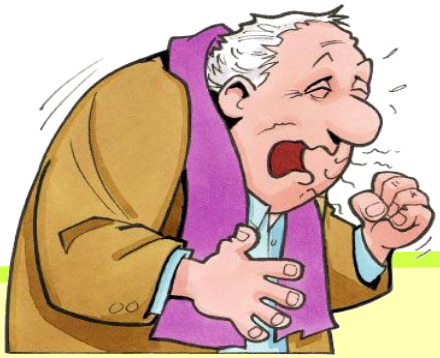
University of THi-Qar
College of Nursing

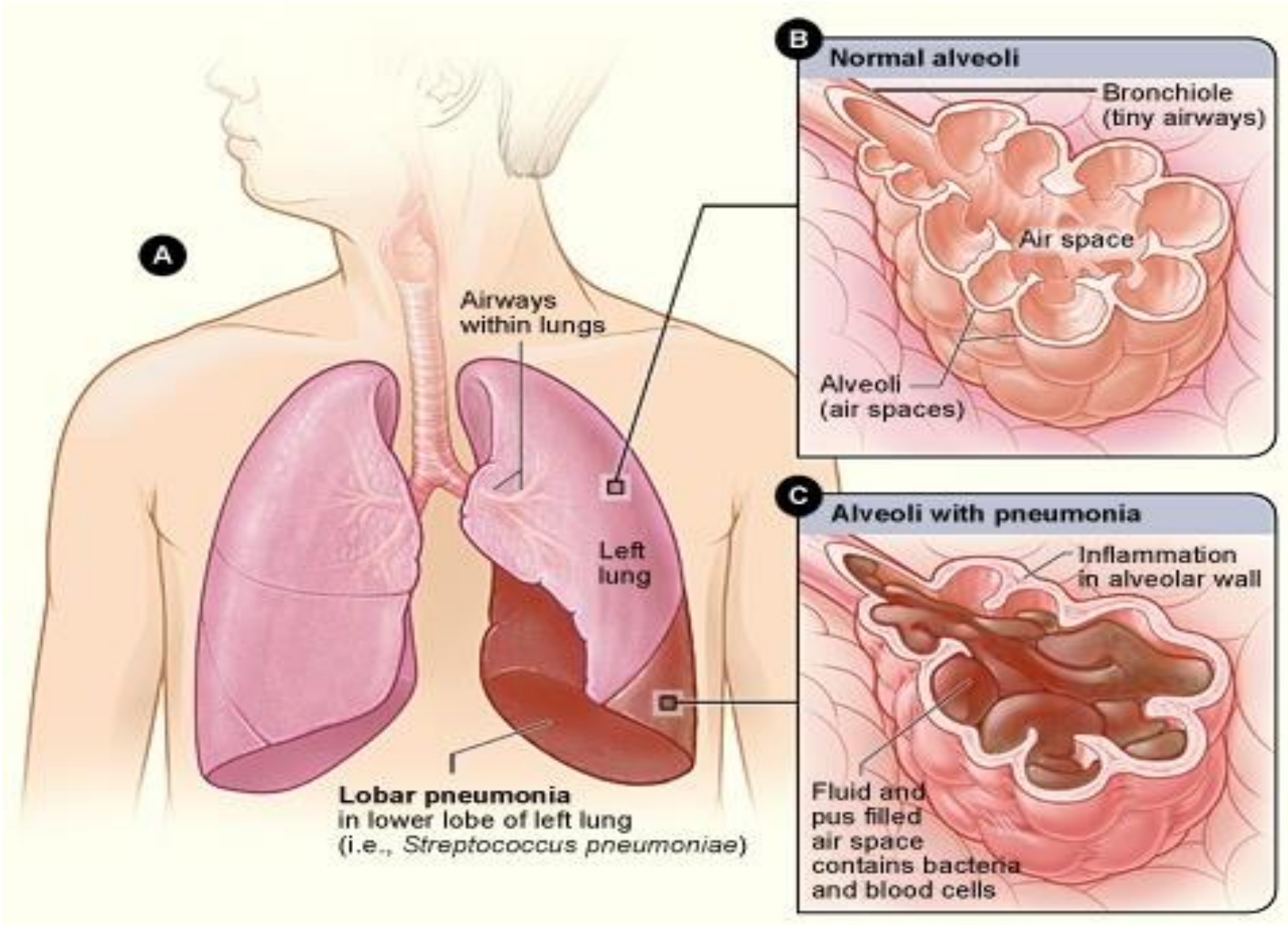


Pneumonia

م .م قاسم علي العمري

Pneumonia – Definition

- An acute infection of the pulmonary parenchyma that is associated with at least some symptoms of acute infection, accompanied by an acute infiltrate on CXR or auscultatory findings consistent with pneumonia


A
Airways within lungs
Left lung
Lobar pneumonia
in lower lobe of left lung
(i.e., Streptococcus pneumoniae)
B
Normal alveoli
Bronchiole (tiny airways)
Air space
Alveoli (air spaces)
C
Alveoli with pneumonia
Inflammation in alveolar wall
Fluid and pus filled air space contains bacteria and blood cells

Epidemiology

- The major cause of death in the world
- The 6th most common cause of death in the U.S.
- Annually in U.S.: 2–3 million cases, ~10 million physician visits, 500,000 hospitalizations, 45,000 deaths, with average mortality ~14% inpatient and <1% outpatient

Types of Pneumonia

- Community-Acquired (CAP)
- Health-Care Associated Pneumonia (HCAP)
  - Hospitalization for > 2 days in the last 90 days
  - Residence in nursing home or long-term care facility
  - Home Infusion Therapy
  - Long-term dialysis within 30 days
  - Home Wound Care
  - Exposure to family members infected with MDR bacteria
- Hospital-Acquired Pneumonia (HAP)
  - Pneumonia that develops after 5 days of hospitalization
  - Includes:
    - Ventilator-Associated Pneumonia (VAP)
    - Aspiration Pneumonia

