

CHEST IMAGING: DO THIS, DON'T DO THAT

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OUTLINE

▶ CASES

- ▶ Be sure to participate through the anonymous audience response system.
- ▶ COMMON things that are UNCOMMONLY known/discussed

▶ TEACHING POINTS

- ▶ Take home points you can apply to many cases

▶ QUESTIONS

- ▶ Anytime during the lecture; this is *interactive*

RADIOLOGIST



What my family thinks I do



What society thinks I do



What the ER intern thinks I do



What the surgeons think I do



What I think I do



What I actually do

CASES



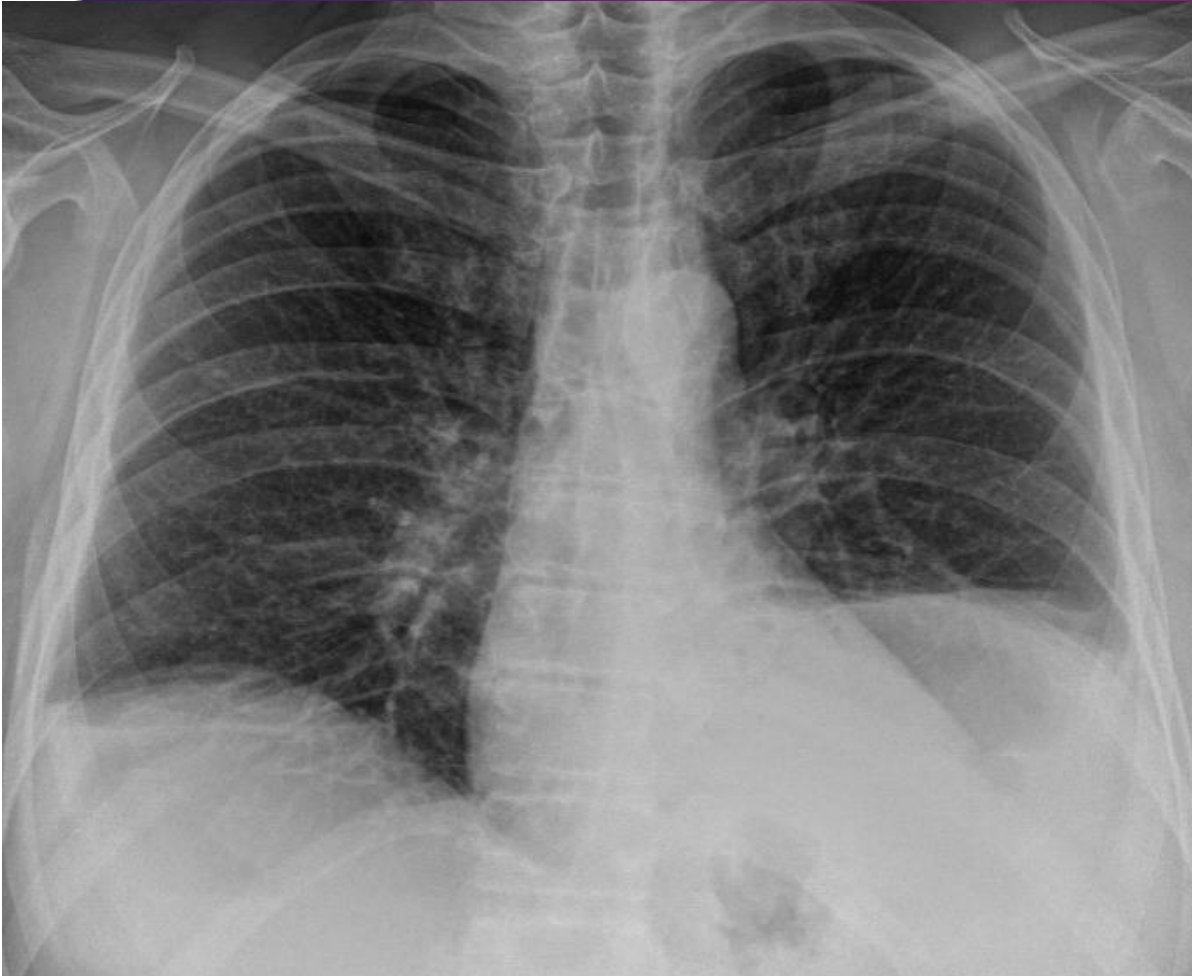
Case 1: 60 y/o, former smoker, presents to clinic with new onset cough, shortness of breath, pleuritic chest pain, and fever x 3 days.

- ▶ Question 1a: Which of the following imaging studies should you order next?
 - ▶ A) Chest radiograph (PA/lateral)
 - ▶ B) Chest CT without contrast
 - ▶ C) CTA Pulmonary Angiogram (PE protocol CT)
 - ▶ D) Chest CT with contrast (standard protocol)
 - ▶ E) No imaging at all; treat empirically.

