# Community-Acquired Pneumonia (CAP)

Community-Acquired Pneumonia (CAP): Infection of the lung parenchyma acquired outside of a hospital setting.

## Epidemiology

- Common cause of hospitalization, especially in adults >65.
- **Risk factors:** Age, smoking, COPD, immunosuppression, recent viral infection.
- **Common pathogens:** Streptococcus pneumoniae, Haemophilus influenzae, atypical bacteria (Mycoplasma pneumoniae, Chlamydia pneumoniae, Legionella pneumophila).

## Pathophysiology

- Inhalation or aspiration of pathogens causes alveolar inflammation, consolidation, and impaired gas exchange.
- Inflammatory response leads to fever, cough, hypoxia, and systemic symptoms.

## Clinical Presentation

- **Symptoms:** Fever, productive cough, dyspnea, pleuritic chest pain, fatigue.
- **Exam Findings:** Tachypnea, crackles, rhonchi, egophony, dullness to percussion.
- **Red Flags:** Hypotension (SBP <90 mmHg), altered mental status, respiratory rate
- >30, SpO2 <90%.

## Differential Diagnoses

- **Congestive Heart Failure (CHF):** Dyspnea, crackles, edema, S3 gallop, bilateral infiltrates on CXR.
- **COPD Exacerbation:** Wheezing, smoking history, hyperinflation on CXR, no focal consolidation.
- **Pulmonary Embolism (PE):** Acute dyspnea, hypoxia, clear lungs, Wells score for risk.
- **Lung Cancer:** Weight loss, hemoptysis, chronic symptoms, mass on imaging.

- **Viral Pneumonia (e.g., Influenza, COVID-19):** Bilateral infiltrates, negative bacterial cultures.
- **Key Tip:** Use history, imaging, and labs (e.g., BNP for CHF, D-dimer for PE) to differentiate.Dierential Diagnoses

## Diagnostic workup

- **Labs:** CBC (leukocytosis), BMP, blood cultures (if severe or ICU), sputum culture (productive cough).
- **imaging:** Chest X-ray (CXR) showing infiltrates or consolidation; CT chest if CXR unclear or complications (e.g., empyema).
- **Pleural Fluid Analysis** (if eusion present):
  - **Procedure:** Thoracentesis (diagnostic) or chest tube (therapeutic for empyema).
  - **Interpretation:**
  - **Light's Criteria (exudative if ≥1):** Pleural fluid protein/serum protein >0.5, pleural fluid LDH/serum LDH >0.6, or pleural fluid LDH >2/3 upper limit of normal serum LDH.
  - **pH:** <7.2 suggests empyema (requires chest tube).
  - **Glucose:** <60 mg/dL in empyema or complicated parapneumonic effusion.
  - **Cell Count:** Neutrophil predominance in bacterial infection; lymphocyte predominance in TB or malignancy.
  - **Cultures/Gram Stain:** Identify causative organism (e.g., S. pneumoniae, S. aureus).
  - **Other:** Amylase (elevated in esophageal rupture), cytology (if malignancy suspected).
- **Key Tip:** Send pleural fluid for pH in a heparinized syringe on ice for accuracy.
- **Other:** Procalcitonin (to dierentiate bacterial vs. viral); CURB-65 score for severity.

### CURB-65 Criteria:

- Confusion
- Urea >7 mmol/L,
- Respiratory rate ≥30,
- BP <90/60,
- Age ≥65.
- **Score 0-1:** Outpatient.
- **Score ≥2:** Inpatient (consider ICU for ≥3).

# Treatment

## Antibiotics (Empiric):

- **Healthy Outpatient:** Amoxicillin (1g TID) or doxycycline (100mg BID).
- **Comorbidities or Inpatient (Non-ICU):** Ceftriaxone (1-2g IV daily) + azithromycin (500mg IV/PO daily) or levofloxacin (750mg IV/PO daily).
- **Severe CAP (ICU):** Ceftriaxone + azithromycin; add coverage for resistant pathogens if indicated (see below).

