Pneumonia

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رسالة RESALA هيئة الإغاثة

نشاط الاستشارات الطبية

استشارات طبية

Definition of Pneumonia

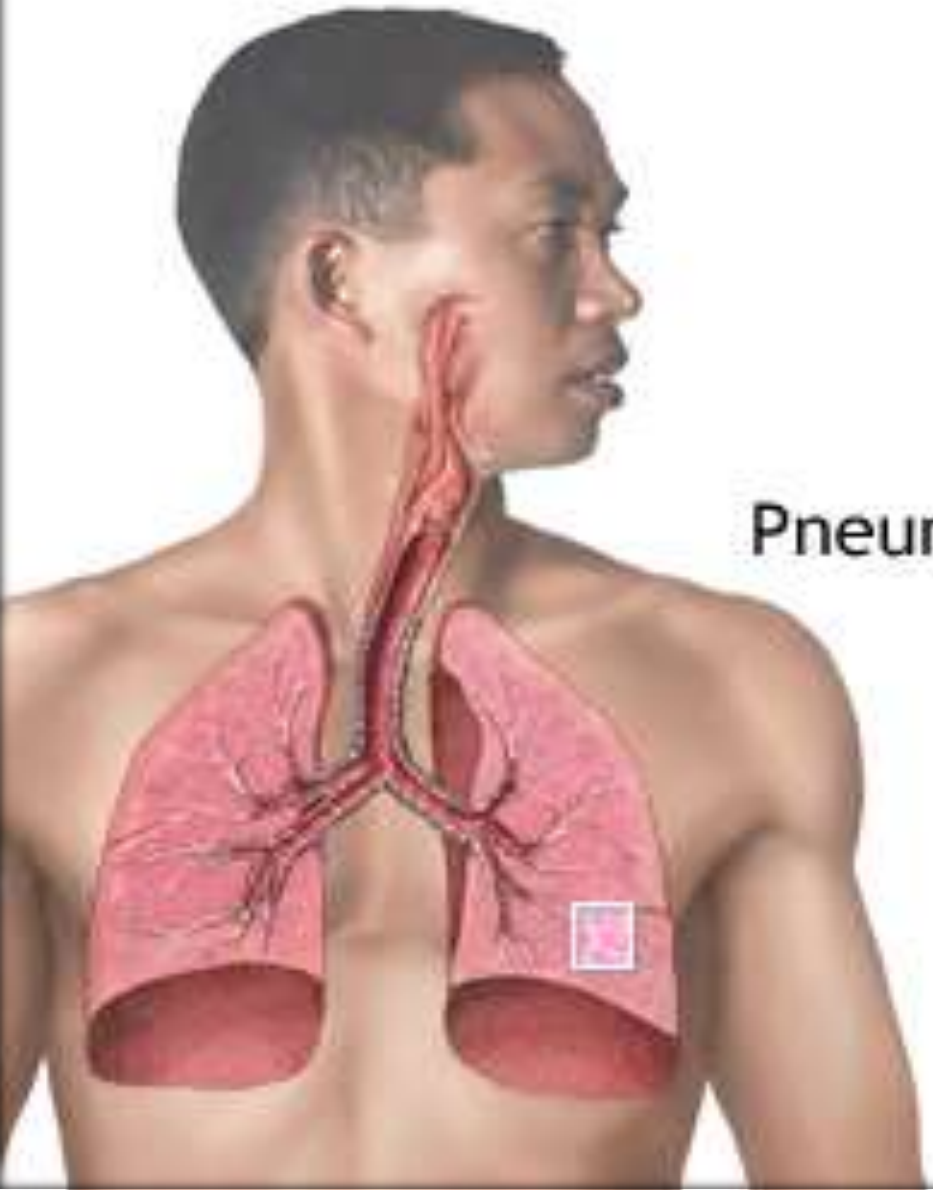
Definition:

It is a syndrome of acute infection of the lung parenchyma, characterized by clinical and / or radiological picture of consolidation.

Commonly due to bacterial infection when the cause is non infectious, it is termed pneumonitis.

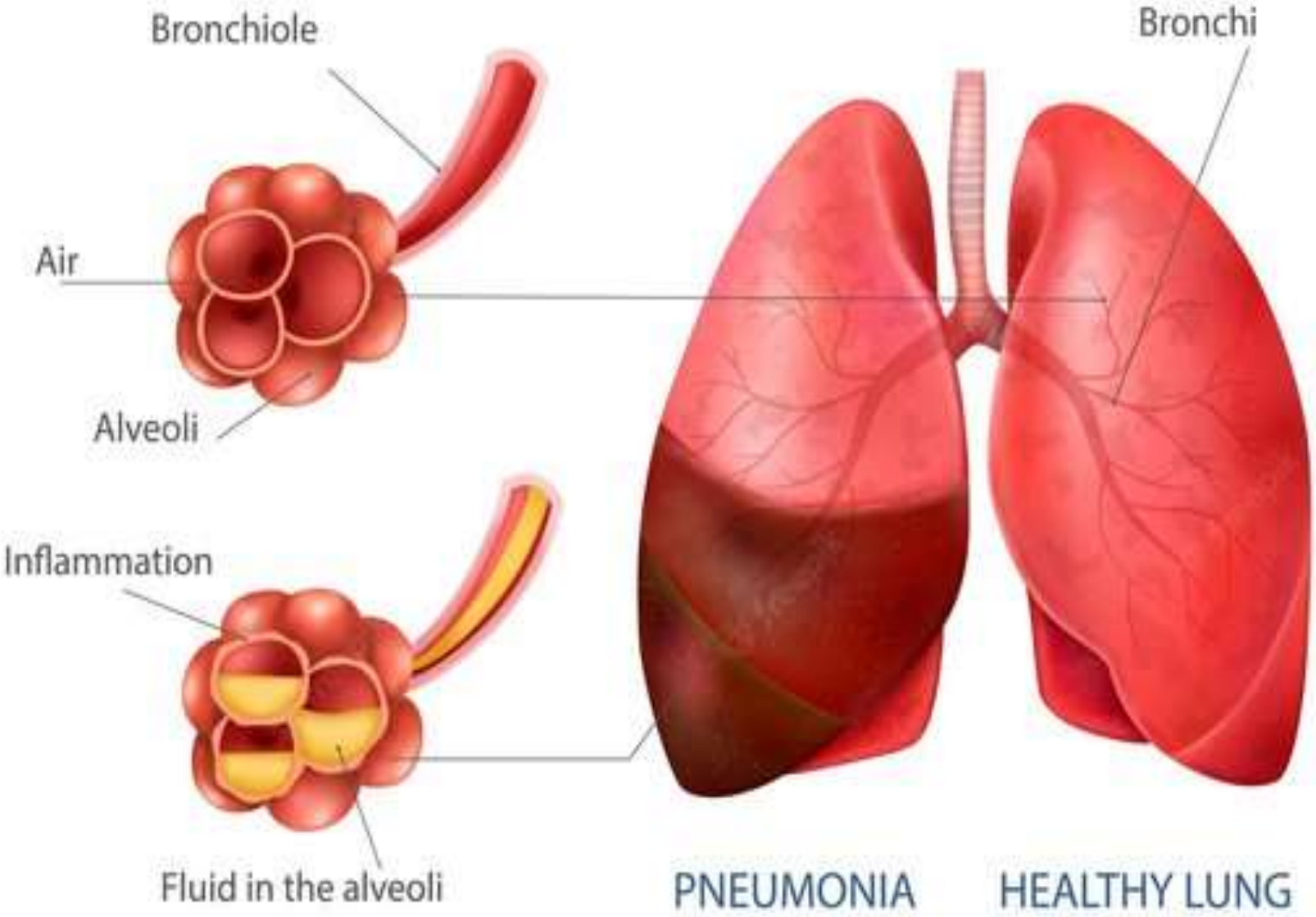
Normal alveoli

Pneumonia



A.D.A.M.

PNEUMONIA


Bronchiole
Air
Alveoli
Inflammation
Fluid in the alveoli
Bronchi
PNEUMONIA
HEALTHY LUNG

Classification of Pneumonia

1- Anatomical Classification:

- Lobar pneumonia.
- Segmental or subsegmental pneumonia.
- Bronchopneumonia.

2 – Aetiological Classification:

According to responsible micro organisms.

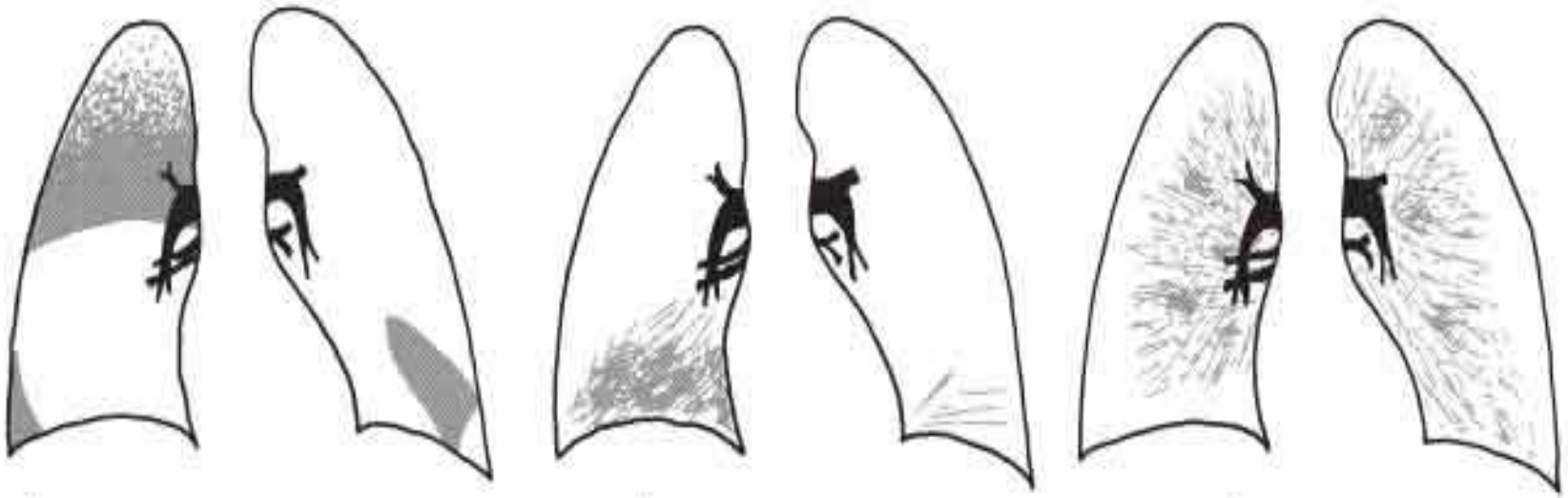
3 – Environmental Classification:

Community or hospital acquired pneumonia

Classification of Pneumonia

1- Anatomical Classification:

- **Lobar pneumonia:** One or more lobes are uniformly affected by inflammation and consolidation.
- **Segmental or subsegmental pneumonia:** There is only part of the lobe is affected.
- **Bronchopneumonia:** There is a patchy involvement of lung parenchyma, particularly in lower zones.



