Pneumonia

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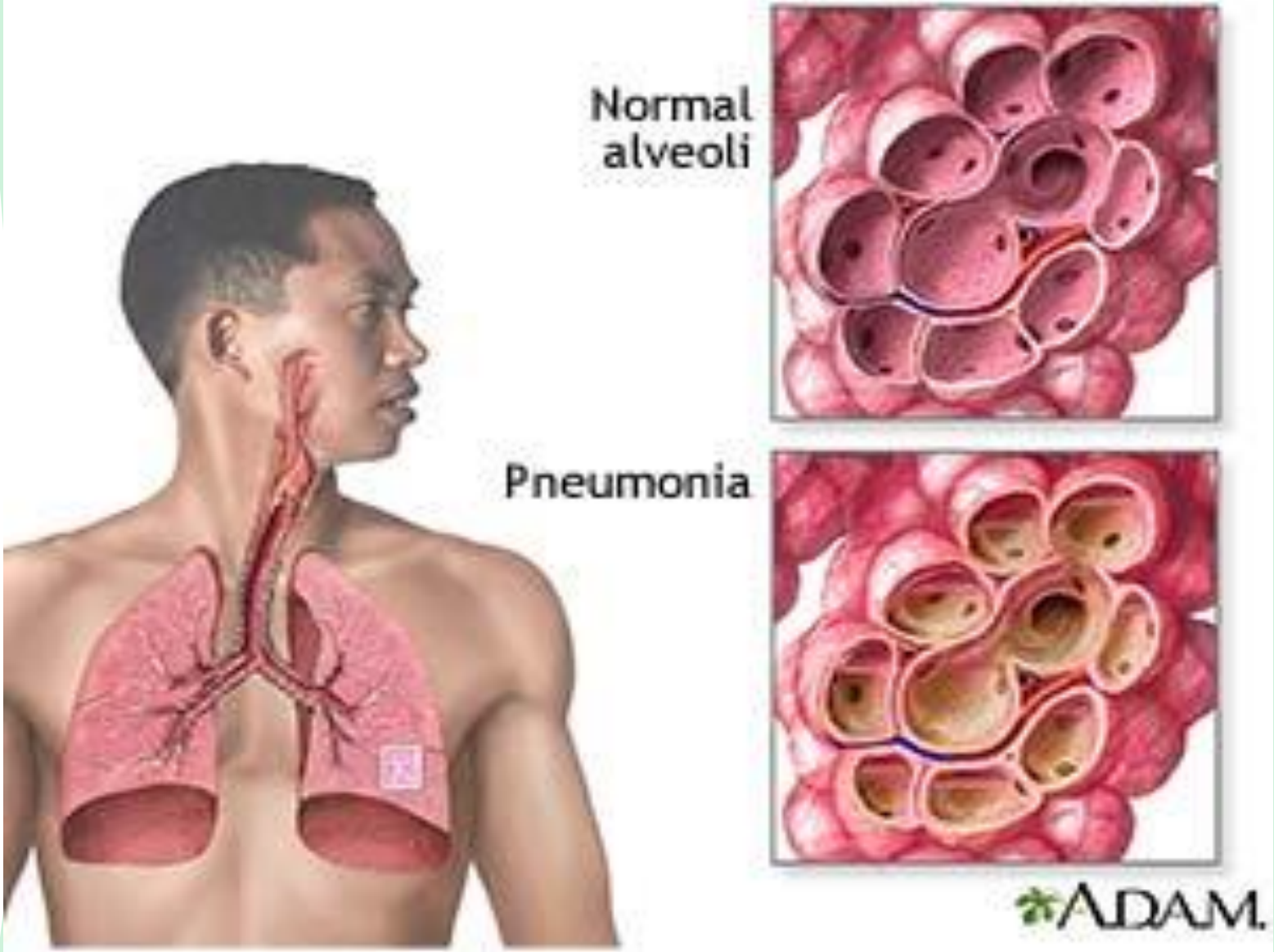
Ass Professor of chest diseases and Tubeculosis

Lecture Outline

- Definition
- Classifications
- Risk Factors & pathophysiology
- Pneumococcal pneumonia
- Viral pneumonia
- Atypical pneumonia
- Gram –ve pneumonia

Definition

- Is an acute respiratory illness associated with recently developed radiological pulmonary shadowing .
- It is an inflammatory process of the lung parenchyma that is commonly caused by infectious agents.


Normal alveoli
Pneumonia
A.D.A.M.

Classification of pneumonia

According to causes (Microbiological)

- Bacterial (the most common cause of pneumonia) e.g. streptococcus
- Viral pneumonia
- Fungal pneumonia
- parasitic

Non infective

- Physical: radiation pneumonitis
- Chemical pneumonia (ingestion of kerosene or inhalation of irritating substance), lipoid
- Inhalation pneumonia (aspiration pneumonia)
- Allergic: loffler,s syndrome.

Classification of pneumonia (cont…)

Anatomical

- Lobar pneumonia; if one or more lobe is involved.It is radiological and pathological term.
- Bronco-pneumonia; the pneumonic process has originated in one or more bronchi and extends to the surrounding lung tissue.
- Segmental or subsegmental

Classification of pneumonia (cont…)

- Community Acquired Pneumonia (CAP)
- Nosocomial/Hospital Acquired Pneumonia.
- Pneumonia in immuno-comprimised host.

CAP

- CAP = pneumonia in person not hospitalized or residing in a long-term care facility for $\geq$ 14 days

Clinical Infectious Diseases 2000;31:347-82

HAP (Nosocomial pneumonia)

- Hospital-acquired pneumonia (HAP) Occurs 48 hours or more after admission, which was not incubating at the time of admission.

Predisposing factors

- Immuno-suppresed patients
- Cigarette smoking
- Difficult swallowing (due to stroke, dementia,parkinsons disease, or other neurological conditions)
- Impaired consciousness (loss of brain function due to dementia, stroke, or other neurological conditions)

- Chronic lung disease (COPD, bronchostasis)
- Old age
- Other serious illness such as heart disease, liver cirrhosis, renal disease and DM
- Recent cold, laryngitis or flu
- Splenectomy, functional asplenia or hyposplenia.

Community Acquired Pneumonia (CAP)

- **Definition**

… an acute infection of the pulmonary parenchyma that is associated with some symptoms of acute infection, accompanied by the presence of an acute infiltrate on a chest radiograph, or auscultatory findings consistent with pneumonia, **in a patient not hospitalized or residing in a long term care facility for > 14 days before onset of symptoms**.

