

- A 50 year old female presents to you with 5 days history of high grade fever, productive cough and shortness of breath. Patient is febrile and tachycardic. Breath sounds are bronchial on right lower chest and vocal resonance is increased.

- What is the diagnosis?



PNEUMONIA

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Aims and Objectives

- Overview
- Classification
- Modes of transmission
- Predisposing factors
- Pathophysiology
- Clinical manifestations
- Investigations
- Management
- Complications



Overview

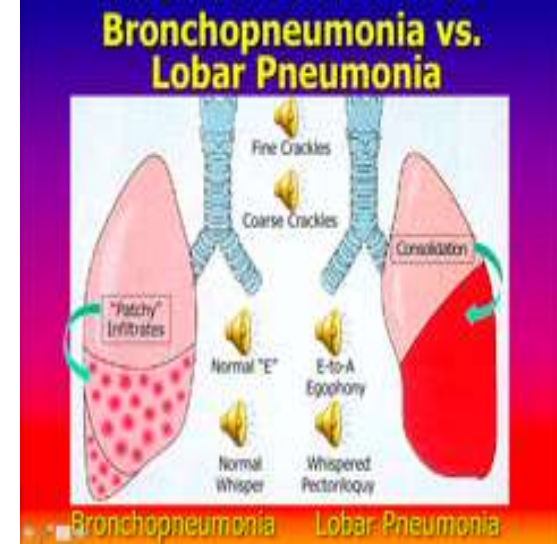
- **Pneumonia is an acute respiratory illness associated with recently developed radiological pulmonary shadowing.**
- The context in which pneumonia arises is highly indicative of organisms.

Classification

- Patho-radiological classification

Lobar pneumonia: homogeneous consolidation of one or more lung lobes, often with associated pleural effusion.

Bronchopneumonia: patchy alveolar consolidation associated with bronchial or bronchiolar inflammation, often affecting both lower lobes.



Brocnchopneumonia vs lobar

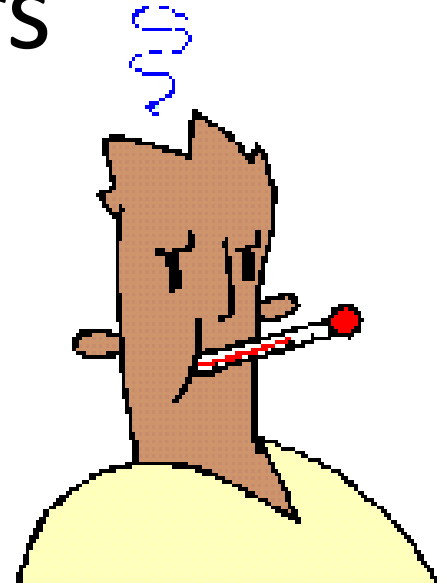


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- According to the context pneumonia can be classified as :
 1. Community acquired pneumonia(CAP).
 2. Hospital acquired pneumonia.
 3. Aspiration/suppurative pneumonia.
 4. Pneumonia in the immunocompromised.

Predisposing factors

- Extremes of ages
- Cigarette smoking
- Alcohol
- Upper respiratory infections
- Recent influenza infection
- Pre-existing lung disease
- Difficult swallowing due to any neurological condition
- HIV
- Corticosteroid therapy
- Indoor air pollution



