Pertussis

Infection Control in Healthcare Personnel: Epidemiology and Control of Selected Infections Transmitted Among Healthcare Personnel and Patients (2024)

AT A GLANCE

Pertussis from the Infection Control in Healthcare Personnel: Epidemiology and Control of Selected Infections Transmitted Among Healthcare Personnel and Patients (2024) guideline.

ON THIS PAGE

Recommendations

1. For asymptomatic healthcare personnel, regardless of vaccination status, who have an exposure to pertussis and are likely to interact with persons at increased risk for severe pertussis:

- Administer postexposure prophylaxis.
- If not receiving postexposure prophylaxis, restrict from contact (e.g., furlough, duty restriction, or reassignment) with patients and other persons at increased risk for severe pertussis for 21 days after the last exposure.

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2. For asymptomatic healthcare personnel, regardless of vaccination status, who have an exposure to pertussis and are not likely to interact with persons at increased risk for severe pertussis:

- Administer postexposure prophylaxis, OR
- Implement daily monitoring for 21 days after the last exposure for development of signs and symptoms of pertussis.

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3. For asymptomatic healthcare personnel, regardless of vaccination status, who have an exposure to pertussis and who have preexisting health conditions that may be exacerbated by a pertussis infection:

- Administer postexposure prophylaxis.

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4. Exclude symptomatic healthcare personnel with known or suspected pertussis from work for 21 days fro after the start of effective antimicrobial therapy.

5. Work restrictions are not necessary for asymptomatic healthcare personnel who have an exposure to pertussis and receive postexposure prophylaxis, regardless of their risk for interaction with persons at increased risk for severe pertussis.

Background

Healthcare-associated transmission of *Bordetella pertussis* (*B. pertussis*) has involved both patients and healthcare personnel (HCP); nonimmunized infants and children are at greatest risk for severe morbidity and mortality [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12]. Serologic studies of HCP suggest that they may be infected with pertussis much more frequently than indicated by attack rates of clinical disease [13] [14].

Prevention of transmission of *B. pertussis* in healthcare settings involves:

a. vaccinating HCP against pertussis in accordance with Advisory Committee on Immunization Practices (ACIP) recommendations[13,15];

b. in addition to using Standard Precautions, placing patients with known or suspected pertussis in Droplet Precautions[16];

c. rapidly diagnosing and treating patients with clinical infection;

d. appropriately administering postexposure prophylaxis (PEP) to persons exposed to pertussis; and

e. excluding potentially infectious HCP from work.[5,13]

[5] [13] [15] [16]

Guidelines for pertussis vaccination of HCP are maintained by ACIP in Prevention of Pertussis, Tetanus, and Diphtheria with Vaccines in the United States: Recommendations of the ACIP (https://www.cdc.gov/mmwr/volumes/67/rr/rr6702a1.htm). [13] [17] [18] In addition, information and recommendations addressing the potential need for revaccination of HCP with Tdap are available from the CDC webpage Evaluating Revaccination of Healthcare Personnel with Tdap: Factors to Consider (https://www.cdc.gov/vaccines/vpd/pertussis/tdap-revac-hcp.html). [17]

Occupational Exposures

During pertussis outbreaks in healthcare settings, the risk for HCP contracting pertussis is often difficult to quantify because exposure is not well-defined [13]. Transmission of *B. pertussis* occurs through deposition of respiratory, oral, or nasal secretions from an infected source person on the mucous membranes of a susceptible host. Unprotected (e.g., not wearing a facemask), close, face-to-face contact with an infectious source person or contact with their secretions may be considered an exposure to pertussis. Close contact may include, but is not limited to, performing a physical examination on, feeding, or bathing a patient; bronchoscopy; intubation; or administration of bronchodilators. Determination of close contact may be more inclusive in settings where interaction with persons at increased risk for severe pertussis is more likely.