Risk Factors

- Conditions that produce mucus or bronchial obstruction and interfere with normal lung drainage (eg, cancer, cigarette smoking, chronic obstructive pulmonary disease)
- Immunosuppressed patients and those with (neutropenic)
- Prolonged immobility and shallow breathing pattern
- Depressed cough reflex (due to medications, or weak respiratory muscles); aspiration of foreign material into the lungs during a period of unconsciousness (head injury, anesthesia, depressed level of consciousness), or abnormal swallowing mechanism

Risk Factors

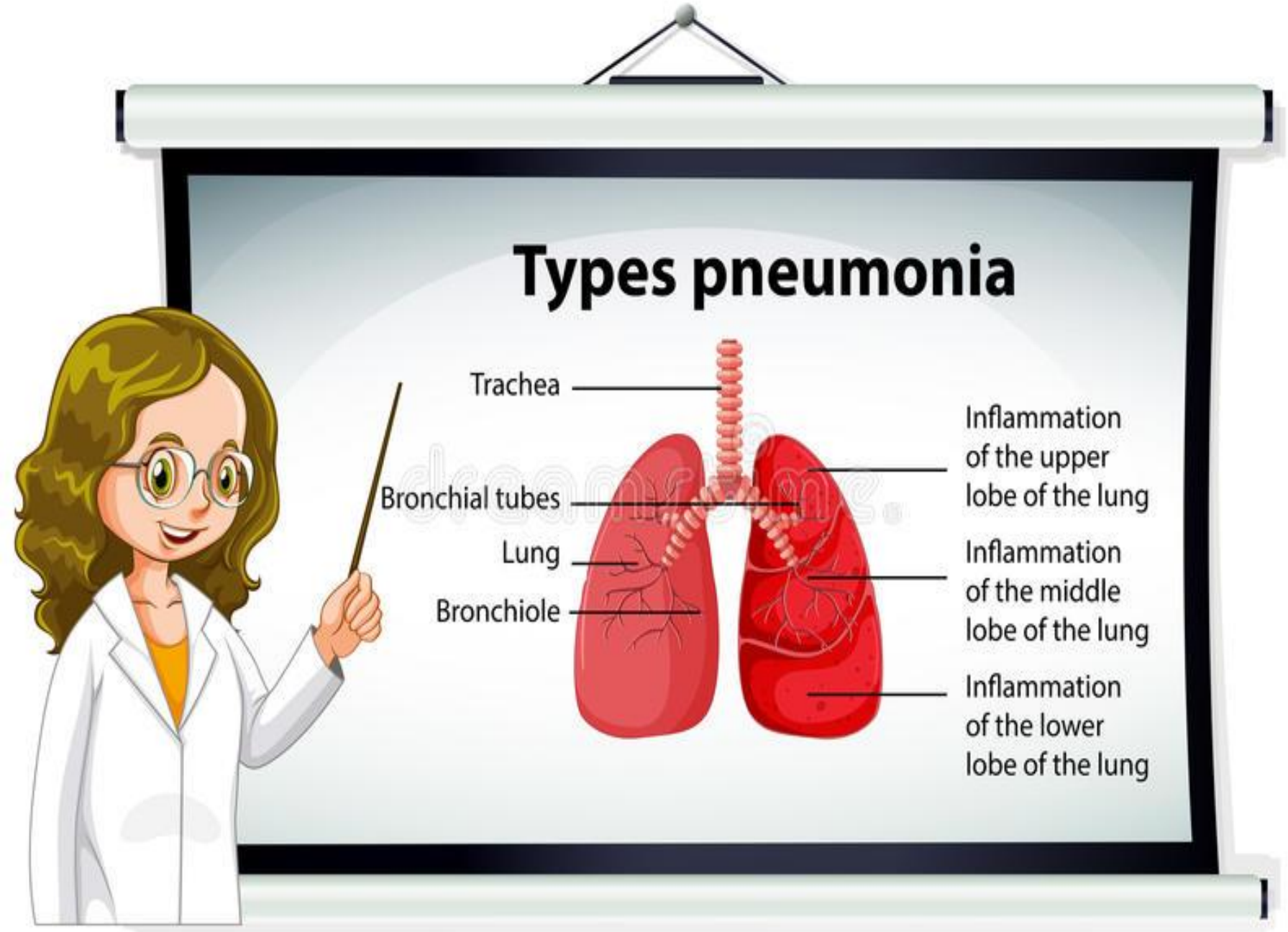
- placement of nasogastric, orogastric, or endotracheal tube
- Antibiotic therapy (in very ill people, the oropharynx is likely to be colonized by gram-negative bacteria)
- Alcohol intoxication (because alcohol suppresses the body's reflexes, may be associated with aspiration, and decreases white cell mobilization and tracheobronchial ciliary motion)
- Respiratory therapy with improperly cleaned equipment
- Transmission of organisms from health care providers

Pathophysiology

Pneumonia often affects both ventilation and diffusion. An inflammatory reaction can occur in the alveoli, producing an exudate that interferes with the diffusion of oxygen and carbon dioxide. White blood cells, mostly neutrophils, also migrate into the alveoli and fill the normally air-containing spaces. Areas of the lung are not adequately ventilated because of secretions and mucosal edema that cause partial occlusion of the bronchi or alveoli, with a resultant decrease in alveolar oxygen tension.

Pathophysiology

Bronchospasm may also occur in patients with reactive airway disease. Because of hypoventilation, a ventilation–perfusion mismatch occurs in the affected area of the lung eventually results in arterial hypoxemia.


Types pneumonia
Trachea
Bronchial tubes
Lung
Bronchiole
Inflammation of the upper lobe of the lung
Inflammation of the middle lobe of the lung
Inflammation of the lower lobe of the lung

Classification of pneumonia

(According to areas involved)

- Lobar pneumonia; if one or more lobe is involved.
- Broncho-pneumonia; the pneumonic process has originated in one or more bronchi and extends to the surrounding lung tissue.

