

# PNEUMONIA

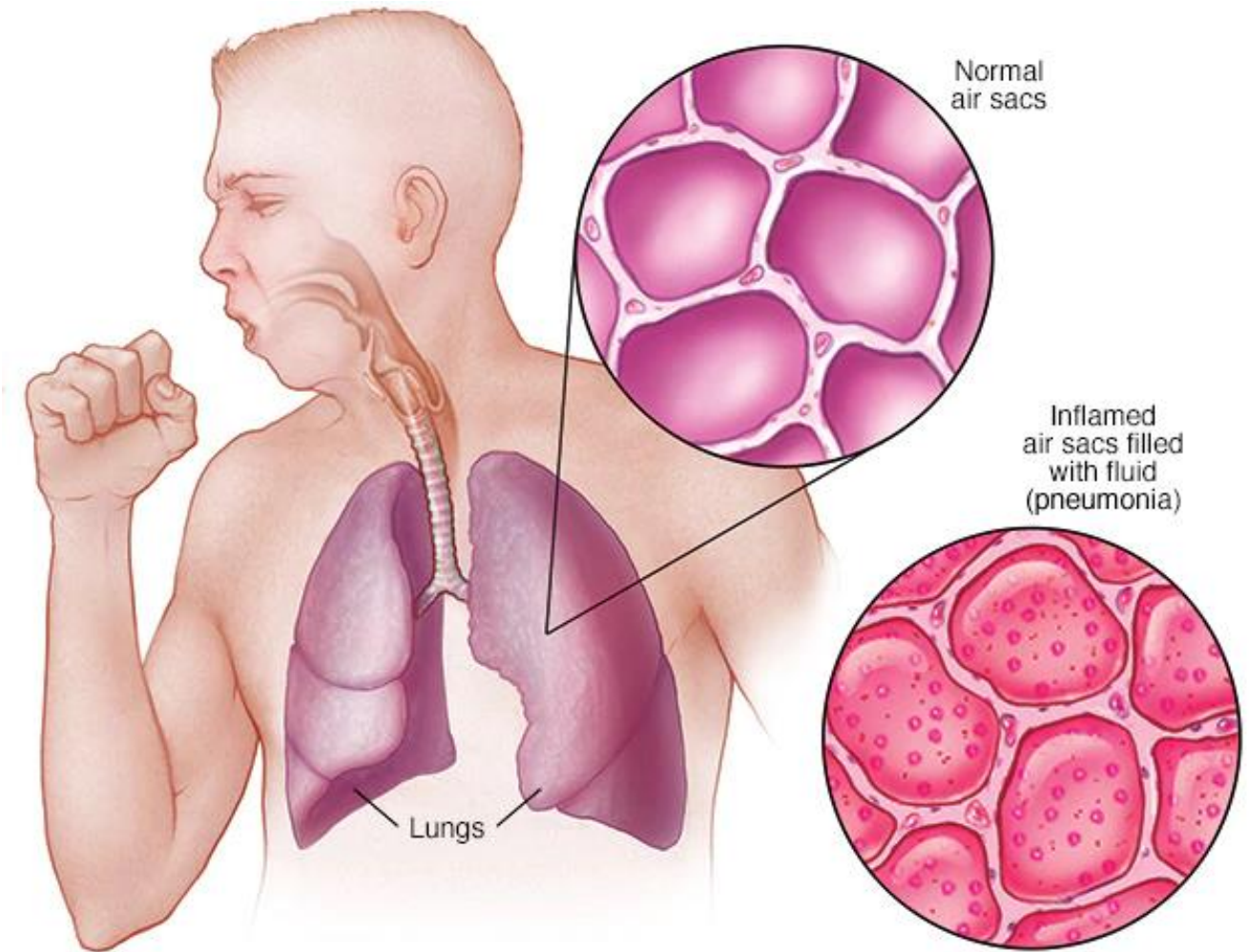
*Vin Kie (Grace) Chong & Siddharth Shah*