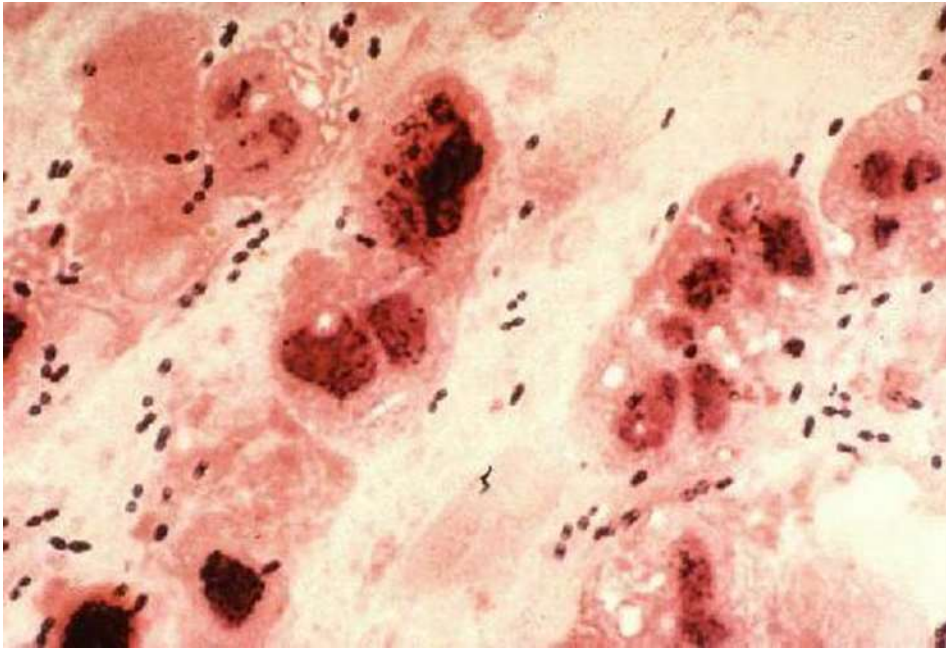
Causes of pneumonia

- Bacterial
- Viral
- Fungal
- Chemical (inhalation of kerosene or other irritants)

Organisms involved

- **Strep.pneumoniae** is the most common agent.
- **Viral infections** more common in children.
- **Mycoplasma pneumoniae** is more common in young.
- **Haemophilus influenzae** is more common in elderly and those with underlying lung disease
- **Legionella** occurs as outbreaks in contaminated cooling towers.
- **Staph.aureus** is more common following an episode of influenza.

Streptococcus pneumoniae



Mode Of Transmission

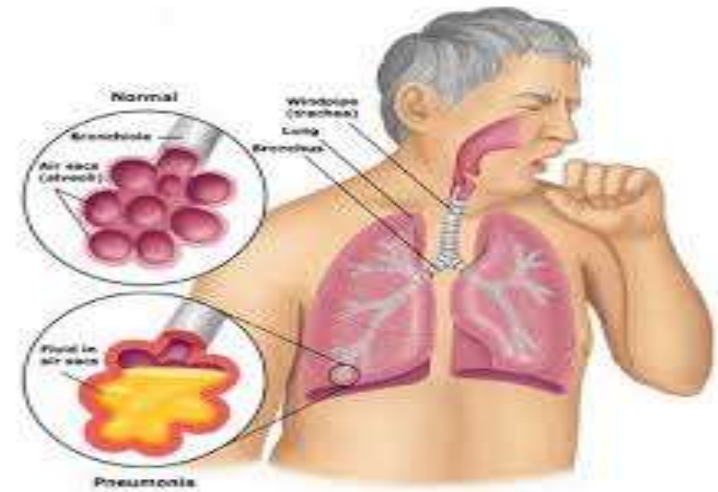
- Bacteria and viruses living in your **nose, sinuses, or mouth** may spread to your lungs.
- You may **breathe** some of these germs directly into your lungs (droplets infection).
- You breathe in (inhale) food, liquids, vomit, or fluids from the mouth into your lungs (**aspiration pneumonia**).

