

Invasive Streptococcal Pneumonia Surveillance Protocol

Summary Paragraph about the Disease

Pneumococcal disease is caused by a bacterium known as *Streptococcus pneumoniae*, or pneumococcus. Pneumococcal infections can range from ear and sinus infections to pneumonia and bloodstream infections. Children younger than 2 years old are among those most at risk for disease. There are vaccines to prevent pneumococcal disease in children and adults.

Invasive *Streptococcus pneumoniae* from a normally sterile site is to be reported to the local health department within 1 week.

Healthcare Provider Responsibilities

1. Report all cases of *Streptococcus pneumoniae* within 1 week of diagnosis to the local health department (LHD).
2. Submit isolates of *Streptococcus pneumoniae* to the West Virginia Office of Laboratory Services (WV OLS) immediately for serogrouping. OLS may be accessed as follows:
 - a. Phone: 304-558-3530
 - b. Web: <http://www.wvdhhr.org/labservices/labs/micro/index.cfm>
 - c. Mailing address: 167 11th Ave.
South Charleston, West Virginia 25303
3. Submit a laboratory report by faxing a copy of the report to the local health department.
4. Standard precautions is recommended for patients with *Streptococcus pneumoniae*.
5. Complete the provider section of the West Virginia Electronic Disease Surveillance System (WVEDSS) form for *Streptococcus pneumoniae*:
<http://www.dhhr.wv.gov/oeps/disease/WVEDSS/Documents/Strep%20Pneumo.pdf>

Laboratory Responsibilities

1. Forward isolates of *Streptococcus pneumoniae* from normally sterile sites to West Virginia Office of Laboratory Services (OLS) for serotyping using the specimen submission form available at: <http://www.wvdhhr.org/labservices/shared/docs/Micro/Micro%20Request%20Form.pdf>
 - a. OLS should be notified by phone of specimen submission at 304-558-3530, and specimens can be mailed to: 167 11th Ave.
South Charleston, WV 25303
2. Notify and fax a copy to your local health department a positive test result of *Streptococcus pneumoniae* within one week of diagnosis for public health investigation. For reference labs, please fax a copy of a lab report to the West Virginia Division of Infectious Disease Epidemiology Program (DIDE) at 304-558-8736.

Local Health Responsibilities

1. Educate the public about *Streptococcus pneumoniae*.

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Invasive Streptococcal Pneumonia

Surveillance Protocol



2. Educate providers and laboratories to report confirmed, probable, and suspect cases of Streptococcus pneumoniae within 1 week to the local health department to assure management and investigation of case.
3. Educate the public and healthcare providers about Streptococcus pneumoniae vaccines and its indications.
4. Inform laboratories to submit all Streptococcus pneumoniae isolates cultured from normally sterile sites to the West Virginia Office of Laboratory Services for serogrouping. This will determine if circulating strains are vaccine preventable, and assist with outbreak management.
5. Educate providers about prevention and treatment for Streptococcus pneumoniae.
6. Upon receiving a report of Streptococcus pneumoniae:
 - a. Investigate the case. Check to confirm that the reported case meets the case definition. Streptococcus Pneumoniae cultured from a non-sterile site (throat, sputum, etc.) does not need to be reported.
 - b. Assure that isolates and specimens are forwarded to the Office of Laboratory Services for serogrouping.
 - c. Enter reports of Streptococcus pneumoniae disease in WVEDSS. Document prophylaxis, vaccinations and results of laboratory tests. Forward all paperwork to DIDE.

State Health Responsibilities

1. Review laboratory reports submitted in WVEDSS and assign to appropriate jurisdiction (local health) for investigation.
2. Remind healthcare providers, laboratories, and local health to submit Streptococcus pneumoniae isolates to OLS for serogrouping
3. Ascertain case reports and review case investigations submitted in WVEDSS and notify CDC (through electronic case report submission to National Notifiable Disease Surveillance System (NNDSS) in a timely manner.
4. Provide technical expertise and guidance on surveillance, investigation, control measures and prevention of Streptococcus pneumoniae.
6. In the event of an outbreak or cluster of cases:
 - a. Identify local health needs.
 - b. Support public health response.
 - c. Notify public health partners (LHD, OLS, CDC, Bureau for Public Health (BPH) through the State Epidemiologist/OEPS Director).
8. Update information sheets and protocol as new information becomes available.
9. Summarize surveillance data and surveillance indicators and share with public health partners.