Bartlett. Clin Infect Dis 2000;31:347-82

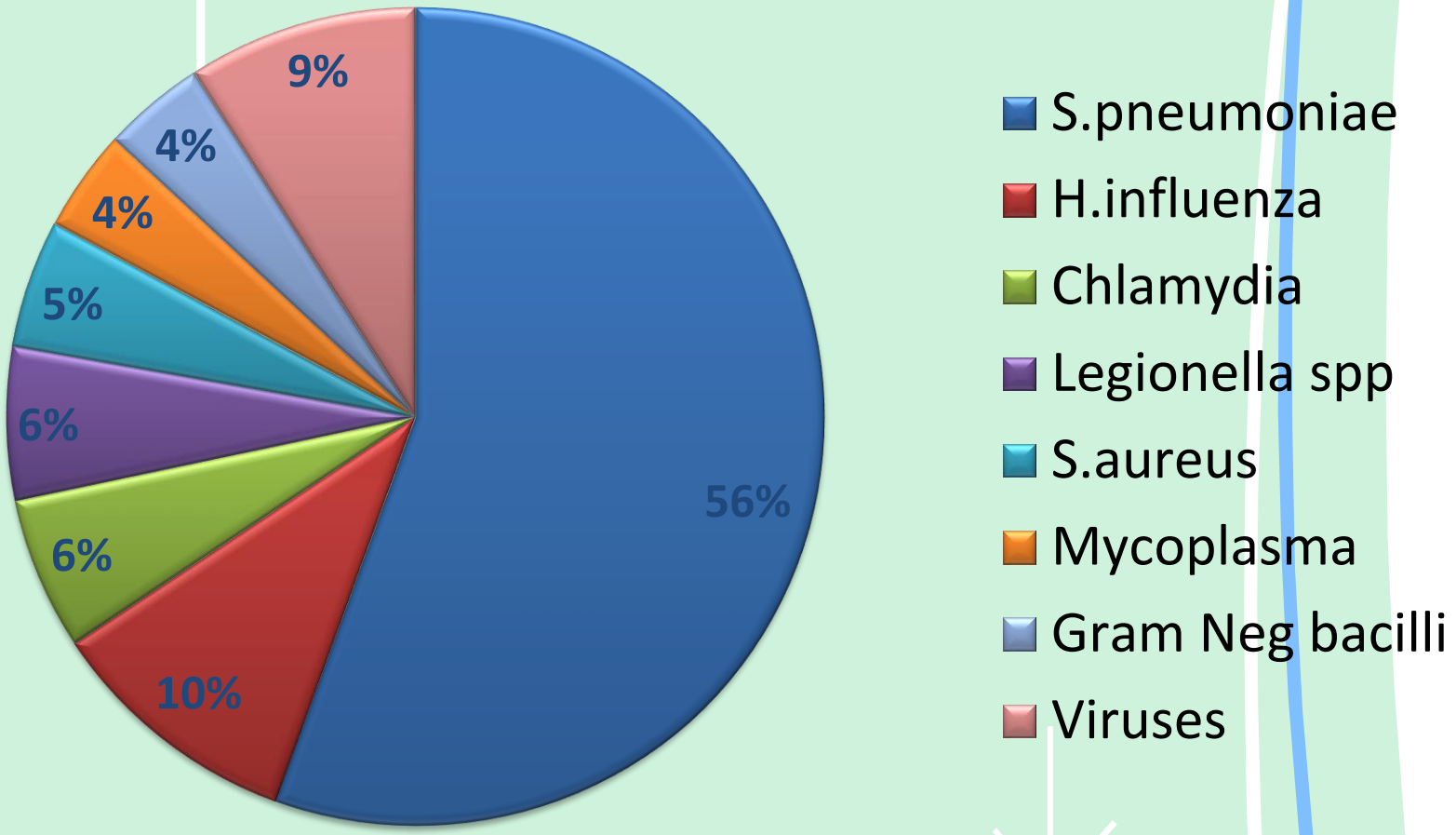
CAP – The Two Types of Presentations

Classical	Atypical
• Sudden onset of CAP • High fever, shaking chills • Pleuritic chest pain, SOB • Productive cough • Rusty sputum, blood tinge • Poor general condition • High mortality up to 20% in patients with bacteremia • S.pneumoniae causative	• Gradual & insidious onset • Low grade fever • Dry cough, No blood tinge • Good GC – Walking CAP • Low mortality 1-2%; except in cases of Legionellosis • Mycoplasma, Chlamydiae, Legionella, Ricketessiae, Viruses are causative

CAP – The Pathogens Involved

40-60% - No causative agent identified

2-5% - Two are more agents identified



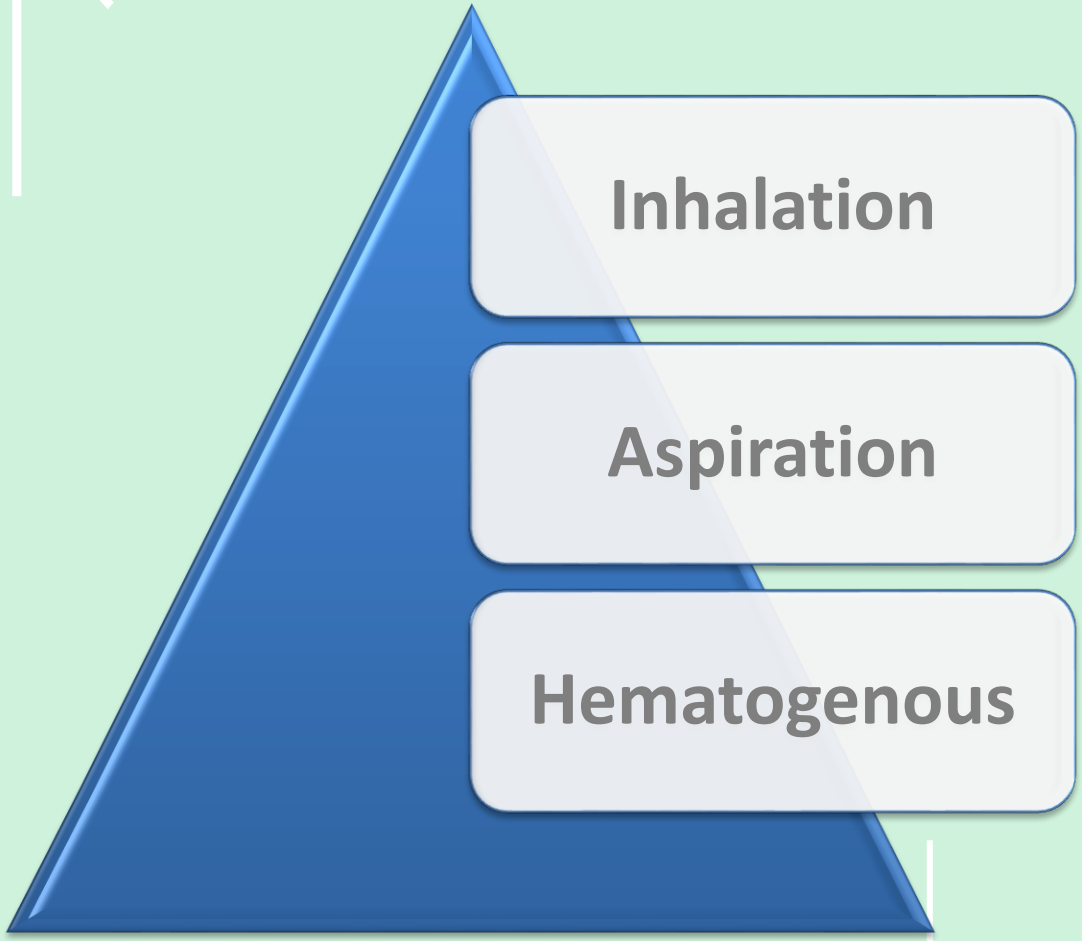
Lobar (pneumococcal) pneumonia

- AE:
- Streptococcus pneumonia (pnemococci): G+ve diplococci. The most common cause of CAP.