Lobar pneumonia:
Lobar and/or segmental consolidation with air bronchogram and accompanying pleural effusion

Bronchopneumonia:
coalescing areas of consolidation in a predominantly basal distribution

Interstitial pneumonia:
reticular pattern in a predominantly central distribution

Classification of Pneumonia

2 – Aetiological Classification:

- **Bacterial**
  - Specific :TB
  - Non-specific
    - Gram +ve organism
    - Gram-ve organism
    - Atypical e.g. Mycoplasma and Legionella species
- **Viral:** e.g. H1N1
- **Fungal:** e.g. Histoplasmosis and Aspergillosis
- **Parasitic:** e.g. Malaria
- **Other causes of pneumonia :**
  - Allergic pneumonitis: e.g., Lupus pneumonitis.
  - Chemical pneumonitis e.g: Lipoid pneumonia.
  - Radiation: e.g. Radiation Pneumonitis

Classification of Pneumonia

3- Community or hospital acquired pneumonia:

Community acquired pneumonia:

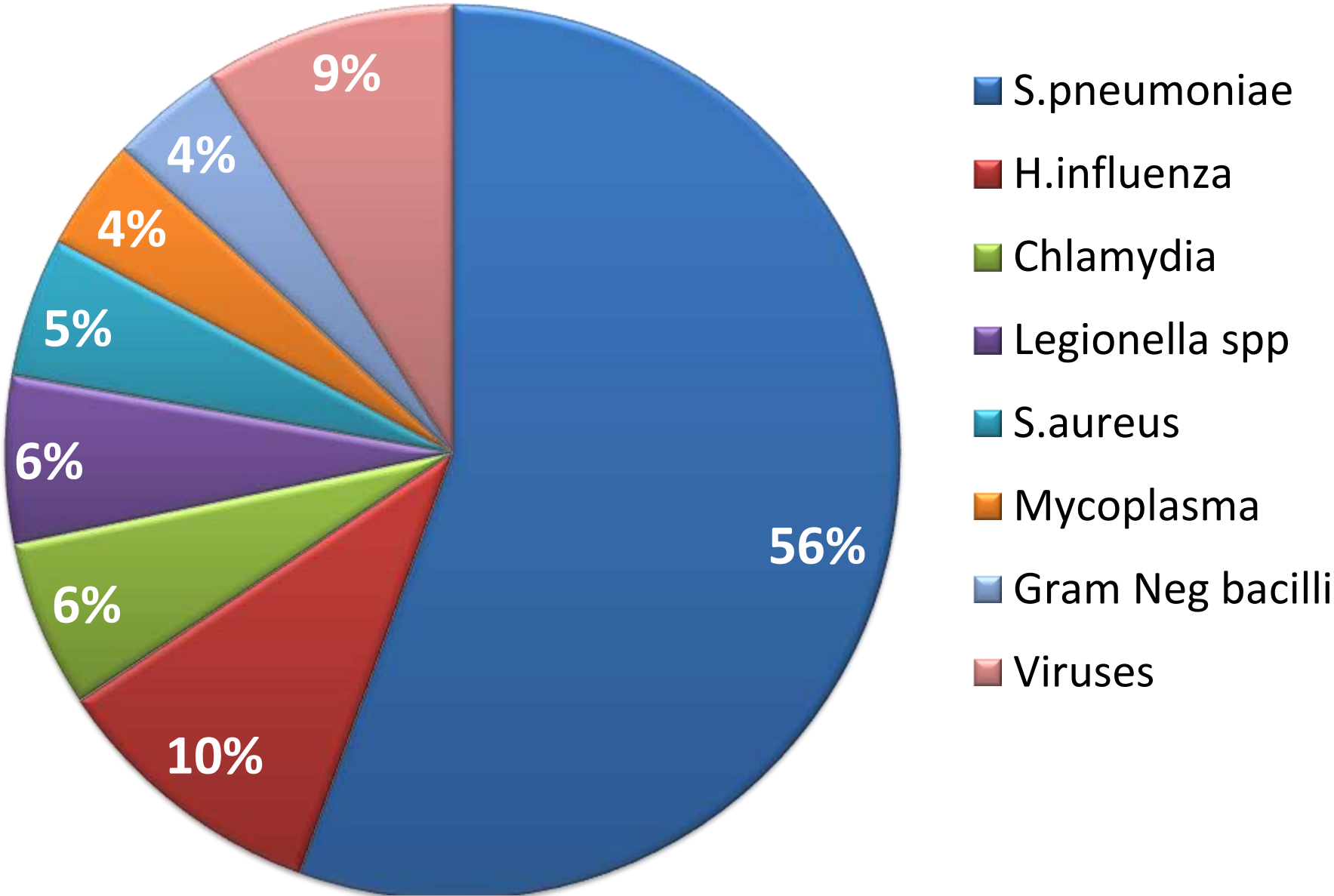
- Pneumonia which is acquired in the community or at hospitalization within the first 2 days.
- The most common organisms are Streptococcal pneumonia, Atypical, Staph. Aureus, Hemophilus influenza, and Branhamella catarrhalis.

Hospital acquired pneumonia: or Nosocomial pneumonia:

- It is a pneumonia which is acquired in the hospital after 2 days of hospitalization.
- The commonest organisms are G–ve bacilli e.g: pseudomonas aeruginosa, Klebsiella and proteus.

Pneumonias – Classification…..

CAP – The Pathogens Involved



Community Acquired Pneumonia (CAP)

Epidemiology

- 6th leading cause of death
- 5 million cases annually
- 20% require admission
- 14% Average mortality rate
- Mortality disproportionately high in old age

Community Acquired Pneumonia (CAP)

Predisposing factors:

1. Impaired cough reflex e.g. Anesthesia, Alcoholism, Tracheostomy.
2. Impairment of mucociliary activity.
3. Decrease of effective phagocytic activity of alveolar macrophages and neutrophils.

Community Acquired Pneumonia (CAP)

Mode of infection and causative organisms:

A- Aspiration:

Predisposed by impaired cough: Anesthesia, Alcoholism, Tracheostomy.

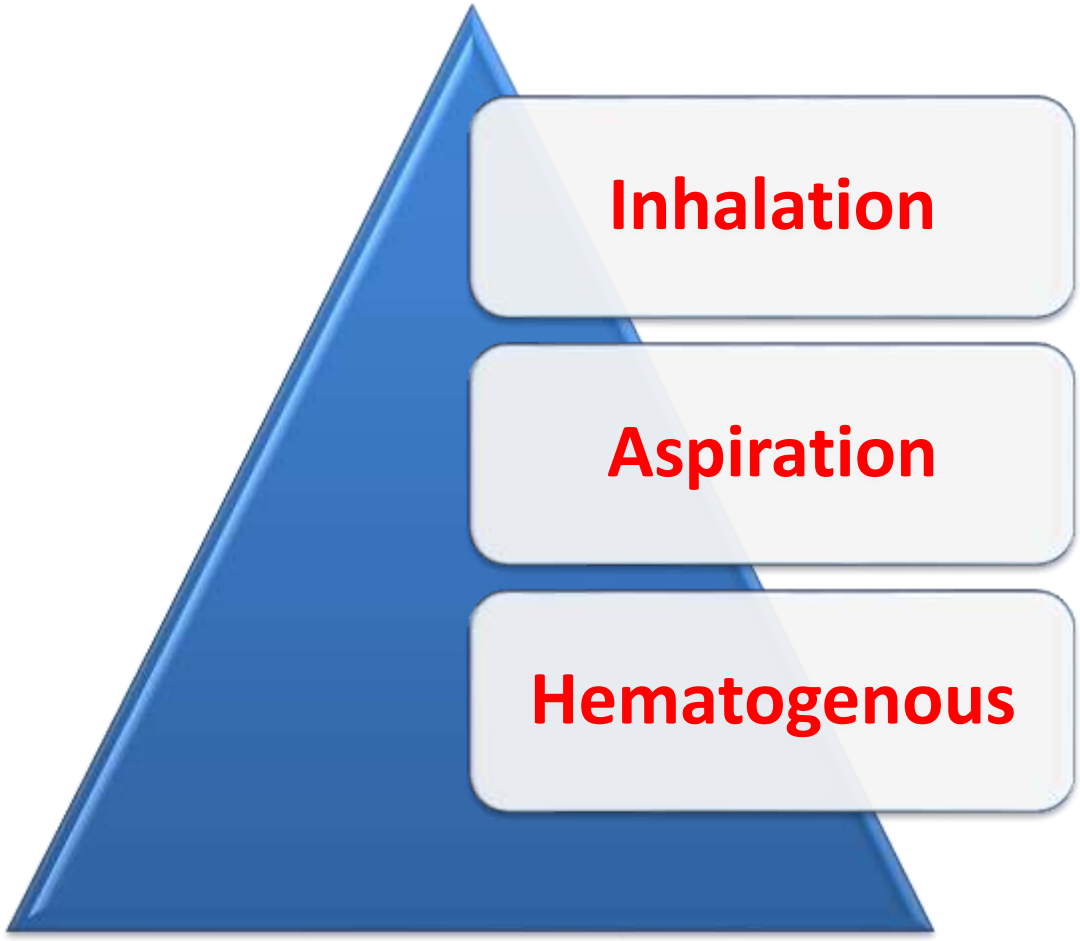
B- Inhalation:

Patient to patient by direct contact through droplet infection 0r Airborne infection.

C- Colonization: In chronically ill patients e.g. COPD, Bronchiectasis.

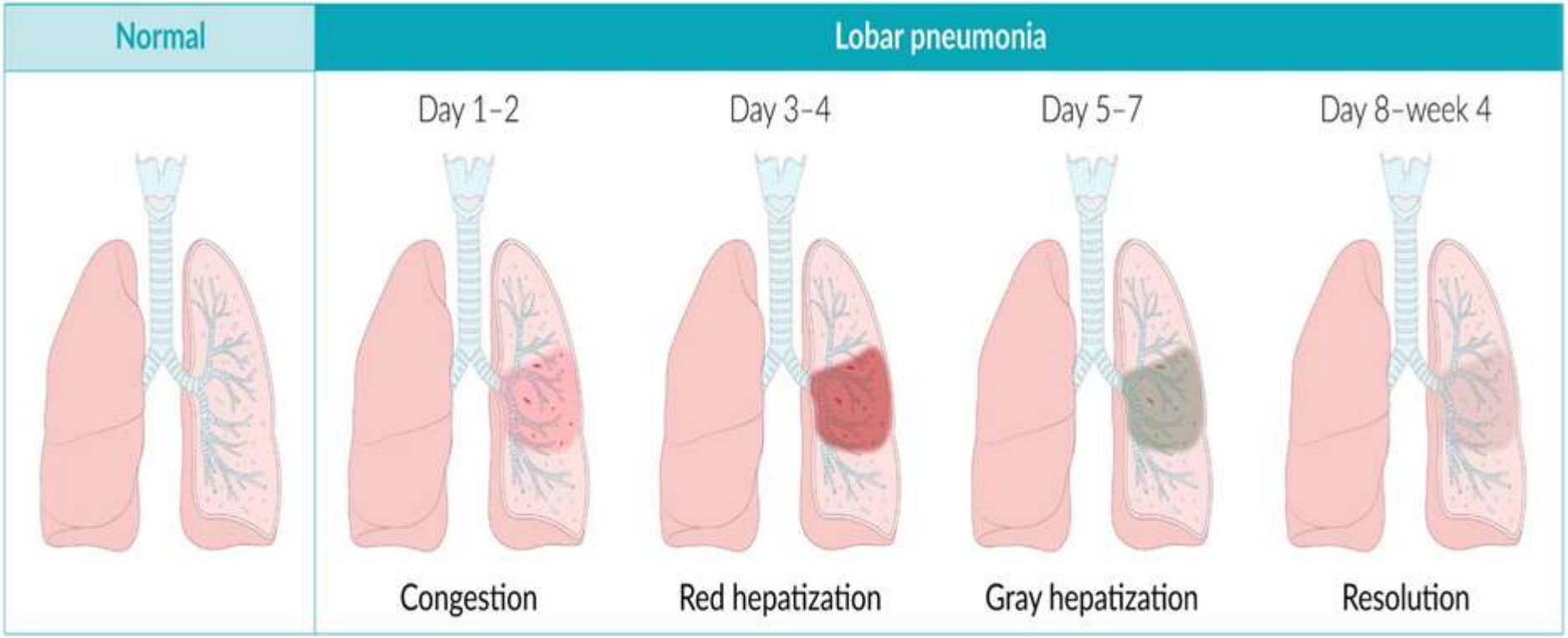
D- Blood spread: IV. Cannula, CV lines, and IV drug abusers .