Clinical Features

Pertussis is highly contagious; secondary attack rates exceed 80% in susceptible household contacts [19] [20]. The incubation period is usually 5 to 10 days, but symptoms may develop up to 3 weeks after exposure [21]. The clinical course of pertussis infection has 3 stages: catarrhal, paroxysmal, and convalescent.

- Stage One, the catarrhal stage (the first 1-2 weeks of infection), is characterized by symptoms such as runny nose, low-grade fever, and mild coughing. Infected persons are highly contagious in this stage, when symptoms are similar to other upper respiratory infections.
- Stage Two, the paroxysmal stage (the next 1-6 weeks; may last up to 10 weeks), is characterized by fits of rapid coughing. Rapid coughing can be followed by the typical "whoop" sound. Vomiting may occur after coughing fits (i.e., post-tussive vomiting).

- Stage Three, the convalescent stage (lasting approximately 2-3 weeks), is characterized by gradual recove[illegible] fits of coughing.

Populations at increased risk for serious complications and death from severe pertussis include:

- Infants aged under 12 months
- Women in their third trimester of pregnancy
- Persons with pre-existing health conditions that may be exacerbated by a pertussis infection (e.g., immunocompromised persons, persons with moderate to severe asthma) [22].

Symptomatic persons who receive effective antimicrobial therapy for pertussis are no longer contagious after 5 days of appropriate treatment [13] [23].

The period of communicability starts at the onset of the catarrhal stage and extends into the paroxysmal stage, up to 3 weeks after the onset of paroxysms [21]. Prevention of secondary transmission of pertussis is especially difficult during the early stages of the disease because pertussis is highly communicable in the catarrhal stage, when symptoms are nonspecific and the diagnosis is uncertain. Furthermore, clinical symptoms in adults and adolescents may be less severe than in children and young infants and may not be recognized as pertussis [21].

Testing and Diagnosis

Diagnosis of pertussis is typically made based upon compatible clinical history and diagnostic laboratory testing. Although culture is considered the "gold standard" for establishing a diagnosis of pertussis, polymerase chain reaction (PCR) provides sensitive results more rapidly [24] [25]. More detailed information regarding testing persons for pertussis is available on the CDC Pertussis (Whooping Cough) Diagnostic Testing website (https://www.cdc.gov/pertussis/clinical/diagnostic-testing/specimen-collection-diagnosis.html). [26]

Other *Bordetella* species (e.g., *B. parapertussis*, *B. holmesii*) may be detected and can occur alone or simultaneously with *B. pertussis* infection [27] [28] [29] [30] [31]. Although the clinical presentation for *B. parapertussis* is similar to that of *B. pertussis*, *B. parapertussis* usually causes less severe disease, which may be related to its lack of production of pertussis toxin [27] [28] [32] [33]. One report from 1971 estimated that 3-4% of patients with parapertussis develop clinical disease, compared to 75% with pertussis [33]. The severity of parapertussis illness among special populations, such as infants and immunocompromised persons, is unclear, with few hospitalizations and related deaths reported [34] [35] [36] [37] [38] [39]. Data on the effectiveness of antibiotics for the treatment or chemoprophylaxis of *B. parapertussis* are also limited. Some states have parapertussis postexposure and illness management guidance, and some institutions choose to apply pertussis strategies for parapertussis [25] [40].

Postexposure Prophylaxis

Vaccinated HCP may still be susceptible to pertussis due to waning immunity, lack of response to the vaccine, immunosuppression, or other factors. Because vaccinated HCP may still be at risk for pertussis infection, vaccination does not preclude the need for PEP, when indicated [13] [17] [18]. Data on the efficacy of, and need for, PEP in Tetanus, Diphtheria, Pertussis (Tdap)-vaccinated HCP are inconclusive, but studies suggest that it may minimize transmission [5] [13] [41] [42] [43]. The preferred agents for postexposure prophylaxis are azithromycin, erythromycin, and clarithromycin [44]. Trimethoprim-sulfamethoxazole (TMP-SMZ) may also be used as an alternative agent. Detailed information regarding dosage and administration of PEP is available in the Recommended Antimicrobial Agents for the Treatment and Postexposure Prophylaxis of Pertussis, 2005 CDC Guidelines (https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5414a1.htm). [44]