Pathophysiology

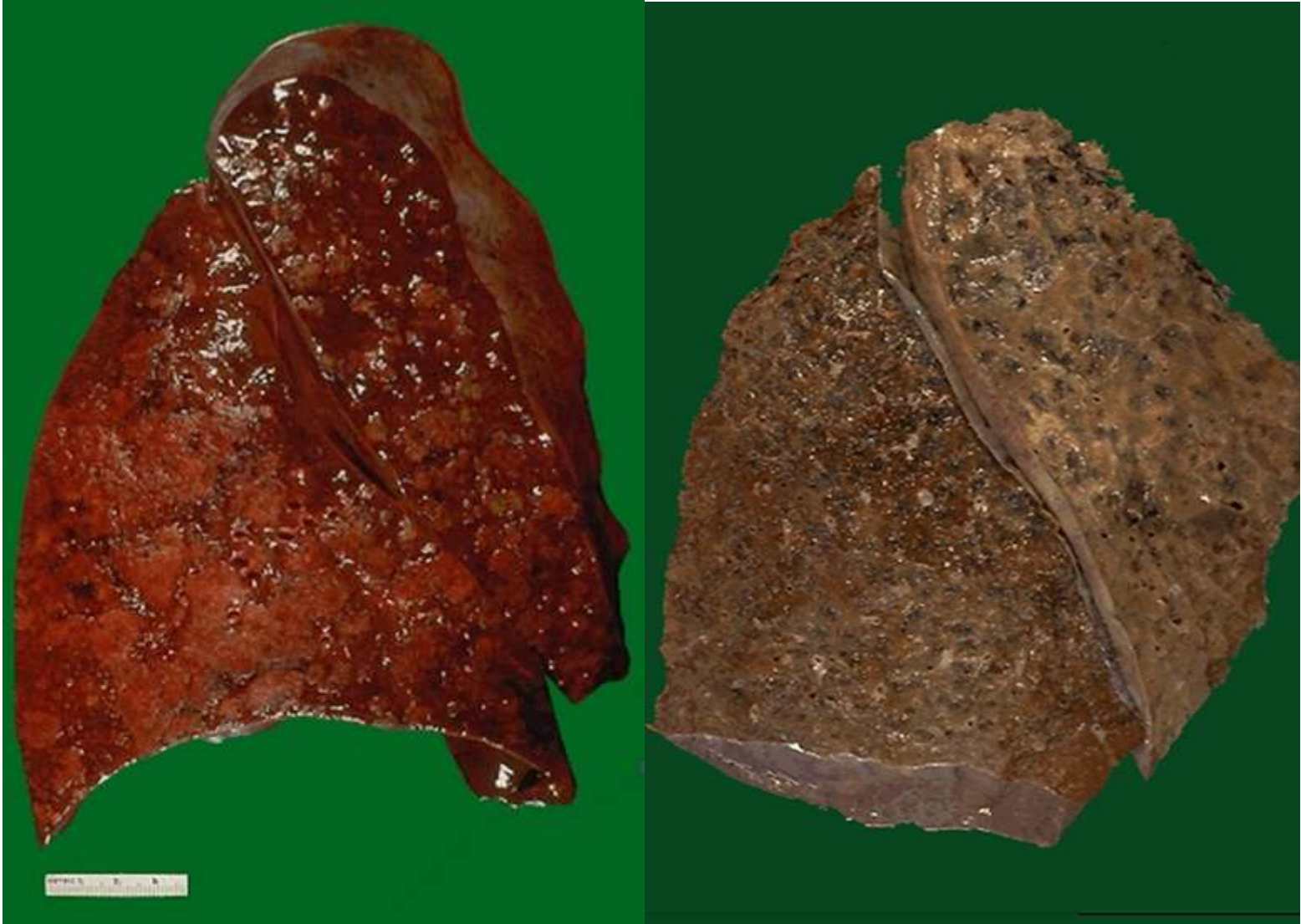
- Four stages involving :

