Patient information: Pneumonia in adults (Beyond the Basics)

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PNEUMONIA OVERVIEW

Pneumonia is an infection of the lungs. It is a serious illness that can affect people of any age, but it is most dangerous in very young children, people older than 65, and in those with underlying medical problems such as heart disease, diabetes, and chronic lung disease. It is most common during the winter months and occurs more often in smokers and men.

This article will focus on community-acquired pneumonia (CAP), which refers to pneumonia that develops in people in the community, rather than in a hospital, nursing home, or assisted-living facility. About four million cases of CAP occur each year in the United States, and approximately 20 percent of people with CAP require hospitalization.

LUNG FUNCTION

During normal breathing, air is inhaled through the nose and mouth and travels through the trachea and the bronchi to the bronchioles. At the end of the bronchioles, there are small air sacs, called alveoli. Alveoli have thin, porous walls that contain tiny blood vessels called capillaries (figure 1).

The mouth and respiratory tract are constantly exposed to microorganisms as air is inhaled through the nose and mouth. However, the body's defenses are usually able prevent microorganisms from entering and infecting the lungs. These defenses include the immune system, the specialized shape of the nose and pharynx (which helps trap microorganisms and particulate matter in the air, thereby preventing them from entering the lungs), the ability to cough, and fine hair-like structures called cilia located on the bronchi. You can develop pneumonia if your defenses are not adequate, you are exposed to a particularly strong microorganism, or you are exposed to a very large number of microorganisms.

As the microorganisms multiply, your immune system responds by sending white blood cells to the alveoli. The infected alveoli become inflamed (filled with white blood cells, proteins, fluid, and red blood cells). These changes lead to the symptoms of pneumonia. (See 'Pneumonia symptoms' below.)

HIGH-RISK GROUPS

Some groups of adults are at a greater risk of developing pneumonia. These include people who:

- Are older than 65 years

- Smoke cigarettes
- Are malnourished due to health conditions or lack of access to food
- Have underlying lung disease, including cystic fibrosis, asthma, or chronic obstructive pulmonary disease (emphysema)
- Have other underlying medical problems, including diabetes or heart disease
- Have a weakened immune system due to HIV, organ transplant, chemotherapy, or chronic steroid use
- Have difficulty coughing due to stroke, sedating drugs or alcohol, or limited mobility
- Have had a recent viral upper respiratory tract infection including influenza

PNEUMONIA CAUSES

Pneumonia can be caused by a variety of microorganisms, including viruses, bacteria, and, less commonly, fungi. The most common cause of pneumonia in the United States is the bacterium *Streptococcus pneumoniae* (also called pneumococcus).

Viruses are estimated to be the cause of adult CAP in at least 20 percent of cases. Fungi rarely cause pneumonia in people who are generally healthy; people with a weakened immune system (those with HIV, organ transplant patients, or those on chemotherapy) are at higher risk of fungal infection. Other organisms, such as *Mycoplasma*, are a common cause of mild pneumonia but can occasionally cause serious disease.

PNEUMONIA SYMPTOMS

Common symptoms of pneumonia include fever, chills, shortness of breath, pain with breathing, a rapid heart and breathing rate, nausea, vomiting, diarrhea, and a cough that often produces green or yellow sputum; occasionally the sputum is rust colored. Most people have a fever (temperature greater than 100.5ºF or 38ºC), although elderly people have fever less often. Shaking chills (called rigors) and a change in mental status (confusion, unclear thinking) can also occur.

The characteristic symptoms of pneumonia are different from those of a more common infection, acute viral bronchitis, which does not usually cause fever and does not require treatment with an antibiotic. (See "Patient information: Acute bronchitis in adults (Beyond the Basics)".)

PNEUMONIA DIAGNOSIS

Pneumonia is usually diagnosed with a medical history and physical examination, as well as a chest x-ray. The need for further testing depends upon the severity of the illness and the person's risk of complications.

