

Internal Medicine Clerkship
Case Discussions

Pneumonia
Student Guide

Objectives:

1. Identify characteristics and relevant review of systems that may indicate pneumonia including whether cough is productive and presence of constitutional symptoms.
2. Assess for comorbidities that increase risk of complicated infection including immunocompromised state, exposure history, or vaccination status.
3. Assess for social factors that increase risk of pneumonia including smoking, vaping, alcohol use, and opioid use.
4. Identify key physical exam findings that determine severity of illness (including vital signs and mental status), assess for comorbidities (including dental exam), and locate consolidation (including crackles and dullness to percussion).
5. Identify and interpret key laboratory and imaging tests and list indications, benefits, test characteristics, risks, and costs of testing:
 - a. Determine type of organism (including urinary antigens, blood cultures, and influenza testing).
 - b. Determine severity of illness including cbc and procalcitonin.
 - c. Determine location of pneumonia including chest x-ray.
6. Describe a rational and evidence-based approach to treating a patient with pneumonia:
 - a. Describe initial triaging decisions including Pneumonia Severity Index or CURB-65.
 - b. List appropriate antimicrobial therapy.
 - c. Describe the need to isolate patient for infection control including likelihood of Mycobacteria or influenza.
7. Describe possible complications including infectious complications (e.g., complicated pleural effusion) and non-infectious complications (e.g., acute coronary conditions and respiratory failure).
8. Describe prevention strategies including proper vaccination.

Clinical Case:

80yo with history of HFpEF, DM, and mild dementia presents to the ER with complaint of cough and fatigue. Her daughter states that she has had the flu. She is coughing up greenish mucous. She denies chest pain but has some shortness of breath. Her temperature this morning at home was 101F. The last two days she has refused to eat, and this evening she appears more confused. Her sugars (per daughter) have been elevated at 200-300 for the last three days. You are unable to obtain a review of systems from the patient.

Her medications include furosemide 20mg per day, digoxin 0.125mg per day, enalapril 2.5mg per day, and glipizide 2.5mg per day. She has no allergies.

Physical examination:

Vitals: 96F, RR 34, BP 100/50, O2 sat is 87% on room air

General: Awake but moaning
HEENT: Bilateral cataracts, equal and reactive pupils, TMs are normal, mouth is dry, and she has an absent gag reflex
Neck: Supple without enlarged lymph nodes or enlargement of the thyroid
CV: Neck veins are flat at 45 degrees elevation, regular rate and rhythm, PMI is displaced laterally, no murmur
Resp: Decreased breath sounds at the right base with crackles
Abdomen: Soft and scaphoid with hypoactive bowel sounds
Extremities: 2+ edema with chronic venous stasis changes, no cyanosis
Neuro: No focal deficits, mini mental status examination score is 6.

Laboratory data:

WBC 12,000, Hbg 11, Platelets 250

Differential:

60% segmented neutrophils

20% bands

10% lymphocytes

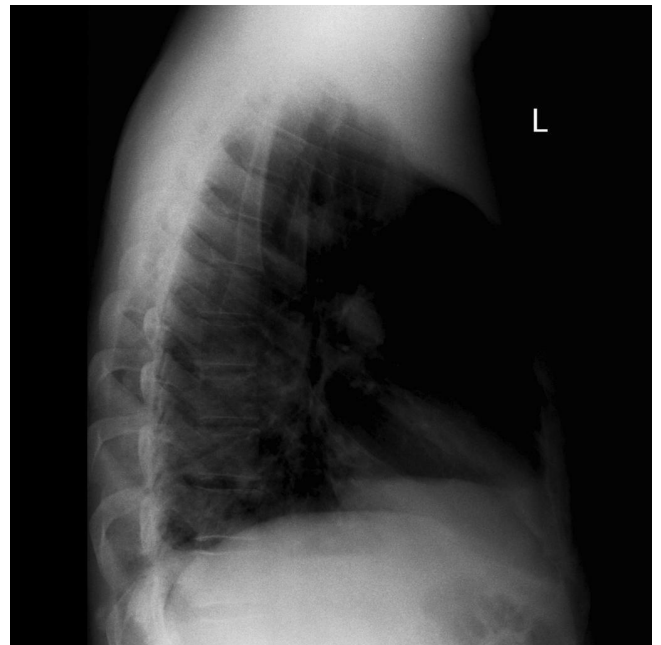
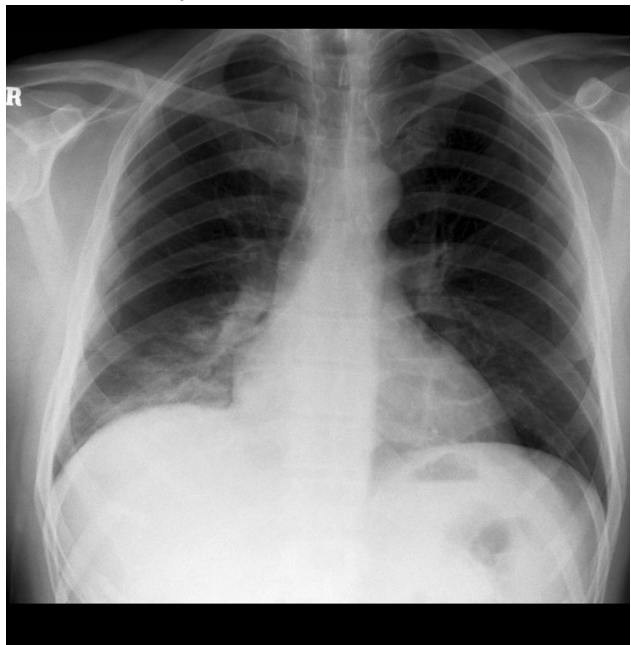
10% monocytes