Clinical Manifestations

•Clinical features vary depending on the causative organism and the patient's status:

- ❑Sudden chills and rapidly rising fever.
- ❑Pleuritic chest pain aggravated by respiration and coughing.
- ❑Severely ill patient has marked tachypnea, dyspnea and orthopnea.
- ❑Rapid and bounding pulse.
- ❑Other signs: upper respiratory tract infection, headache, myalgia, rash, and pharyngitis.

Clinical Manifestations

- Severe pneumonia: flushed cheeks; lips and nail beds demonstrating central cyanosis.
- Sputum purulent, rusty, blood-tinged, viscous, or green depending on etiologic agent.
- Appetite is poor, and the patient is diaphoretic and tires easily.

Healthy Airway

Normal airway:
Airways are open

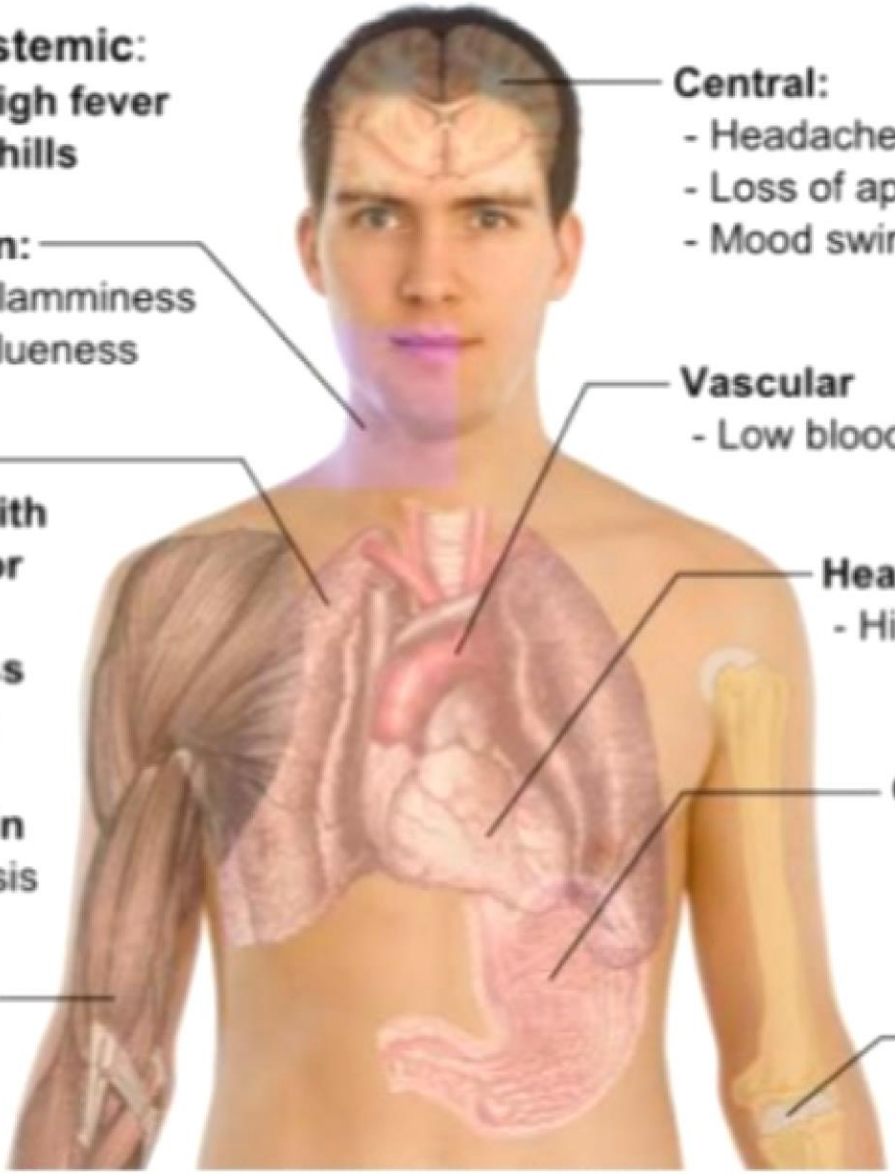
Airway with Pneumonia

Mucus:
Increases, reducing airspace

Swelling:
Narrows the airway, decreasing air flow

Main symptoms of infectious

Pneumonia



Systemic:
- **High fever**
- **Chills**

Skin:
- Clamminess
- Blueness

Lungs:
- **Cough with sputum or phlegm**
- **Shortness of breath**
- **Pleuritic chest pain**
- Hemoptysis

Muscular:
- Fatigue
- Aches

Central:
- Headaches
- Loss of appetite
- Mood swings

Vascular
- Low blood pressure

Heart:
- High heart rate

Gastric:
- Nausea
- Vomiting

Joints:
- Pain

Findings on Exam

- **Physical:**
  - Vitals: Fever or hypothermia
  - Lung Exam: Crackles, rhonchi, dullness to percussion or egophany.
- **Labs:**
  - Elevated WBC, ESR
  - Hyponatremia – Legionella pneumonia
  - Positive Cold-Agglutinin – Mycoplasma pneumonia