Outbreaks

Information and recommendations on the potential need for booster doses of vaccine during outbreaks or periods of increased risk for healthcare-associated transmission of pertussis can be found on the CDC Pertussis (Whooping Cough) website (https://www.cdc.gov/pertussis/outbreaks.html). [45]

Abbreviations

- ACIP = Advisory Committee on Immunization Practices

- *B. pertussis* = *Bordetella pertussis*
- CDC = Centers for Disease Control and Prevention
- HCP = Healthcare Personnel
- PCR = Polymerase Chain Reaction
- PEP = Postexposure Prophylaxis
- PPE = Personal Protective Equipment
- Tdap = Tetanus, Diphtheria, Pertussis
- TMP-SMZ = Trimethoprim-sulfamethoxazole

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REFERENCES

1. Bassinet L, Matrat M, Njamkepo E, Aberrane S, Housset B, Guiso N. Nosocomial pertussis outbreak among adult patients and healthcare workers. *Infect Control Hospital Epidemiol.* 2004;25(11):995-997.
2. Calugar A, Ortega-Sanchez IR, Tiwari T, Oakes L, Jahre JA, Murphy TV. Nosocomial pertussis: costs of an outbreak and benefits of vaccinating health care workers. *Clin Infect Dis.* 2006;42(7):981-988.
3. Centers for Disease Control and Prevention. Outbreaks of pertussis associated with hospitals–Kentucky, Pennsylvania, and Oregon, 2003. *MMWR Morb Moral Wkly Rep.* 2005;54(3):67-71.
4. Centers for Disease Control and Prevention. Hospital-acquired pertussis among newborns–Texas, 2004. *MMWR Morb Moral Wkly Rep.* 2008;57(22):600-603.
5. Christie CD, Glover AM, Willke MJ, Marx ML, Reising SF, Hutchinson NM. Containment of pertussis in the regional pediatric hospital during the Greater Cincinnati epidemic of 1993. *Infect Control Hospital Epidemiol.* 1995;16(10):556-563.
6. Kurt TL, Yeager AS, Guenette S, Dunlop S. Spread of pertussis by hospital staff. *JAMA.* 1972;221(3):264-267.
7. Leekha S, Thompson RL, Sampathkumar P. Epidemiology and control of pertussis outbreaks in a tertiary care center and the resource consumption associated with these outbreaks. *Infect Control Hospital Epidemiol.* 2009;30(5):467-473.
8. Linnemann CC, Jr., Ramundo N, Perlstein PH, Minton SD, Englender GS. Use of pertussis vaccine in an epidemic involving hospital staff. *Lancet (London, England).* 1975;2(7934):540-543.