1. Congestion.
2. Red hepatisation.
3. Grey hepatisation.
4. Resolution(if no complication occurs).

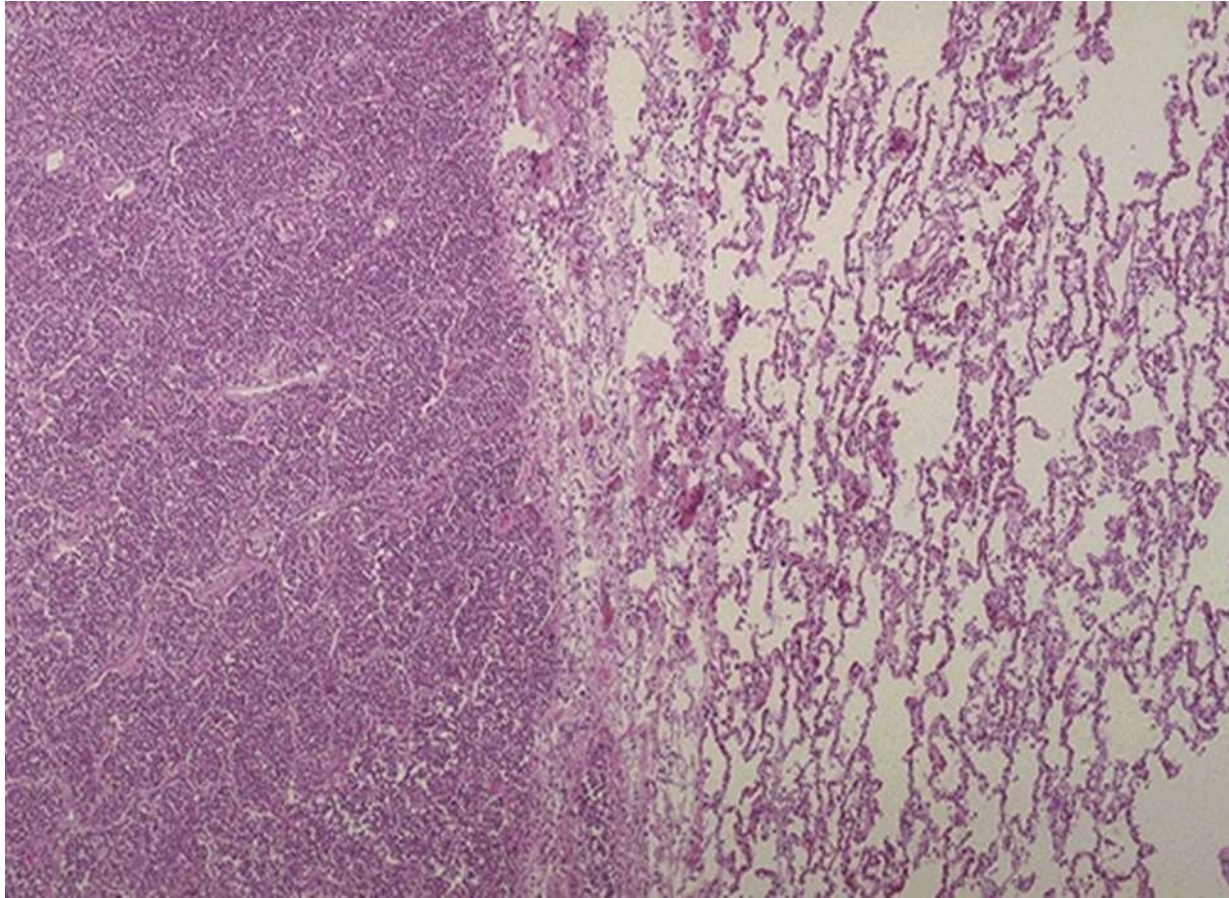
These features are particularly evident with lobar pneumonia.



Hepaticization



Histological picture shown on left



Clinical features

History

- Acute onset (esp with lobar pneumonia).
- Constitutional symptoms.
- Cough(initially short,painful,dry).
- Mucopurulent sputum.
- Rusty sputum(strep.pneumoniae).
- Hemoptysis(ocassionally).
- Pleuritic chest pain.
- Upper abdominal tenderness(lower lobe pneumonia/hepatitis).



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- **Examination**

Vitals : Tachycardia

Tachypnea

Fever

Hypotension

Low spO₂

Cyanosis.

Distress/delirium.

Nutritional status.

Dental hygiene.



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- **Chest findings** include:

Reduced chest expansion.

Intercostal indrawing/use of accessory muscles.

Enhanced vocal fremitus/resonance.

Dull percussion note.