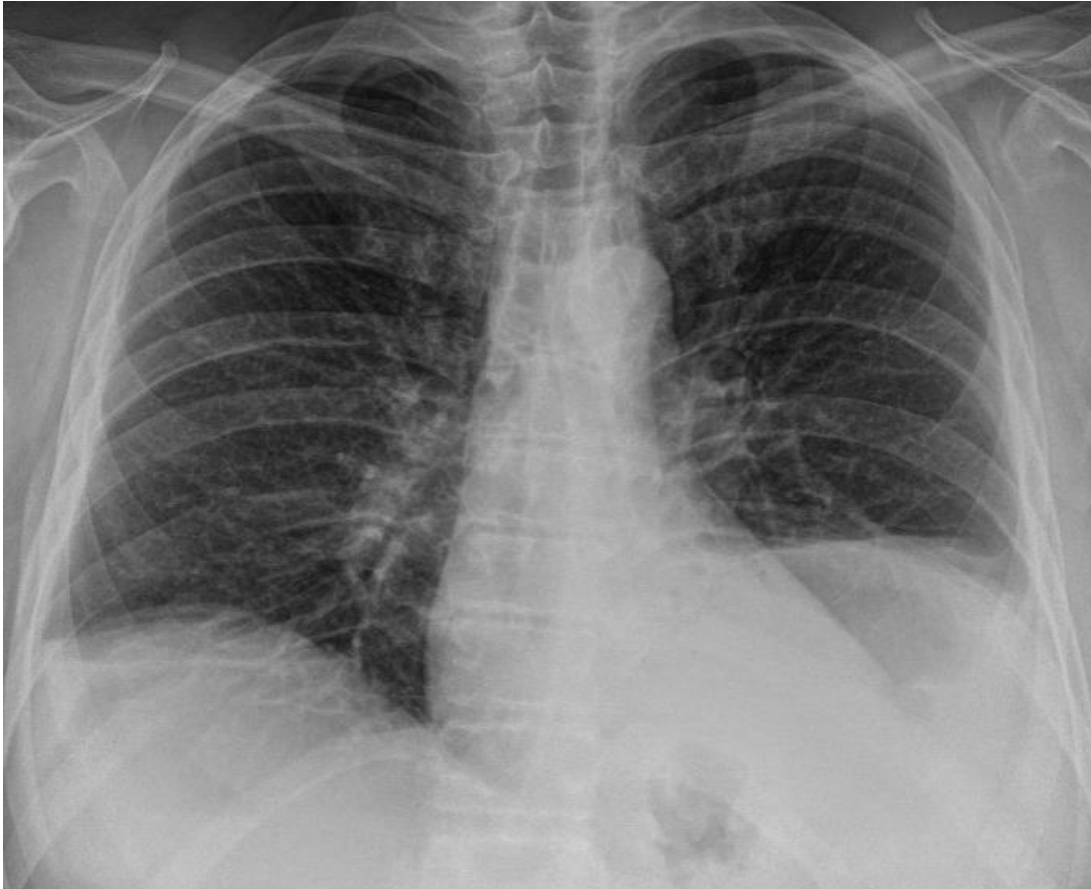
Case 1: 60 y/o, former smoker, presents to clinic with new onset cough, shortness of breath, pleuritic chest pain, and fever x 3 days.

- ▶ If you suspect a diagnosis of pneumonia, a chest x-ray should be obtained to confirm it.
- ▶ Outpatients who have the ability to undergo a PA/lateral should have this performed rather than an AP radiograph since the lateral image is the most sensitive view for pleural effusions and retrocardiac opacities.

Case 1: 60 y/o, former smoker, presents to clinic with new onset cough, shortness of breath, left pleuritic chest pain, and fever x 3 days.

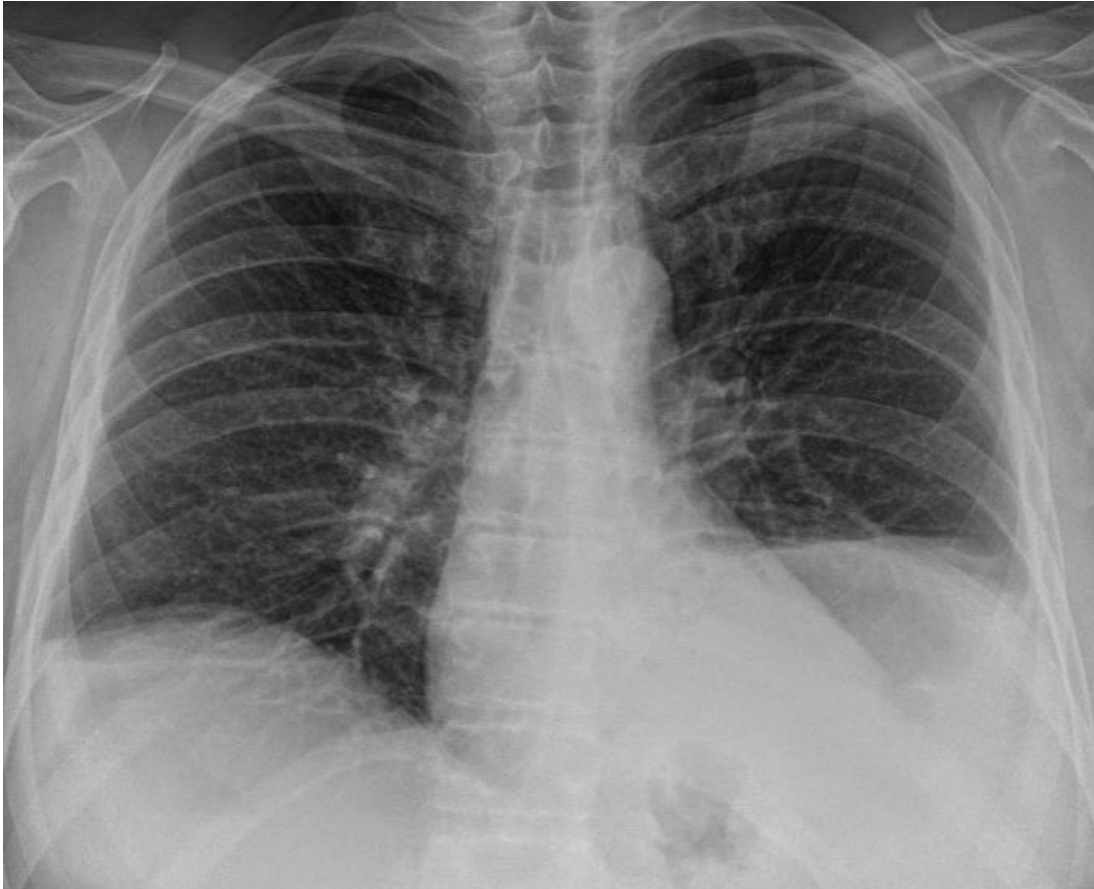


Case 1: 60 y/o, former smoker, presents to clinic with new onset cough, shortness of breath, left pleuritic chest pain, and fever x 3 days.



