

RESEARCH BRIEFS

Healthcare Worker with “Pertussis”: Consequences of a False-Positive Polymerase Chain Reaction Test Result

Pertussis is a serious disease among both children and adults.¹ With an estimated annual number of cases among children ranging from 800,000 to 1.3 million in the United States, pertussis remains the most common vaccine-preventable childhood disease.² More than 60% of children less than 12 months of age with pertussis require hospitalization.³ Because of the severity of pertussis, the Centers for Disease Control and Prevention⁴ and the American Academy of Pediatrics⁵ recommend that persons in close contact with infected persons receive antibiotic prophylaxis.

Although, in the past, pertussis was diagnosed by use of culture, the current standard is to diagnose pertussis using a polymerase chain reaction (PCR) assay, because of its improved sensitivity, especially in the later course of the disease.⁶ We report here an exposure evaluation of a healthcare worker with *Bordetella holmesii* infection whose so-called pertussis was incorrectly diagnosed by a cross-reacting PCR test that resulted in many patients and other healthcare workers receiving postexposure prophylaxis.

The index patient, a pediatric triage nurse in the emergency department, presented to the occupational health department on May 6, 2008, with a 2-week history of productive cough “just like the cough of the children I have seen with pertussis.” The employee had no known exposure to a patient with pertussis and had not yet received the tetanus, diphtheria, and pertussis (Tdap) vaccine. The nurse was afebrile and had had a pulmonary examination and a chest radiograph that were both normal. A nasopharyngeal swab for *Bordetella pertussis* PCR was obtained, and the nurse was furloughed. When, on the next day, the PCR test result was reported to be positive for *B. pertussis* (and negative for *Bordetella paraptussis*), the nurse started a 5-day course of azithromycin, and a postexposure evaluation was initiated of all patients and staff who were in close contact with the nurse. Patients were considered to have been exposed to *B. pertussis* only if they had close contact (as defined by the Centers for Disease Control and Prevention) with the source nurse.⁴ Ultimately, 25 pediatric patients and their primary caregivers (if child sat on their lap during examination) were contacted by phone and registered letter. Symptomatic contacts were referred to their local medical provider, our emergency department, or the local health department for medical evaluation and treatment. Asymptomatic contacts were provided postexposure prophylaxis with azithromycin either from our pharmacy or an outside pharmacy. Twenty-six staff members were evalu-

ated by the occupational health department, and 15 persons who had attended an educational conference with the index patient were contacted by the local health department.

B. pertussis DNA was detected by nucleic acid amplification of the IS481 region, a target known to cross-react with *B. holmesii* DNA. Because of the epidemiologic implications, confirmatory assays were initiated that sequence the pertussis toxin promoter (ie, *B. pertussis*) and the *recA* gene in *B. holmesii*. Sequencing was delayed because of the need to obtain appropriate materials; when the sequencing was finally completed on May 16th, the isolate was confirmed to be *B. holmesii*. All contacts were notified that they had not been exposed to *B. pertussis* and should discontinue their antibiotics. Although we cannot determine the exact costs associated with this pseudo-outbreak, we estimate that the following staff time was required: hospital epidemiology (infection control) staff, 40 person-hours; occupational health department staff, 6.5 person-hours; and physicians from the pediatric emergency department (contacting families and pharmacies that were exposed), 20 person-hours.

Pertussis is a serious disease among both children and adults.^{1,3} Outbreaks continue to be reported in healthcare facilities as a result of infected healthcare workers transmitting the disease to patients and other staff members.^{7,8} The Centers for Disease Control and Prevention have provided detailed recommendations for the management of pertussis outbreaks, including those involving healthcare exposures.⁴ Key measures include the isolation of all infected or exposed patients by implementing droplet precautions, the furloughing of all healthcare workers with known or suspected pertussis pending results of diagnostic testing, the treatment of all patients and healthcare workers with pertussis, and the receipt of post-exposure prophylaxis for all persons in close contact with infected persons. Pertussis outbreaks and exposure evaluations require significant expenditures of time and resources. Recently, the Advisory Committee on Immunization Practices has recommended that all healthcare workers receive the Tdap vaccine unless contraindicated.³ This vaccine is mandatory for healthcare workers at the University of North Carolina Hospitals, unless they have a medical contraindication. We initiated a vaccination program for newly employed healthcare workers in April 2006 but allowed current healthcare workers until July 2008 to get vaccinated.

B. holmesii has been reported as a rare cause of bacteremia, respiratory tract infection, and endocarditis, especially among younger patients. Many patients have had altered host defenses, resulting especially in anatomic or functional asplenia. The Massachusetts Department of Public Health reported that *B. holmesii* was isolated from the respiratory tract of up to 0.6% of patients with pertussis-like symptoms who provided nasopharyngeal specimens during the period from 1994 through 1998.⁹ Patients with *B. holmesii* infection had milder

symptoms than those with *B. pertussis* infection.⁹ *B. holmesii* has been isolated from tracheal aspirate and pleural fluid specimens, and has been reported to cause pneumonia and empyema.^{10,11} Thus, it is likely that the cough in our index patient was due to a *B. holmesii* infection.

Large pseudo-outbreaks of pertussis have been reported as a result of false-positive PCR test results.¹² False-positive PCR test results may be the result of laboratory error or, as in our case, the use of a nonspecific PCR that detects a closely related bacterial species. Healthcare facilities should adhere to proper laboratory procedures when developing and using PCR tests to diagnose pertussis, especially when the standardized kits approved by the US Food and Drug Administration are not available. Only patients with symptomatic pertussis should be tested, and positive test results using nonspecific primers should be confirmed by direct sequencing or a second PCR test that targets a different region of the genome.

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How Accurately Are Starting Times Documented in the Medical Record? Implications for Surgical Infection Prevention Performance Measurement

Public reporting of hospital-level performance measure rates is an effective national strategy for improving care and has been linked to financial rewards or penalties based on performance.^{1,2} Despite the importance of accurate data, little is known about the reliability and validity of most efforts at performance measure data collection after measures have been widely implemented.^{3(p13-20)}

Several publicly reported measures address the time interval between an event and the administration of a drug or intervention.^{4,5} In 2007, the Hospital Quality Alliance recommended⁵ public reporting of a surgical-site infection prevention measure that assesses the time interval between administration of prophylactic antibiotics and surgical incision. We undertook a prospective study to assess whether starting times of antimicrobial prophylaxis administration and surgical incision were being accurately documented in the medical record. These data elements are important because discrepancies of a few minutes can have a major effect on the hospital's performance rate.

The purpose was to determine the accuracy of starting times of documented antimicrobial prophylaxis administration and incision by comparing them with the times observed by independent staff (considered the gold standard). This study was ancillary to a multicenter cluster randomized trial of a quality collaborative for improving the antimicrobial prophylaxis process in 44 hospitals, the Trial to Reduce Antimicrobial Prophylaxis Errors (TRAPE).⁶ TRAPE hospitals were recruited by postal and e-mail communication to mem-