Findings on Exam

- **ABG analysis**

  hypoxemia ,respiratory alkalosis

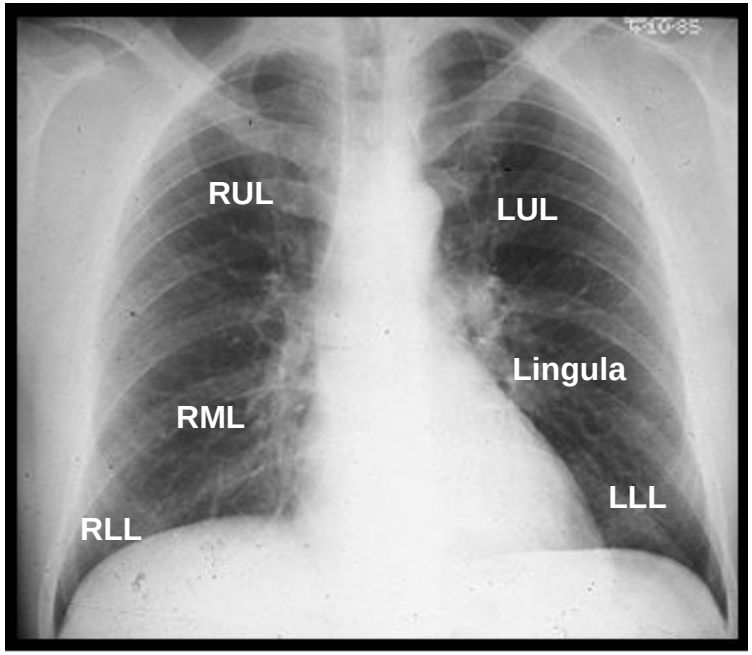
- **Sputum culture**

  identification of organism

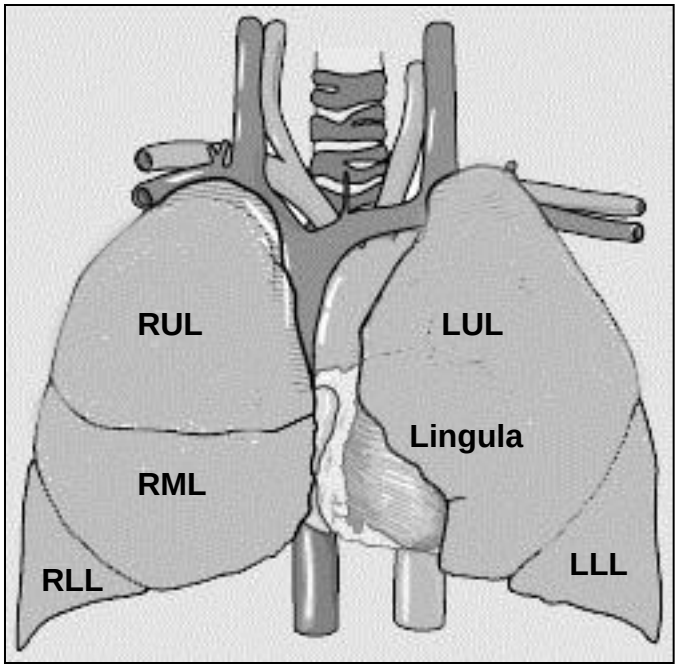
- **Chest x-ray :**

  pulmonary infiltration

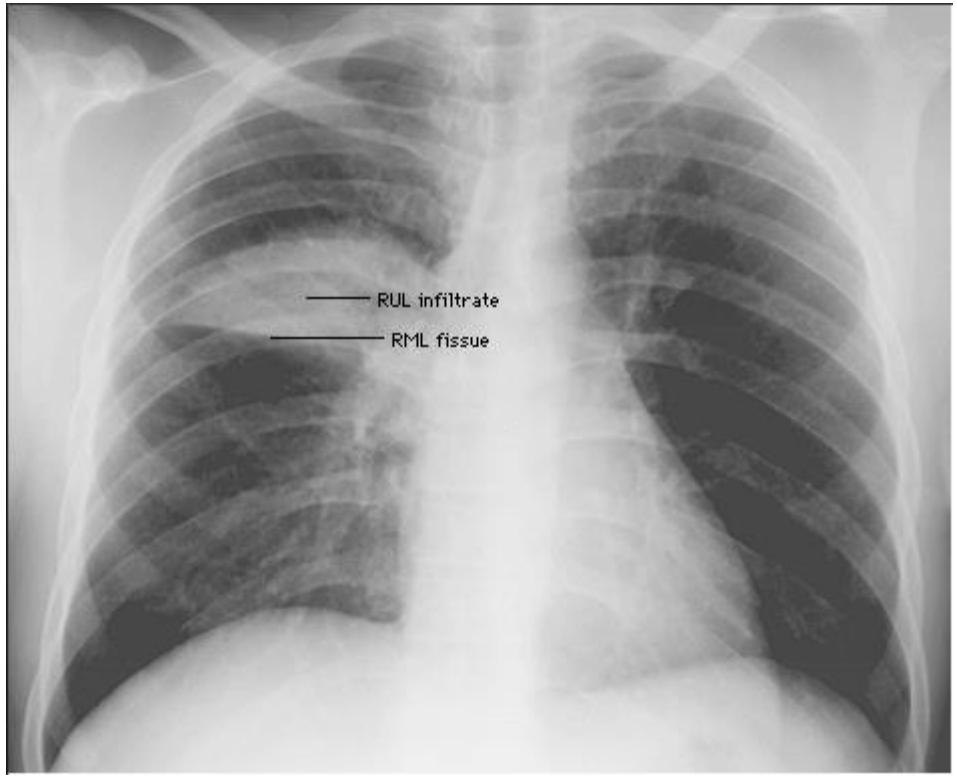
Chest X-ray – Pneumonia



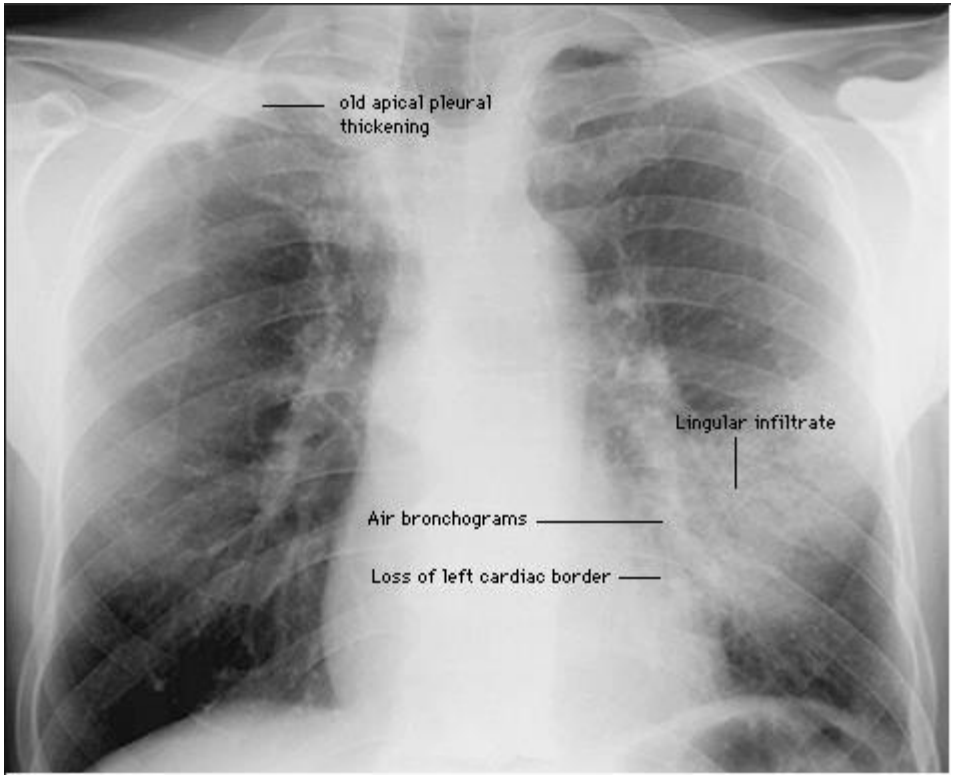
Normal chest film Posteroanterior view of a normal chest radiograph. Courtesy of Carol M Black, MD.



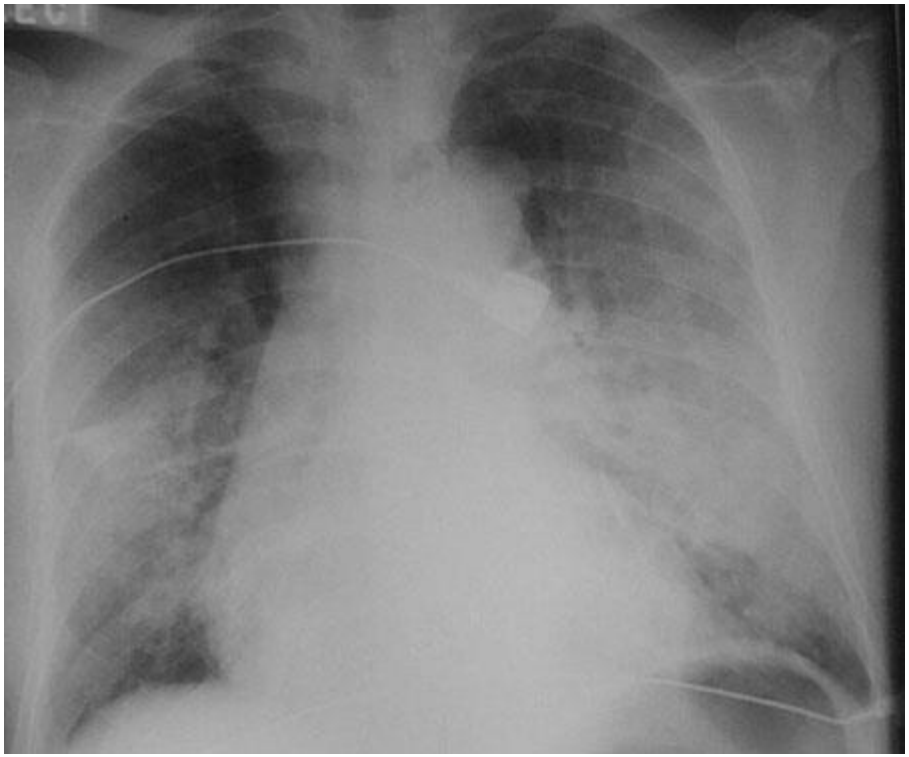
Chest X-ray – Pneumonia



Chest X-ray – Pneumonia



Chest X-ray – Pneumonia



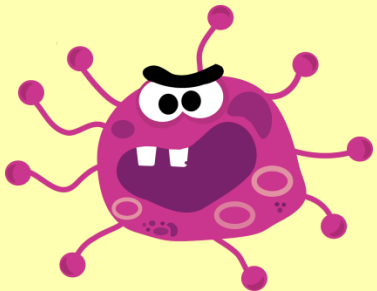
Common Bugs for Pneumonia

Community-Acquired

- Streptococcus pneumoniae
- Mycoplasma pneumoniae
- Chlamydophila psittaci or pneumoniae
- Legionella pneumophila
- Haemophilus influenzae
- Moraxella catarrhalis
- Staphylococcus aureus
- Nocardia
- Mycobacterium tuberculosis
- Influenza
- RSV
- CMV

HCAP or HAP

- Pseudomonas aeruginosa
- Staphylococcus aureus
- (Including MRSA)
- Klebsiella pneumoniae
- Serratia marcescens
- Acinetobacter baumanii



Special Clues on Chest X-ray

- Lobar pneumonia – **Strep. Pneumonia**
- Diffuse interstitial infiltrates – **Pneumocystis**
- RUL infiltrate – **Tuberculosis**
- Diffuse interstitial infiltrates – **Tuberculosis in HIV**