- ▶ **Question 1b: Based on the results of the PA/lateral CXR, what is the next best step?**
 - ▶ **A) Chest CT without contrast**
 - ▶ **B) CTA Pulmonary Angiogram (PE protocol CT)**
 - ▶ **C) Chest CT with contrast (standard protocol)**
 - ▶ **D) No further imaging**

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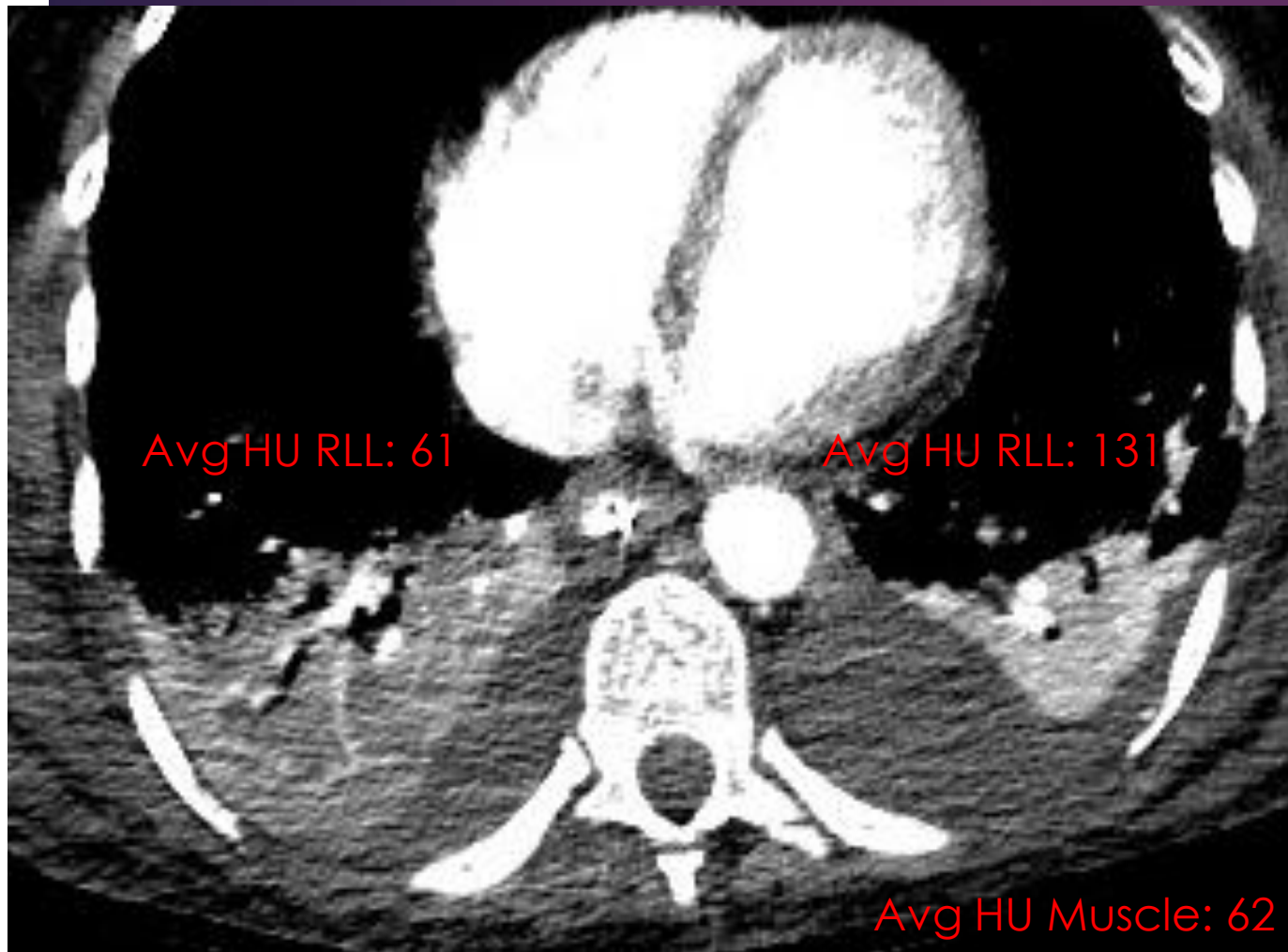


- If the CXR confirms pneumonia without complications, then no cross sectional imaging is required.

Case 1: 60 y/o, former smoker, presents to clinic with new onset cough, shortness of breath, left pleuritic chest pain, and fever x 3 days.

- ▶ **Question 1c: Patient and family insist on a chest CT and you decline. You get a phone call from the ED doc stating that the patient came to the ED to get a chest CT so they are going to order one. They ask your opinion on what type of chest CT to order. You say:**
 - ▶ **A) Chest CT without contrast**
 - ▶ **B) Chest CT with contrast (standard protocol)**
 - ▶ **C) CTA Pulmonary Angiogram (PE protocol CT)**
 - ▶ **D) Chest CT with and without contrast**

Atelectasis versus PNA on contrast CT



- ▶ Contrast helps!
- ▶ Atelectasis is HYPER-attenuating (with contrast) relative to paraspinal musculature.
- ▶ HYPO-attenuation suggests consolidation (from pneumonia, aspiration, tumor).
- ▶ Severe HYPO-attenuation suggests necrosis.