## PNEUMONIA: KEY FACTS

- At risk groups for developing pneumonia: **young children or those who are > 65 years old (with/without comorbidities)**<sup>1</sup>
- According to the World Health Organization (WHO), pneumonia is one of the *leading infectious causes of death* in children worldwide<sup>2</sup>
  - Accounts for **15%** of all deaths in children < 5 years old<sup>2</sup>

# WHAT IS PNEUMONIA?

- An infection that can affect the alveoli (air sacs of the lungs) of one or both lungs
- Can be a mild to severe disease based on multiple factors
- **Subtypes of pneumonia include:**
  - *Bacterial* pneumonia (most common)
  - *Viral* pneumonia
  - *Fungal* pneumonia
  - *Other* pneumonia — less common



# NOW THAT WE'VE LEARNED ABOUT THE DIFFERENT SUBTYPES OF PNEUMONIA...

How can we differentiate between the different subtypes of pneumonia?



- Several studies have suggested that chest radiography *cannot* be used to differentiate nonbacterial pneumonia from bacterial pneumonia<sup>1</sup>
  - **If this is the case, how do we make the proper diagnosis and provide the appropriate course of treatment?**

# KEYS TO DIAGNOSIS

## Patient Medical History

- 25 y/o pt with no significant pmhx presents to the office with a sudden onset of fever, cough, and shortness of breath — what would be the first thing (or one of the first things) you suspect?

## Physical Examination

- **Common Signs and Symptoms<sup>1</sup>:**
  - Fever
  - Chills
  - Cough with/without (purulent/bloody) sputum
  - Shortness of breath
  - Chest pain when breathing/coughing
  - Tachycardia
  - Tachypnea
  - Decreased breath sounds
  - Crackles (rales)<sup>2</sup> 
  - Ronchi<sup>3</sup> 
- \* Presentation may vary for different groups

What is the next course of action to confirm our diagnosis?

