first reported to public health authorities.

Primary Case in a setting (closed group)

- The first symptomatic case of pertussis, either laboratory-confirmed or clinical, occurring in a defined setting (e.g., a household, institution).[5]

Co-primary Case

- A person with cough onset 1 to 6 days after the cough onset of the primary case-patient.[5,6]

Secondary Case

1. If exposure date is discrete: A pertussis case with cough onset 7 to 21 days after last exposure to the primary case-patient.[5,7,8] For example, a child with pertussis who had cough onset 20 days after last exposure at a child care center to another child with pertussis.

OR

2. If exposure is continuous: A pertussis case with cough onset 7 to 42 days after cough onset of the primary case-patient.[6,9] For example, a second case of pertussis in a household with cough onset 40 days after cough onset in the primary case-patient who also lived in the household.

Suspected Case

- A clinical syndrome compatible with pertussis; an illness consistent with pertussis and without other apparent cause such as:

- cough of ≥7 days
- paroxysmal cough of any duration
- cough with inspiratory whoop
- cough associated with apnea in an infant
- cough in a close contact

Comment. Suspected cases should be reported to the appropriate public health officials for follow up (e.g., to ensure nasopharyngeal swab or aspirate is taken for culture, and for treatment and prophylaxis, if indicated).[10]

Close Contact

- Specific definitions of a contact are problematic and will vary according to the situation.[11,12] Transmission can be expected with:
  - Direct face-to-face contact for a period (not defined) with a case-patient who is symptomatic (e.g., in the catarrhal or paroxysmal period of illness);
  - Shared confined space in close proximity for a prolonged period of time, such as ≥1 hour, with a symptomatic case-patient; or
  - Direct contact with respiratory, oral, or nasal secretions from a symptomatic case-patient (e.g., an explosive cough or sneeze in the face, sharing food, sharing eating utensils during a meal, kissing, mouth-to-mouth resuscitation, or performing a full medical exam including examination of the nose and throat).
- Identification and prophylaxis of significant contacts needs to be individualized and take into consideration the risk of pertussis to the individual and the specifics of the exposure.[11] In chapters of this guide there are examples of persons to consider as close contacts (e.g, in a school).

High-Risk Cases or Contacts

1. Persons who have or are suspected to have pertussis, or are contacts of a pertussis case-patient, who are at risk for developing severe disease and adverse outcomes including:
   - infants aged <1 year;

   Others may be at risk but few data are available:[13]
   - persons who have an immunodeficiency condition
   - persons who have other underlying severe disease such as chronic lung disease or cystic fibrosis
2. Persons who have or are suspected of having pertussis, or are contacts of a pertussis case-patient and may expose persons at high risk for severe disease including:
   - Health care workers providing direct patient care. Examples include nurses who works with neonatal or pediatric patients, with labor & delivery, or with post-partum women; pediatricians; and obstetricians.
   - other health care workers (e.g., administrative staff, nursing or medical

students, emergency medical personnel, laboratory technicians, hospital volunteers, dieticians, janitors, etc.)
- midwife
- labor coach
- babysitter (of infants)
- a woman who is pregnant (because she may expose other pregnant women and health care workers, and because she will be a mother of an infant)
- other household members or contacts who have pertussis and may expose an infant

Incubation Period

- The period from exposure and infection to cough onset.
- The incubation period is thought to be usually about 7-10 days (range 4-21 days)[14,15] and rarely may be as long as 42 days.[6,9]

Infectious Period

- The period of time in which a case-patient is infectious to others.
- This period is thought to typically be at the beginning of the catarrhal period (i.e., prior to cough onset) and up to 21 days after the cough starts.[6,9,14,15]
- Treatment with an appropriate antibiotic (see **Chapter 3: Treatment and Chemoprophylaxis**) will shorten the infectious period to 5 days after initiation of treatment, unless there is antibiotic resistance.