## Coverage for Pseudomonas or MRSA:

- • **Pseudomonas aeruginosa:**
  - **Indications:** Structural lung disease (e.g., bronchiectasis, severe COPD), recent hospitalization, recent antibiotics, gram-negative rods on sputum Gram stain.
  - **Regimen:** Add piperacillin-tazobactam (4.5g IV q6h) or cefepime (2g IV q8h); consult ID for local resistance.
- **Methicillin-Resistant Staphylococcus aureus (MRSA):**
  - **Indications:** Necrotizing pneumonia, post-influenza pneumonia, IV drug use, recent MRSA infection/colonization, cavitary lesions on imaging.
  - **Regimen:** Add vancomycin (15-20mg/kg IV q8-12h, target trough 15-20 mcg/mL) or linezolid (600mg IV/PO q12h).
- **Key Tip:** De-escalate antibiotics based on culture results to minimize resistance.

## Treatment Duration:

- • Minimum 5 days; extend to 7-10 days for slow response, complications (e.g., bacteremia, empyema), or resistant pathogens.
- **For empyema:** 2-4 weeks of antibiotics, guided by clinical response and cultures.
- Stop antibiotics if clinically stable (afebrile, improved symptoms, no ongoing infection).

## Supportive Care:

- **Oxygen Support:** Target SpO2 >90% (or >88% in COPD).
- **Nasal Cannula:** 1-6 L/min for mild hypoxia.
- **High-Flow Nasal Cannula (HFNC):** 20-60 L/min for moderate-severe hypoxia.

- **Non-Invasive Ventilation (BiPAP/CPAP):** For respiratory distress or hypercapnia (e.g., COPD overlap).
- **Mechanical Ventilation:** For severe respiratory failure (intubation in ICU).
- IV fluids for dehydration; antipyretics for fever.

### Management of Empyema:

- **Definition:** Pus in the pleural space or complicated parapneumonic eusion (pH <7.2, glucose <60 mg/dL, positive cultures).
- **Treatment:**
  - **Chest Tube:** Required for empyema or large, loculated eusions.
    - **Size:** 14-28 Fr, depending on fluid viscosity.
    - **Placement:** Ultrasound-guided, typically 5th intercostal space,mid-axillary line.
    - **Management:** Monitor output, remove when drainage <50-100 mL/day and infection controlled.
- **Antibiotics:** Continue 2-4 weeks based on pleural fluid cultures.
- **Surgical Consult:** For loculated or persistent empyema (consider VATS or thoracotomy).
- • **Key Tip:** Early ID and thoracic surgery consult for complex empyema cases.

## Complications

- Respiratory failure, pleural eusion, empyema (see above), sepsis, acute respiratory distress syndrome (ARDS).
- Monitor for worsening hypoxia, hemodynamic instability, or multi-organ dysfunction.

## Prognosis

- **General:** Most recover within 1-2 weeks with appropriate treatment.
- **Mortality:** ~1-5% in outpatients, 10-20% in hospitalized patients, >30% in ICU cases.
- **Poor Prognostic Factors:** Age >65, comorbidities (e.g., COPD, diabetes), high CURB-65 score, multidrug-resistant pathogens, empyema.
- **Recovery:** Symptoms (e.g., fatigue, cough) may persist 4-6 weeks; follow-up CXR in 6-8 weeks if no resolution.

## Key Pearls

- • Check for travel/exposures (e.g., Legionella from water sources).
- • Use CURB-65 to guide admission; reassess daily in hospital.

- • Suspect Pseudomonas/MRSA in high-risk patients (e.g., bronchiectasis, IV drug use).
- • Pleural fluid pH <7.2 or pus mandates chest tube for empyema.
- • Vaccinate eligible patients (PCV20 or PPSV23) to prevent recurrence.

## References


- • ATS/IDSA Community-Acquired Pneumonia Guidelines (2019).
- • **UpToDate:** “Community-Acquired Pneumonia in Adults” and “Parapneumonic Effusion and Empyema.”


**Visit: webcheatsheets.com for more education, fun resources and 10 category 1 AAPA CME credit!**