Occupational Health

Standard precautions are recommended, including for patient with infections caused by drug-resistant Streptococcal pneumonia.

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It is also important to practice appropriate hand hygiene and cough etiquette techniques.

Disease Control Objectives

To identify outbreaks of pneumococcal disease and institute appropriate control measures.

Disease Prevention Objectives

1. To reduce the incidence of invasive *Streptococcus pneumoniae* disease among children less than age five by effective use of the conjugate pneumococcal vaccine.
2. To reduce the incidence of invasive *Streptococcus pneumoniae* among people age 65 and older by effective use of the polysaccharide vaccine.
3. To reduce the incidence of invasive *Streptococcus pneumoniae* among people with chronic diseases by effective use of pneumococcal vaccines.
4. To reduce the incidence of drug-resistant pneumococcal disease through education about appropriate antibiotic use.

Disease Surveillance Objectives

1. To identify the demographic characteristics of persons with invasive *Streptococcus pneumoniae*.
2. To understand the risk factors for invasive *Streptococcus pneumoniae* in West Virginia.
3. To differentiate between pneumococcal vaccine failure and failure to receive appropriate vaccine, as risk factors for invasive *Streptococcus pneumoniae*.
4. To determine the antimicrobial resistance pattern of invasive *Streptococcus pneumoniae* isolates in the state of West Virginia.

Public Health Significance

Based on available data, the World Health Organization (WHO) estimates that *Streptococcus pneumoniae* kills close to half a million children under 5 years old worldwide every year, with most of these deaths occurring in developing countries.

More than 90 pneumococcal serotypes have been identified. Before implementation of routine immunization in infants with heptavalent pneumococcal conjugate vaccine (PCV7) in 2000, serotypes 4, 6B, 9V, 14, 18C, 19F, and 23F caused most invasive childhood pneumococcal infections in the United States. Those 7 types were contained in PCV7. Serotypes 6A, 6B, 9V, 14, 19A, 19F, and 23F were the most common serotypes associated with resistance to penicillin, but serotype 19A emerged as the most common cause of invasive disease and the serotype most associated with resistance in PCV7-immunized children. The 13 valent pneumococcal conjugate vaccine (PCV13) was introduced in 2010 and includes types 1, 3, 5, 6A, 7F, and 19A in addition to the serotypes in PCV7.

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Invasive Streptococcal Pneumonia Surveillance Protocol

Pneumococcal infections are most prevalent during winter months. Rates of infection are highest in infants, young children, elderly people, and black, Alaska Native, and some American Indian populations. The incidence and severity of infections are increased in people with congenital or acquired humoral immunodeficiency, human immunodeficiency virus (HIV) infection, absent or deficient splenic function, diabetes mellitus, chronic liver disease, chronic renal failure, or nephrotic syndrome, or abnormal innate immune responses. Children with cochlear implants have high rates of pneumococcal meningitis, as do children with congenital or acquired cerebrospinal fluid (CSF) leaks.

Since introduction of PCV7 and PCV13, racial disparities have diminished; however, rates of invasive pneumococcal disease among American Indian (Alaska Native and Apache) populations remain more than fivefold higher than the rate among children in the general US population.

From 1998 (before PCV7) to 2007, the incidence of vaccine type invasive pneumococcal infections decreased by 99%, and the incidence of all invasive pneumococcal disease decreased by 76% in children younger than 5 years. In adults 65 years and older, invasive pneumococcal disease caused by PCV7 serotypes decreased 92%. The reduction in cases in these latter groups indicates the significant indirect benefits of PCV7 immunization by interruption of transmission of pneumococci from children to adults. Further reductions in disease in children of all ages, also associated with herd protection, have been demonstrated to date for at least three of the additional six serotypes in PCV13, including serotype 19A.

Clinical Description

The major clinical syndromes of pneumococcal disease are pneumonia, bacteremia, and meningitis. The immunologic mechanism that allows disease to occur in a carrier is not clearly understood. However, disease most often occurs when a predisposing condition exists, particularly pulmonary disease, and, if it is going to occur at all, shortly after carriage is acquired.