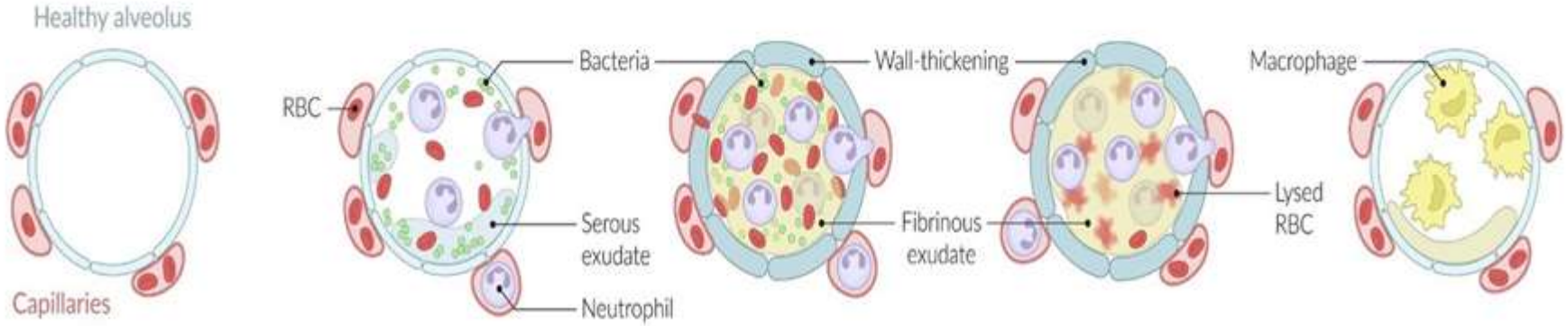
CAP – Mode of Infection



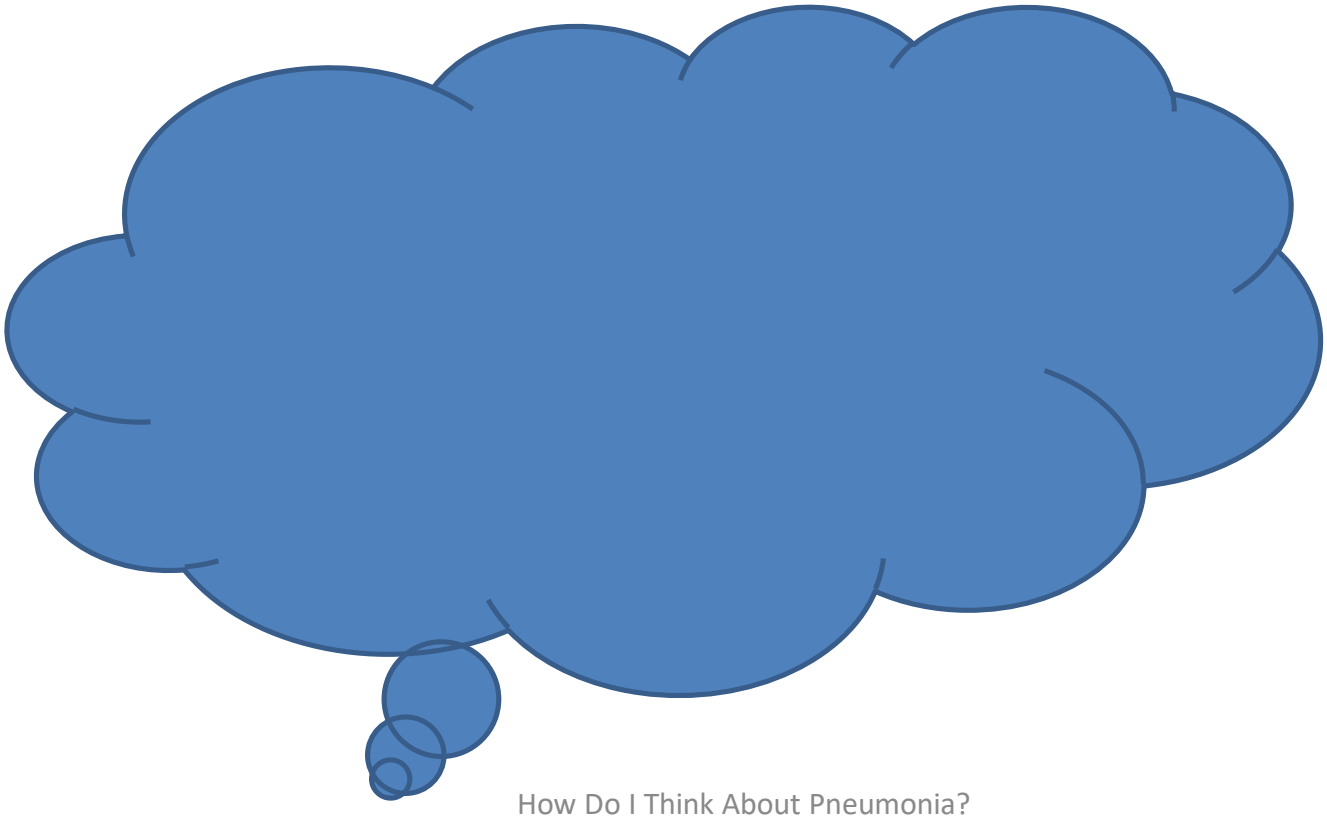
Pathology of Pneumonia

- The commonest feature of pathology is the presence of cellular exudate in the alveolar spaces.
- In pneumococcal and viral pneumoniae, resolution occurs through the action of macrophages and lung tissue may return to former state.


Normal
Lobar pneumonia
Day 1–2
Day 3–4
Day 5–7
Day 8–week 4
Congestion
Red hepatization
Gray hepatization
Resolution


Healthy alveolus
Capillaries
RBC
Bacteria
Serous exudate
Neutrophil
Wall-thickening
Fibrinous exudate
Lysed RBC
Macrophage

Diagnosis of pneumonia



History and examination

- Symptoms:
  - **Systemic:** Fever, malaise, anorexia, body pain, sweating
  - **Chest:** Cough, purulent expectoration, sometimes blood tinged, Dyspnea and Pleuritic chest pain.

- Examination
  - **General:**
    - Fever
    - Tachypnea: Short and rapid breathing.
    - Tachycardia: Relative Bradycardia in viral pneumonia.
    - Cyanosis in severe pneumonia.

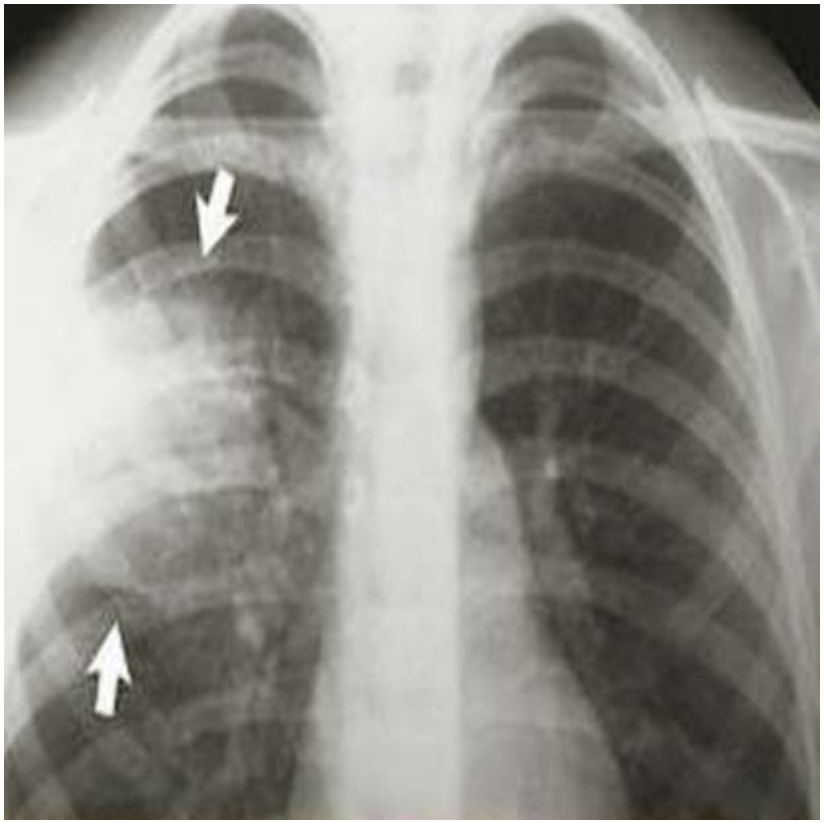
  - **Local chest symptoms:**
    - Increased TVF,
    - Impaired note or Dullness to percussion,
    - Bronchial breath sounds, or crackles

CAP – Two Types of Presentations

Classical	Atypical
• Sudden onset	• Insidious onset
• High fever, chills	• Low grade fever, Confusion
• Pleuritic chest pain, SOB	• A typical chest pain, SOB
• Productive cough, Rusty sputum, blood tinge	• Dry cough .
• Poor general condition	• Diarrhea, abdominal pain
• High mortality up to 20% in patients with bacteremia	• Low mortality 1-2%; except in cases of Legionellosis
• S.pneumoniae causative	• Mycoplasma, Chlamydia, Legionella, and Viruses

Streptococcus Pneumonia

- Most common cause of CAP (about 2/3 of cases of CAP)
- These are gram positive diplococci
- Typical presentation (e.g. fever, chills, Pleuritic chest pain, cough with rusty sputum)
- Lobar infiltrate on CXR