Streptococcus pneumonia
(Pneumococcus)

- Most common cause of CAP
- About 2/3 of CAP are due to S.pneumoniae
- These are gram positive diplococci
- Typical symptoms (e.g. malaise, shaking chills fever, rusty sputum, pleuritic chest pain, cough)
- Lobar infiltrate on CXR
- May be Immuno suppressed host
- 25% will have bacteremia – serious effects

CAP – Pathogenesis



Pathological picture

- Stage of congestion
- Stage of red hepatization
- Stage of grey hepatization
- Stage of resolution
- 7-10 days

How is pneumonia spread?

- Most cases of pneumonia are spread person-to-person by coughing out of tiny droplets.
  - Some pathogens can live in nose and throat without causing disease.But when inhaled into lungs, they can cause pneumonia.
  - While many people are exposed to pneumococcus, usually only those with underlying health issues develop pneumonia.

Clinical manifestations

- Acute onset usually perceded by mild coryza or URT symptom
- Shaking chills
- Rapidly rising fever (39.5 to 40.5 degree)
- Tachypnea, nasal flaring
- Flushed cheeks
- Loss of appetite, low energy, and fatigue

- Stabbing chest pain aggravated by respiration and coughing
- Patient is very ill and lies on the affected side to decrease pain

- Cough with purulent, blood tinged, rusty sputum
- Shortness of breath
- Use of accessory muscles of respiration e.g. abdomen and intercostals muscles

General signs

- Pt looks ill, sweaty and flushed.
- Fever, Tachycardia and Tachypnia.
- Herbes Labialis
- Cyanosis

Local signs

- Signs of consolidation taking the topography of a lobe
- Diminished respiratory movements
- Increased TVF (Bronchophony)
- Impaired note
- Tubular breathing, crackles, pleural rub.
- Recovery by crisis or lysis

Diagnostic tests

- Chest X- ray

CAP – Laboratory Tests

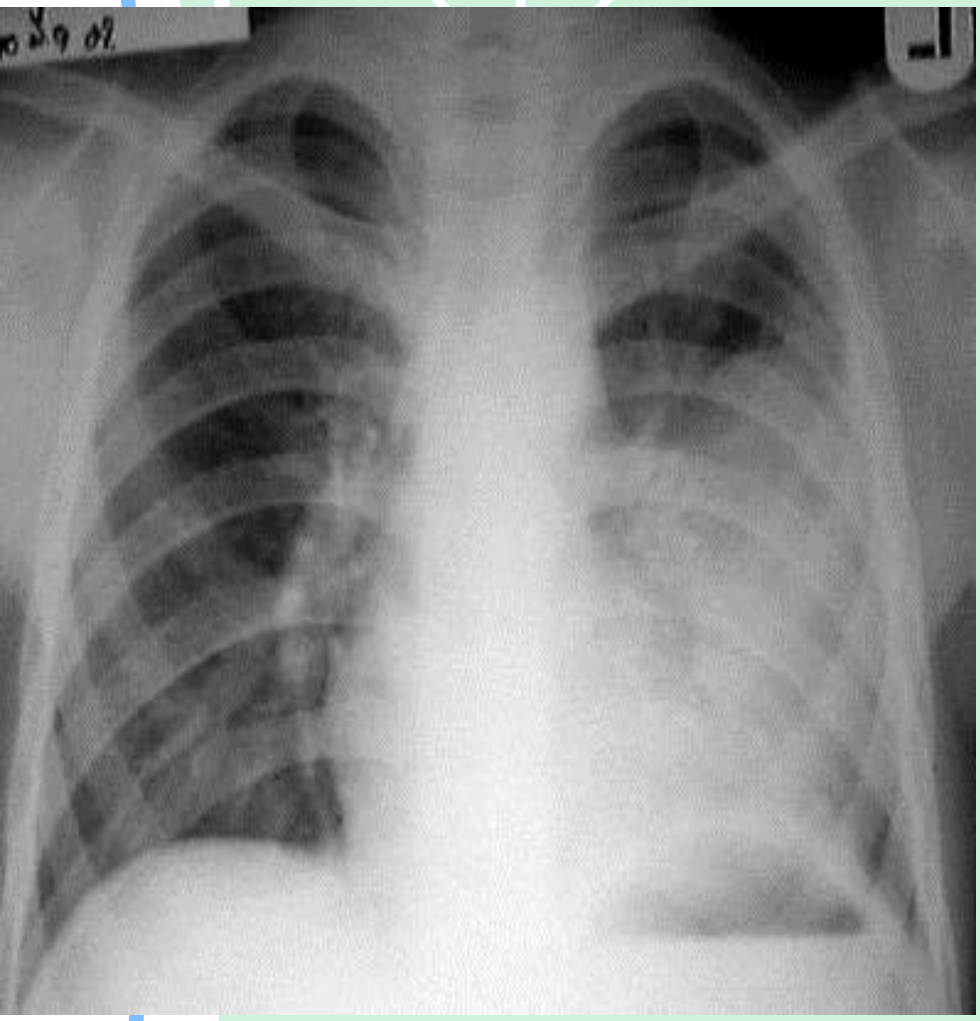
- **CXR – PA & lateral**
- **CBC with Differential**
- **BUN and Creatinine**
- **FBG, PPBG**
- **Liver enzymes**

- **Serum electrolytes**
- **Gram stain of sputum**
- **Culture of sputum**
- **Pre Rx. blood cultures**
- **Oxygen saturation**

CAP – Value of Chest Radiograph

- **Usually needed to establish diagnosis**
- **It is a prognostic indicator**
- **To rule out other disorders**
- **May help in etiological diagnosis**

J Chr Dis 1984;37:215-25



- Heamatology and Biochemistry
- Blood gas
- Microbiological tests (sputum, blood and pleural fluid), Serology and PCR
- Bactremia in COPD, DM and women.