Outbreak Case Definition

- In outbreak settings, including household exposures, a case may be defined as a cough illness lasting $\geq$ 14 days.
  Comment. The outbreak definition should be used for the epidemiologic investigation and not for implementing control measures (see **Chapter 3: Treatment and Chemoprophylaxis**). One or more cases should be confirmed to be pertussis by positive culture results (see **Chapter 2: Diagnosis and Laboratory Methods**).

Outbreak in Households

- A household consists of all persons who occupy a particular housing unit as their usual residence, or who live there at the time of the disease of the case.
- Household contacts should be considered "epidemiologically-linked." Other close contacts include a child's care-giver, friends, or relatives that come to the home regularly.
- Two or more cases; the outbreak case definition may be used to count cases if one case has been confirmed.

Outbreak in Institutions (e.g., schools, day care centers, health care settings, etc)

- Two or more cases clustered in time (e.g., cases occurring within 42 days of each other) and space (e.g., in one building) where transmission is suspected to have occurred in that setting (e.g., nosocomial transmission in a hospital)
- The outbreak case definition may be used to count cases if one case has been confirmed.

Outbreak in Communities

- When the number of reported cases is:
    - higher than what is expected on the basis of previous reports during a non-epidemic period
    - for a given population
    - in a defined time period (i.e., historical disease patterns).

Droplet Precautions

- In addition to Standard Precautions, use Droplet Precautions, or the equivalent, for a patient known or suspected to be infected with microorganisms transmitted by droplets (large-particle droplets [larger than 5 μm in size], such as *B. pertussis*, that can be generated by the patient during coughing, sneezing, talking, or the performance of procedures).[16,17]

- In a hospital, the suspected pertussis case-patient should be placed in a private room.[16,17] When a private room is not available, place the patient in a room with a patient(s) who has active infection with the same microorganism but with no other infection (cohorting). When a private room is not available and cohorting is not achievable, maintain spatial separation of at least 3 ft between the infected patient and other patients and visitors. Special air handling and ventilation are not necessary, and the door may remain open.

- In addition to wearing a mask, wear a mask when working within 3 ft of the patient. (Logistically, some hospitals may want to implement the wearing of a mask to enter the room.)

- Limit the movement and transport of the patient from the room to essential purposes only. If transport or movement is necessary, minimize patient dispersal of droplets by masking the patient, if possible.

Comment. Droplet precautions are designed to reduce the risk of droplet transmission of infectious agents.[16,17] Droplet transmission involves contact of the conjunctivae or the mucous membranes of the nose or mouth of a susceptible person with large-particle droplets (larger than 5 μm in size) containing microorganisms generated from a person who has a clinical disease or who is a carrier of the microorganism. Droplets are generated from the source person primarily during coughing, sneezing, or talking and

during the performance of certain procedures such as suctioning and bronchoscopy. Transmission via large-particle droplets requires close contact between source and recipient persons, because droplets do not remain suspended in the air and generally travel only short distances, usually 3 ft or less, through the air. Because droplets do not remain suspended in the air, special air handling and ventilation are not required to prevent droplet transmission. Droplet Precautions apply to any patient known or suspected to be infected with epidemiologically important pathogens that can be transmitted by infectious droplets.[16,17]

PERTUSSIS SYMPTOMS AND COMPLICATIONS

Paroxysmal or Spasmodic Cough: Sudden uncontrollable "spasms" or spells of coughing where one cough follows the next without a break for breath.
Whoop: High-pitched noise heard upon inhalation after a coughing spasm.
Apnea: Prolonged breathlessness which may occur either after a coughing spasm or spontaneously in an infant.
Cyanosis: Paleness or blueness of the skin, often most noticeable on the lips and tongue, occurring after coughing paroxysm.
Post-tussive Vomiting: Vomiting that follows a paroxysm of coughing (post-tussive vomiting).
Cold-like Symptoms: Coryza (runny nose) or conjunctival injection (redness of the eyes) or both.
Acute Encephalopathy: Acute illness of the brain manifesting as decreased level of consciousness (excluding transient drowsiness after a seizure), with or without seizures. Such patients are almost always hospitalized, and have undergone extensive diagnostic evaluations.

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