Chest x-ray — A chest x-ray or sometimes another imaging study, such as a computed tomography (CT) scan, is used for diagnosing pneumonia when the history and physical examination also support the diagnosis.

Sputum testing — Sputum testing requires a sample of sputum collected from a deep cough. Culture of sputum is used to identify the bacteria that caused the pneumonia and can help determine which antibiotic is best.

Urine antigen testing — Urine tests can be helpful for diagnosing pneumonia caused by two bacteria, *Streptococcus pneumoniae* and *Legionella pneumophila*. These tests are easy to perform and provide rapid results.

Blood testing — Patients who are hospitalized require blood testing, including a complete blood cell count (CBC) and sometimes a blood culture. A CBC measures the number of many types of blood cells, including white blood cells (WBC); these cells increase in number when there is a bacterial infection. An increased number of WBCs is one indicator that a bacterial infection, including pneumonia, may be present.

A blood culture is used to determine whether the infection has spread from the lungs into the blood stream. It involves taking a sample of blood from a vein and testing it for bacteria. Normally, there should be no bacteria in the bloodstream. Blood cultures are used to identify the bacteria that caused the pneumonia and to guide the choice of antibiotic. A patient's antibiotics may be changed when results of the blood or sputum cultures are completed (usually after 48 to 72 hours).

Blood oxygen measurement — Pneumonia can decrease the amount of oxygen available in the blood. As a result, a blood oxygen level is often measured by attaching a small clip to the finger or ear that uses infrared light. In those who are sicker, the oxygen level may be measured by withdrawing a sample of blood from an artery.

Bronchoscopy — Patients who present initially with severe pneumonia or who fail to improve or worsen during their hospitalization despite treatment with antibiotics may require further testing with bronchoscopy. In this procedure, a physician uses a thin, flexible tube with a camera to view the trachea and bronchi (the tube between the trachea and lungs). This allows them to look directly at the lungs, collect fluid samples or a biopsy (a small tissue sample), and determine whether there is an underlying cause of infection, such as a growth or inhaled foreign body. (See "Patient information: Flexible bronchoscopy (Beyond the Basics)".)

PNEUMONIA TREATMENT

The goal of treatment for patients with CAP is to treat the infection and prevent complications. Initial treatment of CAP is based upon the organism that is likely to be causing pneumonia (called empiric treatment). Most patients improve with empiric treatment.

Hospital versus home care — Most patients are treated for CAP at home with oral antibiotics. People who are seriously ill or are at increased risk for complications may be hospitalized. Hospital monitoring usually includes measurement of heart rate and breathing rate, temperature, and oxygen levels. Hospitalized patients are usually given intravenous (IV) antibiotics initially. The number of days spent in the hospital is variable and depends upon how a person responds to treatment and if there are underlying medical problems.

Some patients, including people with previous lung damage or disease, a weakened immune system, or infection in more than one lobe of the lungs (called multilobar pneumonia), may be slow to recover and require a longer hospitalization.

Antibiotic choice — A number of antibiotic treatment regimens exist for treatment of CAP. The choice of which antibiotic to use is based upon several factors, including the person's underlying medical problems and the likelihood of being infected with a bacterium that is resistant to specific drugs.

People with certain underlying medical problems and those who have used antibiotics in the past three months have a higher risk of infection with drug-resistant bacteria. For all antibiotic regimens, it is important to finish the entire course of medication and take it exactly as directed.

EXPECTED RECOVERY FROM PNEUMONIA

A person with pneumonia usually begins to improve after three to five days of antibiotic treatment. Improvement may be defined as feeling better or having fewer symptoms, such as cough and fever. Fatigue and a persistent, but milder, cough can last for up to one month, although most people are able to resume their usual activities within seven days. Patients treated in the hospital may require three weeks or more to resume normal activities.