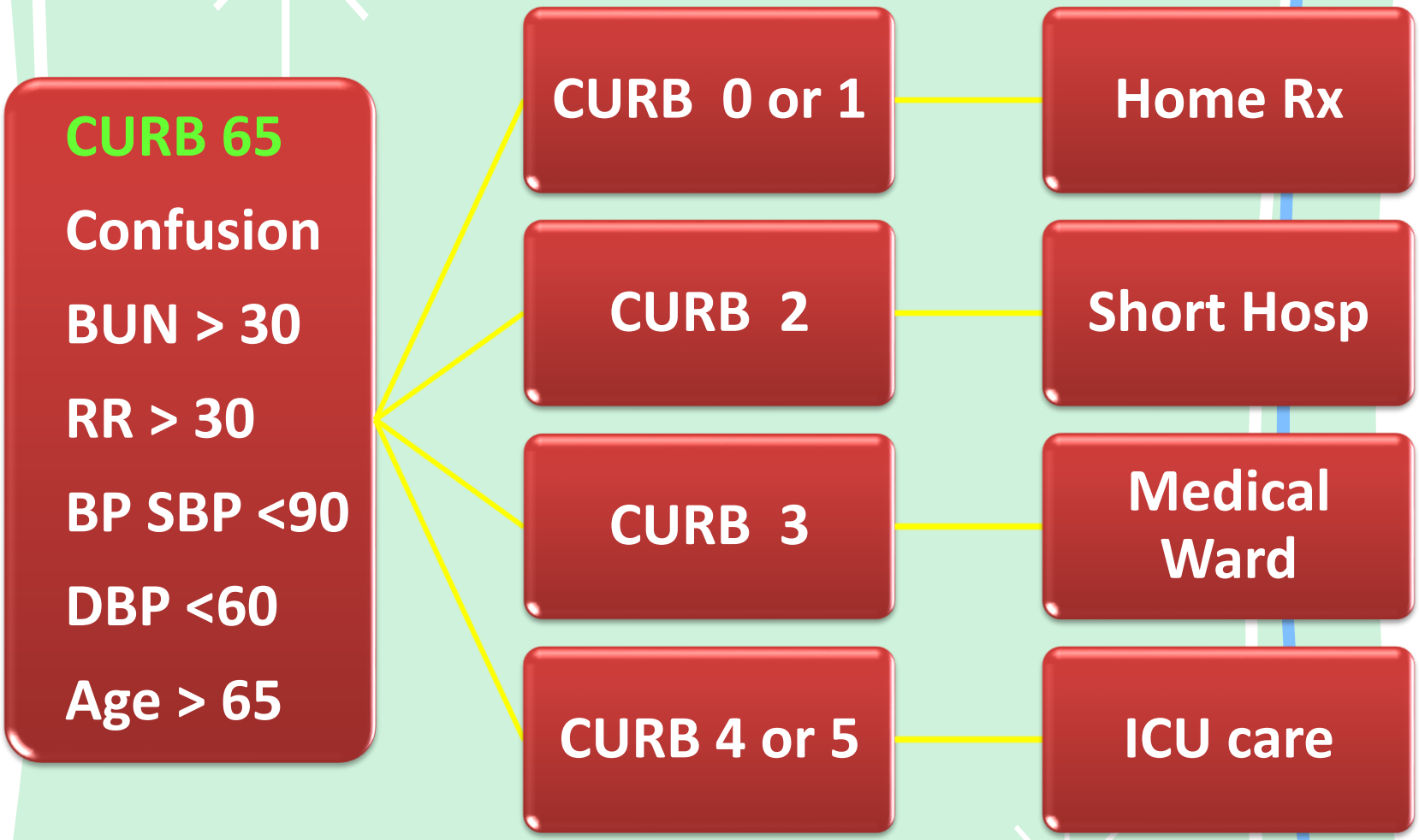
- According to the Infectious Disease S ociety of American (ID S A) 2007 Guidelines, testing is based on severity and specific risk factors.
  - If the community acquired pneumonia (CAP) is severe (e.g., ICU admission), blood cultures and expectorated sputum Gram staining and culture and urinary antigen tests for *Legionella pneumophia* and *Streptococcus pneumoniae* are recommended.
  - If the CAP is not severe and no other risk factors (e.g., asplenia, alcohol abuse, severe liver disease, severe obstructive lung disease, failure of outpatient antibiotic therapy) are present, testing is optional.

- The pneumococcal urinary antigen test may be used to supplement blood and sputum cultures in adults. This assay is an immunochromatographic membrane test to detect the pneumococcal cell-wall polysaccharide. The test has sensitivity of 50%-880% (70%-90% if bacteremia) and a specificity of about 90% in adults (lower in children).

CURB-65 severity of illness score

- **C**onfusion: new mental confusion
- **U**rea: new raised > 7 mmol/L
- **R**espiratory rate: >30/min
- **B**lood pressure: low blood pressure (systolic blood pressure < 90 mm Hg and/or diastolic blood pressure <60 mm Hg)
- Age: ≥ **65** years.

