STREPTOCOCCUS PNEUMONIAE, INVASIVE DISEASE
(ISP, Pneumococcal Infection)

REPORTING INFORMATION
• **Class B**: Report by the close of the next business day after the case or suspected case presents and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report to the local public health department in which the reporting health care provider or laboratory is located.
• Reporting Form(s) and/or Mechanism: The Ohio Disease Reporting System (ODRS) should be used to report lab findings to the Ohio Department of Health (ODH). For healthcare providers without access to ODRS, you may use the Ohio Confidential Reportable Disease Form (HEA 3334).
• **CDC National Bacterial Meningitis and Bacteremia Case Report** (form 52.15) is available for use to assist in local disease investigation and contact tracing activities. Information collected from the form should be entered into the Ohio Disease Reporting System (ODRS) and not sent to the Ohio Department of Health (ODH), unless otherwise requested.

AGENT
*Streptococcus pneumoniae* (pneumococci) are lancet-shaped, gram-positive diplococci. Over ninety pneumococcal serotypes, designated by number, have been identified. Most pneumococcal disease is caused by 23 of these serotypes. Certain of these serotypes are prevalent in adults; others are prevalent in children.

CASE DEFINITION

**Clinical Criteria**
*Streptococcus pneumoniae* causes many clinical syndromes, depending upon the site of infection (e.g. acute otitis media, pneumonia, bacteremia, meningitis).

**Laboratory Criteria for Diagnosis**
- Isolation of *S. pneumoniae* from a normally sterile site (e.g. blood, cerebrospinal fluid, or, less commonly, joint, pleural or pericardial fluid).
- Culture independent diagnostic tests (CIDTs) (e.g. polymerase chain reaction (PCR))

**Only invasive cases of S. pneumoniae are reportable. Please do not report cases from non-sterile sites (e.g. sputum, urine, skin).**

**Case Classification**
Two ISP reporting categories exist in Ohio:
1. Cases that are susceptible or where the antimicrobial susceptibilities are not available/unknown and
2. Cases demonstrating resistance or intermediate resistance to one or more antibiotics.

**Suspected***: A clinically compatible case that is not yet laboratory confirmed and is not epidemiologically linked to a confirmed case.

**Probable**: A case that is laboratory confirmed by a CIDT.

**Confirmed**: A case that is laboratory confirmed by culture.
**Not a Case:** This status will not generally be used when reporting a case, but may be used to reclassify a report if investigation revealed that it was not a case or if *S. pneumoniae* was identified from a non-normally sterile site.

**Comment**
Confirmation is based on laboratory findings. Clinical illness is not required.

Laboratory reports of *S. pneumoniae* from sterile sites must identify tests for antibiotic antibiotic sensitivity and results of these tests, when performed.

The use of CIDTs as stand-alone tests for the direct detection of *S. pneumoniae* from clinical specimens is increasing. Data regarding their performance indicate variability in the sensitivity, specificity, and positive predictive value of these assays depending on the manufacturer and validations methods used. It is therefore useful to collect information on the laboratory conducting the testing, and the type and manufacturer of the CIDT used to diagnose each IPD case. Culture confirmation of CIDT-positive specimens is still the ideal method of confirming a case of IPD.

A single case should be defined as a health event with a specimen collection date that occurs more than 30 days from the last known specimen with a positive lab finding.

* This case classification can be used for initial reporting purposes to ODH as the Centers for Disease Control and Prevention (CDC) has not developed a classification.

**SIGNS AND SYMPTOMS**
The major clinical syndromes of pneumococcal disease are pneumonia, bacteremia, and meningitis.

Pneumococcal pneumonia is the most common clinical presentation of pneumococcal disease among adults. Symptoms generally include an abrupt onset of fever and chills or rigors. Other common symptoms include chest pain, rapid breathing or difficulty breathing, malaise, and weakness. Older adults with pneumococcal pneumonia may experience confusion or low alertness, rather than the more common symptoms listed above.

Pneumococcal bacteremia symptoms generally include fever, chills, and low alertness. Patients with asplenia who develop bacteremia may experience a fulminant clinical course.

Pneumococcal meningitis symptoms include stiff neck, fever, headache, photophobia, and confusion. In babies, meningitis may cause poor eating and drinking, low alertness, and vomiting.

**DIAGNOSIS**
A definitive diagnosis of infection with *S. pneumoniae* generally relies on isolation of the organism from blood or other normally sterile body sites. The ability to test for *Streptococcus pneumoniae* using culture independent diagnostic tests (CIDTs) like polymerase chain reaction (PCR)-based testing has become both more available and more common. PCR can be and is used for typing of *Streptococcus pneumoniae*. Isolates or specimens from normally sterile sites can be sent to ODH Laboratory for
serotyping. Please complete the [Ohio Department of Health Laboratory Microbiology Specimen Submission Form](#) and the [Wisconsin (WI) VPD Submission Form](#).