Medical Management

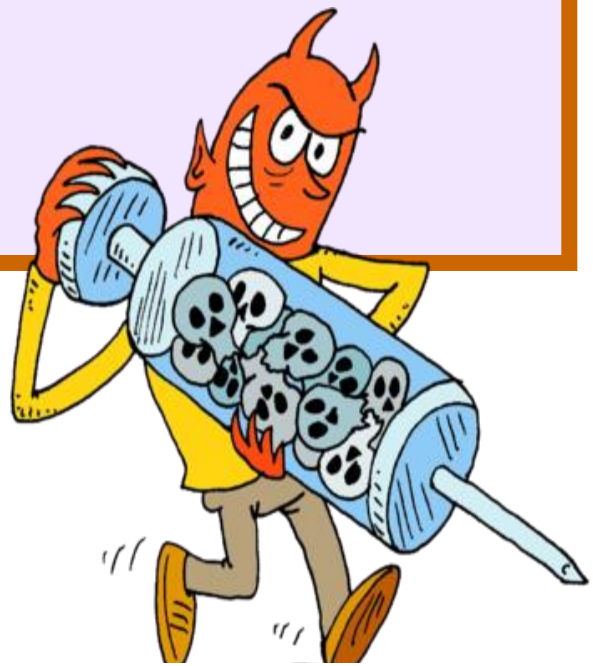
- Broad-spectrum antibiotics are initiated as soon as cultures are sent to the lab., even if results are not completed.
- If the pneumonia is caused by a virus, antiviral medications are used.
- Fluid intake is increased to thin the viscous and tenacious secretions.
- Expectorants, bronchodilators, and analgesics for symptom relief.

Medical Management

- Nebulized mist treatments or metered-dose inhalers for bronchodilators.
- Bed rest is recommended until infection shows signs of clearing.
- Oxygen therapy is given for hypoxemia.
- Antipyretics may be used to treat headache and fever.
- Nasal decongestants may be used to treat symptoms and improve sleep.

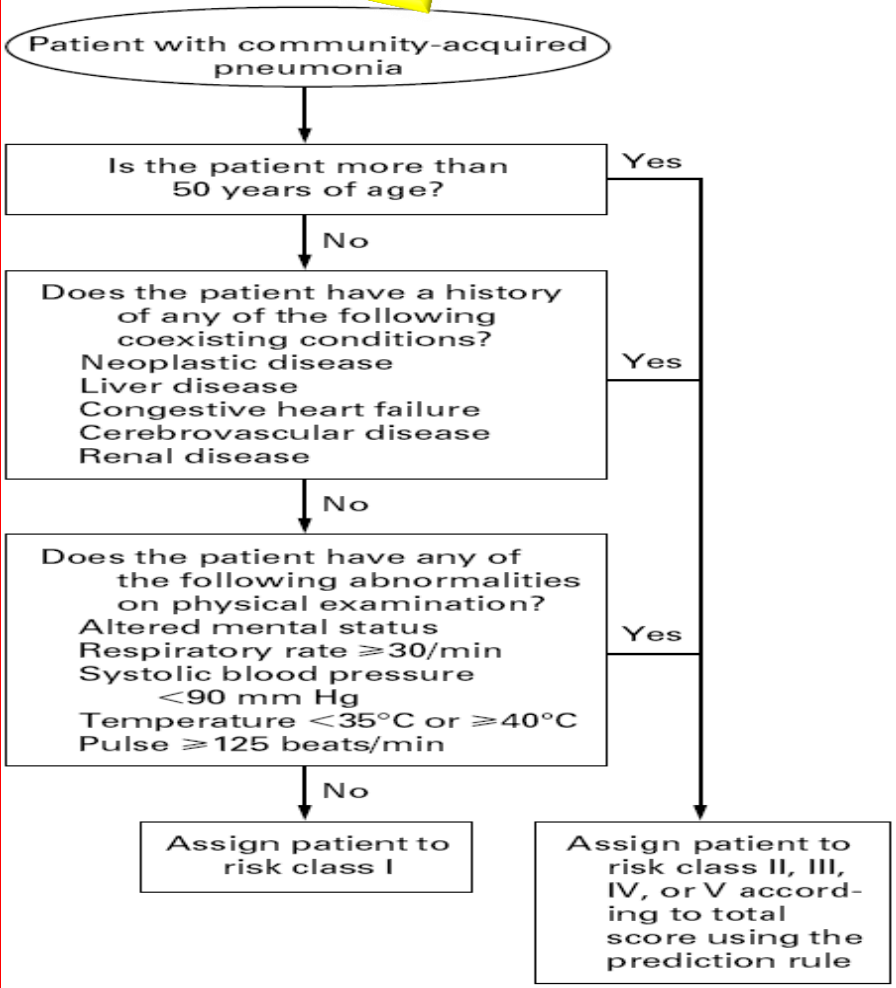
Inpatient or Outpatient Treatment of CAP

- Patient's safety at home
- PORT score
- Clinical Judgement



Pneumonia Patien Outcomes Research Team

PORT Score



Characteristic	No. of Points Assigned
Demographic factors	
Age	
Men	Age (in yr)
Women	Age (in yr) − 10
Nursing home resident	+10
Coexisting illnesses	
Neoplastic disease	+30
Liver disease	+20
Congestive heart failure	+10
Cerebrovascular disease	+10
Renal disease	+10
Findings on physical examination	
Altered mental status	+20
Respiratory rate ≥30/min	+20
Systolic blood pressure <90 mm Hg	+20
Temperature <35°C or ≥40°C	+15
Pulse ≥125 beats/min	+10
Laboratory and radiographic findings	
Arterial pH <7.35	+30
Blood urea nitrogen ≥30 mg/dl (11 mmol/liter)	+20
Sodium <130 mmol/liter	+20
Glucose ≥250 mg/dl (14 mmol/liter)	+10
Hematocrit <30%	+10
Partial pressure of arterial oxygen <60 mm Hg or oxygen saturation <90%	+10
Pleural effusion	+10

Stratification of Risk Score

Risk	Risk Class	Score	Mortality
Low	I	Based on algorithm	0.1%
Low	II	≤70	0.6%
Low	III	71–90	0.9%
Moderate	IV	91–130	9.3%
High	V	>130	27.0%

Figure 1. The Pneumonia Severity Index.

The Pneumonia Severity Index is used to determine a patient's risk of death. The total score is obtained by adding to the patient's age (in years for men or in years − 10 for women) the points assigned for each additional applicable characteristic.