All patients, whether treated at home or in the hospital, should take special care of themselves during the recovery period. This includes getting adequate rest at night and taking naps during the day if needed. Patients should drink fluids to avoid becoming dehydrated; there is no specific amount of fluid recommended, but thirst is a good indicator of the need to drink more fluids. Patients should be sure to finish all of their antibiotic medication, even if they feel better after a few days.

All patients should see a healthcare provider four to six weeks after being diagnosed with pneumonia. This visit allows the provider to be sure that the patient is feeling better and has no new problems.

PNEUMONIA COMPLICATIONS

Pneumonia can usually be treated successfully without leading to complications. However, complications can develop in some patients, especially those in high-risk groups. These complications can be related to the pneumonia or to the drugs used to treat the pneumonia. In addition, pneumonia may result in worsening of chronic conditions such as chronic obstructive pulmonary disease (emphysema) or congestive heart failure.

Complications due to the pneumonia include:

- Fluid accumulation – Fluid can develop between the covering of the lungs (pleura) and the inner lining of the chest wall; this is called a pleural effusion. If the fluid becomes infected as a result of pneumonia (called empyema), a chest tube (or less commonly, surgery) may be needed to drain the fluid.
- Abscess – A collection of pus in the area infected with pneumonia is known as an abscess. They can usually be treated with antibiotics; rarely, surgical removal is needed.
- Bacteremia – Bacteremia occurs when the pneumonia infection spreads from the lungs to the bloodstream. This is a serious complication since infection can spread quickly from the bloodstream to other organs. Bacteremia can also cause the blood pressure to be dangerously low.
- Death – Although most people recover from pneumonia, it can be fatal in some cases. The 30-day mortality rate is approximately 5 to 10 percent among patients admitted to a general medical ward but is as high as 30 percent in patients with severe infection requiring admission to an intensive care unit.

Complications due to medications used to treat the pneumonia include:

- Diarrhea and rash – Each medication has a list of side effects and patients should be familiar with the side effects of the medications used to treat their pneumonia.

WHEN TO SEEK HELP

Anyone who suspects that they have pneumonia should seek medical care as soon as possible. Pneumonia is a serious illness that can be life threatening if not treated, especially for people who are older than 65 years, alcoholic, have underlying medical problems, or have a weakened immune system.

People with the following symptoms should see their healthcare provider promptly:

- Fever and cough with phlegm that does not improve or worsens
- New shortness of breath with normal daily activities
- Chest pain with breathing
- Feeling suddenly worse after a cold or the flu
- Respiratory symptoms (as listed above) with new confusion

PREVENTION

The pneumococcal vaccine is one of the most effective ways to prevent pneumonia. The influenza (or "flu") vaccine is important not only for preventing influenza but also for preventing its complications, including pneumonia. These vaccines are discussed separately. (See "Patient information: Pneumonia prevention (Beyond the Basics)" and "Patient information: Influenza prevention (Beyond the Basics)".)

Smoking cessation is another important way to prevent pneumonia.

Infection control — Infection control measures can help to prevent the spread of any type of infection, including pneumonia. Infection control is most commonly practiced in healthcare settings but is useful in the community as well. Simple practices such as frequent hand washing with soap and water or alcohol-based hand rubs can be effective.

Because pneumonia is spread by contact with infected respiratory secretions, people with pneumonia should limit face-to-face contact with uninfected family and friends. The mouth and nose should be covered while coughing or sneezing, and tissues should be disposed of immediately. Sneezing/coughing into the sleeve of one's clothing (at the inner elbow) is another means of containing sprays of saliva and secretions and has the advantage of not contaminating the hands.

WHERE TO GET MORE INFORMATION

Your healthcare provider is the best source of information for questions and concerns related to your medical problem.

This article will be updated as needed on our web site (www.uptodate.com/patients). Related topics for patients, as well as selected articles written for healthcare professionals, are also available. Some of the most relevant are listed below.

Patient level information — UpToDate offers two types of patient education materials.

The Basics — The Basics patient education pieces answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials.