# LABS & OF COURSE, IMAGING

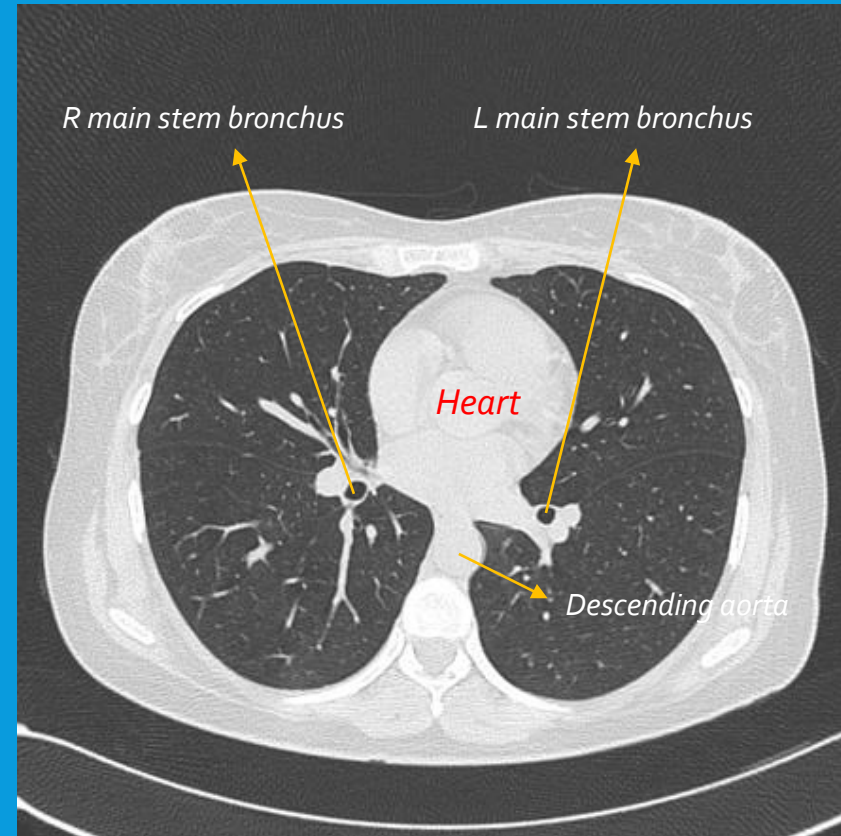
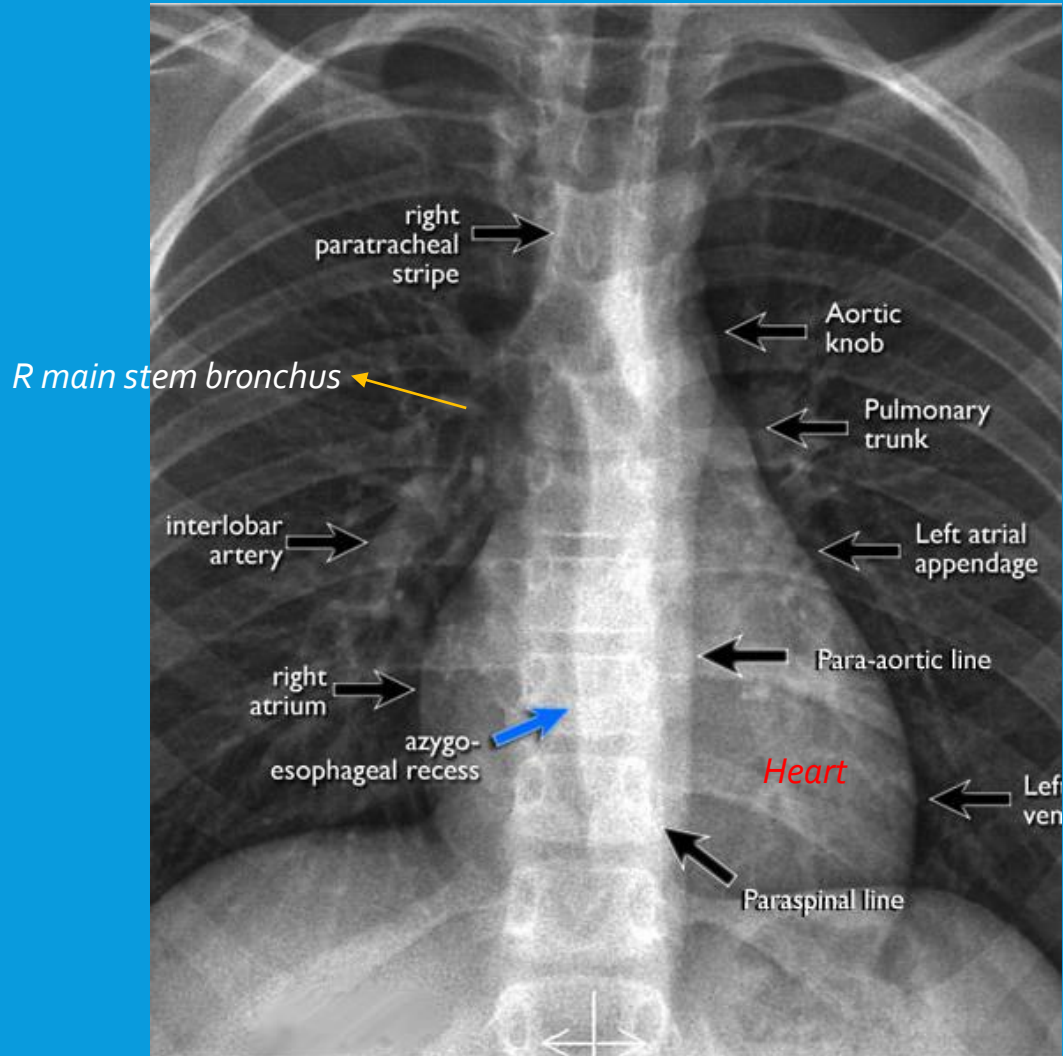
## Labs:

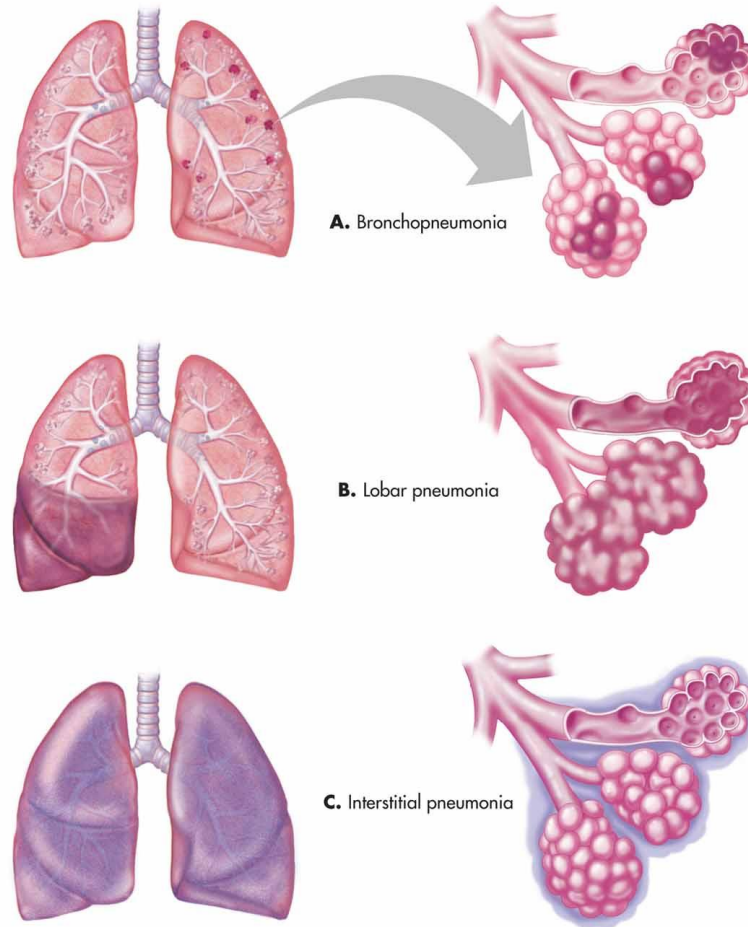
- Tests/results vary depending on the etiology of the pneumonia<sup>1</sup>
  - **If bacterial** — + bacterial sputum cultures and gram stains, CBC abnormalities (marked left shift), etc.
  - **If viral** — + Influenza and RSV tests, viral cultures, CBC abnormalities (lymphocytosis)

## Diagnostic Imaging<sup>2</sup>:

- **Chest X-ray (*radiography*)**
  - Standard modality — used to detect and help evaluate the severity of infection
- Chest CT (*computed tomography*) scan
- Needle biopsy of the lung
- **Further diagnostics/therapeutic interventions:** thoracentesis, chest tube placement, or image-guided abscess drainage