Atypical Pneumonia

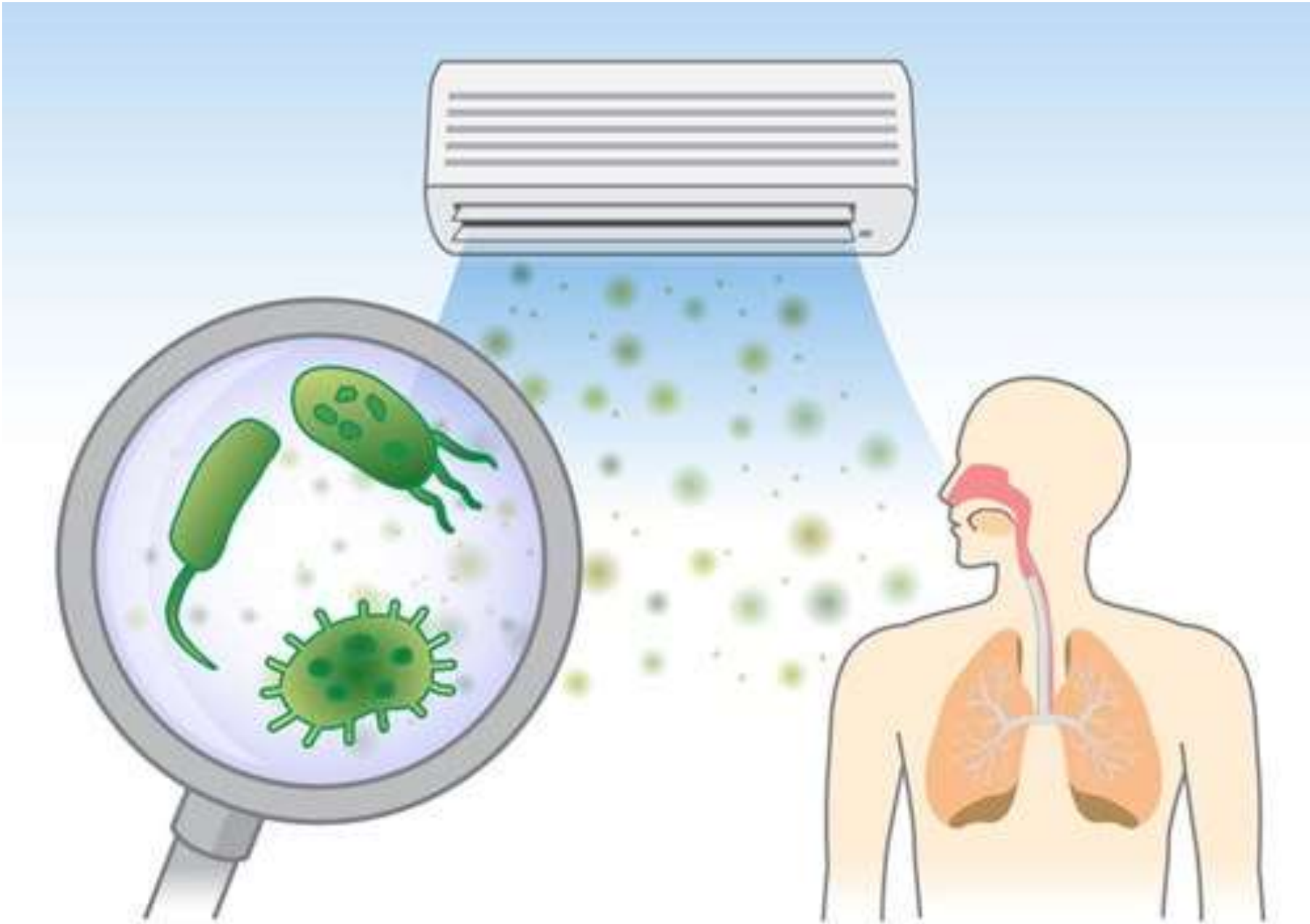
➢ Legionella pneumonia

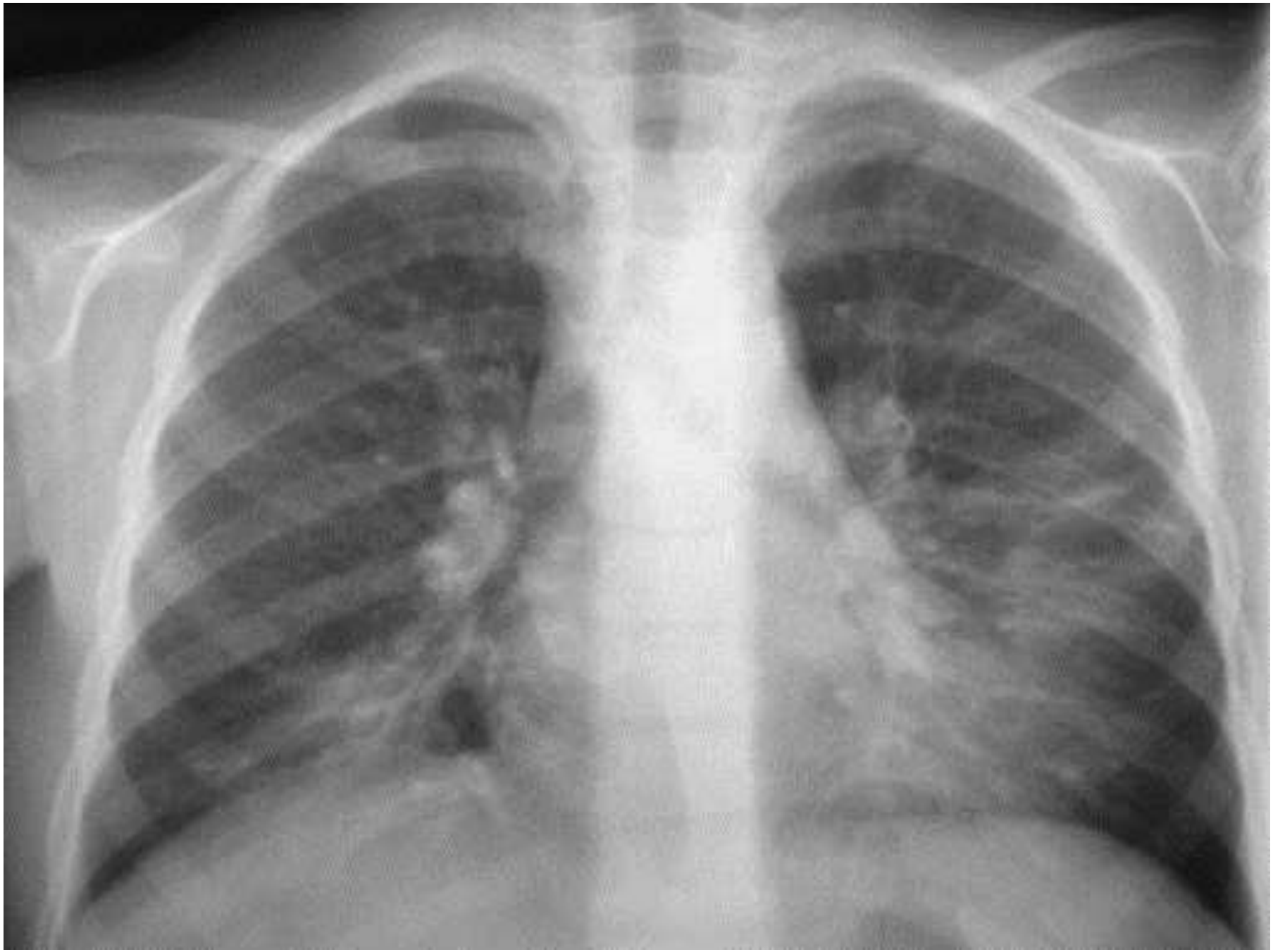
- ❑ Legionnaires' disease is **a lung infection** occur by inhaling the bacteria from contaminated water system like air conditioning or hot tubs.
- ❑ Older adults, smokers and people with weakened immune systems are particularly susceptible.
- ❑ May be presented with fever, headache, myalgia and diarrhea.

➢ Mycoplasma pneumoniae:

mostly presented with extrapulmonary manifestations such as

- ❑ Myringitis
- ❑ Encephalitis
- ❑ Myocarditis



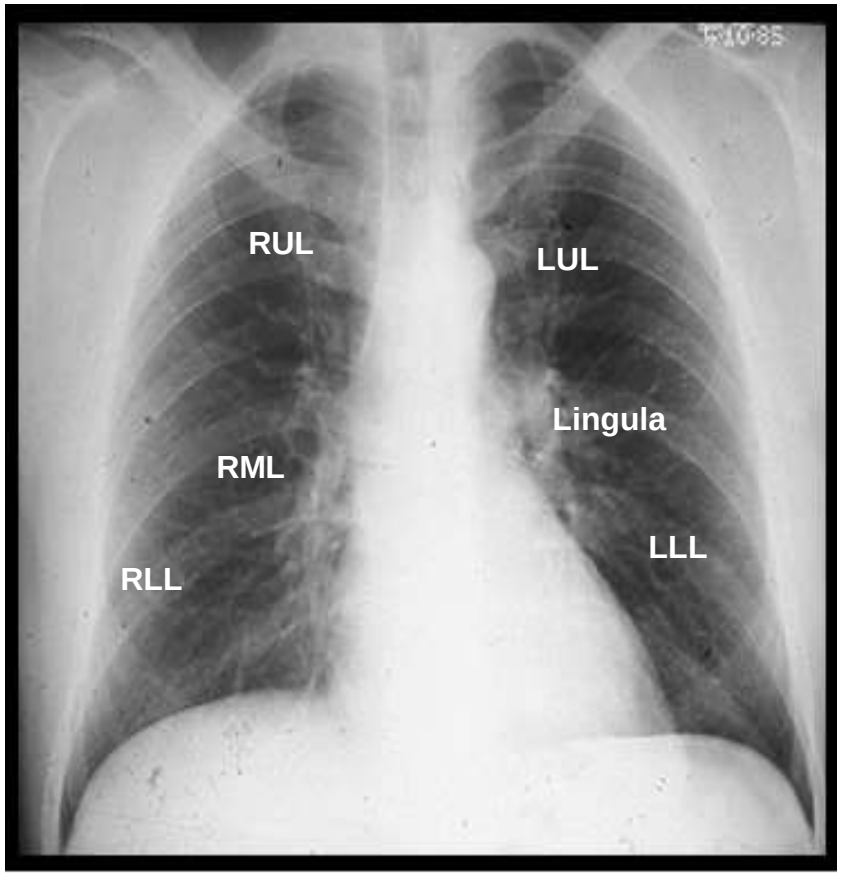


S. aureus CAP – Dangerous

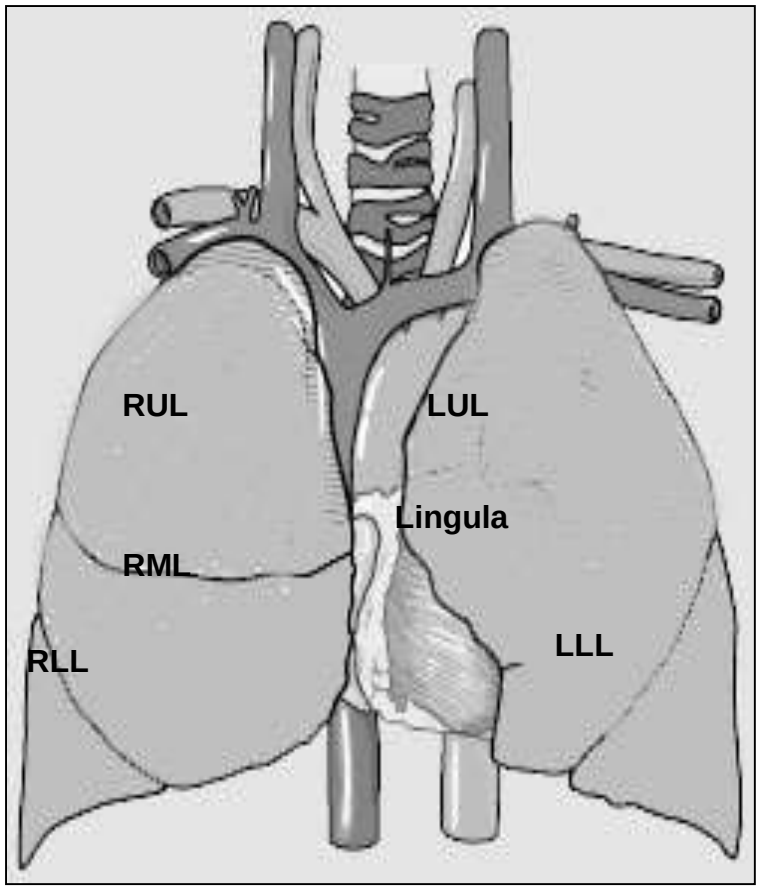
- Not common
- Post Influenza complication.
- Compromised host, Co-morbidities, Extreme of age
- May be MSSA or MRSA (community acquired MRSA)
- Multi lobar involvement, necrosis of lung with cavitations causing lung abscess or multiple pyemic abscesses and empyema
- Septic Arthritis
- Hypoxemia, and Hypotension are common