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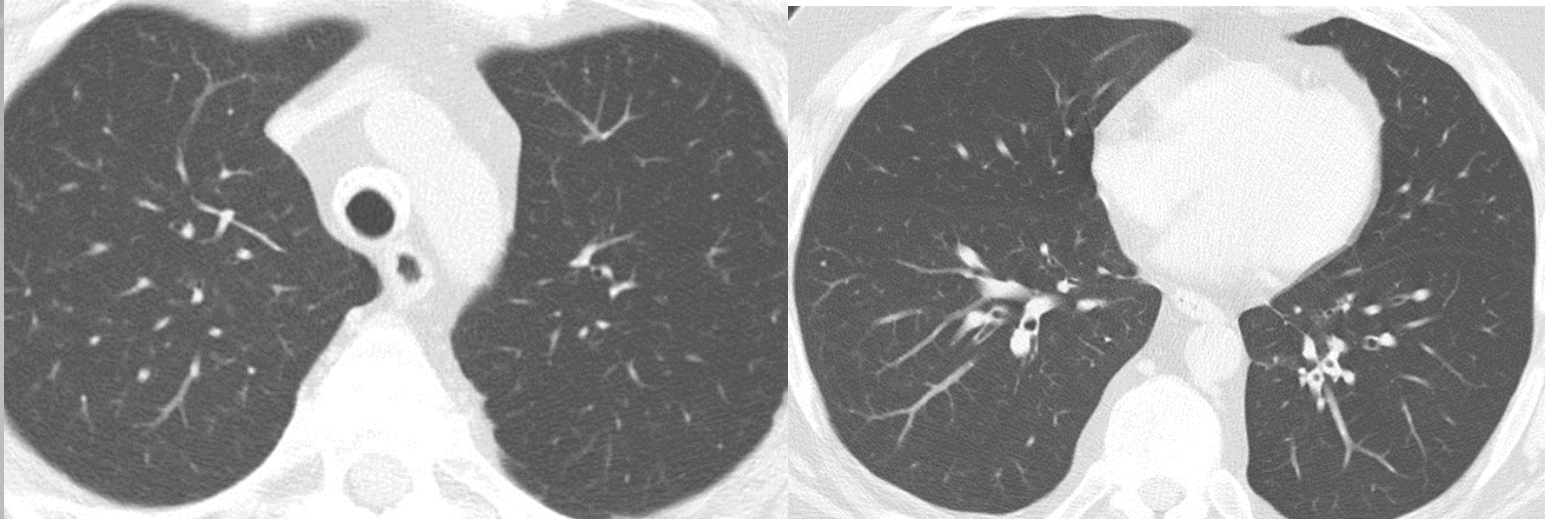
- ▶ **Question 1d: The patient undergoes chest CT with contrast which confirms the clinical diagnosis of pneumonia with a trace parapneumonic effusion. The patient is initiated on antibiotics and feels better. Does the patient need follow-up imaging?**
 - ▶ **A) No**
 - ▶ **B) Yes in 2-4 weeks**
 - ▶ **C) Yes in 8-12 weeks**
 - ▶ **D) Yes in 6 months**

Case 1 TEACHING POINTS

- ▶ All contrast-enhanced CTs are not the same.
- ▶ If you obtain a PE protocol CT, you are compromising the contrast enhancement of the lung parenchyma and pleura, so if evaluating that is more important, then get a routine chest CT with contrast (not a CTA pulmonary angiogram).
- ▶ Contrast (in the venous phase) helps distinguish atelectasis from pneumonia.
- ▶ Follow-up imaging (CXR) is important to ensure complete resolution of pneumonia in patients > age 50 and with risk factors for malignancy*. It can take up to 12 weeks for a pneumonia to completely resolve.

* Little BP et al. Outcome of recommendations for radiographic follow-up of pneumonia on outpatient chest radiography. AJR 2014; 202:54-9.

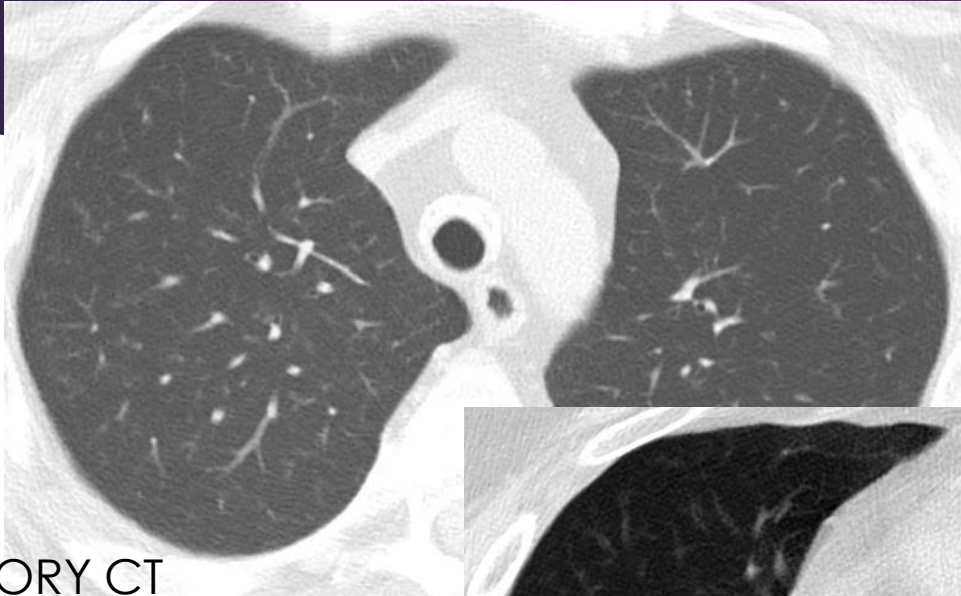
Case 2: 55 y/o with history of COPD presents with chronic cough and chronic dyspnea despite repeated doses of steroids. Prior workup includes negative CXR and chest CT.