# BEFORE WE DIVE INTO ABNORMAL IMAGINGS...

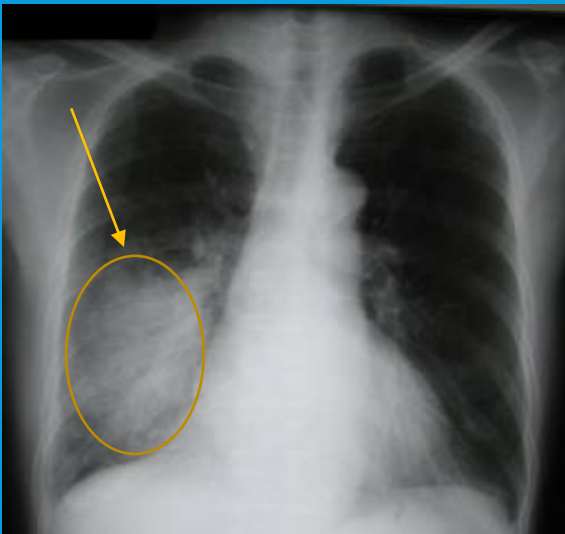




### 3 DIFFERENT PATTERNS OF PNEUMONIA

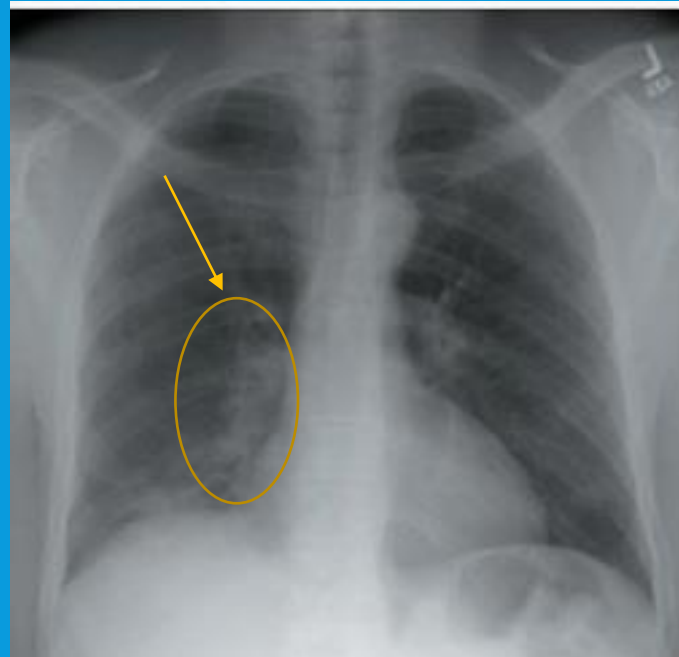


# WHERE SHOULD WE LOOK?



## Lobar pneumonia

- *Lobar* distribution
- Usually bacterial; CAP



## Bronchopneumonia

- *Patchy* distribution
- Usually bacterial; HAP



## Atypical (interstitial) pneumonia

- *Diffuse* infiltrates with perihilar concentration
- Mostly viral but can also be bacterial

# BACTERIAL PNEUMONIA

## Most common subtype of pneumonia!

- Can be *primary*, *secondary* to a viral infection, or a *co-infection* with a virus<sup>1</sup>
- Common cause of community-acquired pneumonia (CAP)
  - Most common cause of CAP: *Streptococcus pneumoniae*<sup>2</sup>