9. Pascual FB, McCall CL, McMurtray A, Payton T, Smith F, Bisgard KM. Outbreak of pertussis among healthcare workers in a hospital surgical unit. *Infect Control Hospital Epidemiol.* 2006;27(6):546-552.
10. Shefer A, Dales L, Nelson M, Werner B, Baron R, Jackson R. Use and safety of acellular pertussis vaccin during an outbreak of pertussis. *J Infect Dis.* 1995;171(4):1053-1056.
11. Valenti WM, Pincus PH, Messner MK. Nosocomial pertussis: possible spread by a hospital visitor. *Am J Dis Child.* 1980;134(5):520-521.
12. Yasmin S, Sunenshine R, Bisgard KM, Wiedeman C, Carrigan A, Sylvester T, et al. Healthcare-Associated Pertussis Outbreak in Arizona: Challenges and Economic Impact, 2011. *Pediatric Infect Dis Soc.* 2014;3(1):81-84.
13. Centers for Disease Control and Prevention. Immunization of health-care personnel: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep.* 2011;60(Rr-7):1-45.
14. Kretsinger K, Broder KR, Cortese MM, Joyce MP, Ortega-Sanchez I, Lee GM, et al. Preventing tetanus, diphtheria, and pertussis among adults: use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine recommendations of the Advisory Committee on Immunization Practices (ACIP) and recommendation of ACIP, supported by the Healthcare Infection Control Practices Advisory Committee (HICPAC), for use of Tdap among health-care personnel. *MMWR Recomm Rep.* 2006;55(Rr-17):1-37.
15. Core Infection Prevention and Control Practices for Safe Healthcare Delivery in all Settings – Recommendations of the Healthcare Infection Control Practices Advisory Committee (HICPAC). Healthcare Infection Control Practices Advisory Committee. 2017; (https://www.cdc.gov/hicpac/pdf/core-practices.pdf [PDF – 15 Pages]). Accessed August 12, 2019.
16. 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. Siegel JD, Rhinehart E, Jackson M, Chiarello L, the Healthcare Infection Control Practices Advisory Committee. 2007; (https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html). Accessed August 7, 2019.
17. Evaluating Revaccination of Healthcare Personnel with Tdap: Factors to Consider. Centers for Disease Control and Prevention; National Center for Immunization and Respiratory Diseases. 2015; (https://www.cdc.gov/vaccines/vpd/pertussis/tdap-revac-hcp.html). Accessed August 8, 2019.
18. Liang JL, Tiwari T, Moro P, Messonnier NE, Reingold A, Sawyer M, et al. Prevention of Pertussis, Tetanus, and Diphtheria with Vaccines in the United States: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep.* 2018;67(2):1-44.
19. Deen JL, Mink CA, Cherry JD, Christenson PD, Pineda EF, Lewis K, et al. Household contact study of Bordetella pertussis infections. *Clin Infect Dis.* 1995;21(5):1211-1219.
20. Mortimer EA, Jr. Pertussis and its prevention: a family affair. *J Infect Dis.* 1990;161(3):473-479.
21. Pertussis (Whooping Cough): Clinical Features. Centers for Disease Control and Prevention; National Center for Immunization and Respiratory Diseases; Division of Bacterial Diseases. 2017; (https://www.cdc.gov/pertussis/clinical/features.html). Accessed December 9, 2019.
22. Pertussis (Whooping Cough): Postexposure Antimicrobial Prophylaxis: Information for Health Professionals. Centers for Disease Control and Prevention; National Center for Immunization and Respiratory Diseases; Division of Bacterial Diseases. 2017; (https://www.cdc.gov/pertussis/pep.html). Accessed December 9, 2019.
23. Langley JM, Halperin SA, Boucher FD, Smith B. Azithromycin is as effective as and better tolerated than erythromycin estolate for the treatment of pertussis. *Pediatrics.* 2004;114(1):e96-101.
24. Centers for Disease Control and Prevention. Chapter 16: Pertussis. In: Hamborsky J, Kroger A, Wolfe S, eds. *Epidemiology and Prevention of Vaccine-Preventable Diseases.* 13 ed. Washington, DC: Public Health Foundation; 2015.
25. Faulkner A, Skoff T, Cassiday P, Tondella ML, Liang J. Chapter 10: Pertussis. In: Roush S, Baldy L, eds. *Manual for the Surveillance of Vaccine-Preventable Diseases.* 5 ed. Atlanta, GA: Centers for Disease Control and Prevention; 2018.
26. Pertussis (Whooping Cough): Diagnostic Testing. Centers for Disease Control and Prevention; National Center for Immunization and Respiratory Diseases; Division of Bacterial Diseases. 2017; (https://www.cdc.gov/pertussis/clinical/diagnostic-testing/specimen-collection-diagnosis.html). Accessed December 9, 2019.
27. Cherry JD, Seaton BL. Patterns of Bordetella parapertussis respiratory illnesses: 2008-2010. *Clin Infect Dis.* 2012;54(4):534-537.
28. Koepke R, Bartholomew ML, Eickhoff JC, Ayele RA, Rodd D, Kuennen J, et al. Widespread Bordetella parapertussis Infections-Wisconsin, 2011-2012: Clinical and Epidemiologic Features and Antibiotic Use for Treatment and Prevention. *Clin Infect Dis.* 2015;61(9):1421-1431.
29. Mattoo S, Cherry JD. Molecular pathogenesis, epidemiology, and clinical manifestations of respiratory infections due to Bordetella pertussis and other Bordetella subspecies. *Clin Microbiol Rev.* 2005;18(2):326-382.