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- ▶ **Question 2: What is the best next step?**
 - ▶ **A) CTA Pulmonary Angiogram (PE protocol CT)**
 - ▶ **B) Repeat CXR**
 - ▶ **C) Repeat Chest CT without contrast**
 - ▶ **D) Paired inspiratory/expiratory chest CT**
 - ▶ **E) High resolution chest CT**

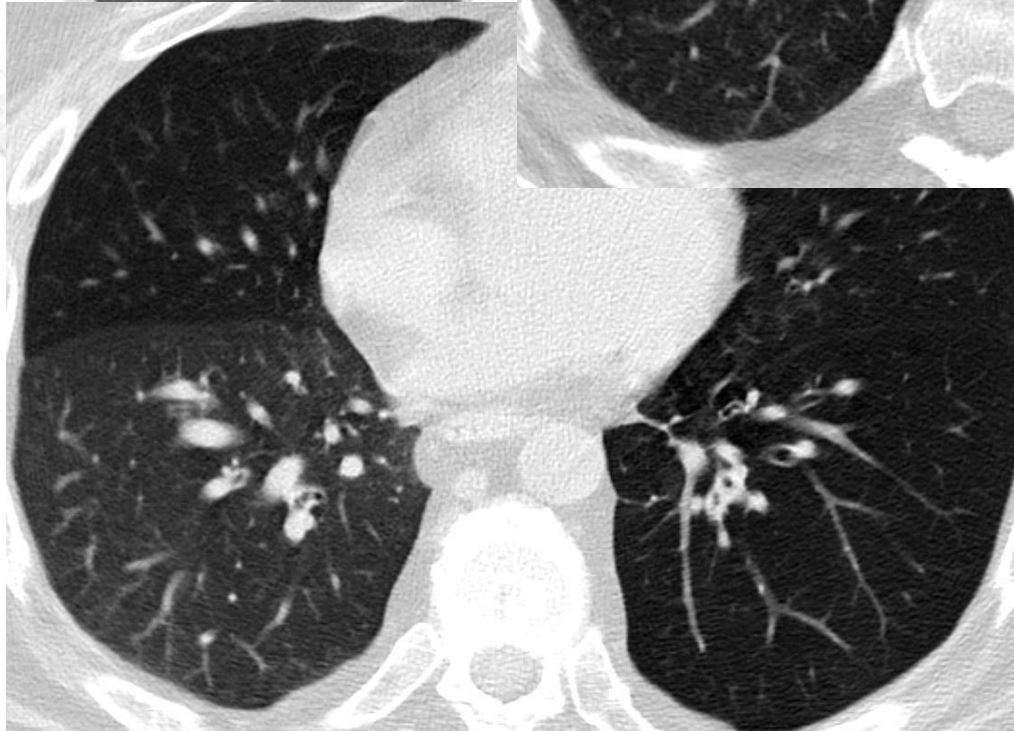
Case 2: COPD with chronic cough/dyspnea and prior negative CT.



INSPIRATORY CT

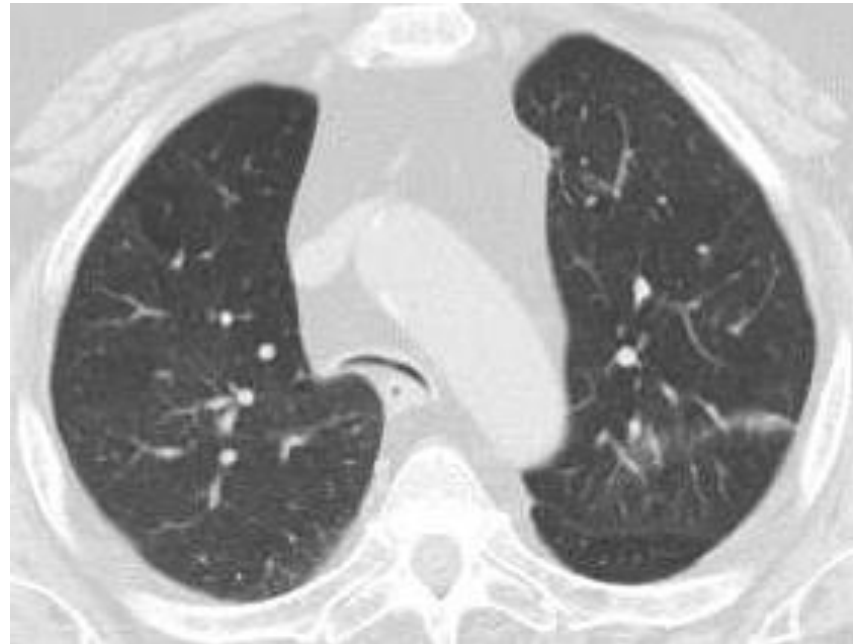
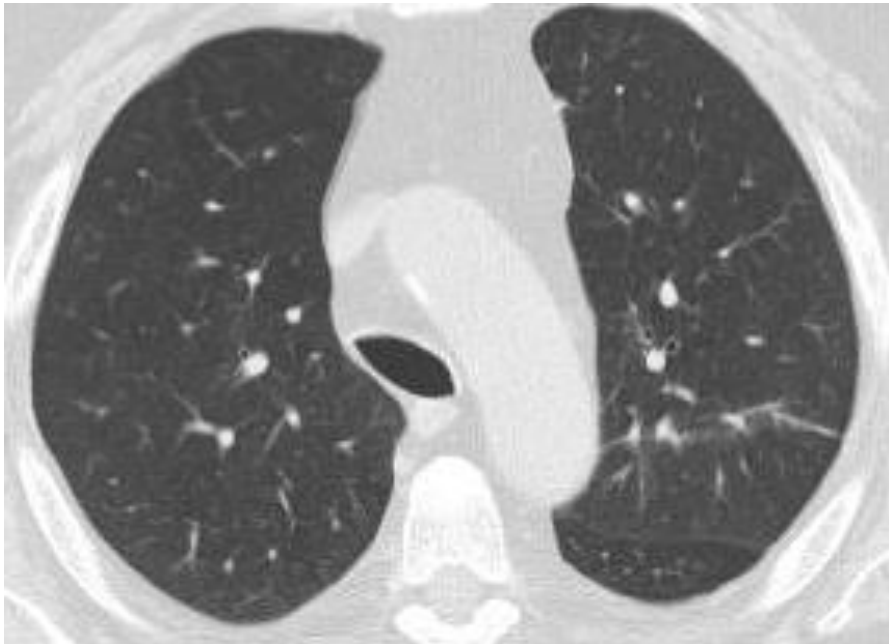


EXPIRATORY CT



Case 2 **TEACHING POINTS**

- ▶ Tracheomalacia is an under-suspected diagnosis and is often the cause of chronic cough and/or dyspnea.
- ▶ It is often occult on CXR and routine inspiratory CT.