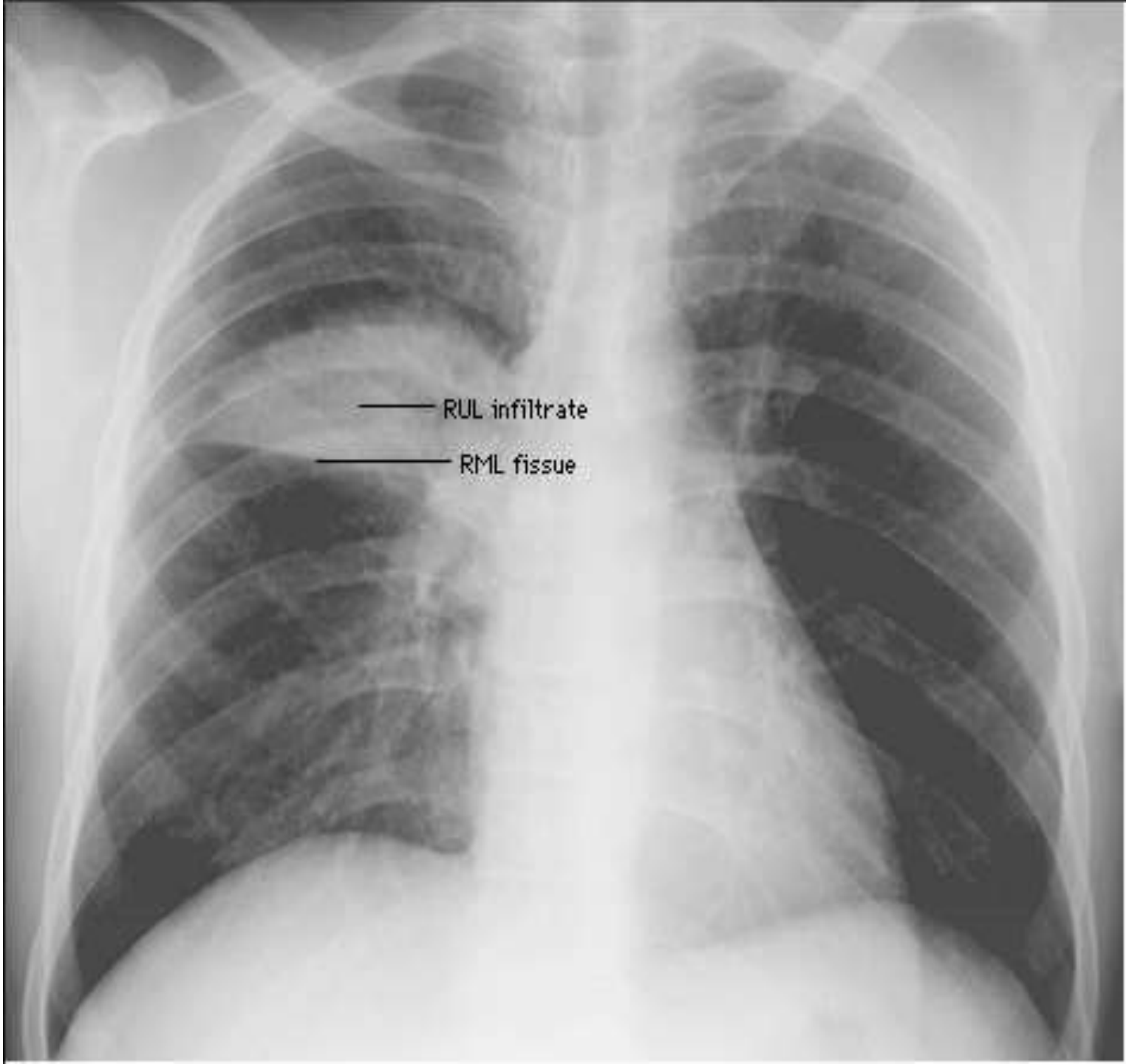
Chest X-ray

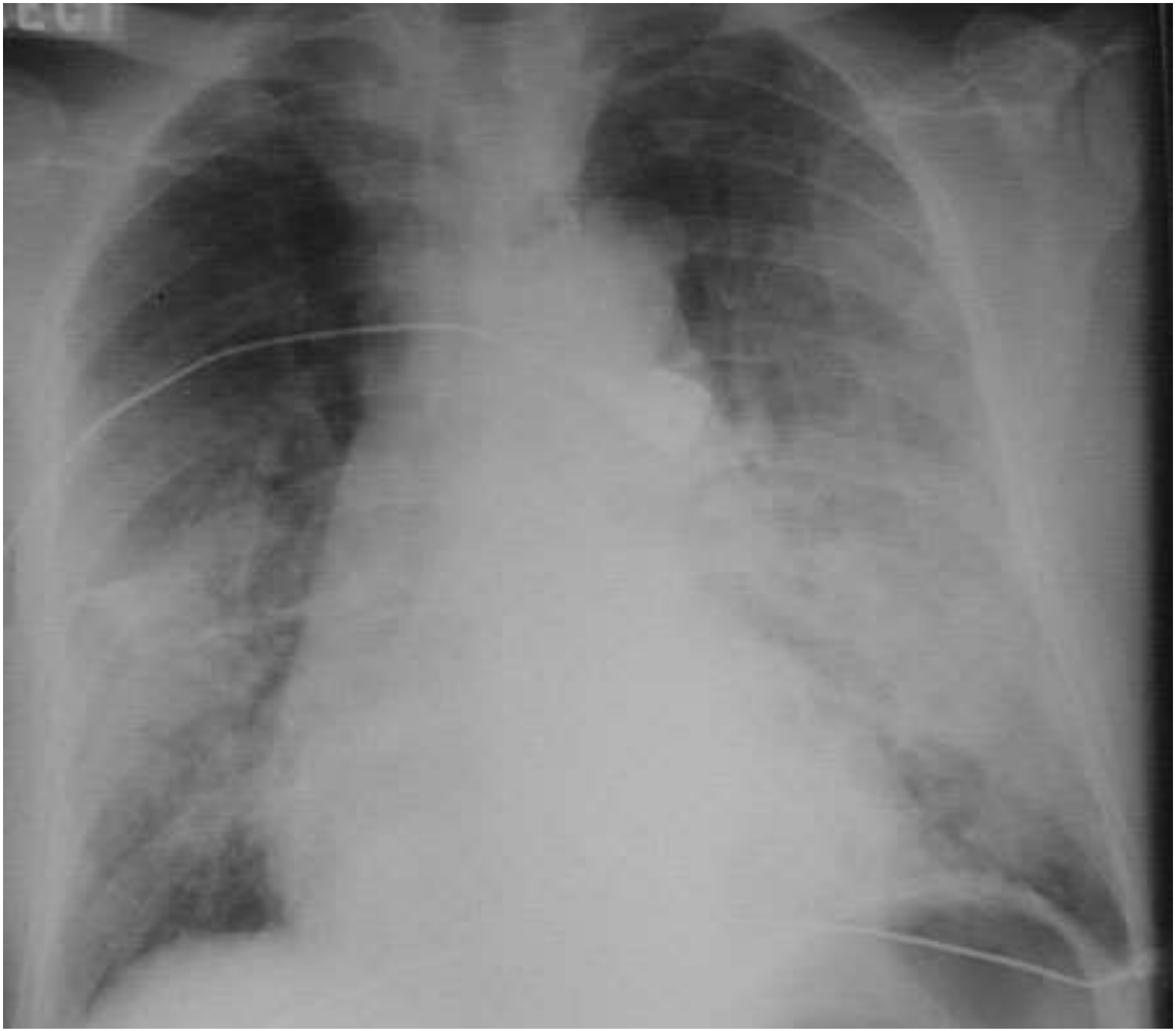
Diagnosis ,prognosis , pathogens…….



Normal chest film Posteroanterior view of a normal chest radiograph. Courtesy of Carol M Black, MD.




RUL infiltrate
RML fissue

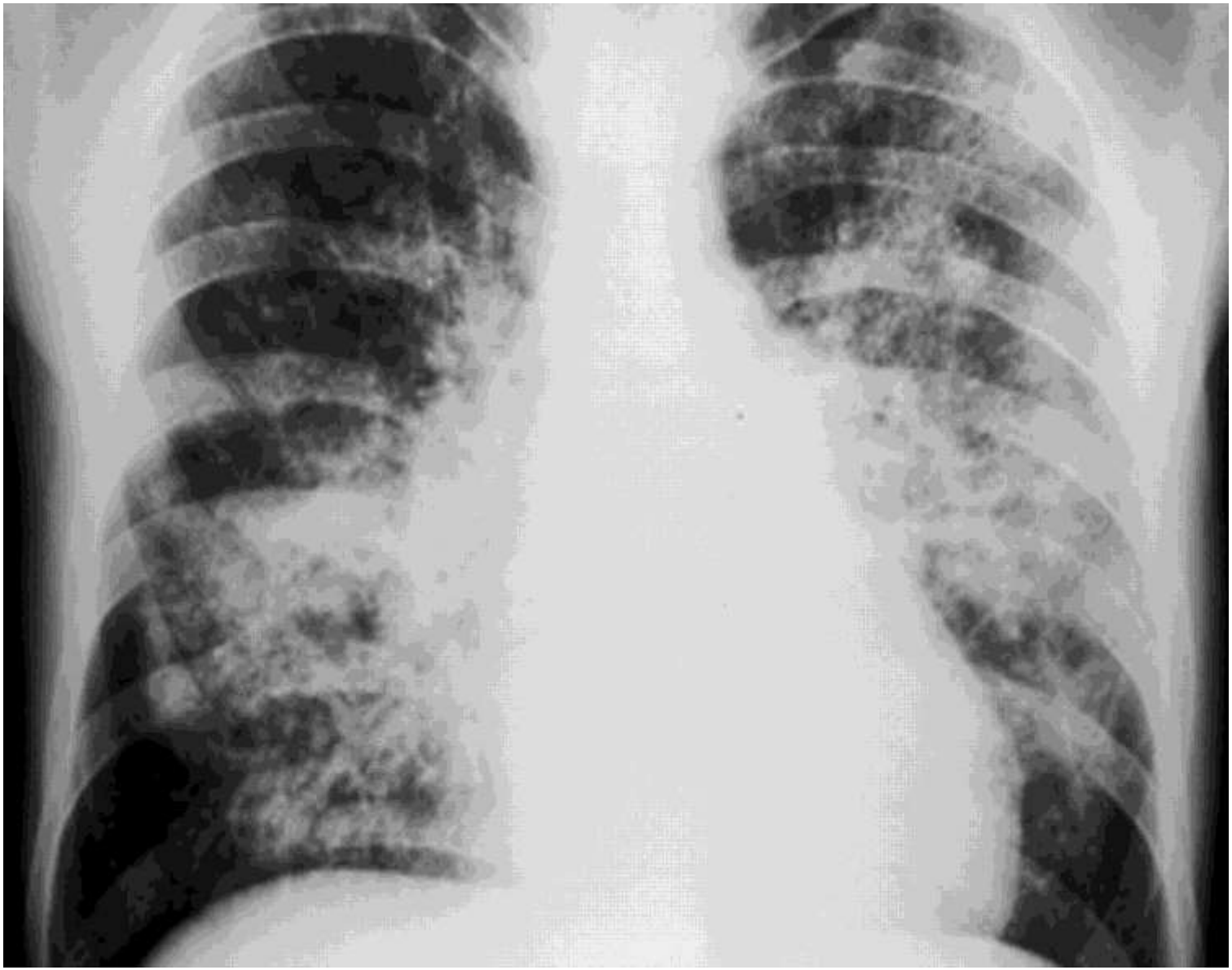


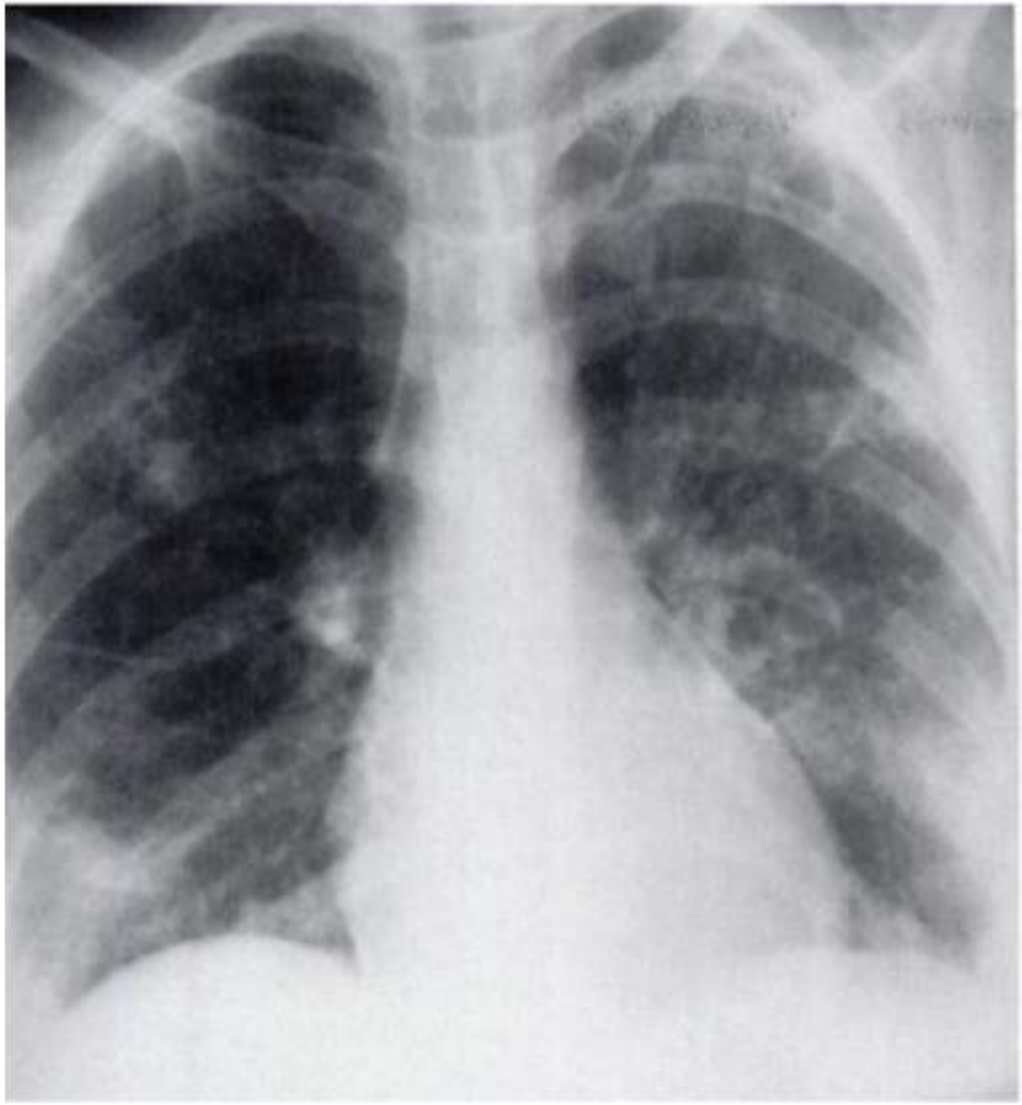
Right upper lobe consolidation. Dense opacification in the right upper zone containing air bronchograms.

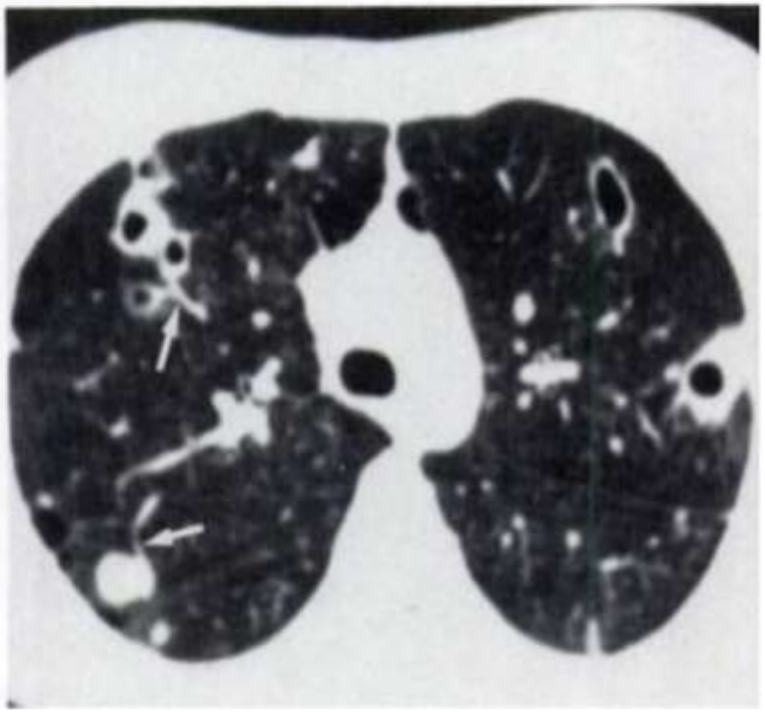
Right middle lobe consolidation – PA. Dense opacification in the right mid zone; this abuts the horizontal fissure and effaces the right heart border.