CURB 65 Rule – Management of CAP



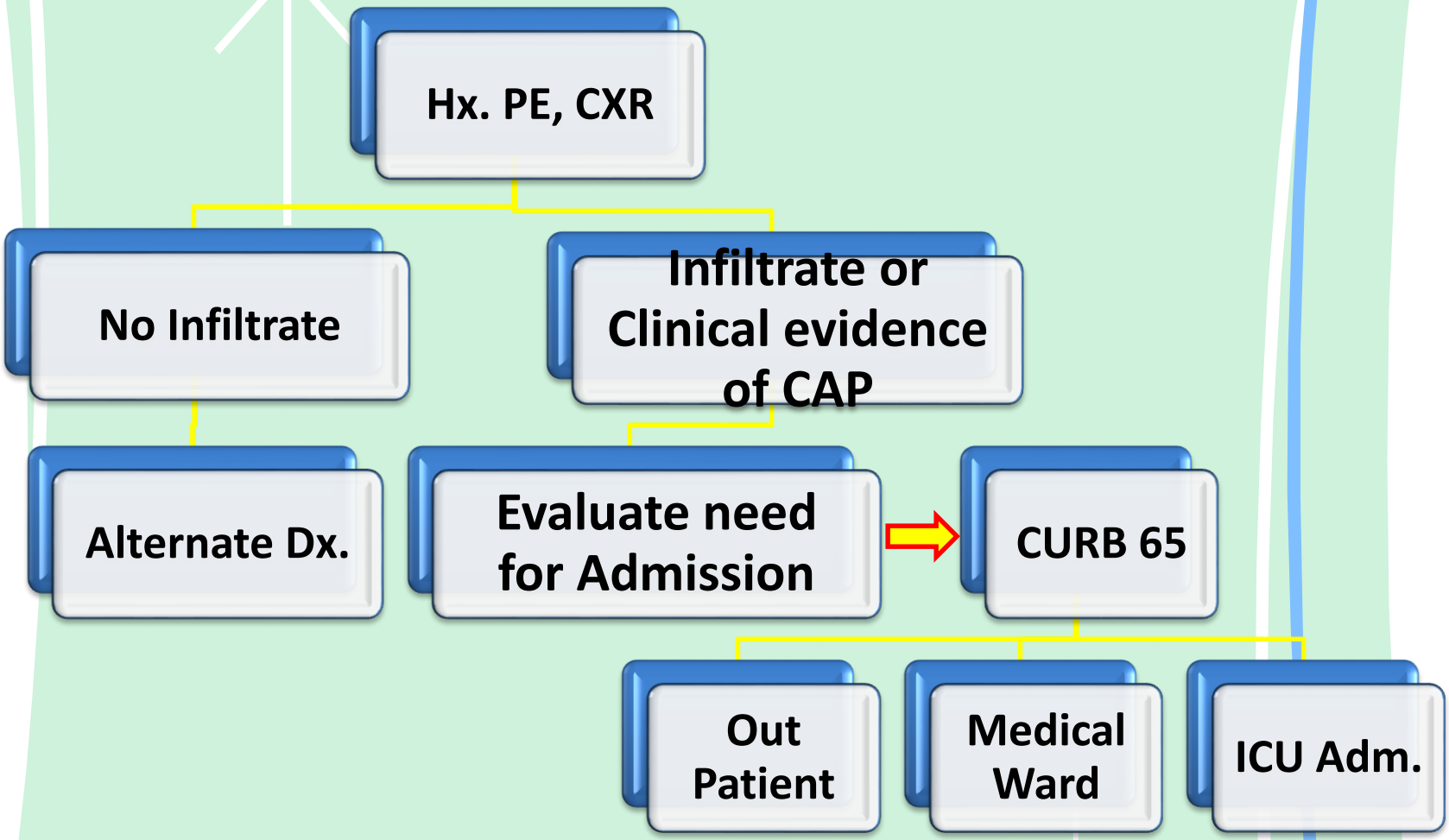
Complications

- Pulmonary :
- Delayed or failure of resolution
- Lung abscess
- Pleural; pleurisy, serous effusion or empyema.
- Systemic:
- Heamatogenous spread; pericarditis, endocarditis, to x ic myocarditis &HF, peritonitis and arthritis.
- DIC, SIADH and septic shock.

Differential Diagnosis

- Fever with chest symptom.
- Bacterlogical diagnosis.
- Consolidation Vs collapse, fibrosis and pleural effusion

CAP – Evaluation of a Patient



Treatement

- **General:**
- Bed rest and good nutrition and hydration.
- **Antibiotic:**
- Benzyl penicillin, Amoxicillin or Ampicillin in appropriate dose intravenously followed by oral route.

Drug-Resistance

- About 34% of pneumococcal isolates are penicillin-resistant.
- The mechanism of resistance: altered penicillin-binding protein
  - Resistant to amoxicillin-clavulanate
- Resistance to other antibiotic classes is higher among penicillin-resistant strains.

- Advanced Macrolide e.g azithro or clarithromycin.
- amoxicillin-clavulanate.
- Respiratory quinolone (mo x i-, levo-, gemi floxacin.

- **Symptomatic treatment:**

- Analgesic
- Oxygen therapy.
- Ventilatory support.

- **Treatment of complications**

Prevention

- Smoking cessation
- Vaccination recommendations
  - Influenza
  - Pneumococcal

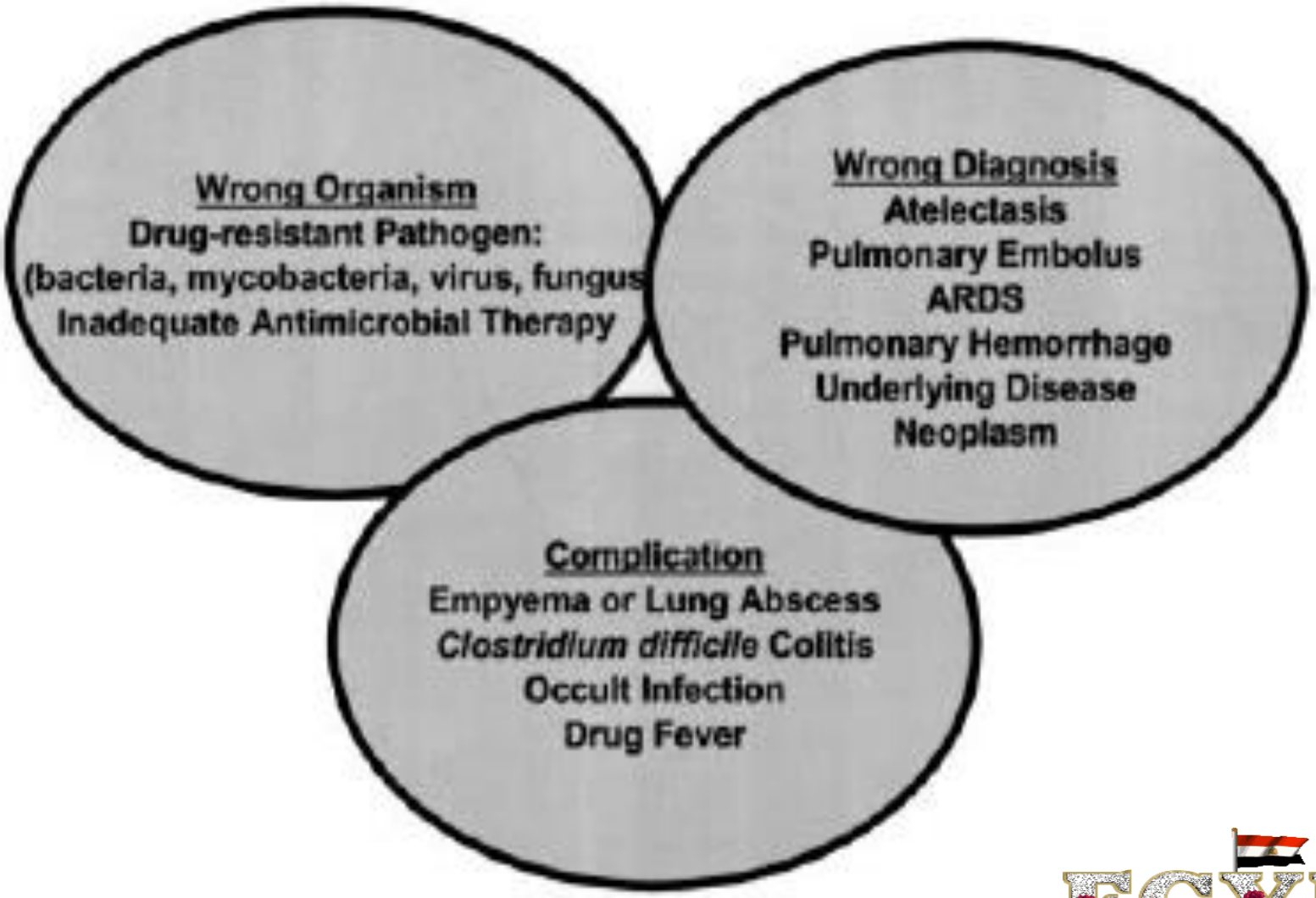
Indications

1. All patients with chronic illness
2. Immunocompetent ≥ 65 y, and immunocompromised ≤ 64 y.
3. All patients in long term care facilities
4. Revaccinate after 5-7 years

