

1. DEFINITION

- **Pneumonia** is an **acute respiratory illness** associated with **recently developed radiological pulmonary shadowing**, which may be **segmental, lobar, or multilobar**.
- Classification is based on **the context of acquisition** (community-acquired, hospital-acquired, or in immunocompromised hosts).
- **Lobar pneumonia**: Homogeneous consolidation of one or more lobes, often with pleural inflammation.
- **Bronchopneumonia**: Patchy alveolar consolidation with bronchial and bronchiolar inflammation, usually affecting lower lobes.

2. EPIDEMIOLOGY

- Incidence of **Community-Acquired Pneumonia (CAP)**: 5–11/1000 adults/year in the UK.
- Accounts for **5–12% of all lower respiratory tract infections**.
- Can occur at **any age**, but is **commonest at extremes of age** (children and elderly).

3. ETIOLOGY & CLASSIFICATION

A. Based on Acquisition

Type	Features	Common Organisms
Community-Acquired Pneumonia (CAP)	Acquired outside hospitals	Streptococcus pneumoniae (most common), H. influenzae, Mycoplasma pneumoniae
Hospital-Acquired Pneumonia (HAP)	>48 hours after admission	Gram-negative bacilli (Klebsiella, Pseudomonas), Staphylococcus aureus
Pneumonia in Immunocompromised Hosts	Patients with HIV, transplant, steroids	Pneumocystis jirovecii, CMV, fungal infections

B. Lobar vs. Bronchopneumonia

- **Lobar pneumonia**: Single lobe, consolidation, often pneumococcal.
- **Bronchopneumonia**: Patchy, multiple lobes, seen in elderly or debilitated patients.

4. RISK FACTORS

- Cigarette smoking
- Upper respiratory tract infections
- Alcohol abuse
- Glucocorticoid therapy
- Old age

- Recent influenza infection
- Pre-existing lung disease (COPD, bronchiectasis)
- HIV infection
- Indoor air pollution

5. CAUSATIVE ORGANISMS

Bacteria

- **Streptococcus pneumoniae** (most common)
- Mycoplasma pneumoniae
- Legionella pneumophila
- Chlamydia pneumoniae
- Haemophilus influenzae
- Staphylococcus aureus (post-influenza)
- Chlamydia psittaci (psittacosis)
- Coxiella burnetii (Q fever)
- Klebsiella pneumoniae (alcoholics, severe disease with cavitation)

Viruses

- Influenza, Parainfluenza
- Measles
- Herpes simplex
- Varicella
- Adenovirus
- Cytomegalovirus (CMV)
- Coronaviruses (SARS-CoV-2, MERS-CoV)

6. MODE OF TRANSMISSION

- Mainly **droplet infection**.
- May follow viral infections (e.g. influenza).
- Certain organisms associated with **specific exposures**:
 - Legionella → contaminated cooling towers (hotels, hospitals).
 - Klebsiella → alcohol abuse.
 - Chlamydia psittaci → exposure to birds.
 - Travel history → MERS, melioidosis (SE Asia), endemic fungal infections (Americas).

7. CLINICAL FEATURES

A. General (Systemic) Features

- Fever with rigors, chills, and malaise
- Delirium (especially in elderly)
- Loss of appetite
- Headache

B. Respiratory Symptoms

- **Cough:** Initially dry, later productive of mucopurulent sputum
 - Rust-colored sputum → *Streptococcus pneumoniae*
 - Hemoptysis (occasional)
- **Pleuritic chest pain:** May radiate to shoulder or anterior abdominal wall
- **Upper abdominal tenderness:** Seen in lower lobe pneumonia

C. Physical Signs

- Tachypnea and tachycardia
- Dullness to percussion over consolidation
- Bronchial breath sounds
- Whispering pectoriloquy
- Crackles on auscultation
- Herpes labialis → suggests pneumococcal infection
- **Signs of consolidation progress through stages:**
 1. Acute exudation
 2. Red hepatization
 3. Grey hepatization
 4. Resolution

D. Atypical Presentations

- Seen in children and elderly (less pronounced systemic signs, confusion in elderly).
 - *Mycoplasma pneumoniae* → younger patients.
 - *H. influenzae* → older patients with lung disease.
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8. INVESTIGATIONS

1. Blood Tests

- Full blood count
 - Very high ($>20 \times 10^9/L$) or very low ($<4 \times 10^9/L$) WBC: marker of severity.
 - Neutrophil leukocytosis $>15 \times 10^9/L$: suggests bacterial cause.
 - Haemolytic anaemia: occasional in *Mycoplasma pneumoniae*.
- Urea & electrolytes
 - Urea $>7 \text{ mmol/L}$ ($>20 \text{ mg/dL}$): marker of severity.
 - Hyponatremia: marker of severity.
- Liver function tests
 - Abnormal if basal pneumonia inflames the liver.
 - Hypoalbuminemia: marker of severity.
- Procalcitonin
 - High: bacterial $>$ viral infection.
- C-reactive protein (CRP)/ESR
 - Non-specific elevation.
- Blood culture
 - Bacteraemia: marker of severity.
- Arterial blood gases (ABG)
 - Measure when $\text{SpO}_2 < 93\%$ or in severe illness $\rightarrow$ to assess ventilatory failure/acidosis.