## Sign/Symptom of Interest:

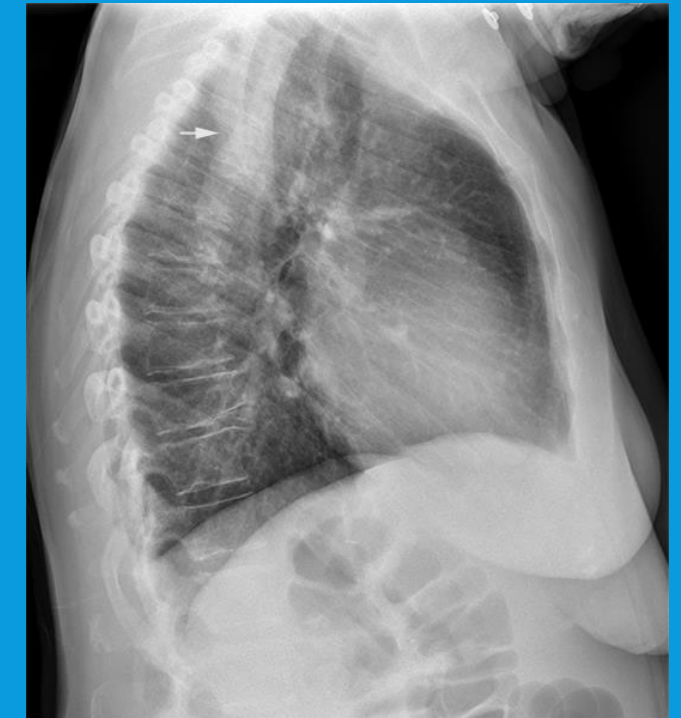
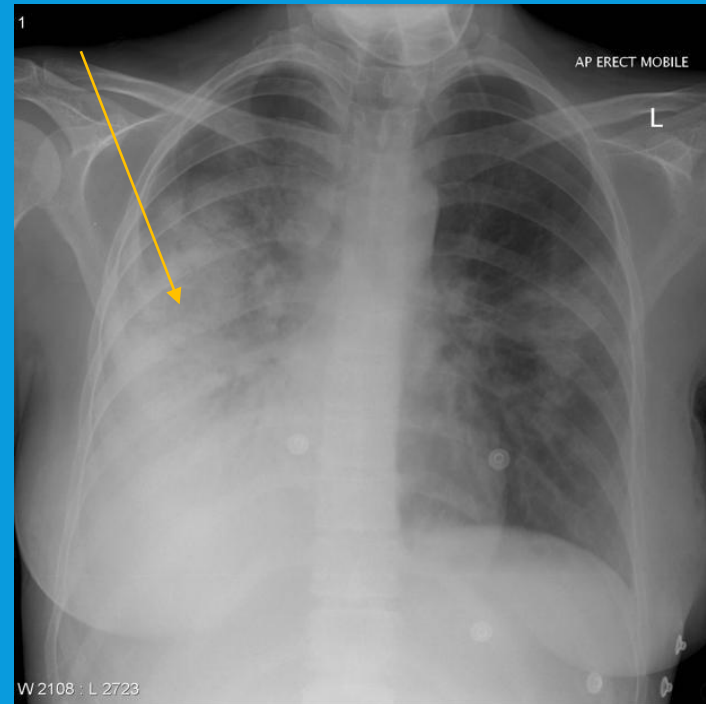
- Cough — if productive, *purulent/blood-stained sputum* suggests bacterial vs. viral pneumonia

## Treatment:

- Antibiotic therapy
  - Choice of Rx & ROA depends on severity and type of pneumonia (CAP vs. HAP)

## Complications:

- Pneumonia can usually be treated successfully without further complications<sup>3</sup>
  - However, if complications do arise, it's typically in high risk groups: children, older adults, and people with comorbidities
- Ex: cavitation, lung abscess, pneumatocele, parapneumonic effusion, empyema<sup>4,5</sup>



Lateral view: LUL pneumonia

# VIRAL PNEUMONIA

## Common Causes<sup>1</sup>:

- Respiratory Syncytial Virus (RSV) — most common
- Influenza
- SARS-CoV-2 (COVID-19 pneumonia)