Data have been adapted from Fine et al.[23]

PORT Score

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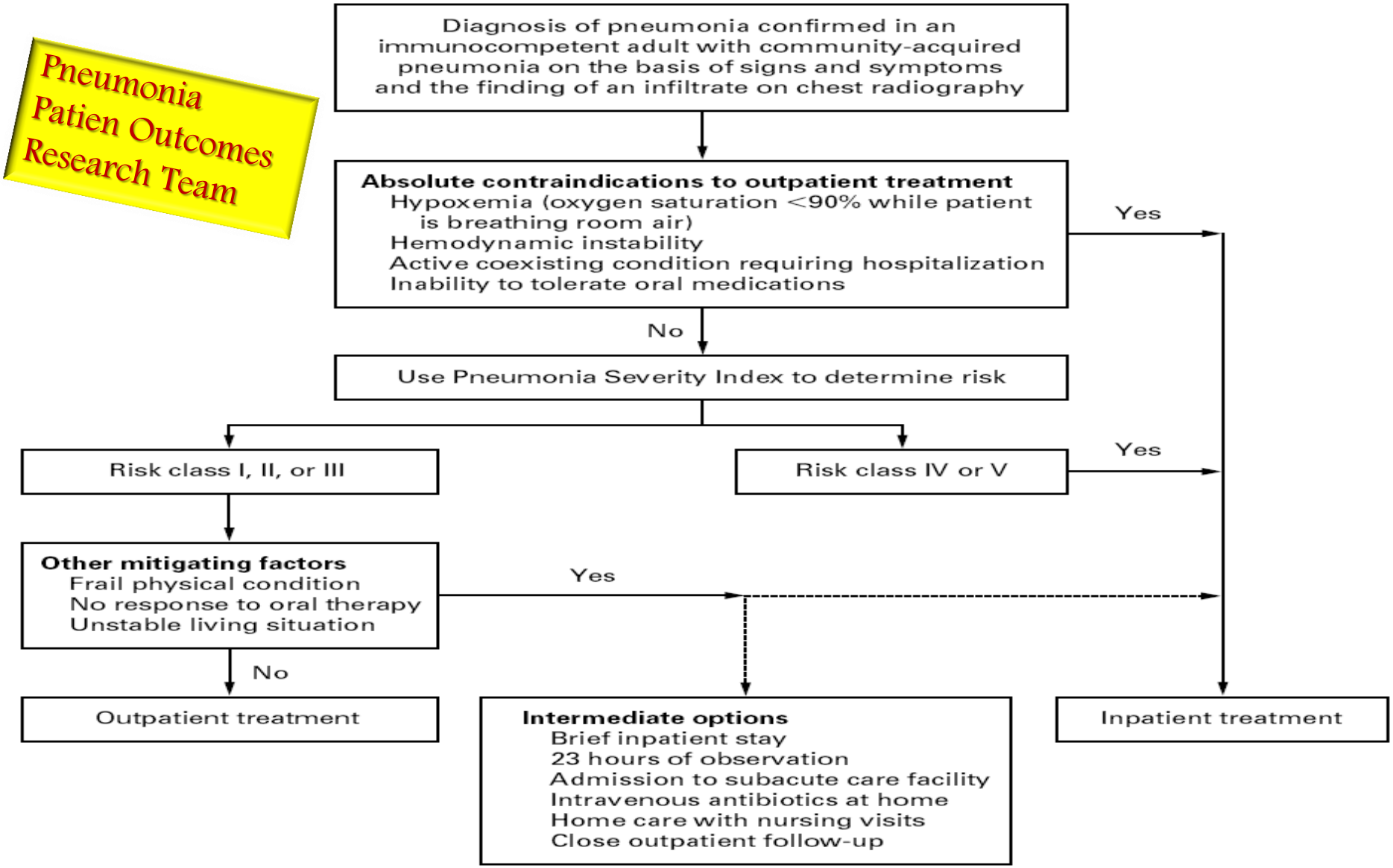

Treatment of CAP

- Outpatient:
  - Macrolide (**Azithromycin**)
  - Fluoroquinolone (**Levaquin, Moxifloxacin**)
  - Doxycycline
- Inpatient:
  - Beta-Lactam + Macrolide
    - **Ceftriaxone** + **Azithromycin**
  - Fluoroquinolone (**Levaquin, Moxifloxacin**)
    - For suspicion of highly resistant *Strep. pneumoniae*

Treatment of HCAP, HAP, VAP

- Antipseudomonal cephalosporin (Cefepime, Ceftazidime) + Vancomycin
- Anti-pseudomonal Carbapenem (Imipenem, Meropenem) + Vancomycin
- Beta-Lactamase/Beta-Lactamase Inhibitor (Pip-Tazo – Zosyn) + Pseudomonal Fluoroquinolone (Cipro) + Vancomycin
- Aminoglycoside (Gentamycin, Amikacin) + Vancomycin

Special Cases!

- **HIV**
  - Pneumocystis jirovecii
  - Mycobacterium tuberculosis
  - Cryptococcus
  - Histoplasmosis
- **Transplant Patients**
  - Fungi (Aspergillosis, Cryptococcus, Histoplasmosis)
  - *Nocardia*
  - *CMV*
- **Neutropenic Patients**
  - Fungi (Aspergillosis)
  - Gram-negatives

Pneumonia
Nursing intervention

- Maintain a patent airway and adequate oxygenation.
- Obtain sputum specimens as needed.
- Use suction if the patient can't produce a specimen.
- perform chest physiotherapy.

Nursing intervention (cont…)

- Provide a high calorie, high protein diet of soft foods.
- To prevent aspiration during nasogastric tube feedings, check the position of tube, and administer feedings slowly.
- To control the spread of infection, dispose secretions properly.

Nursing intervention (cont…)

- Provide a quiet, calm environment, with frequent rest periods.
- Monitor the patient's ABG levels, especially if he's hypoxic.
- Assess the patient's respiratory status. Auscultation breath sounds at least every 4 hours.
- Monitor fluid intake and output.
- Evaluate the effectiveness of administered medications.
- Explain all procedures to the patient and family.