Delayed or unresolved

- Inadequate TTT
- Post obstructive pneumonia
- Underlying lung pathology
- Immuno-comprimised patient

Assessment of Nonresponders

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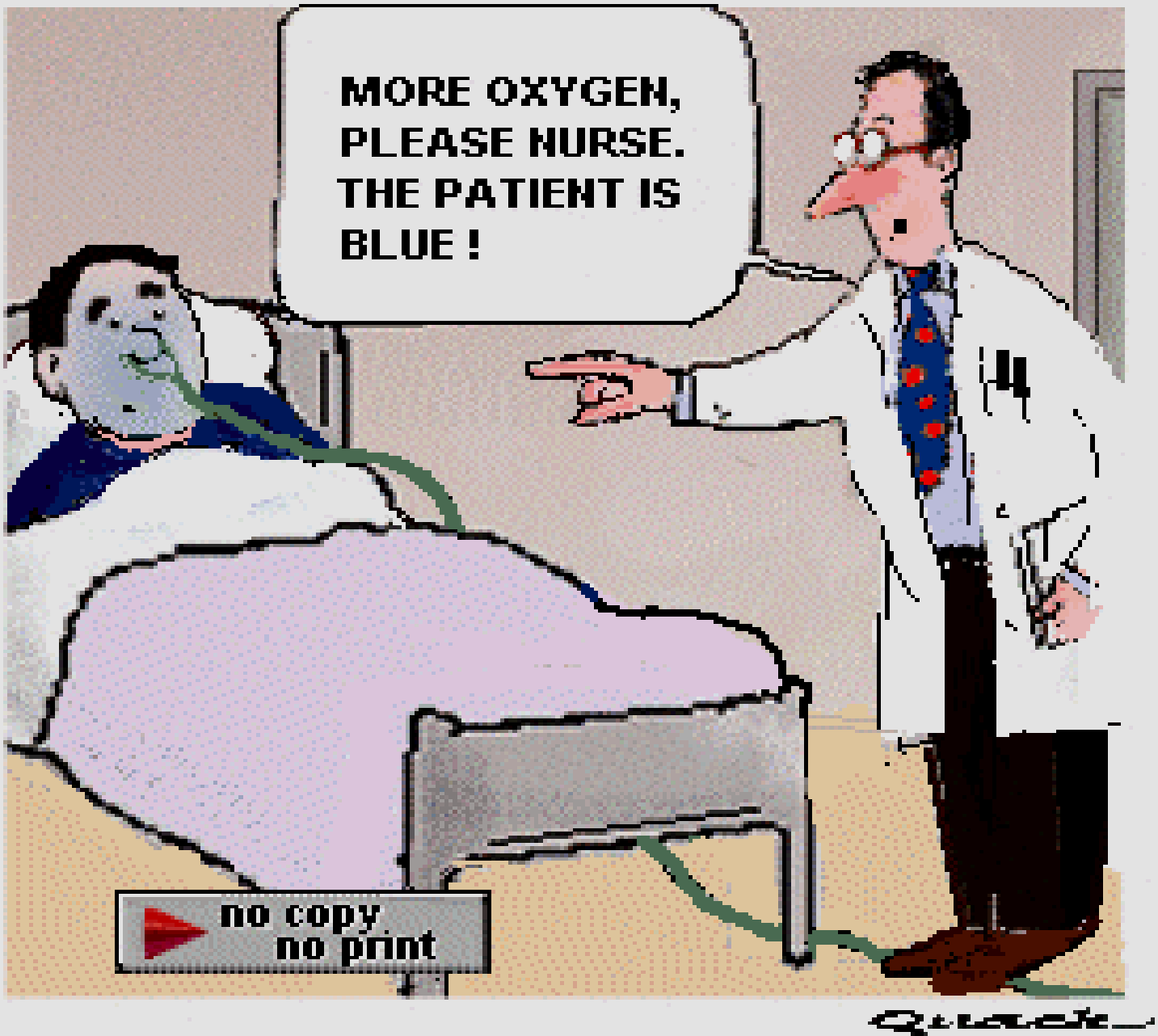
MORE OXYGEN, PLEASE NURSE. THE PATIENT IS BLUE !
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Viral Pneumonia

- More common cause in children
  - RSV, influenza, parainfluenza
- Influenza most important viral cause in adults, especially during winter months (H1N1, H5N1)
- Post-influenza pneumonia (secondary bacterial infection) S. pneumo, Staph aureus

- Clinical picture:
- D.D bacterial pneumonia.
- Flu like symptoms, skin rash, dry cough, dyspnea
- X ray: diffuse infiltrates.
- Investigations: serology and viral culture???
- TTT: symptomatic, Antiviral; Oseltamivir, amantatine, remantadine, acyclovir.

Atypical bacterial pneumoia

- Aetiology
- Mycoplasma P., Legionella , Chlamydia.
- Small free living lacking cell wall.

Clinical Picture

- Youger populations (5-15 ys):

Mild, upper respiratory symptoms; coryza and tracheobronchitis.

- Older populations:

1. More serious. Common cause of CAP.
2. 2-3 weeks IP.
3. Gradual onset of symptoms over 2-4 days

- Extrapulmonary symptoms
  - *Legionella*-CNS, heart, liver, GI and GU
  - *M.pneumoniae*- upper RT, GI, skin

investigations

- X ray:
- patchy, widespread or confluent shadows.
- Blood picture:
- N. leucocytic count or mild increase.
- IgM cold heamagglutinins against I on RBCs with titre ≥ 1/ 32 or rising.
- Culture & serology.


SITTING

Treatement

- Macrolide antibiotics; Ertythromycin, clarithromycin.
- Doxycycline and tetracycline.

Comlication

- Autoimmune heamolysis.
- Extrapulmonary complication; meningitis , transverse myelitis, pericarditis and fulminant renal failure 2ry to intravascular heamolysis.

CAP – The Two Types of Presentations

Classical

- Sudden onset of CAP
- High fever, shaking chills
- Pleuritic chest pain, SOB
- Productive cough
- Rusty sputum, blood tinge
- Poor general condition
- High mortality up to 20% in patients with bacteremia
- S.pneumoniae causative

Atypical

- Gradual & insidious onset
- Low grade fever
- Dry cough, No blood tinge
- Good GC – Walking CAP
- Low mortality 1-2%; except in cases of Legionellosis
- Mycoplasma, Chlamydiae, Legionella, Ricketessiae, Viruses are causative

Staphylococcal pneumonia

- AE: Staphylococcus aureus; coagolase and other toxins producing.
- Less common but more serious cause of CAP.
- Important cause of nosocomial pneumonia.
- Aspiration .
- heamatogenous spread(usually in setting of endocarditis or infected IV line .

