Pneumonia in the Adult

Pneumonia is a heterogeneous disease, with a host response that ranges from mild symptoms such as fever, cough, and chest pain to septic shock with multisystem organ failure, including respiratory failure. Nurses have an important role in the management of the patient being treated for pneumonia in both the inpatient and outpatient settings. This guide provides basic information on the different classifications and treatment of pneumonia in adults.

Pathophysiology Review

- Infection of the pulmonary parenchyma leads to alveolar inflammation, producing an exudate that interferes with the diffusion of oxygen and carbon dioxide.
- Secretions and mucosal edema cause areas of the lung to be inadequately ventilated.
- Hypoventilation can result in arterial hypoxia.
- Complications of pneumonia may include acute hypoxic respiratory failure, sepsis, pleural effusion, and empyema.

Classifications of Pneumonia

DEFINITIONS	
Pneumonia	● An acute infection of the lower respiratory tract caused by the invasion of microorganisms into the pulmonary parenchyma. ● Pneumonia can result from a wide variety of bacteria, viruses, or fungi. ● Risk factors for developing pneumonia include age 65 or older, age 2 or younger, immunosuppression, underlying lung disease such as chronic obstructive pulmonary disease (COPD), cigarette smoking, and neurologic or mechanical conditions that interfere with swallowing function or suppress the cough reflex. ● Pneumonia may present as the primary disease process or as a secondary disorder in an already debilitated patient.
Community-acquired pneumonia (CAP)	● Pneumonia diagnosed in non-hospitalized patients or in a previously ambulatory patient within 48 hours after admission to the hospital. ● *Streptococcus pneumoniae* is the most commonly identified bacterial causative organism of CAP. ● Common causes of viral pneumonia are influenza, respiratory syncytial virus (RSV), and SARS-CoV-2 (the virus that causes COVID-19). ● CAP also includes all pneumonia acquired in settings such as assisted-living facilities, rehabilitation facilities, dialysis centers, and nursing homes.
Hospital-acquired pneumonia (HAP)	● Pneumonia that occurs 48 hours or more after hospital admission that did not appear to be incubating at time of admission. ● It may be caused by exposure to large volumes of pathogens in

	inspired air, increasingly virulent pathogens, aspiration or impaired host defenses.
Ventilator-associated pneumonia (VAP)	• Pneumonia that develops after 48 hours of exposure to mechanical ventilation. • It may be caused by aspiration of oropharyngeal pathogens or leakage of bacteria around cuff of endotracheal tube. • The usual gram-negative microorganisms involved in both HAP and VAP are *Pseudomonas aeruginosa*, *Escherichia coli*, *Klebsiella pneumoniae*, and *Acinetobacter species*; *Staphylococcus aureus* is the primary gram-positive microorganism.

Assessment and Diagnosis

Clinical Features

General

- Cough, fever, pleuritic chest pain, dyspnea, tachypnea, hypoxia, purulent sputum production, leukocytosis or leukopenia, confusion, and rarely, hemoptysis.
- Crackles, rhonchi, tubular breath sounds, diminished breath sounds, or dullness to percussion

CAP

- Typical: Sudden-onset fever, productive cough, shortness of breath, signs of pulmonary consolidation (dullness, increased fremitus, bronchial breath sounds, crackles), and occasionally, pleuritic chest pain
- Atypical: Gradual onset, dry cough, shortness of breath, crackles, general myalgias, fatigue

HAP

- New or progressive pulmonary infiltrate on chest imaging, plus at least two of the three following clinical features: fever greater than 38°C, leukocytosis or leukopenia, and purulent secretions

VAP

- New or progressive pulmonary infiltrate on chest imaging, along with one or more of the following findings: fever, purulent tracheobronchial secretions, leukocytosis, tachypnea, decreased tidal volume, increased minute ventilation, and increased oxygen (FiO_2) requirement.
- Signs and symptoms may develop gradually or suddenly.