Case 2 TEACHING POINTS (cont'd)

- ▶ Tracheomalacia is diagnosed on expiratory phase CT (or by bronchoscopy) by >70% tracheal collapse on expiration.
- ▶ When severe (> 90% collapse), tracheal stent trial with possible surgery may be indicated.
- ▶ Steroids will worsen the problem.

Case 3: 77 y/o, former smoker, presents to clinic with unintentional 40 lb. weight loss over 1 month, new dyspnea, and hemoptysis.



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- ▶ Question 3: What is the best next step?
 - ▶ A) CTA Pulmonary Angiogram to exclude PE given hemoptysis and risk factor of likely new primary lung cancer
 - ▶ B) Chest CT with contrast to better evaluate the lymph nodes
 - ▶ C) Referral to radiology for percutaneous biopsy to secure diagnosis
 - ▶ D) Referral to pulmonology for bronchoscopic biopsy



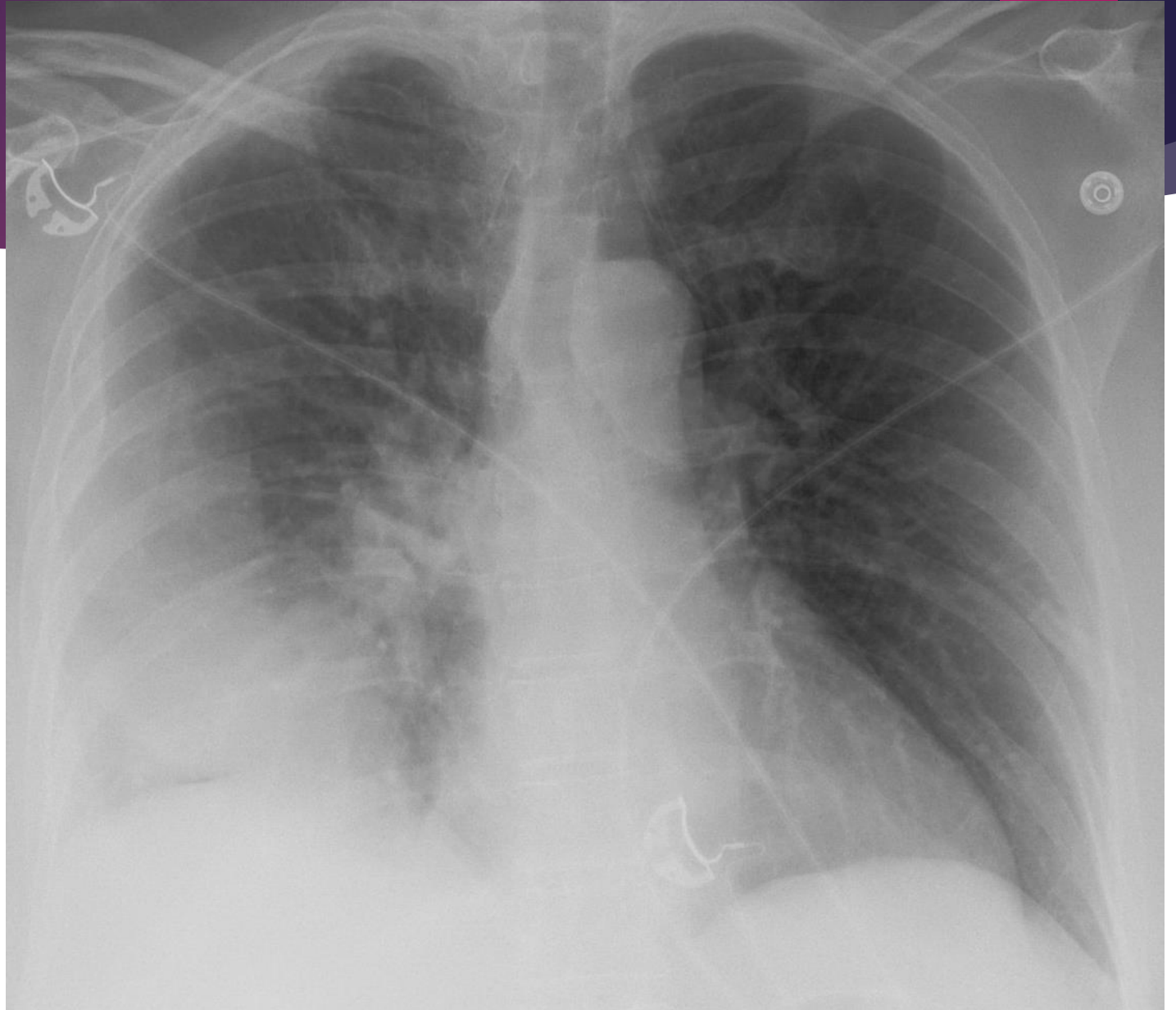
Case 3: 77 y/o, former smoker, presents to clinic with unintentional 40 lb. weight loss over 1 month, new dyspnea, and hemoptysis.

- ▶ If you can clearly see that there are enlarged lymph nodes on the CT, then you will need to biopsy these to ensure that they are not malignant.
- ▶ Although contrast can help in visualizing borderline-sized hilar lymph nodes on suboptimal CT, it will not change the fact that the patient will need a complete lymph node staging in this case.