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. Classically there is a single rigor, and repeated shaking chills are uncommon. Other common symptoms include pleuritic chest pain, cough productive of mucopurulent, rusty sputum, dyspnea, tachypnea, hypoxia, tachycardia, malaise and weakness. Nausea, vomiting, and headaches occur less frequently.

Bacteremia without a known site of infection is the most common invasive clinical presentation of pneumococcal infection among children 2 years of age and younger. Streptococcus Pneumonia has become the leading cause of bacterial meningitis among children younger than 5 years of age in the United States.

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Invasive Streptococcal Pneumonia

Surveillance Protocol

Etiologic Agent

The pathogen is the bacteria *Streptococcus pneumoniae* (pneumococcus).

Reservoir

Streptococcus pneumoniae is a human pathogen. The reservoir for pneumococci is the nasopharynx of asymptomatic humans. There is no animal or insect vector.

Mode of Transmission

Transmission of *Streptococcus pneumoniae* occurs as the result of direct person-to-person contact with respiratory droplets and by autoinoculation in persons carrying the bacteria in their upper respiratory tract.

Incubation Period

Varies by type of infection but can be as short as 1 to 3 days.

Period of Communicability

This is unknown, but presumably transmission can occur as long as the organism appears in respiratory secretions.

Outbreak Recognition

Although it is possible for anyone to get pneumococcal disease at any time of the year, outbreaks are apt to occur in densely populated living communities, such as nursing homes and jails. Consider the possibility of an outbreak whenever **two or more cases** occur in a facility within a short period of time. Infections occur most frequently during the winter. In outbreaks within institutions or closed population groups, immunization with the 23-valent vaccine should be carried out unless it is known that the type causing the disease is not included in the vaccine or the population is fully immunized.

Case Definition

Clinical Criteria-

- Invasive Pneumococcal (*Streptococcus pneumoniae*) Disease or IPD causes many clinical syndromes, depending on the site of infection (e.g., bacteremia, meningitis)

Laboratory Criteria for Diagnosis

- Supportive: Identification of *S. pneumoniae* from a normally sterile body site by a CIDT without isolation of the bacteria.
- Confirmatory: Isolation of *S. pneumoniae* from a normally sterile body site

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Epidemiologic Linkage

- Not required

Criteria to Distinguish a New Case from an Existing Case

- 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.

Case Classification

Probable

- A case that meets the supportive laboratory evidence.

Confirmed

- A case that meets the confirmatory laboratory evidence.

Comments

The use of CIDTs as stand-alone tests for the direct detection of *S. pneumoniae* from clinical specimen is increasing. Data regarding their performance indicate variability in the sensitivity, specificity and positive predictive value of these assays depending on the manufacturer and validation 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.

Case definitions can be found here:

<https://www.cdc.gov/nndss/conditions/invasive-pneumococcal-disease/>

Preventive Interventions

The best way to prevent pneumococcal disease is to vaccinate your patients. There are two types of vaccinations that protect against pneumococcal disease. The pneumococcal conjugate vaccine (PCV13 or Prevnar 13) provides protection against 13 serotypes responsible for most severe illness. The vaccine can also prevent some ear infections. PCV13 is administered in a four-dose series, given at 2, 4, 6, 12-15 months of life. It should also be given to all adults 65 years or older. Some adults aged 19-64 years should receive the vaccine if they have immunocompromising conditions or other high-risk conditions such as; cerebrospinal fluid leaks, cochlear implants, sickle cell disease and other hemoglobinopathies, and congenital or acquired asplenia. The other vaccine is the pneumococcal polysaccharide vaccine (PPSV23 or Pneumovax 23). This vaccine is a 23-valent polysaccharide vaccine that is currently used in all adults who are 65 years or older and for persons under age 2 who are at high risk for disease. It is also recommended to be used in adults who smoke cigarettes or who have asthma aged 19 through 64.

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Invasive Streptococcal Pneumonia

Surveillance Protocol

For children with functional or anatomic asplenia, especially those with sickle-cell disease, daily antimicrobial prophylaxis with oral penicillin V or G is typically recommended. In general, antimicrobial prophylaxis (in addition to immunization) should be considered for all children with asplenia younger than 5 years of age and for at least 1 year after splenectomy.

Because secondary cases of invasive pneumococcal infection are uncommon, chemoprophylaxis is not indicated for contacts of patients with such infection.