Bronchial breathing.

Whispering pectoriloquy.

Crepitations .

Reduced air entry only in some patients.

Hospital CURB-65

This is calculated to make an assessment of mental state and need for hospitalization.

1. Confusion .
2. Urea >7 mmol/lit(20mg/dl).
3. Respiratory rate >30 /min.
4. Blood pressure(systolic <90 or diastolic <60).
5. Age >65 years.
6. Score 1 point for each feature present.

Differential diagnosis

- Pulmonary infarction
- Pulmonary/pleural TB
- Pulmonary edema
- Pulmonary eosinophilia
- Malignancy bronchoalveolar CA
- COPD/BOOP

Investigations

- **Full blood counts** (very high or low TLC is marker of severity).
- **U and E** (urea > 7 mmol/L and hyponatremia).
- **LFTs** (deranged in basal pneumonia).
- **Serum albumin** (hypoalbuminemia - marker of severity).
- **ESR/CRP.**
- **Blood cultures** (marker of severity).

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- **Serology** : acute and convalescent titres for Mycoplasma, Chlamydia, Legionella and viral infections.
- **Cold agglutinins.**
- **ABGs** measure when SaO₂ < 93 % or severe clinical features.
- **Sputum for gram stain, c/s.**
- **Oro-pharynx swab.**
- **PCR** for Mycoplasma pneumoniae and other atypical pathogens.

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- **Urine** for pneumococcal or legionella antigen.
- **Chest x-rays.**