Radiographic features

- Infiltrate on chest x-ray, or CT scan of the chest/thorax may include lobar consolidation, interstitial infiltrates, and/or cavitation.

Diagnostic criteria

- Clinical symptoms plus radiological evidence of infiltrate on chest imaging
- Pathogen identification by microbiologic evaluation of lower respiratory secretions supports diagnosis.

Microbiologic evaluation

- Sputum culture and gram stain: expectorated sputum, induced sputum, endotracheal secretions, or alveolar lavage via bronchoscopy
- Collection in non-intubated patients: Obtain specimen prior to antibiotic initiation, rinse mouth prior to expectoration, ensure no food intake one to two hours prior to expectoration, and transport specimen promptly to lab.
- Test for influenza, RSV and COVID-19 during the winter months.
- Urine testing for legionella or pneumococcal antigens for atypical pathogens
- A specific pathogen may not be identifiable.

Care Essentials for Patients with Pneumonia

- Perform a detailed history to identify patients at risk for multi-drug resistant (MDR) pathogens.
- If patient is admitted to the hospital, first dose of antibiotics should be administered in the emergency department.
- In hospitalized patient:
    - Closely monitor vital signs.
    - Observe for progression of symptoms, such as hypoxemia, tachypnea, tachycardia, and fever.
    - Use standard infection control strategies, including strict handwashing and use of alcohol-based hand sanitizers.
    - Follow policies to encourage antimicrobial stewardship and guide appropriate antibiotic prescribing practices.
    - If the patient is intubated, use ventilator bundle strategies to prevent VAP:
        - Elevate the head of bed 30 to 45 degrees per policy, unless contraindicated.
        - Perform oral hygiene with oral chlorhexidine solution.
        - Assess daily for ventilator weaning and extubation readiness.
        - Use sedation reduction strategies as ordered, unless contraindicated.
        - Maintain endotracheal cuff pressures of 20 to 25 mm Hg.
        - Ensure aspiration precautions; enteral feedings are preferred over parenteral.
        - Administer stress ulcer and deep vein thrombosis prophylaxis, as ordered.
- Administer antibiotics, antivirals and/or supplemental oxygen, as prescribed.

  - **For patients with HAP or VAP:** a 7-day course of antibiotics is recommended. Therapy should be de-escalated if cultures identify a specific organism and sensitivities (e.g., narrow the regimen and change from combination therapy to monotherapy).
  - **For patients with CAP:** treat for a minimum of five days; however longer treatment may be necessary based on the patient's clinical response.
  - **Before stopping therapy:** the patient should be afebrile for 48 to 72 hours, adequate oxygenation without supplemental oxygen (unless required for preexisting disease), and have no more than one clinical instability factor (defined as HR greater than 100 beats/min, RR greater than 24 breaths/min, and SBP less than or equal to 90 mmHg).
  - Procalcitonin, along with clinical criteria, may guide the discontinuation of antibiotic therapy; procalcitonin levels have been shown to correlate with bacterial infection.
- In hospitalized patients with COVID-19, antiviral therapy within 5-7 days of symptom onset may help prevent progression to pneumonia.
- Monitor for drug reactions.
- Maintain adequate hydration to thin pulmonary secretions and compensate for insensible losses due to fever.
- Perform respiratory/pulmonary hygiene, including incentive spirometry, chest percussion, coughing exercises, and frequent repositioning.
- Observe isolation precautions, as indicated.
- Assist with early mobility.
- Encourage smoking cessation or refer, when applicable.
- Provide nutritional support.
- Immunize prior to discharge from hospital and educate patient on immunization recommendations, including vaccines for COVID-19, influenza, and pneumococcus according to age and previous immunization status.
- Initiate strict aspiration precautions for any patients at risk.

References:

Klompas, M. (2025, November). Clinical evaluation and diagnostic testing for community-acquired pneumonia in adults. *UpToDate.* https://www.uptodate.com/contents/clinical-evaluation-and-diagnostic-testing-for-community-acquired-pneumonia-in-adults

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