Normal electrolytes, BUN 30, CR 1.3, Glucose 280, Normal LFTs

Urinalysis: No wbc, 1-2 rbc, dark yellow but clear, specific gravity 1.04, + ketones

Radiologic data:

The CXR is depicted below.



Questions:

1. Interpret the chest x-ray above.
2. Does this patient have pneumonia? What are the generally accepted criteria for a diagnosis of pneumonia?
3. What are common risk factors for the development of pneumonia?
4. Describe the different types of pneumonia including community-acquired, nosocomial, and aspiration pneumonia. Discuss the meaning of the term healthcare-associated pneumonia and why that term is no longer used.
5. Differentiate the organisms responsible for a typical, atypical, and viral pneumonia.
6. Should this patient be admitted to the hospital? If so, how would decide if she needs admission to a general medicine floor or the ICU? Is she at increased risk for a complicated course?
7. What further history regarding exposure should be asked of this patient and her family before bed assignment?
8. Explain the physical findings present in consolidation versus pleural effusion.
9. What further lab studies should be ordered? What is the percentage of patients who have a febrile bacteremia associated with pneumonia? What is the most common early sign of pneumonia in the elderly?
10. Do you need to confirm what organisms is responsible for the pneumonia? When would absolutely want to know the causative organism?

11. Discuss the sensitivity and specificity of the gram stain and the sputum culture.
12. What four ways do micro-organisms get to the lung, and which of these four is most common?
13. What is the most common pathogen in community acquired pneumonia? What antibiotic coverage might you suggest initially for this patient? What would be first line for outpatient treatment?
14. What are risk factors for a multi-drug resistance organism in a community-acquired pneumonia?
15. What pathogens are involved in nosocomial pneumonia and what antibiotic coverage might you suggest? What are risk factors for drug resistant pathogens in nosocomial pneumonias, and how would that alter your treatment?
16. How would treatment differ if this patient was immunocompromised?
17. What are other complications of pneumonia that you should be aware of?
18. Once clinically improved, what medications would you discharge her on and for how long?
19. When should the patient have a repeat CXR? How long might it take before her CXR is normal?
20. What care can be given this patient in your outpatient clinic to prevent another pneumonia?

References:

File TM Jr, Ramirez JA. Community-Acquired Pneumonia. N Engl J Med. 2023 Aug 17;389(7):632-641. doi: 10.1056/NEJMcp2303286. PMID: 37585629.

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Lanks CW, Musani AI, Hsia DW. Community-acquired Pneumonia and Hospital-acquired Pneumonia. Med Clin North Am. 2019 May;103(3):487-501. doi: 10.1016/j.mcna.2018.12.008. Epub 2019 Mar 7. PMID: 30955516.

<https://www.sciencedirect-com.archer.luc.edu/science/article/pii/S0025712518301731>

Harrison's Principles of Internal Medicine, 21e. Chapter 126: Pneumonia

<https://accessmedicine-mhmedical-com.archer.luc.edu/content.aspx?bookid=3095§ionid=263547796>

Harrison's Manual of Medicine, 20e. Chapter 134: Pneumonia, Bronchiectasis, and Lung Abscess

<https://accessmedicine-mhmedical-com.archer.luc.edu/content.aspx?bookid=2738§ionid=227558361>

Harrison's Manual of Medicine, 20e. Chapter 100: Mycoplasma pneumoniae, Legionella species, and Chlamydia pneumoniae

<https://accessmedicine-mhmedical-com.archer.luc.edu/content.aspx?bookid=2738§ionid=228068151>

Symptom to Diagnosis: An Evidence-Based Guide, 4e. Part 10: Cough and Congestion

<https://accessmedicine-mhmedical-com.archer.luc.edu/content.aspx?bookid=2715§ionid=249058959>

Chest x-ray image:

<https://radiopaedia.org/cases/right-lower-lobe-pneumonia-1?lang=us>