Lobar pneumonia: homogenous consolidation
/air bronchogram

Bronchopneumonia: patchy and segmental
shadowing

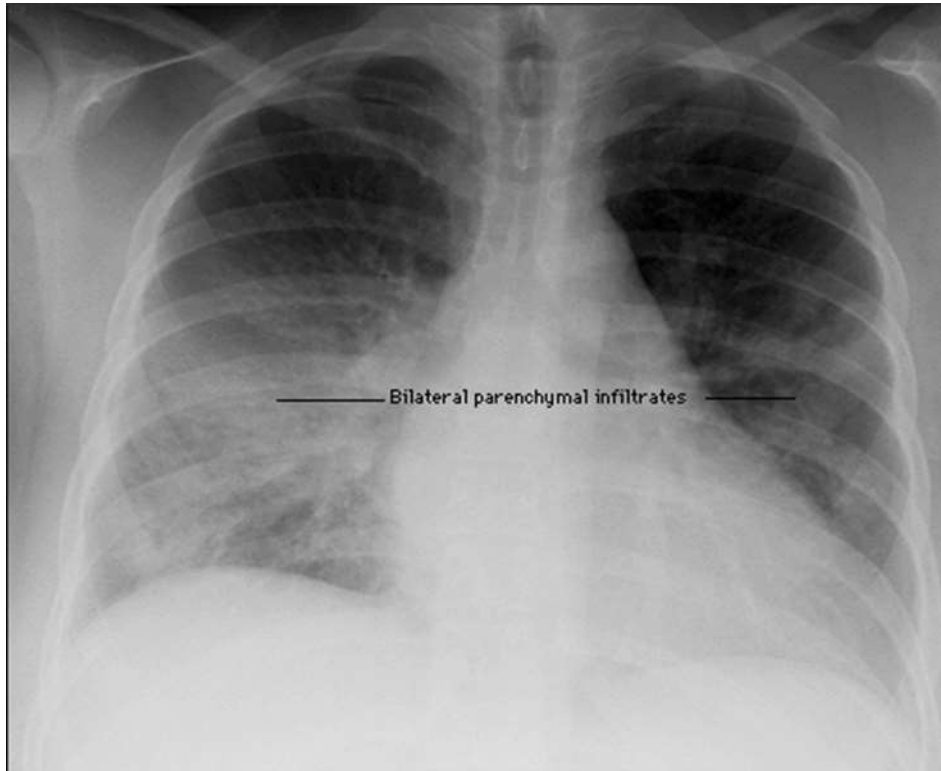
Para pneumonic effusions

Abcess/empyema

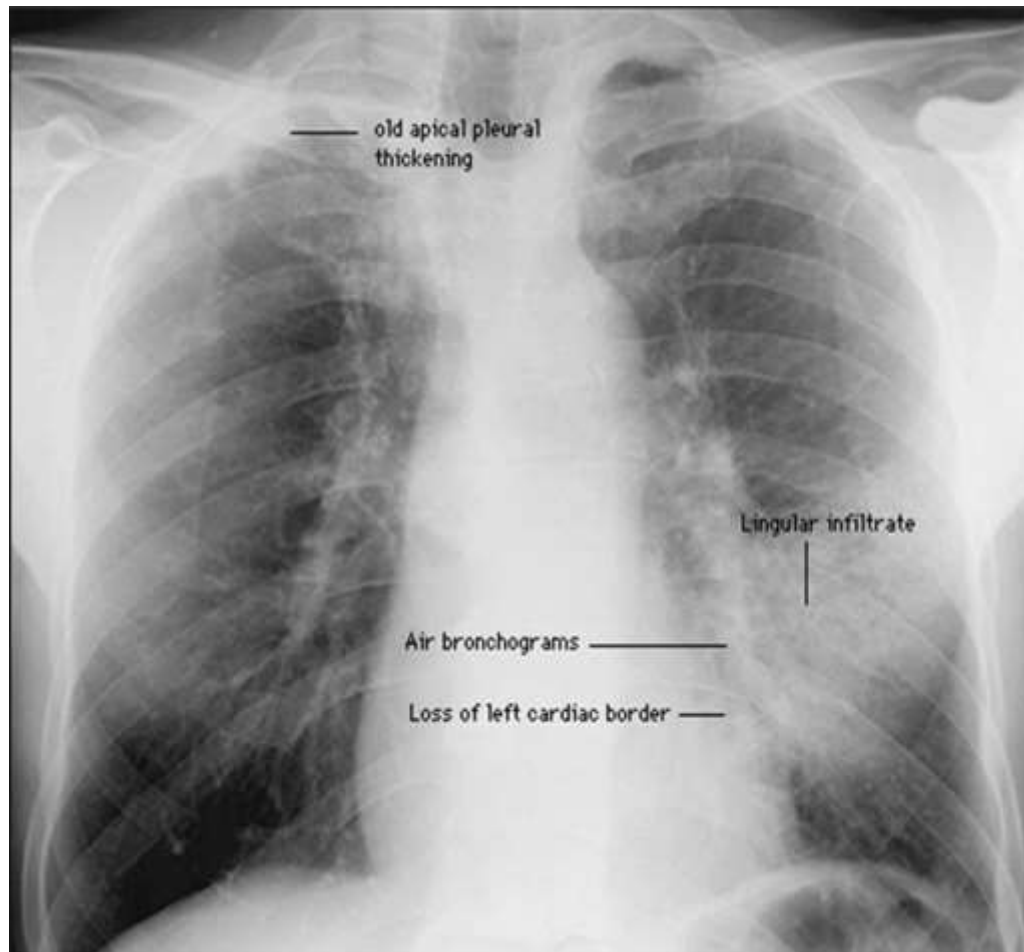
Cavitation/pneumatocoeles

- **Pleural fluid examination.**

Bilateral parenchymal infiltrates



Air bronchogram with infiltrates



Lobar pneumonia



Management

- Oxygenation
- Fluid balance
- Antibiotic therapy
- Analgesics
- Nutritional support
- Prevention of complications

Oxygen



- In all patients with tachypnea, hypoxemia, hypotension or acidosis.
- Target $PaO_2 > 60$ mmHg.
- $SaO_2 > 92\%$.
- High conc $> 35\%$ and humidified.
- CPAP in those who still remain hypoxic.

IV Fluids

- Severe illness
- Elderly
- Intractable vomiting
- Hypotension

Encourage oral intake in all.

Antibiotic therapy

- In uncomplicated cases a 7 day course is adequate.