**Epidemiology**

**Source**
Humans are the reservoir of pneumococci, which are commonly found in the upper respiratory tract of healthy persons throughout the world.

**Occurrence**
*S. pneumoniae* is the leading cause of bacterial meningitis among children younger than five years of age. CDC estimates that as many as 400,000 hospitalizations from pneumococcal pneumonia occur annually in the United States. Pneumococci account for up to 36% of adult community-acquired pneumonia. Bacteremia occurs in up to 25–30% of patients with pneumococcal pneumonia. The case-fatality rate is 5–7% and may be much higher among elderly persons. Complications of pneumococcal pneumonia include empyema, pericarditis, and respiratory failure. Pneumococcal infections are more common during the winter and in early spring when respiratory diseases are more prevalent.

**Mode of Transmission**
Pneumococci are transmitted from person-to-person by droplet spread, by direct oral contact and indirectly through articles freshly soiled with respiratory discharges. Although these routes of transmission are easily accomplished, illness among casual contacts and attendants of patients is infrequent. The spread of the organism within a family or household is influenced by such factors as household crowding and viral respiratory infections. The pneumococcal serotypes most often responsible for causing infection are those most frequently found in carriers. Although carriage does not necessarily lead to disease, it is an important precursor for pneumococcal disease.

**Period of Communicability**
The period of communicability for pneumococcal disease is unknown, but presumably transmission can occur as long as the organism appears in respiratory secretions. Treatment with an antibiotic to which the infecting organism is sensitive can be expected to terminate communicability within 24 hours.

**Incubation Period**
The incubation period varies by type of infection and can be as short as 1-3 days.

**Public Health Management**

**Case**
The principal role of local and state public health agencies in the management of invasive pneumococcal disease is to contribute to the descriptive epidemiology of disease caused by this agent. This is accomplished by reporting cases of invasive disease, and associated drug resistance, in order that regional and statewide trends in disease incidence and results of antibiotic resistance can be identified. Publication of compilations of disease incidence and antibiotic susceptibility trends is useful to clinicians in the selection of empiric treatment regimens likely to be effective. Field investigation of cases of pneumococcal disease and their contacts in an attempt to identify source of infection is ordinarily of no practical value and is not recommended.
Isolation
None.

Contacts
No prophylactic treatment is recommended for contacts of cases of invasive pneumococcal infections. Encourage a high index of suspicion and early medical care for contacts that develop cough, chills, fever and other nonspecific symptoms within a few days after contact with a case. Quarantine of contacts is not warranted.

Prevention and Control
Avoid overcrowding in schools, child care centers, residence facilities and other institutions. Before the introduction of pneumococcal conjugate vaccine to prevent infection, many types of pneumococcal bacteria were becoming resistant to some of the antibiotics used to treat pneumococcal infections. Antibiotic-resistant pneumococcal infections have significantly declined, but remain a concern in some populations. Appropriate use of antibiotics may also slow or reverse emerging drug resistant found among pneumococcal infections. Immunization with either the 13-valent pneumococcal conjugate vaccine (PCV13) or the 23-valent pneumococcal polysaccharide vaccine (PPSV23), as appropriate, is recommended.

The Advisory Committee for Immunization Practices (ACIP) recommends that PCV13 be used for all children <5 years of age. For routine immunization of infants, PCV13 is recommended as a 4-dose series at 2,4,6, and 12-15 months of age. Children 2-18 years of age with certain underlying medical conditions that put them at higher risk for disease should also receive PPSV23 after completing all recommended doses of PCV13.

In addition, a single dose of PCV13 should be administered to PCV13-naïve children 6-18 years of age who are at increased risk for IPD because of sickle cell disease, human immunodeficiency virus (HIV) infection or other immunocompromising condition, cochlear implant, or CSF leaks, regardless of whether they have previously received PCV7 or PPSV23. A dose of PCV13 is also recommended for adults >19 years of age with sickle cell disease, HIV infection or other immunocompromising condition, cochlear implant, or CSF leaks, and for all adults >65 years of age.

Children ≥ 2 years of age with underlying medical conditions should receive PPSV23 at least 8 weeks after completing all recommended doses of PCV13. Adults >19 years of age with sickle cell disease, HIV infection or other immunocompromising condition, cochlear implant, or CSF leaks, and all persons ≥65 years of age are recommended to receive a dose of PPSV23 following a dose of PCV13.