Case 3 **TEACHING POINTS**

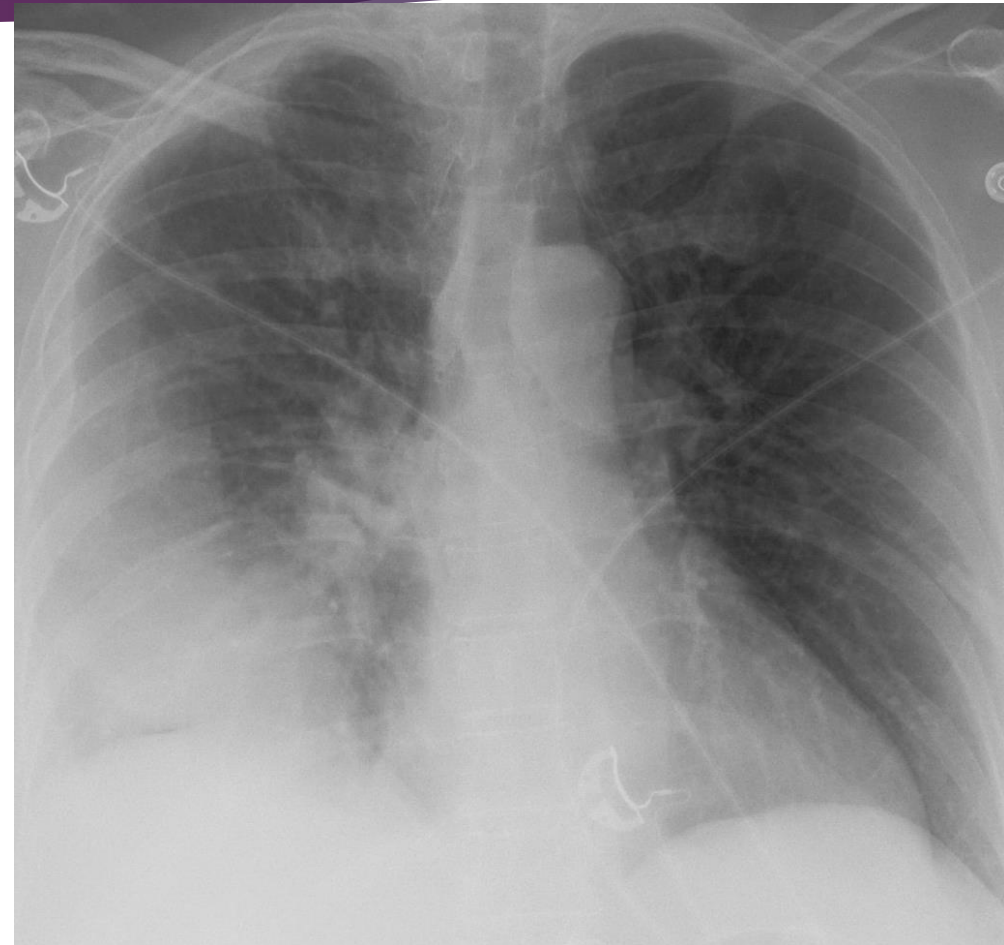
- ▶ Always upstage the patient! (you don't want to offer them surgery if they have contralateral lymph node mets or distant disease).
- ▶ If diagnosis of malignancy is clear, PET CT is often done first (if patient is outpatient) to identify most distant site for biopsy.
- ▶ If diagnosis is unclear and includes infection, then biopsy of lymph node or mass is often performed first.
- ▶ Pleural fluid sampling may be helpful for diagnosis (although yield is only 85% after 3 thoracenteses), but tissue is usually needed for molecular markers to determine therapy.

Case 4: 37 y/o presents with new onset fevers, chills, pleuritic chest pain, and cough productive of green sputum. Patient is tachycardic and tachypneic.



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- ▶ **Question 4a: What is the best next step?**
 - ▶ **A) Antibiotics, no further imaging for now**
 - ▶ **B) PA/lateral CXR**
 - ▶ **C) Chest ultrasound**
 - ▶ **D) Chest CT with contrast (standard protocol)**
 - ▶ **E) CTA Pulmonary Angiogram (PE protocol) given associated tachycardia and tachypnea**