Patient information: Pneumonia in adults (The Basics)
Patient information: Community-acquired pneumonia in adults (The Basics)
Patient information: Hospital-acquired pneumonia (The Basics)
Patient information: Aspiration pneumonia (The Basics)
Patient information: Pneumocystis pneumonia (PCP) (The Basics)
Patient information: Shortness of breath (dyspnea) (The Basics)
Patient information: Cough in adults (The Basics)
Patient information: Adult respiratory distress syndrome (The Basics)
Patient information: Pleuritic chest pain (The Basics)
Patient information: Paraplegia and quadriplegia (The Basics)
Patient information: Rib fractures in adults (The Basics)
Patient information: Diabetes and infections (The Basics)
Patient information: Interstitial lung disease (The Basics)

Beyond the Basics — Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are best for patients who want in-depth information and are comfortable with some medical jargon.

Patient information: Acute bronchitis in adults (Beyond the Basics)
Patient information: Flexible bronchoscopy (Beyond the Basics)
Patient information: Pneumonia prevention (Beyond the Basics)

Professional level information — Professional level articles are designed to keep doctors and other health professionals up-to-date on the latest medical findings. These articles are thorough, long, and complex, and they contain multiple references to the research on which they are based. Professional level articles are best for people who are comfortable with a lot of medical terminology and who want to read the same materials their doctors are reading.

Aspiration pneumonia in adults
Bacterial pulmonary infections in HIV-infected patients
Clinical manifestations and diagnosis of Legionella infection
Clinical presentation and diagnosis of Pneumocystis pulmonary infection in HIV-infected patients
Clinical presentation and diagnosis of ventilator-associated pneumonia
Community-acquired pneumonia in adults: Risk stratification and the decision to admit
Diagnostic approach to community-acquired pneumonia in adults
Epidemiology and pathogenesis of Legionella infection
Epidemiology, pathogenesis, and microbiology of community-acquired pneumonia in adults
Epidemiology, pathogenesis, microbiology, and diagnosis of hospital-acquired, ventilator-associated, and healthcare-associated pneumonia in adults
Mycoplasma pneumoniae infection in adults
Nonresolving pneumonia
Pneumococcal pneumonia in adults
Pneumonia caused by Chlamydophila (Chlamydia) pneumoniae in adults
Pseudomonas aeruginosa pneumonia
Risk factors and prevention of hospital-acquired, ventilator-associated, and healthcare-associated pneumonia in adults
Sputum cultures for the evaluation of bacterial pneumonia

Treatment of community-acquired pneumonia in adults in the outpatient setting
Treatment of community-acquired pneumonia in adults who require hospitalization
Treatment of hospital-acquired, ventilator-associated, and healthcare-associated pneumonia in adults
Principles of antimicrobial therapy of Pseudomonas aeruginosa infections

The following organizations also provide reliable health information.

- National Library of Medicine

(www.nlm.nih.gov/medlineplus/ency/article/000145.htm, available in Spanish)

- National Institute of Allergy and Infectious Diseases

(www.niaid.nih.gov)

- American Lung Association

(www.lungusa.org, click on "Diseases A to Z", then click on "P")

- Canadian Lung Association

(www.lung.ca/pneumonia)

[1,2]