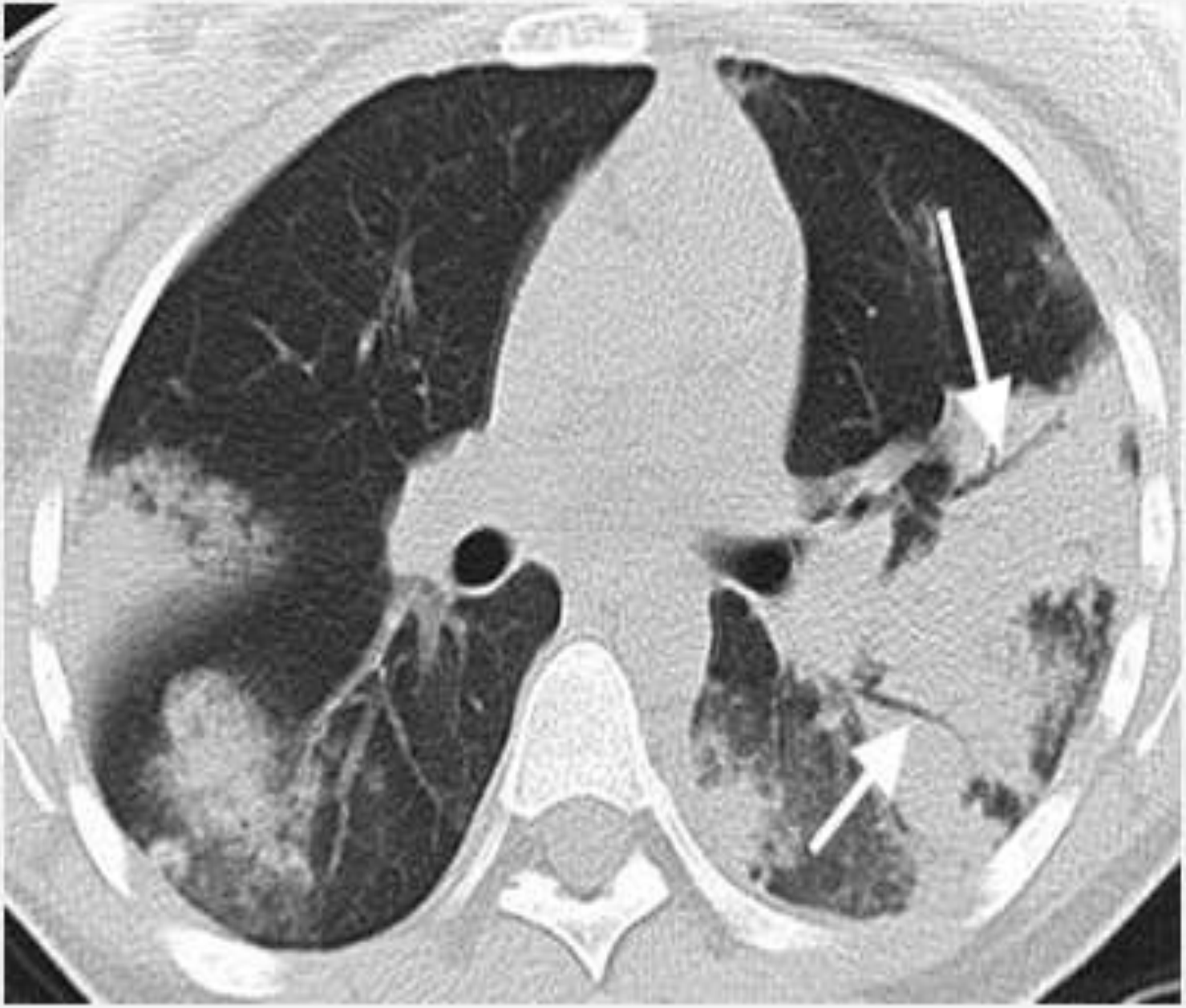
ight lower lobe consolidation – PA. Dense opacification in the ight lower zone with effacement of the outline of the right hemi-liaphragm.

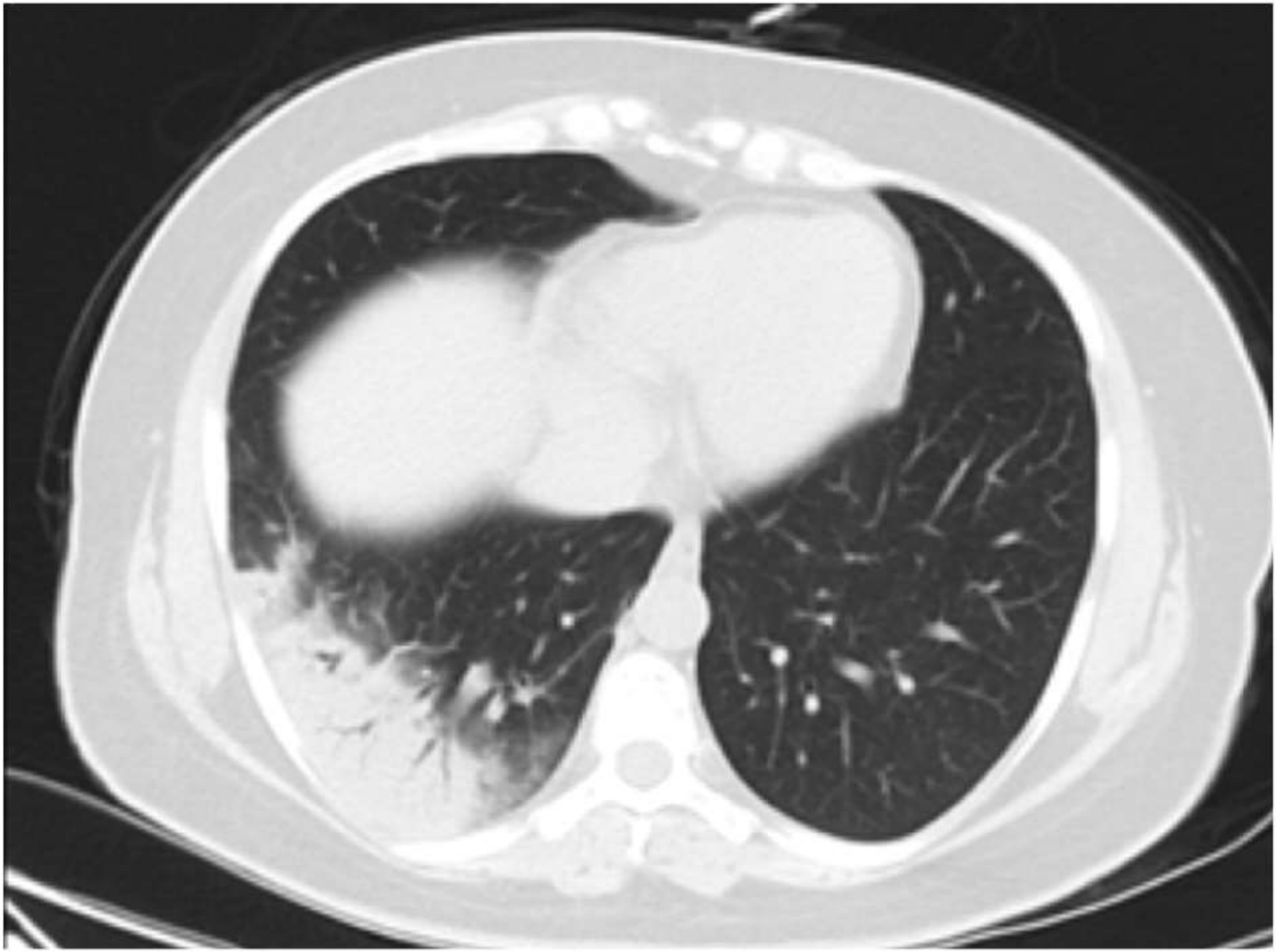
Legionella Pneumonia

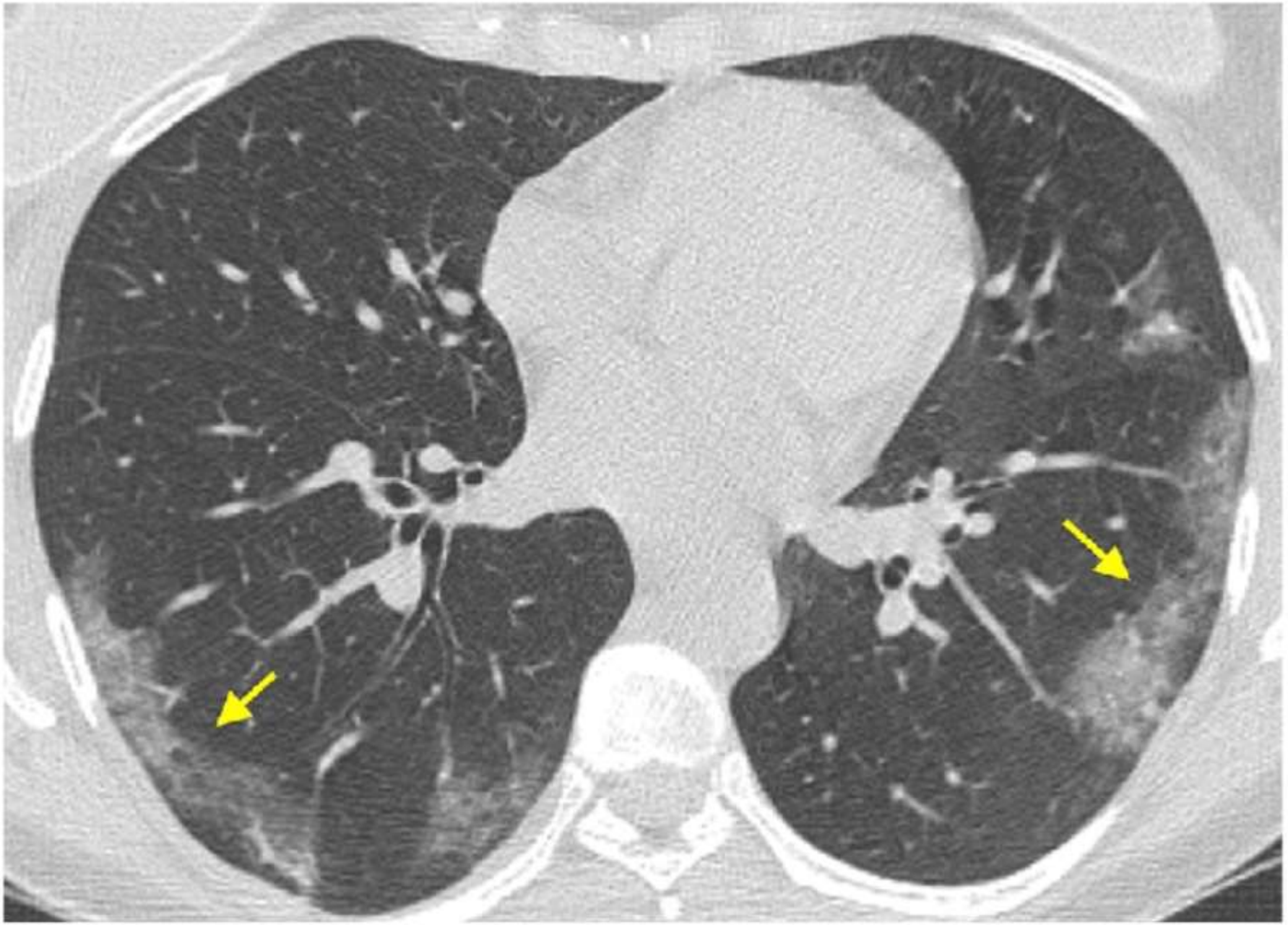












Infiltrate Patterns and Pathogens

CXR Pattern	Possible Pathogens
Lobar	• Strept. Pneumoniae. • Gram neg. e.g. Klebsiella, H. influ.
Patchy	• Atypical, Viral
Interstitial	• Viral, Legionella
Cavitatory	• S.aureus, Klebsiella, Anaerobes • TB, Fungi
pleural effusion	• Staph • Klebsiella

Laboratory Tests for CAP

- CBC
- CRP and ESR
- BUN and Creatinine
- Liver enzymes
- Serum electrolytes

- ABG
- Gram stain of sputum
- Culture of sputum
- Blood cultures
- Septic work up

Complications of CAP

- Parapneumonic effusion.
- Empyema
- Lung abscess – destruction of lung .
- Multiple Pyaemic Abscesses
- Septicemia – Brain abscess, Liver Abscess
- Hypotension and septic shock

Risk Factors for Hospitalization in CAP

- **Old Age**
- **Comorbidities:**
  - **Chronic chest diseases**
    - Asthma,
    - COPD,
    - Bronchiectasis
  - **Chronic diseases:**
    - Diabetes,
    - CHF,
    - Neoplasia

CURB-65 AND CRB-65 SEVERITY SCORES FOR COMMUNITY-ACQUIRED PNEUMONIA

Clinical factor	Points
Confusion	1
Blood urea nitrogen > 19 mg per dL	1
Respiratory rate ≥ 30 breaths per minute	1
Systolic blood pressure < 90 mm Hg or Diastolic blood pressure ≤ 60 mm Hg	1
Age ≥ 65 years	1
Total points:	

CURB-65 score	Deaths/total (%)*	Recommendation†
0	7/1,223 (0.6)	Low risk; consider home treatment
1	31/1,142 (2.7)	
2	69/1,019 (6.8)	Short inpatient hospitalization or closely supervised outpatient treatment
3	79/563 (14.0)	Severe pneumonia; hospitalize and consider admitting to intensive care
4 or 5	44/158 (27.8)	

PNEUMONIA SEVERITY INDEX FOR COMMUNITY-ACQUIRED PNEUMONIA

Risk factor	Points
Demographics	
Men	Age (years): ___
Women	Age (years) - 10: ___
Nursing home resident	+10
Comorbidities	
Neoplasm	+30
Liver disease	+20
Heart failure	+10
Stroke	+10
Renal failure	+10
Physical examination findings	
Altered mental status	+20
Respiratory rate ≥ 30 breaths per minute	+20
Systolic blood pressure < 90 mm Hg	+20
Temperature < 95°F (35°C) or ≥ 104°F (40°C)	+15
Pulse rate ≥ 125 beats per minute	+10
Laboratory and radiographic findings	
Arterial pH < 7.35	+30
Blood urea nitrogen > 30 mg per dL	+20
Sodium < 130 mmol per L	+20
Glucose ≥ 250 mg per dL	+10
Hematocrit < 30 percent	+10
Partial pressure of arterial oxygen < 60 mm Hg	+10
Pleural effusion	+10
Total points:	