A single revaccination with PPSV23 at least 5 years following the most recent PPSV23 dose should be considered for persons ≥ 2 to 64 years of age who are at highest risk or likely to have rapid declines in serum antibody levels. This includes those with functional or anatomic asplenia, HIV infection, leukemia, lymphoma, Hodgkin’s disease, multiple myeloma, generalized malignancy, chronic renal failure, nephrotic syndrome or immunosuppression (e.g., organ transplants or receiving chemotherapy). Pneumococcal vaccine may be
administered concurrently with influenza vaccine by separate injection in the opposite arm.

The most current ACIP vaccine recommendations can be found at: https://www.cdc.gov/vaccines/hcp/acip-recs/index.html.
What is pneumococcal disease?
Pneumococcal disease is defined as infections that are caused by the bacteria *Streptococcus pneumoniae*, also known as pneumococcus. The most common types of pneumococcal infections include middle ear infections, sinus infections, lung infections (pneumonia), blood stream infections (bacteremia), and meningitis. Some of these infections are considered to be “invasive”. Invasive disease means that germs invade parts of the body that are normally free from germs. For example, pneumococcal bacteria can invade the bloodstream, causing bacteremia, and/or tissues and fluids surrounding the brain and spinal cord, causing meningitis. When this happens, disease is usually very severe, causing hospitalization or even death.

Which children are most likely to get pneumococcal disease?
Young children are much more likely than older children and young adults to get pneumococcal disease. Children under 2 years of age, children in group child care, and children who have certain illnesses (for example, sickle cell disease, HIV infection, diabetes, chronic heart or lung conditions) are at higher risk than other children to get pneumococcal disease. In addition, pneumococcal disease is more common among children of certain racial or ethnic groups, such as Alaska Natives, American Indians living in certain communities, and African-Americans, than among other groups.

How common is pneumococcal disease?
Each year in the United States, pneumococci cause over 50% of all cases of bacterial meningitis. *S. pneumoniae* is the leading cause of bacterial meningitis among children younger than 5 years of age. An estimated 3,000 to 6,000 cases of pneumococcal meningitis occur each year Pneumococcal pneumonia is the most common form of pneumococcal disease in adults. It is estimated that 900,000 Americans get pneumococcal pneumonia each year. More than 12,000 cases of pneumococcal bacteremia without pneumonia occur each year.

Which children are at increased risk?
Children at increased risk of pneumococcal infections include those with anatomic or function asplenia (including sickle cell disease), patients taking immunosuppressive drugs, those with congenital and acquired immune deficiency (including HIV infections), children with cochlear implants, and those with chronic renal disease. Some American Indian, Alaska Native and African American children may also be at increased risk. Children younger than 5 years of age in out-of-home day care are at increased risk (approximately 2-fold higher) of experiencing invasive pneumococcal infections than other children.

How serious is pneumococcal disease?
Most pneumococcal infections are mild. However, some can be deadly or result in long-term problems, such as brain damage or hearing loss. Meningitis is the most severe type of pneumococcal disease. The case-fatality rate of pneumococcal meningitis is about 8% among children and 22% among adults.

The overall case-fatality rate for pneumococcal bacteremia is 20% but may be as high as 60% among the elderly. However, many children with blood stream infections will be ill enough to be hospitalized.
The case-fatality rate for pneumococcal pneumonia is 5% to 7% and may be much higher among elderly patients. Complications include infection of space between membranes that surround the lungs and chest cavity (empyema), inflammation of the sac surrounding the heart (pericarditis), and endobronchial obstruction, with atelectasis and lung abscess formation.

**How is pneumococcal disease spread?**
The bacteria that cause pneumococcal disease are spread through contact with persons who are ill or healthy persons who carry the bacteria in the back of the nose. Transmission is mostly through the spread of respiratory droplets from the nose or mouth of a person with a pneumococcal infection. It is common for people, especially children, to carry the bacteria in their throats without being ill from it.

**How is pneumococcal disease treated/cured?**
Pneumococcal disease is treated with antibiotics. Before the introduction of pneumococcal conjugate vaccine (PCV) to prevent infection, many types of pneumococcal bacteria were becoming resistant to some of the antibiotics used to treat pneumococcal infections. Antibiotic-resistant pneumococcal infections have significantly declined, but remain a concern in some populations. Appropriate use of antibiotics may also slow or reverse emerging drug resistant found among pneumococcal infections.

**Who needs to be vaccinated with pneumococcal vaccines?**
The Advisory Committee for Immunization Practices (ACIP) recommends that PCV13 be used for all children <5 years of age. For routine immunization of infants, PCV13 is recommended as a 4-dose series at 2,4,6, and 12-15 months of age. Children 2-18 years of age with certain underlying medical conditions that put them at higher risk for disease should also receive PPSV23 after completing all recommended doses of PCV13.

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