Refer to the current American Academy of Pediatrics AAP or Advisory Committee on Immunization Practices (ACIP) recommendations for more complete immunization information

Treatment

Treatment usually includes a broad-spectrum cephalosporin, and often vancomycin, until results of antibiotic sensitivity testing are available. Data shows that pneumococcal bacteria are resistant to one or more antibiotics in 30 % of cases.

In 2000, the 7-valent pneumococcal conjugate vaccine was introduced which decreased the pneumococcal infections that were resistant to penicillin and other antibiotics. However, in 2008 the definition of penicillin resistance was changed such that a much larger proportion of pneumococci are now considered susceptible to penicillin.

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Invasive Streptococcal Pneumonia Surveillance Protocol



Medical Indication	Underlying Condition	PCV13 for ≥ 19 years	PPSV23 for 19 through 64 years	PPSV23 for 19 through 64 years	PCV13 at ≥ 65 years	PPSV23 at ≥ 65 years
		Recommended	Recommended	Revaccination	Recommended	Recommended
None	None of the below				X	X ≥ 1 year after PCV13
Immunocompetent persons	Alcoholism, chronic heart disease†, chronic liver disease, chronic lung disease§, cigarette smoking, diabetes mellitus		X		X	X ≥ 1 year after PCV 13 ≥ 5 years after any PPSV23 at < 65 years
Immunocompetent persons	Cochlear implants, CSF leaks	X	X ≥ 8 weeks after PCV13		X If no previous PCV13 vaccination	X ≥ 8 weeks after PCV13 ≥ 5 years after any PPSV23 at < 65 years
Persons with functional or anatomic asplenia	Congenital or acquired asplenia, sickle cell disease/ other hemoglobinopathies	X	X ≥ 8 weeks after PCV13	X ≥ 5 years after first dose PPSV23	X If no previous PCV13 vaccination	X ≥ 8 weeks after PCV13 ≥ 5 years after any PPSV23 at < 65 years
Immunocompromised persons	Chronic renal failure, Congenital or acquired immunodeficiencies¶, Generalized malignancy, HIV infection, Hodgkin disease, iatrogenic immunosuppression**, leukemia, lymphoma, multiple myeloma, nephrotic syndrome, solid organ transplant	X	X ≥ 8 weeks after PCV13	X ≥ 5 years after first dose PPSV23	X If no previous PCV13 vaccination	X ≥ 8 weeks after PCV13 ≥ 5 years after any PPSV23 at < 65 years

*PPSV23 column only refers to adults 19 through 64 years of age. All adults 65 years of age or older should receive one dose of PPSV23 5 or more years after any prior dose of PPSV23, regardless of previous history of vaccination with pneumococcal vaccine. No additional doses of PPSV23 should be administered following the dose administered at 65 years of age or older.

†Including congestive heart failure and cardiomyopathies

§Including chronic obstructive pulmonary disease, emphysema, and asthma

¶Includes B-(humoral) or T-lymphocyte deficiency, complement deficiencies (particularly C1, C2, C3, and C4 deficiencies), and phagocytic disorders (excluding chronic granulomatous disease)

**Diseases requiring treatment with immunosuppressive drugs, including long-term systemic corticosteroids and radiation therapy

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Invasive Streptococcal Pneumonia

Surveillance Protocol

Surveillance Indicators

- The proportion of confirmed cases with complete information (clinical case definition, species, specimen type, serotype testing, vaccine history).
- The proportion of confirmed cases with complete vaccination history (with/without manufacturer name).
- The proportion of confirmed cases with serotype testing.
- The proportion of investigations reported in a timely manner (1week).

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Invasive Streptococcal Pneumonia Surveillance Protocol

References

American Academy of Pediatrics. Pneumococcal Infections, Red Book. Report of the Committee on Infectious Diseases, 30th edition, 2015.

CDC, Medical conditions or other indication for administration of PCV13 and PPSV23 for adults.

<https://www.cdc.gov/vaccines/vpd/pneumo/downloads/pneumo-vaccine-timing.pdf>

<https://www.cdc.gov/pneumococcal/index.html>

Pneumococcal Disease. Epidemiology and Prevention of Vaccine-Preventable Disease, 13th edition, 2015.