Point total	Risk class	Deaths/total (%)		Recommendation†
		Adults with CAP*	Nursing home patients with CAP[1]	
< 51	I	3/1,472 (0.2)	None	Outpatient therapy should be considered, especially for patients in classes I and II
51 to 70	II	7/1,374 (0.5)	None	
71 to 90	III	41/1,603 (2.6)	1/21 (4.8)	
91 to 130	IV	149/1,605 (9.3)	6/50 (12.0)	Patient should be hospitalized
> 130	V	109/438 (24.9)	28/85 (32.9)	

Criteria for severe pneumonia:

Minor criteria

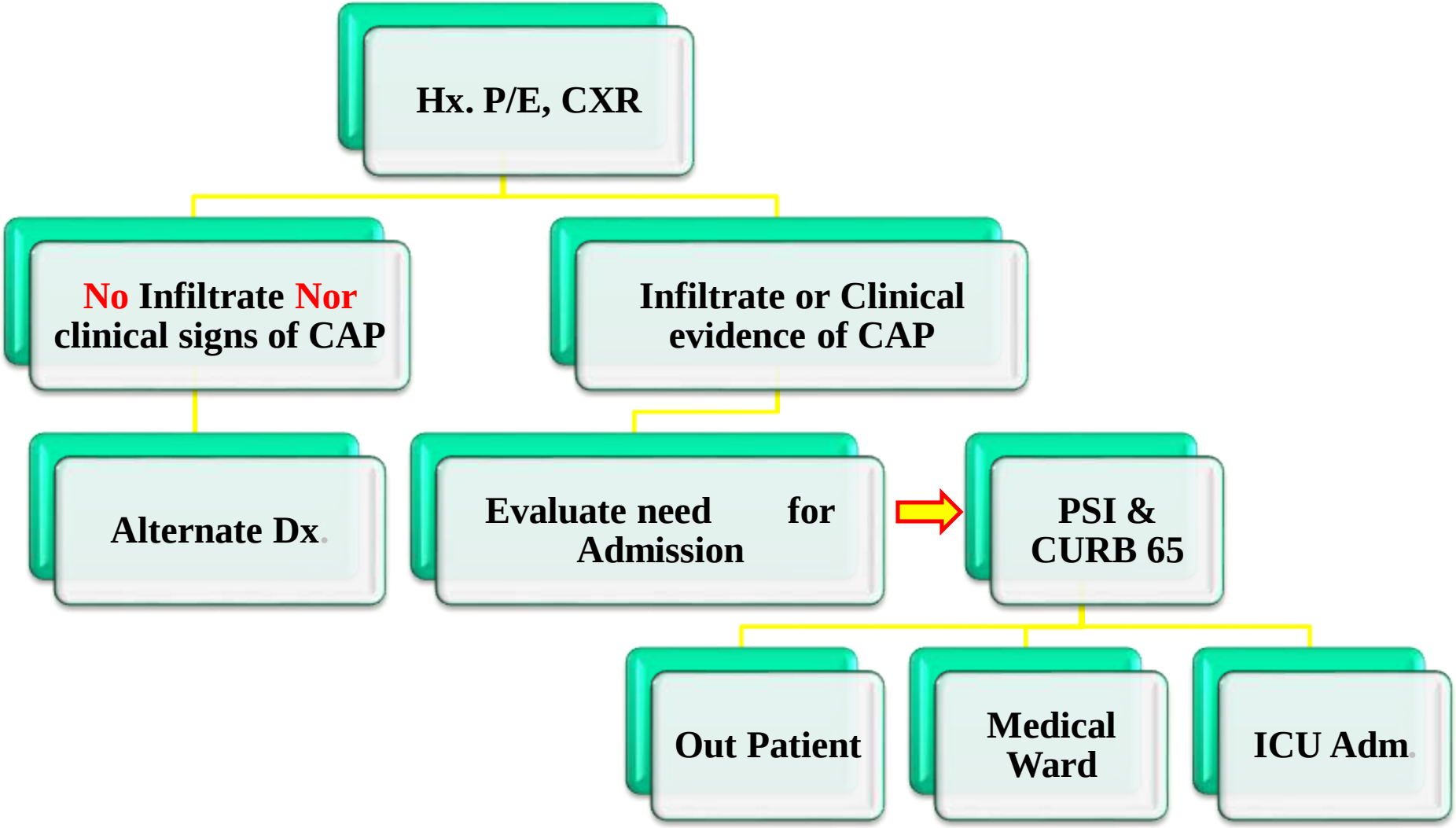
1. Confusion
2. Respiratory rate> 30 breaths/min
3. Hypothermia (core temperature, <36C)
4. Hypotension requiring aggressive fluid resuscitation
5. Multilobar infiltrates
6. Leucopenia: (WBC <4000 cells/mm3)
7. Thrombocytopenia (<100,000 cells/mm3)
8. Uremia (BUN level, 20 mg/dL)
9. PaO2/FiO2 ratio< 250

Major criteria

1. Invasive mechanical ventilation
2. Septic shock with the need for vasopressors

ICU admission = one major or 3 minor

CAP – Evaluation of a Patient



Treatment

Patients should initially be treated empirically , based on the likely pathogens for each patient group.

Supportive measures

a. Bed rest.
b. Adequate nutrition either orally or IV in severe cases.
c. Fluid and electrolytes replacement.
d. Analgesics for pain and antipyretics for fever.
e. Respiratory support by oxygen supply or mechanical ventilation.
f. Circulatory support by inotropic agent in hypotension.
g. Steroids may be used to suppress the inflammatory response to infection.

CAP

- The patient may be Previously Healthy or has Comorbidities such as:
  - Chronic heart, lung, liver, and renal disease,
  - Diabetes mellitus, Alcoholism,
  - Malignancies, Immunosuppression
  - Asplenia,
  - Use of antimicrobials within the previous 3 months

Group I: Outpatients but no Comorbidities

Organisms

- Streptococcus pneumoniae
- Hemophilus influenza
- Mycoplasma pneumoniae
- Chlamydia pneumoniae
- Legionella spp
- Respiratory viruses

Therapy

Macrolide:

- Azithromycin500mg once or
- Clarithromycin 500mg bid
- Erythromycin

or

- Amoxicillin or
- amoxicillin + clavulanic acid

- Erythromycin is not active against H. Influenza and the advanced generation Macrolides Azithromycin and Clarithromycin are better tolerated.
- Many isolates of S.pneumoniae are resistant to tetracycline, and it should be used only if the patient is allergic to or intolerant of macrolides.

Group ll: Outpatient, with Comorbidities

ORGANISMS

- Strept. pneumoniae (including DRSP)
- Hemophilus influenza
- Mycoplasma pneumoniae
- Chlamydia pneumoniae
- Legionella spp.,
- Enteric gram-negatives
- Aspiration(anaerobes)
- Respiratory viruses

Therapy

β –Lactam ;

- Amoxicillin,
- Cefpodoxime,
- Cefuroxime
- Amoxicillin /clavulanate
- Ampicillin-sulbactam
- Ceftriaxone

\+ **Macrolide**

Or

Lung Fluroquinolones as Monotherapy

- Levofloxacin 750 mg OD
- Moxifloxacin 400 mg OD
- Gemifloxacin 320 mg OD

Group III: Inpatient (Not in ICU)

ORGANISMS

- Strept. pneumoniae (including DRSP)
- Hemophilus influenza
- Mycoplasma pneumoniae
- Chlamydia pneumoniae
- Legionella spp.,
- Enteric gram-negatives
- Aspiration(anaerobes)
- Respiratory viruses

Therapy

β –Lactam ;

- Cefpodoxime,
- Cefuroxime, 1.5 g bid or tds
- Amoxicillin /clavulanate, 1.2 g bid or tds
- Ampicillin-sulbactam
- Ceftriaxone, 1-2 gm od
- Cefotaxime

+

Macrolide

Or

B-lactam + Lung Floroquinolones

Group IV : ICU- Admitted Patients
A. No Risks for Pseudomonas aeruginosa or MRSA

Organisms

- Streptococcus pneumoniae (including DRSP)
- Hemophilus influenzae
- Legionella spp.
- Mycoplasma pneumoniae
- Enteric gram-negatives
- Aspiration(anaerobes)
- Respiratory viruses

Therapy

Intravenous β-lactam;

- Amoxicillin /clavulanate
- Ampicillin-sulbactam
- Cefotaxime
- Ceftriaxone

+

Intravenous Macrolide

or

IV B-lactam + Intravenous Fluroquinolones

Group IV : ICU- Admitted Patients
B. Risks for Pseudomonas aeruginosa or MRSA

Organisms

All above pathogen.

+

- P. Aeruginosa
- MRSA

If MRSA is suspected

Vancomycin 1 gm /8-12 h

or

Linezolid 600mg /12 h

Antipseudomonal B- lactam

+

Antipseudomonal Fluroquinolones

or

Aminoglycoside + Azithromycin

or

Aminoglycoside + Lung Fluroquinolones

NB: Antipseudomonal B- lactam:

- Ceftazidime, Cefepime
- Piperacillin / tazobactam,
- Imipenem cilastien, or Meropenem

NB: Antipseudomonal Fluroquinolones:

- Ciprofloxacin
- Levofloxacin.

- Early treatment (within 48 h of the onset of symptoms) with Oseltamivir is recommended for H1N1 viral infection if suspected
- Antiviral drugs against COVID-19 e.g. Favipiravir should be used in case of confirmed cases.

Patient follow up

Patients should be evaluated after 2-3 days for initial improvement in:

- Clinical parameters e.g. Fever and toxic symptoms.
- Lab parameters e.g. leukocytosis and acute phase reactant.
- Chest radiograph findings shows no progression but usually clear within 1-4 weeks but may persist for longer duration in older individuals and those with underlying pulmonary disease

Switch to Oral Therapy

Four criteria

1. A febrile on two occasions 8 h apart
2. Improvement in cough, dyspnea & clinical signs
3. WBC decreasing towards normal
4. Functioning GI tract with adequate oral intake

Duration of Therapy

- For patients with low or moderate severity and uncomplicated pneumonia, **5-7 days** of appropriate antibiotics is recommended.

- For those with high severity and complicated pneumonia or microbiologically-undefined pneumonia, **7–10 days** treatment is proposed.

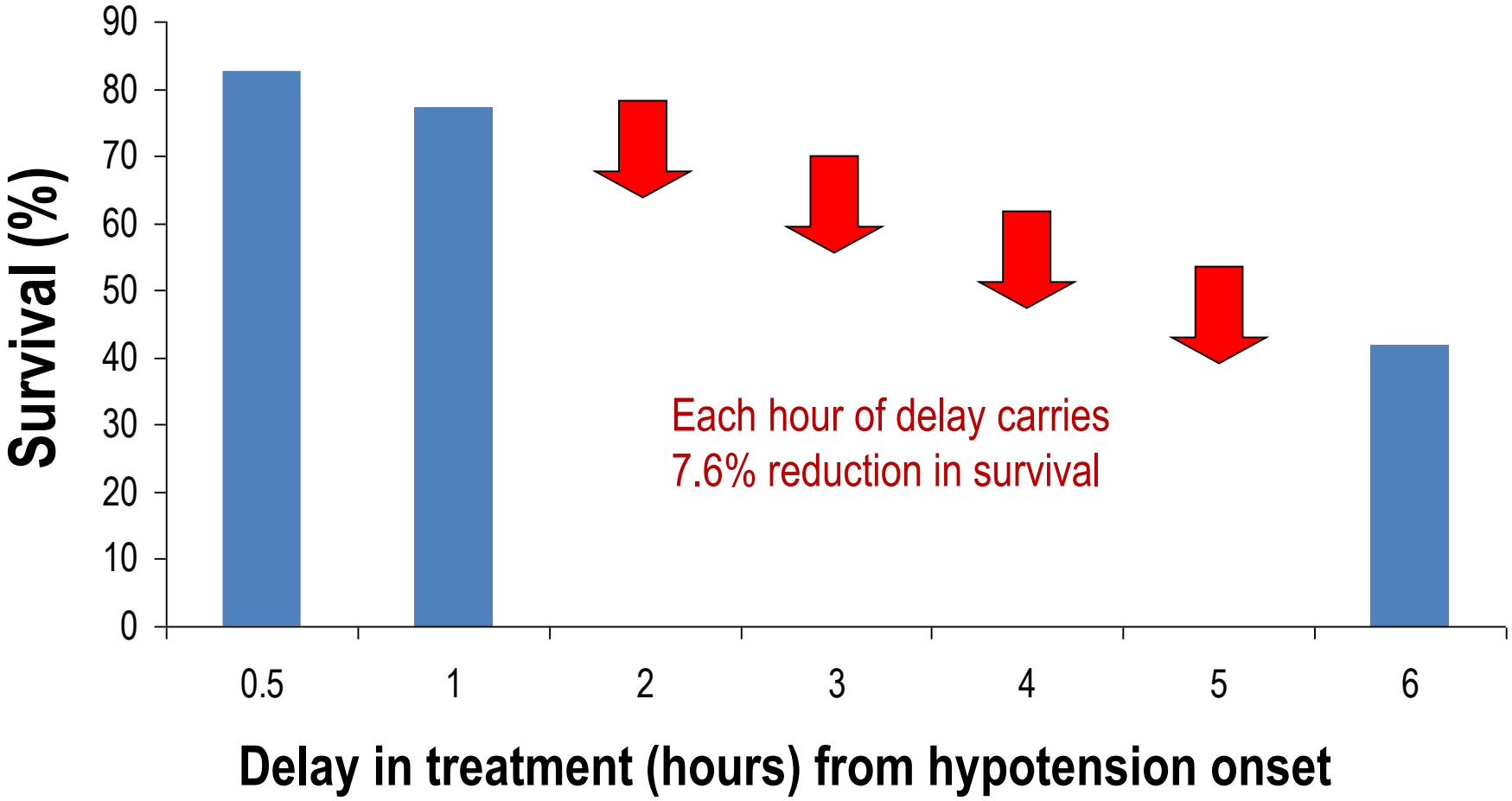
- If S. aureus or Gram-negative enteric bacilli pneumonia is suspected or confirmed **14 - 21 days** treatment is used.