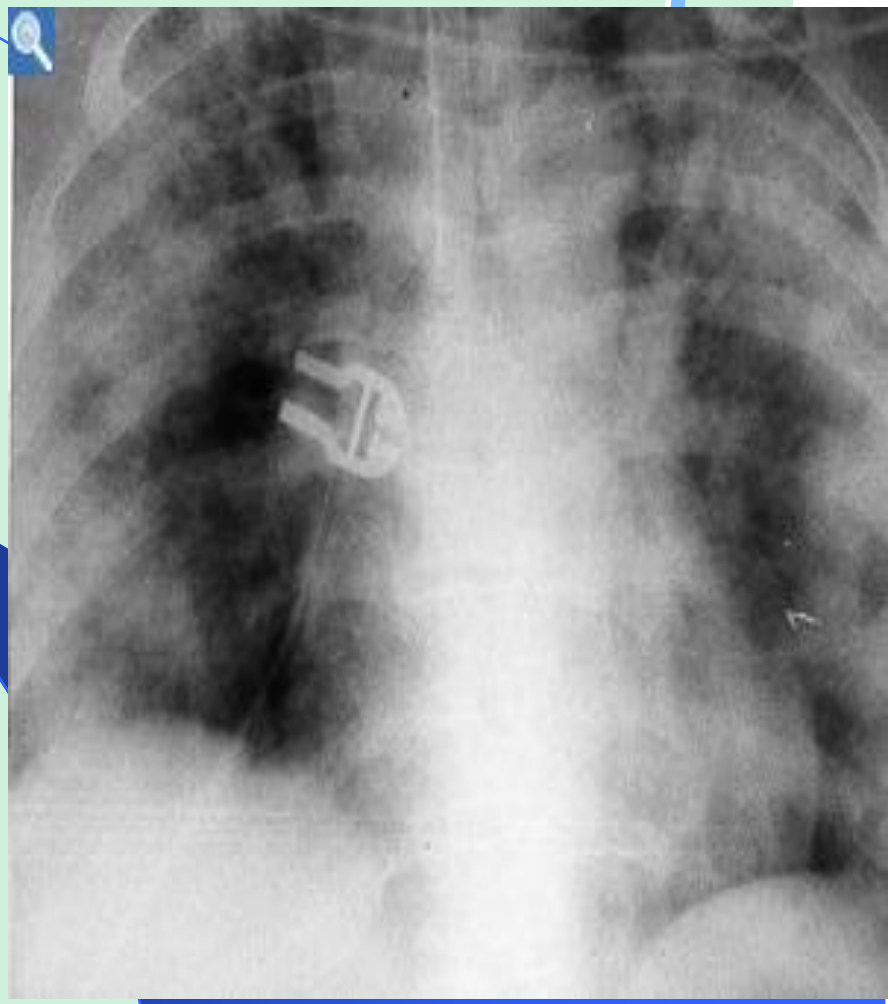
Lobar pneumonia	Bronchopneumonia
S.pneumoniae	S. aureus
1ry involves alveoli	1ry involve bronchi
No volume loss	Volume loss
Air bronchogram	No air bronchogram
Spread through pores of Kohn	Bronchial spread
Non segmental, lobar	Segmental , patchy

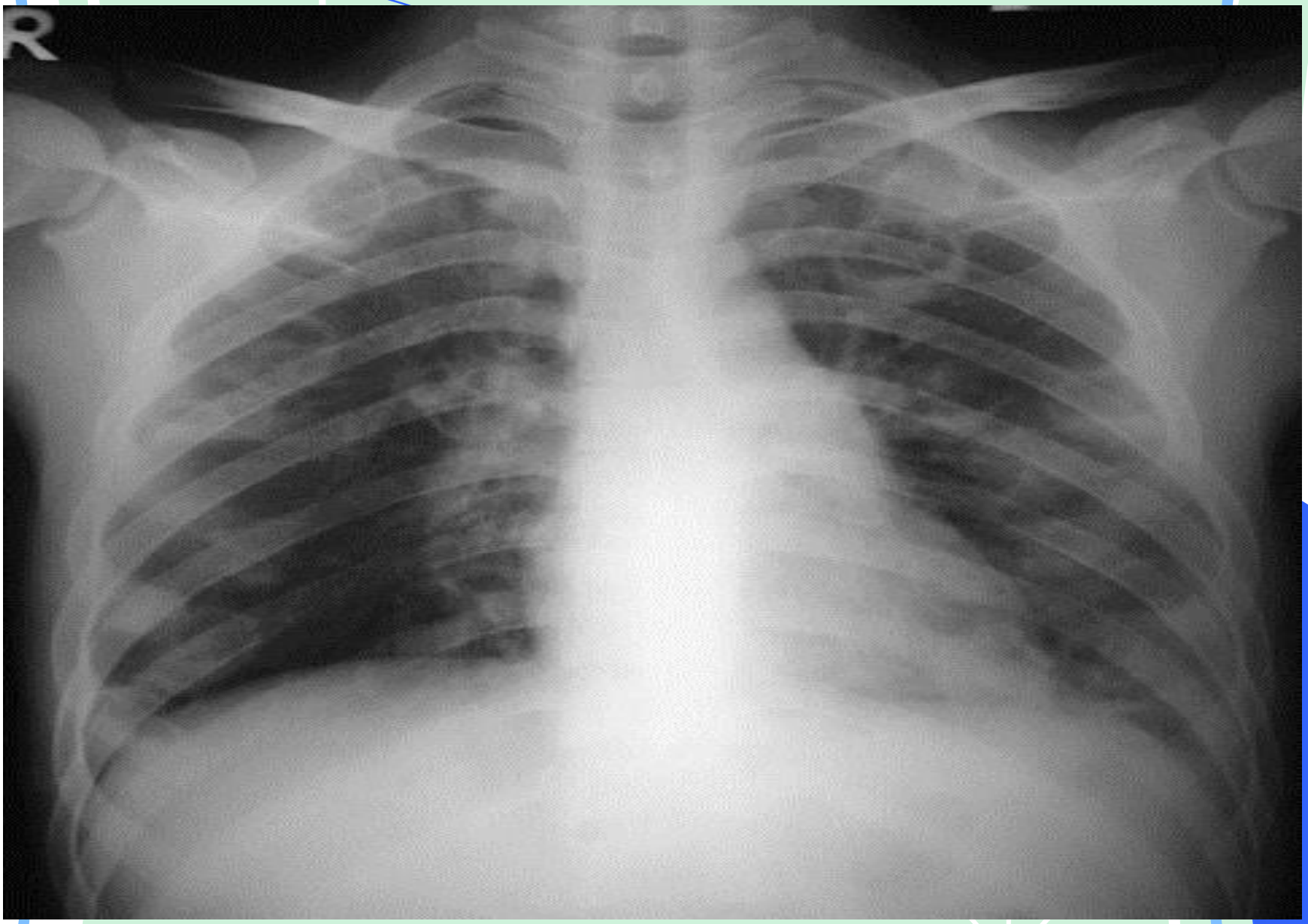
Clinical presentation

- Fever, dyspnea, cough and purulent sputum.
- Symptoms & signs of underlying endocarditis or infected IV line .