30. Rodgers L, Martin SW, Cohn A, Budd J, Marcon M, Terranella A, et al. Epidemiologic and laboratory feat[illegible] pertussis-like illnesses associated with cocirculating Bordetella holmesii and Bordetella pertussis–Ohio 2013;56(3):322-331.
31. Weber DJ, Miller MB, Brooks RH, Brown VM, Rutala WA. Healthcare worker with "pertussis": consequences of a false-positive polymerase chain reaction test result. *Infect Control Hosp Epidemiol.* 2010;31(3):306-307.
32. Guiso N, Hegerle N. Other Bordetellas, lessons for and from pertussis vaccines. *Expert Rev Vaccines.* 2014;13(9):1125-1133.
33. Lautrop H. Epidemics of parapertussis. 20 years' observations in Denmark. *Lancet (London, England).* 1971;1(7711):1195-1198.
34. al-Bargish KA. Outbreak of pertussis in Basra, Iraq. *East Mediterr Health J.* 1999;5(3):540-548.
35. He Q, Viljanen MK, Arvilommi H, Aittanen B, Mertsola J. Whooping cough caused by Bordetella pertussis and Bordetella parapertussis in an immunized population. *JAMA.* 1998;280(7):635-637.
36. Linnemann CC, Perry EB. Bordetella parapertussis. Recent experience and a review of the literature. *Am Dis Child.* 1977;131(5):560-563.
37. Mertsola J. Mixed outbreak of Bordetella pertussis and Bordetella parapertussis infection in Finland. *Eur J Clin Microbiol.* 1985;4(2):123-128.
38. Nordmann P, Francois B, Menozzi FD, Commare MC, Barois A. Whooping cough associated with Bordetella parapertussis in a human immunodeficiency virus-infected child. *Pediatr Infect Dis J.* 1992;11(3):248.
39. Zuelzer WW, Wheeler WE. Parapertussis pneumonia. *J Pediatr.* 1946;29(4):493-497.
40. Communicable Disease Case Reporting and Investigation Protocol: Parapertussis. Wisconsin Department of Health Services Division of Public Health. 2015; (https://www.dhs.wisconsin.gov/publications/p01108.pdf [PDF – 2 Pages]). Accessed September 16, 2019.
41. Goins WP, Edwards KM, Vnencak-Jones CL, Rock MT, Swift M, Thayer V, et al. A comparison of 2 strategies to prevent infection following pertussis exposure in vaccinated healthcare personnel. *Clin Infect Dis.* 2012;54(7):938-945.
42. Halsey NA, Welling MA, Lehman RM. Nosocomial pertussis: a failure of erythromycin treatment and prophylaxis. *Am J Dis Child.* 1980;134(5):521-522.
43. Weber DJ, Rutala WA. Management of healthcare workers exposed to pertussis *Infect Control Hosp Epidemiol.* 1994;15(6):411-415.
44. Tiwari T, Murphy TV, Moran J. Recommended antimicrobial agents for the treatment and postexposure prophylaxis of pertussis: 2005 CDC Guidelines. *MMWR Recomm Rep.* 2005;54(Rr-14):1-16.
45. Pertussis (Whooping Cough): Pertussis Outbreaks. Centers for Disease Control and Prevention; National Center for Immunization and Respiratory Diseases; Division of Bacterial Diseases. 2017; (https://www.cdc.gov/pertussis/outbreaks.html). Accessed December 9, 2019.

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