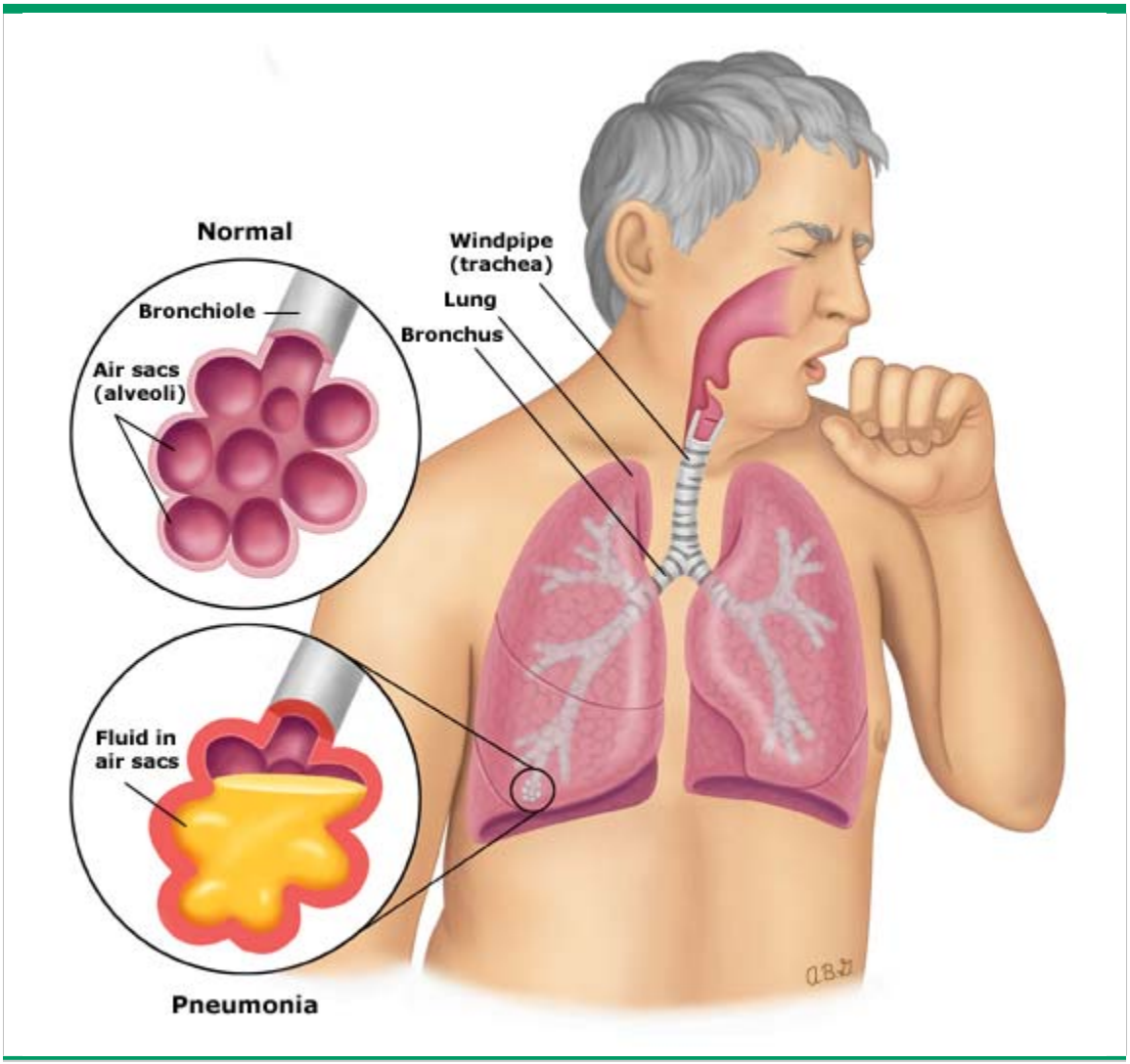
Literature review current through: Apr 2014. |**This topic last updated:** Apr 2, 2014.

References

1. Mandell LA, Wunderink RG, Anzueto A, et al. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. Clin Infect Dis 2007; 44 Suppl 2:S27.
2. File TM. Community-acquired pneumonia. Lancet 2003; 362:1991.

GRAPHICS

Pneumonia



"Alveoli" are air sacs in your lungs that are surrounded by tiny blood vessels called capillaries. The air sacs have thin walls that allow the exchange of gases. When blood flows through the capillaries around the air sacs, it picks up oxygen that you have breathed in and dumps off carbon dioxide that you then breathe out. But if you have pneumonia, your alveoli swell and fill with fluid. This makes you cough and makes it hard to breathe.

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