Investigations

- X-ray: segmental or central consolidation, Pl effusion, empyema, cavities and abcesses.

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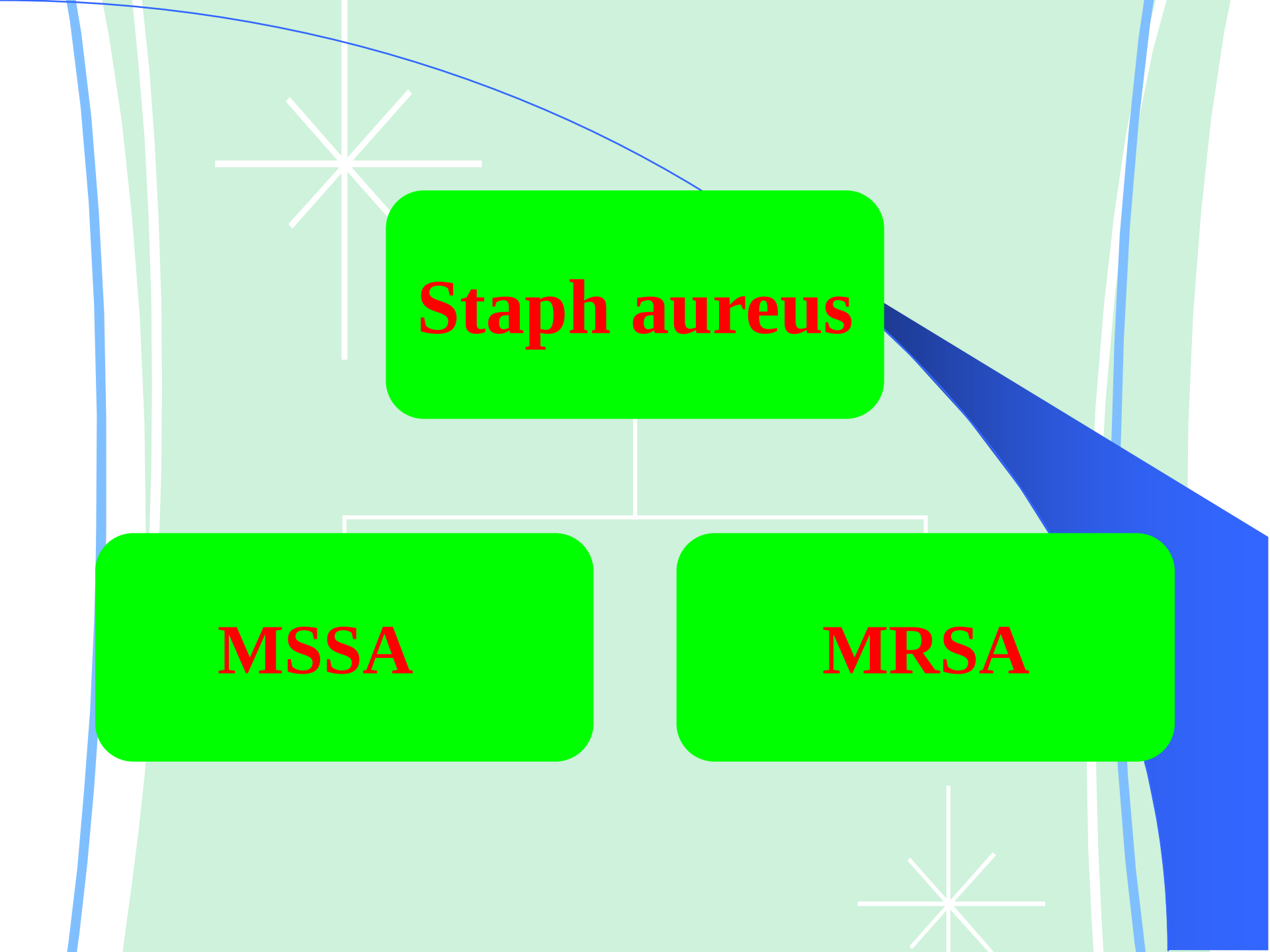
Staph aureus
MSSA
MRSA

Treatment of MSSA

- Methicillin.
- Amoxycillin clavulinate, Ampicillin sulbactam.
- 1st generation cephalosporins.
- 2nd generation cephalosporins (Cefuroxime).

Glycopeptides

Glycopeptides (vancomycin, teicoplanin) is used for MRSA.

Oxazolidinone

Linezolid (Zyvox) is the first antibacterial drug in a new class of synthetic antibiotics called oxazolidinones.

Gram –ve Pneumonia

- Klebsiella p., Pseudomonas aerogenosa, E coli.
- Important cause of nosocomial P
- Aspiration or heamatogenous spread from GIT or Genitourinary.

Diagnosis

- Clinical Picture
- Productive cough, Pleuritic chest pain.
- Fever, rigors, Prostration and hypotension.
- Blood tinged sputum, Current jelly sputum in case of Klebsiella P.
- X- ray:
- Consolidation, Pl effusion.
- Bowed fissure sign.

Treatment

- Hospitalzation.
- Antibiotic according to culture sensitivity
- Combination of antipseudomonal drugs e.g. antipseudomonal penicillin , aminoglycoside, ceftazidime and cefepime, quinolones.

Antipseudomonal cephalosporins:

- Cefepime1–2 g every 12 h
- Ceftazidime2 g every 8 h
- **Or Carbepenems:**
- Meropenem 1g every 8 h
- **Or ß-Lactam/ß-lactamase inhibitor**:
- Piperacillin–tazobactam4.5 g every 6h.
- Plus

Aminoglycosides

Amikacin20 mg/kg per d

Or

Antipseudomonal quinolones

Levofloxacin750 mg every d

Ciprofloxacin400 mg every 8 h

Plus

Glycopeptides:

Vancomycin15 mg/kg every 12 h.

Teicoplanin 400mg/ d.

Or

Oxazolidinone:

Linezolid600 mg every 12 h.

CAP – Special Features – Pathogen wise

Typical – S.pneumoniae, H.influenza, M.catarrhalis – Lungs

Blood tinged sputum - Pneumococcal, Klebsiella, Legionella

H.influenzae CAP has associated of pleural effusion

S.Pneumoniae – commonest – penicillin resistance problem

S.aureus, K.pneumoniae, P.aeruginosa – not in typical host

S.aureus causes CAP in post-viral influenza; Serious CAP

K.pneumoniae primarily in patients of chronic alcoholism

P.Aeruginosa causes CAP in pts with CSLD or CF, Nosocom

Aspiration CAP only is caused by multiple pathogens

Extra pulmonary manifestations only in Atypical CAP


Thank You