Uncomplicated CAP:

Amoxicillin, 500mg, PO, tds.

If allergic to penicillins:

Clarithromycin, 500mg, PO, bd.

If staphylococcus is suspected/cultured:

Flucloxacillin, 1-2g, qid, iv plus
clarithromycin, 500mg, bd, iv.

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- If mycoplasma or legionella is suspected:

Clarithromycin 500mg PO/IV bd or

Erythromycin 500mg PO/IV qid plus

Rifampicin 600mg IV bd in severe cases.

Severe CAP

- Clarithromycin 500 iv bd or erythromycin 500mg iv qid plus
- Co-amoxiclav 1.2g iv tds or ceftriaxone 1-2 g iv daily or cefuroxime 1.5g iv tds or
- Amoxicillin 1g iv qid plus flucloxacillin 2g iv qid.

Indications for referral to ICU

- CURB score of 4-5 failing to respond rapidly to initial therapy.
- Persisting hypoxia($\text{PaO}_2 < 60$).
- Progressive hypercapnia.
- Severe acidosis.
- Circulatory shock.
- Reduced conscious level.

Prognosis

- The mortality rate of adults with non severe pneumonia is very low <1 %.
- Hospital death rates are typically b/w 5 and 10% but death rates may be as high as 50 % in those with severe illness.
- Many patients respond promptly to antibiotic therapy.
- Chest xrays often take weeks or even months to resolve especially in elderly.
- A follow up around 6 weeks later is recommended.

Prevention

- Stop smoking
- Influenza and pneumococcal vaccination
- Tackling malnourishment
- Controlling indoor air pollution



Hospital acquired pneumonia (HAP)

- A new episode of pneumonia occurring at least 2 days after hospital admission.
- The organisms involved in early onset HAP are similar to those of CAP.
- Late onset HAP is associated with more gram negative bacteria like Escherichia, Pseudomonas, klebisella and Staph.aureus.
- Mortality is upto 30%.

VAP and HCAP

- Pneumonia developing in patients on mechanical ventilation is known as ventilator associated pneumonia.
- Healthcare associated pneumonia is the development of pneumonia in a person who has spent atleast 2 days in hospital within last 90 days,or has attended a haemodialysis unit,received antibiotics or been resident in a nursing home or other health care facility.

Predisposing Factors

- Reduced host defenses.
- Aspirations.
- Bacteria introduced into lower respiratory tract by intubation.
- Bacteremia .

Management

- Investigations and management are similar to CAP but choice of antibiotic is more challenging.

- Early onset HAP:

If patient has not received any previous antibiotic ;treat with co-amoxiclav or cefuroxime.

If the patient has received a course of antibiotic recently,then piperacillin/tazobactam or a 3rd generation cephalosporin should be considered.

Late-onset HAP

- Must cover gram negative, staph. aureus and anaerobes.
- Anti-pseudomonal cover provided by carbapenem or 3rd generation cephalosporin+ aminoglycoside.
- MRSA cover provided by vancomycin or linezolid.
- Physiotherapy and nutritional support is recommended.

Prevention

- Good hygiene/handwashing.
- The use of PPIs should be limited; increase the risk of VAP.
- Oral antiseptic like chlorhexidine to decontaminate upper airways.
- Selective decontamination of the digestive tract when the anticipated requirement for ventilation will exceed 48 hours.

Aspiration/suppurative pneumonia

- Suppurative pneumonia is characterised by destruction of the lung parenchyma by the inflammatory process and microabscess formation.
- Often develop after inhalation of septic material during surgery, coma, bulbar/vocal cord palsy, stroke, GERD and alcoholism.
- Tend to localize to dependent areas of lung such as the apical segment of lower lobe.

Organisms

- Mixture of anaerobes and aerobes.
- Bacterioides, fusobacterium and micro-aerophilic cocci.
- In previously healthy lung Staph.aureus and klebisella are commonly isolated.
- Strains of CA-MRSA produce cytotoxin Pantone-Valentine leukocidin leading to rapidly progressive severe necrotising pneumonia.