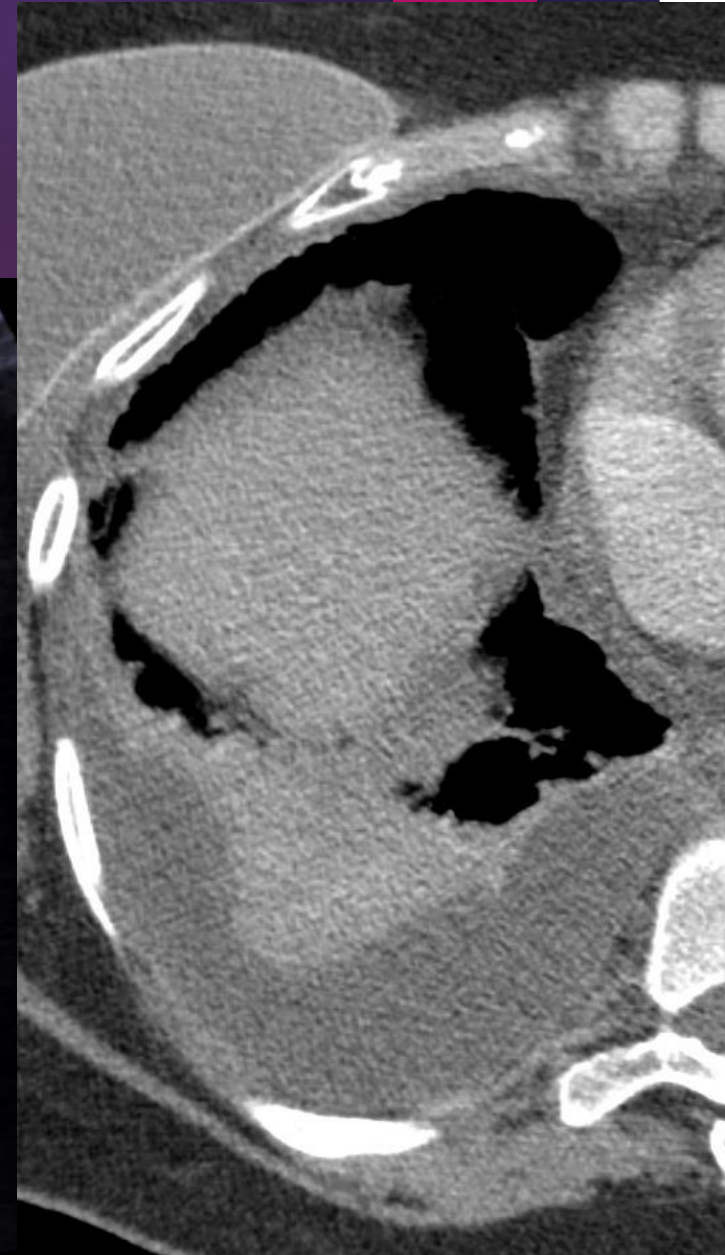
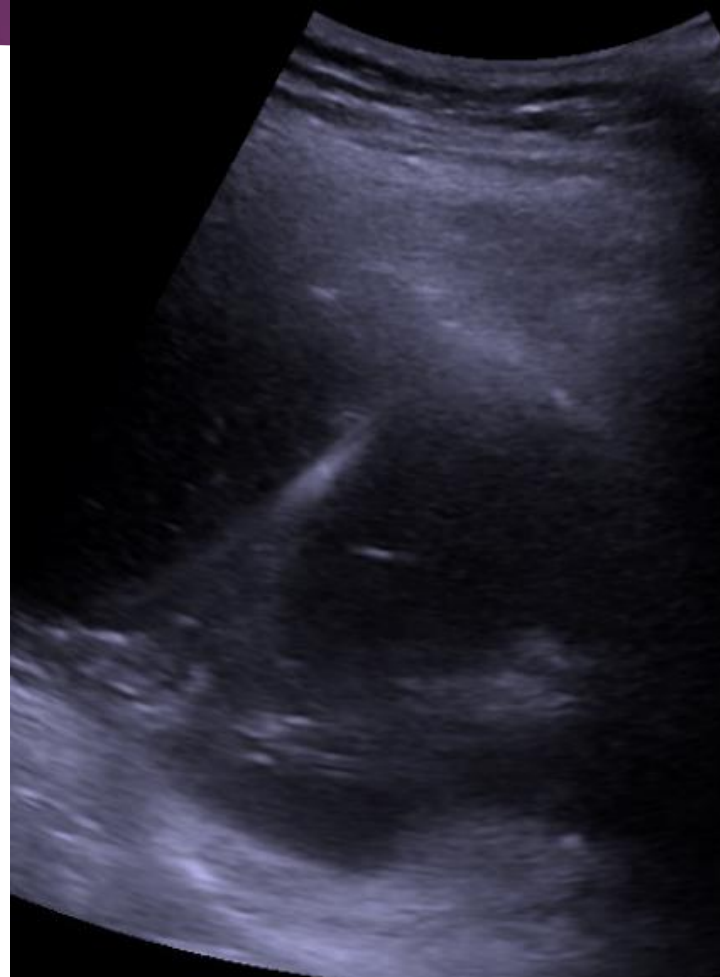


Case 4: 37 y/o presents with new onset fevers, chills, pleuritic chest pain, and cough productive of green sputum. Patient is tachycardic and tachypneic.

- ▶ **Question 4b: Ultrasound shows multiple loculated pockets of debris-filled fluid with presence of thick septations. What is the best next step?**
 - ▶ **A) Diagnostic thoracentesis**
 - ▶ **B) Diagnostic and therapeutic thoracentesis**
 - ▶ **C) Tube thoracostomy (chest tube)**
 - ▶ **D) Chest CT with contrast (standard protocol)**
 - ▶ **E) Admission with close clinical monitoring and repeat imaging after trial of antibiotics**

Case 4 TEACHING POINTS

- ▶ If you see a parapneumonic effusion, particularly one that is more than trace, obtain a chest ultrasound for further evaluation.
- ▶ Ultrasound is the *gold standard* for evaluation of pleural effusions due to high sensitivity for visualization of loculations/septations.



Case 4 **TEACHING POINTS (cont'd)**

- ▶ A persistent loculated pleural effusion can result in a chronic fibrothorax and therefore chronic restrictive lung disease. Time is lung and pleura.
- ▶ Effusions containing thick septations often require intrapleural fibrinolytics to adequately drain the effusion, so early placement of chest tube is necessary.
- ▶ Don't wait—chest tubeate!

DO THIS, DON'T DO THAT SUMMARY

- ▶ A CTA Pulmonary Angiogram (PE protocol CT) is NOT the same thing as a chest CT with contrast. The PE CT is performed approximately 30 seconds earlier and provides limited evaluation of the lung parenchyma and pleura. *Don't* get a PE CT if you aren't truly concerned that the patient has a PE.
- ▶ Chest CT with contrast (routine protocol) helps distinguish atelectasis from pneumonia, as well as exudative from transudative effusions.
- ▶ *Do* get follow-up imaging (CXR) approximately 8-12 weeks after antibiotics in patients > age 50 and with risk factors for malignancy in order to ensure there is no persistent mass or post-obstructive pneumonia.
- ▶ In a patient with chronic cough/dyspnea without improvement despite repeated courses of steroids, *do* consider the diagnosis of tracheomalacia; work this up with paired inspiratory/expiratory phase CT.

Summary (cont'd)

- ▶ For cancer work-up, always sample from the highest possible level of involvement so that you can accurately stage the patient. *Don't* just biopsy the most obvious/largest site.
- ▶ Ultrasound is the gold standard for evaluation of pleural effusions due to high sensitivity for visualization of loculations. *Do* get a chest ultrasound if you think the patient has a drainable parapneumonic effusion.
- ▶ With a highly loculated parapneumonic effusion, *do* consult pulm or thoracic surgery early on for chest tube placement (and possible intrapleural fibrinolytics). Time is lung and pleura.

Questions?

- ▶ Do contact me if you have questions:

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