2. Microbiological Tests

- Sputum
 - Gram stain, culture & sensitivity.
- Pharyngeal swab
 - NAAT for respiratory viruses (influenza, parainfluenza, coronaviruses) & *Mycoplasma pneumoniae*.
- Urine
 - Pneumococcal & Legionella antigen tests.

3. Imaging

- Chest X-ray
 - Lobar pneumonia: homogeneous consolidation; air bronchogram sign may be seen.
 - Bronchopneumonia: patchy/multilobar shadowing.

4. Complications (on imaging or clinically)

- Para-pneumonic effusion, empyema, cavitation (esp. *Staph. aureus*), pneumatocele, abscess.

- Pleural fluid
 - Always aspirate and culture if > trivial amount.

SEVERITY ASSESSMENT

CURB-65 Score

Parameter	Point if present
Confusion	1
Urea >7 mmol/L	1
Respiratory rate ≥ 30 /min	1
Blood pressure <90 systolic or <60 diastolic	1
Age ≥ 65 years	1

- 0–1 → Home treatment.
- 2 → Consider hospital-supervised treatment (short-stay inpatient or outpatient).
- ≥ 3 → Severe pneumonia → hospitalize, assess for ICU (esp. if 4–5).

9. MANAGEMENT

1. General

- **Oxygen:** for tachypnoea, hypoxia, hypotension, or acidosis.
 - Consider CPAP if persistent hypoxia despite oxygen.
- **Fluids:** IV fluids if severe; avoid overload, especially if elderly or with cardiac/renal issues. Vasopressors if shock.
- **Nutrition:** Support if prolonged illness.

2. Antibiotic Therapy

Severity	First-line	If allergic to penicillin
Low (0–1)	Amoxicillin 500 mg TDS PO (or IV if needed)	Doxycycline 200 mg loading → 100 mg OD PO OR Clarithromycin 500 mg BD PO
Moderate (2)	Amoxicillin 500 mg TDS PO/IV $\pm$ Clarithromycin 500 mg BD PO/IV	Doxycycline 200 mg loading → 100 mg OD PO OR Levofloxacin 500 mg OD PO/IV
Severe (≥ 3)	Co-amoxiclav 1.2 g IV TDS OR Cefuroxime 1.5 g IV TDS $\pm$ Clarithromycin 500 mg BD IV	Benzympenicillin 1.2 g IV QDS $\pm$ Levofloxacin 500 mg OD PO/IV
If Legionella suspected	Add Levofloxacin 500 mg BD PO/IV	

Duration:

Uncomplicated: 5 days.

Severe: Longer, guided by response.

3. Other Management

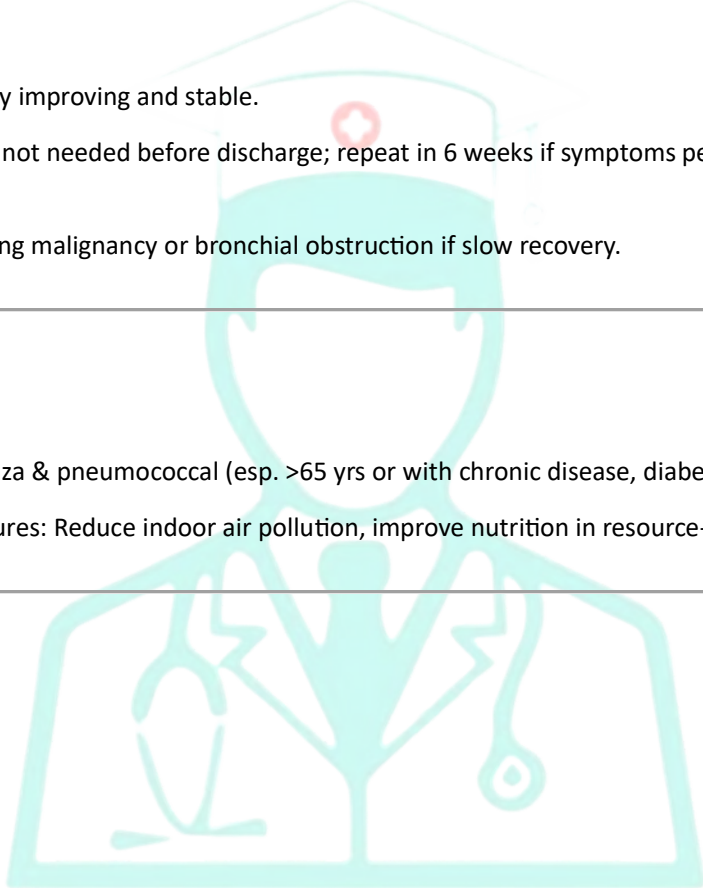
- Relieve pleural pain: Paracetamol, co-codamol, NSAIDs.
 - Physiotherapy: Encourage cough in those suppressing.
 - Drain pleural effusion if >trivial amount.
 - Monitor for complications: e.g. empyema, abscess, cavitation.
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Discharge & Follow-Up

- Discharge if clinically improving and stable.
 - Routine chest X-ray not needed before discharge; repeat in 6 weeks if symptoms persist or risk factors present.
 - Review for underlying malignancy or bronchial obstruction if slow recovery.
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PREVENTION

- Smoking cessation.
 - Vaccination: Influenza & pneumococcal (esp. >65 yrs or with chronic disease, diabetes, immunosuppression).
 - Public health measures: Reduce indoor air pollution, improve nutrition in resource-poor settings.
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