Risk factors for treatment failure:

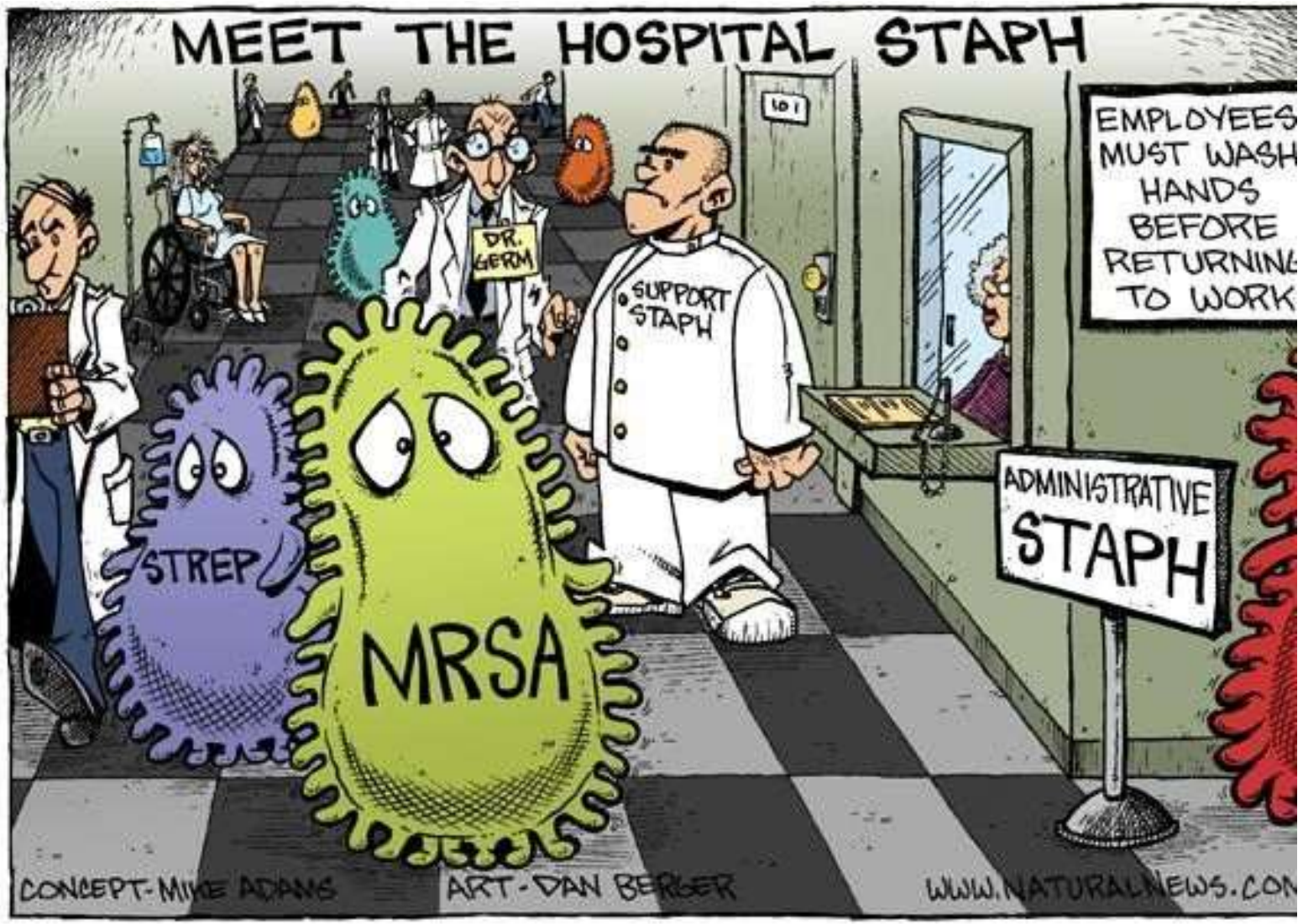
1. **Age > 65**
2. **Patient with comorbidities:**
   - Neoplasia .
   - Liver disease .
   - Neurologic disease.
   - Structural lung disease e.g. Bronchiectasis.
3. **Multilobar pneumonia .**
4. **Cavitation, pleural effusion .**
5. **Leukopenia .**
6. **Aspiration pneumonia .**
7. **Infection with MRSA, Legionella, or gram-negative bacilli .**

CAP – Management summery……

- CURB-65 scoring and Classification of cases
- Sputum and Blood culture collection in the first 24 h prior to Antibiotic administration.
- Early Empirical Antibiotic administration within 4-6 hours
- **Empirical on non Empiric Bases**
- Change Antibiotic according to pathogen & sensitivity pattern
- Pneumococcal & Influenza vaccination; Smoking

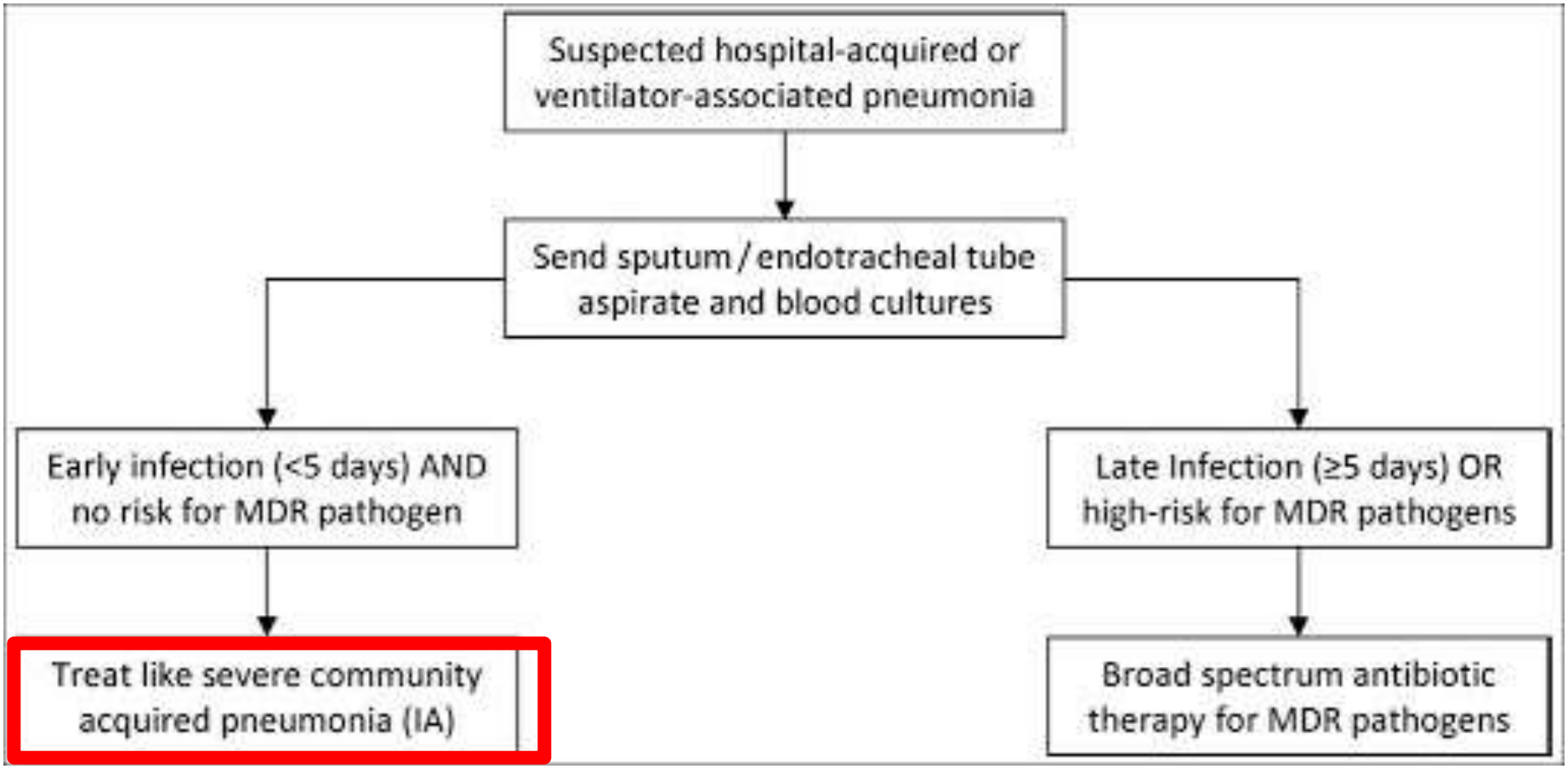

Survival (%)
90
80
70
60
50
40
30
20
10
0
0.5
1
2
3
4
5
6
Each hour of delay carries
7.6% reduction in survival
Delay in treatment (hours) from hypotension onset

HAP & VAP


MEET THE HOSPITAL STAPH
EMPLOYEES MUST WASH HANDS BEFORE RETURNING TO WORK
DR. GERM
SUPPORT STAPH
ADMINISTRATIVE STAPH
STREP
MRSA
CONCEPT-MIKE ADAMS
ART-DAN BERGER
WWW.NATURALNEWS.COM

Hospital acquired pneumonia (HAP)

- Defined as pneumonia that occurs 48 hours or more after admission


Suspected hospital-acquired or ventilator-associated pneumonia
Send sputum / endotracheal tube aspirate and blood cultures
Early infection (<5 days) AND no risk for MDR pathogen
Late Infection (≥5 days) OR high-risk for MDR pathogens
Treat like severe community acquired pneumonia (IA)
Broad spectrum antibiotic therapy for MDR pathogens

Group IV : ICU- Admitted Patients
A. No Risks for Pseudomonas aeruginosa or MRSA

Organisms

- Streptococcus pneumoniae (including DRSP)
- Hemophilus influenzae
- Legionella spp.
- Mycoplasma pneumoniae
- Enteric gram-negatives
- Aspiration(anaerobes)
- Staphylococcus aureus
- Respiratory viruses

Therapy

Intravenous β-lactam;

- Amoxicillin /clavulanate
- Ampicillin-sulbactam
- Cefotaxime
- Ceftriaxone

+

Intravenous Macrolide

or

Intravenous Fluroquinolones

Group IV : ICU- Admitted Patients
B. Risks for Pseudomonas aeruginosa or MRSA

Organisms

All above pathogen.

+

- P. Aeruginosa
- MRSA
- MDR pathogen "ESBL"
  - Klebsiella
  - E coli
  - Acinetobacter
  - Enterobacter

If MRSA is suspected

Vancomycin 1 gm /8-12 h

or

Linezolid 600mg /12 h

Antipseudomonal B- lactam

+

Antipseudomonal Fluroquinolones

or

Aminoglycoside + Azithromycin

or

Aminoglycoside + Lung Fluroquinolones

NB: Antipseudomonal B- lactam:

- Ceftazidime, Cefepime
- Piperacillin / tazobactam,
- Imipenem cilastien, or Meropenem

NB: Antipseudomonal Fluroquinolones:

- Ciprofloxacin
- Levofloxacin.

Duration of Therapy

- Optimal duration of antimicrobial therapy in HAP patients is 10-14 days.

- A trend to greater rates of relapse for short duration therapy was seen if the etiologic agent was P. aeruginosa or an Acinetobacter species, so treatment duration is 14-21 days.


THANK YOU
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