Lemierre's syndrome

- A rare cause of pulmonary abscess caused by *Fusobacterium necrophorum*; typically commences as fever, rigor, sore throat, painful swollen neck, haemoptysis and dyspnea, and spread into the jugular veins leads to thrombosis and metastatic spread of the organism.

Exogeneous lipid pneumonia

- A non-infective of aspiration pneumonia-may follow the aspiration of animal,vegetable or mineral oils.

Symptomatology and labs

- Copious, foul smelling ,blood stained sputum is common.
- Digital clubbing may develop over 10-14 days.
- Pleural rub is common.
- Abscesses characterised by cavitation and fluid levels are common.

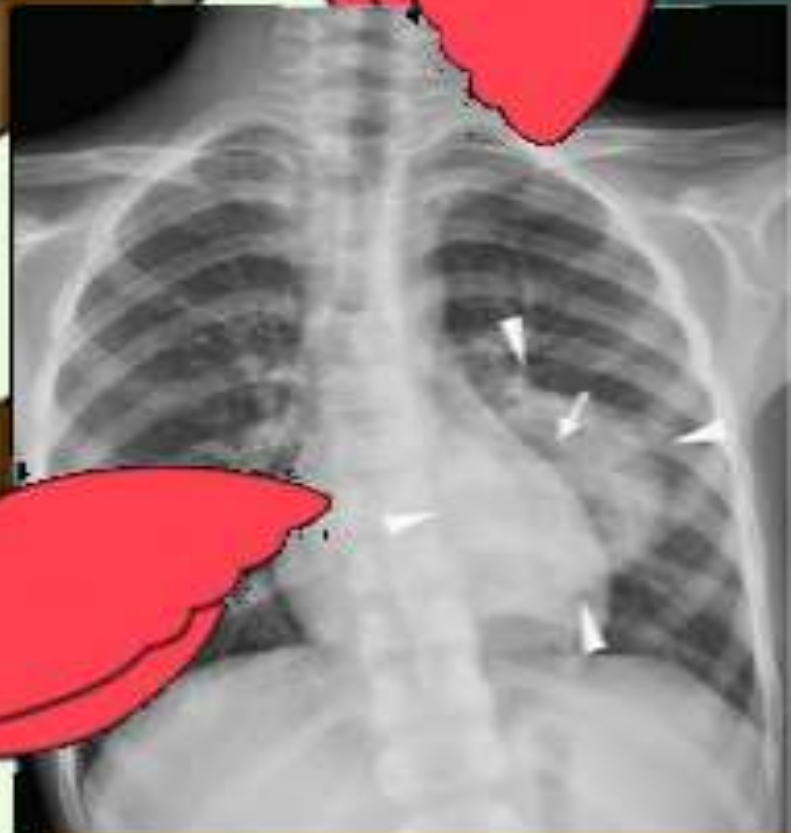
Management

- Iv co-amoxiclav 1.2g tds.
- Oral metronidazole 400mg in tds added to cover anaerobes.
- CA-MRSA treated with trimethoprim-slfamethoxazole, clindamycin, tetracyclines or linezolid.
- F.necrophorum susceptible to metronidazole, clindamycin and 3rd generation cephalosporins.
- Prolonged treatment for 4-6 weeks may be required.

Pneumonia in the immunocompromised

- Spectrum of the organisms involved depends on the type and degree of defect in immune system.
- Opportunistic pathogens like pseudomonas, fungi, viruses and mycobacteria.
- Clinical features are same to those in non immunocompromised; course of events less rapid with opportunistic pathogens.
- Induced sputum and HRCT are the additional techniques being used.
- Broad spectrum antibiotics are used.

These Arrows adjacent to the ROUND object seem to indicate a potential concern. How did those arrows get there?



Questions

- What are the causative organisms of pneumonia?

- What are the clinical signs of consolidation?

- What investigations you will order in a patient with pneumonia?

- How will you treat pneumonia?

- Thank you!