Nursing intervention (cont…)

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- Assess the patient's respiratory status. Auscultate breath sounds at least every 4 hours.
- Monitor fluid intake and output.
- Evaluate the effectiveness of administered medications.
- Explain all procedures to the patient and family.

Complications

- Shock and respiratory failure.
- Pleurisy and pleural effusion.
- Atelectasis: (collapsed alveoli) occur as a result of trapped secretions.
- Super infection.
- Other complications result from spread of infection to other parts of the body, causing septicemia, meningitis, septic arthritis, pericarditis, or endocarditis

Prevention:

❖A pneumococcal vaccine provides specific prevention against pneumococcal pneumonia and other infections caused by streptococcus pneumonia (otitis media, other upper respiratory tract infections).

❖Vaccination against pneumococcal infection is advised for the following:

❑People 65 years of age or older

❑People with chronic illness (eg., CVD, pulmonary disease, DM, chronic liver disease) or disability.

Prevention:

- People with functional or anatomic asplenia.
- People living in environments or social settings in which the risk of disease is high.
- Immunocompromised people at high risk for infection.

❖**Nursing care plays an important role in the prevention of nosocomial pneumonia by:**

- **Regular coughing and deep breathing for patients on bed rest or after surgery.**

Prevention:

- Good hand washing practices by health care personnel can help prevent separating of infection.
- The risk of ventilator-associated pneumonia can be reduced with frequent mouth care and use of a special endotracheal tube that allows continuous suctioning of secretions above the inflated cuff.
- All patients should be positioned with the head of the bed elevated 30 to 45 degrees to help prevent aspiration.

Questions

A 45-year old male smokere presents with symptoms of cough, fever with temperature to 39° C, and yellow sputum of 2 days duration. He denies shortness of breath and has no chest pain. His symptoms were of gradual onset but have steadily worsened since they first appeared.

Question #1 (cont.)

Physical Exam:

VS: 39.2° C, 110/75, 88, 22, 98% RA

Gen: Alert, oriented in NAD

Resp: crackles at right lung base posteriorly

MKSAP Question #1 (cont.)

MKSAP Question #1 (cont.)

What is the most appropriate drug therapy for this patient?

(A) Oral azithromycin

(B) Oral Cefuroxime

(C) Oral penicillin G

(D) Intravenous ceftriaxone in your office, followed by oral cefpodoxime

(E) Oral tetracycline

Question #2

A 72-year-old female with a history of CHF, hypertension, and CRI presents to the ER with fever, productive cough (green sputum) and SOB for five days. She was seen by her outpatient doctor three days earlier and was started on a Z-pak, but has not improved. The patient lives by herself, and has never been hospitalized before.

Question # 2

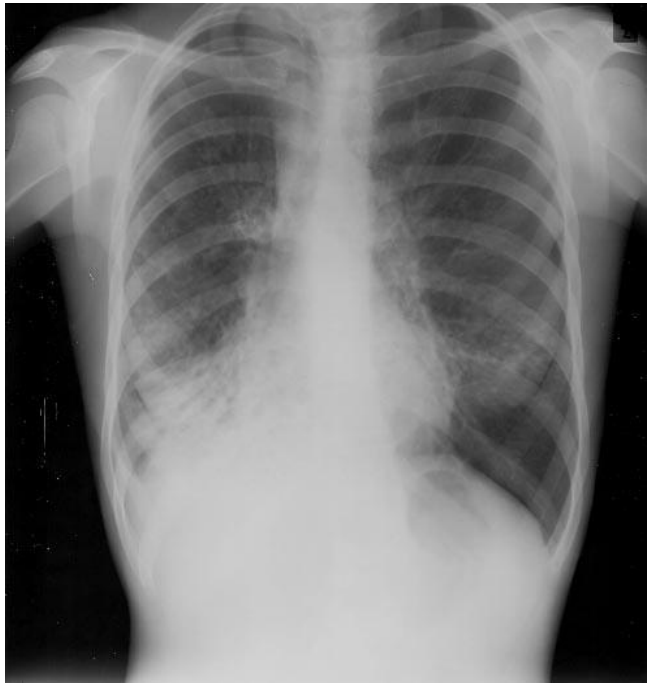
Physical Exam:

VS: 38.4, 100/54, 122, 26, 95% on 2L NC

Gen: Alert, oriented, in NAD but a little winded.

Resp: Decreased breath sounds at right lung base; + egophany at right base

Question # 2 (cont.)



Question #2 (cont.)

- Labs:
  - WBC: 11.2, Hgb: 10.2, Hct: 30.6, Platelets: 240
  - Sodium: 130, Potassium: 4.3, BUN: 36, Cr: 1.4

Question #2 (cont.)

What is the best management for this patient?

(A) Send home longer course of azithromycin
(B) Send home on oral Levofloxacin
(C) Hospitalize and start on Zosyn
(D) Hospitalize and start on Ceftriaxone and Azithromycin
(E) Hospitalize and start on Vancomycin and Imipenem

Question # 3

56-year-old female nursing home resident with a history of hypertension. Diabetes, ESRD on HD, PVD with bilateral BKA presents with 3 days of fever, with some mental status changes, per nursing home. Patient was also noted to have some recent coughing.

Question #3 (cont.)

Physical Exam:

VS: 39.6, 88/52, 129, 28, 88% on RA

Gen: Awake, but lethargic, oriented to person but not place or time.

CV: tachy, no murmurs

Resp: Diffuse rhonchi in both lung fields

Question # 3

Question

- What is the best therapy for this patient?

(A) IV Ceftriaxone with IV Azithromycin

(B) IV Moxifloxacin

(C) PO Azithromycin with IV Zosyn

(D) IV Imipenem with IV Vancomycin

(E) IV Azithromycin with IV Linezolid