## Sign/Symptom of Interest:

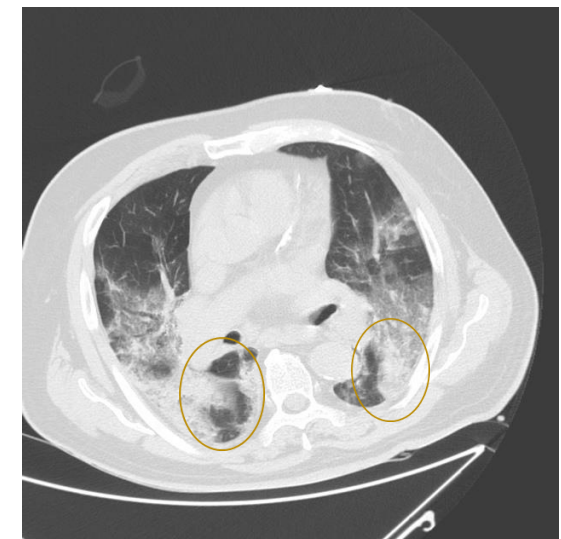
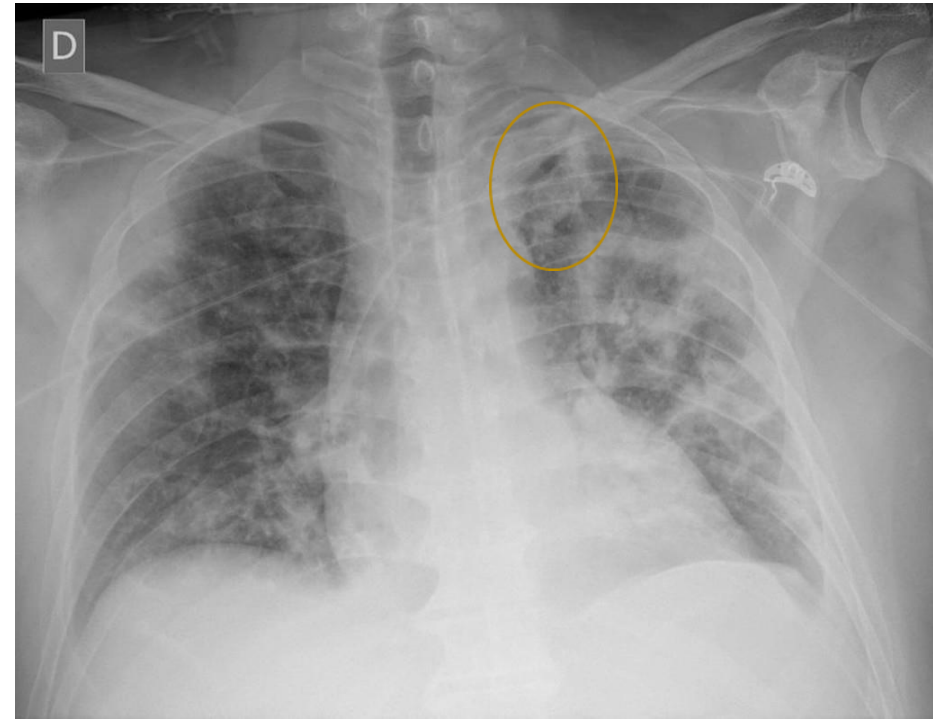
- *Wheezing* — more common in viral vs. bacteria pneumonia<sup>2</sup>

## Treatment:

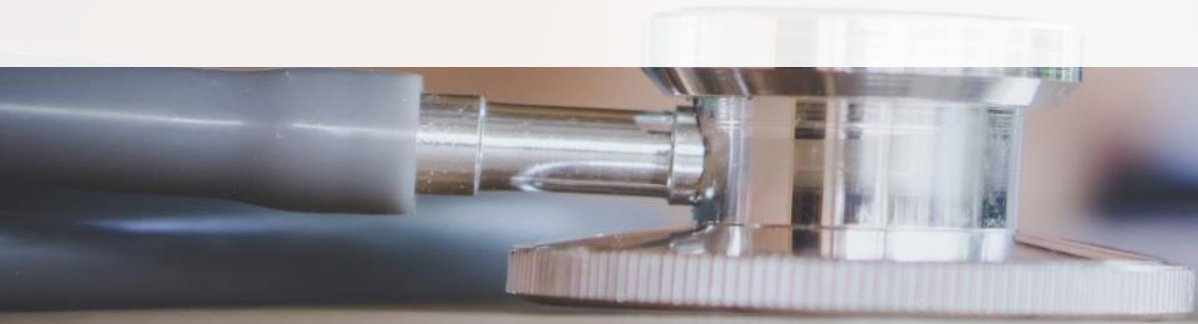
- Supportive care — Rx for controlling flu-like sx's, increase fluid intake/rest, O<sub>2</sub> supplement if necessary

## Prevention:

- Vaccination against Influenzas, RSV, and **COVID-19** helps to lower chances of developing pneumonia



SOME MORE IMAGINGS 😊



Q: WHERE IS THE ABNORMALITY IN THIS CXR?

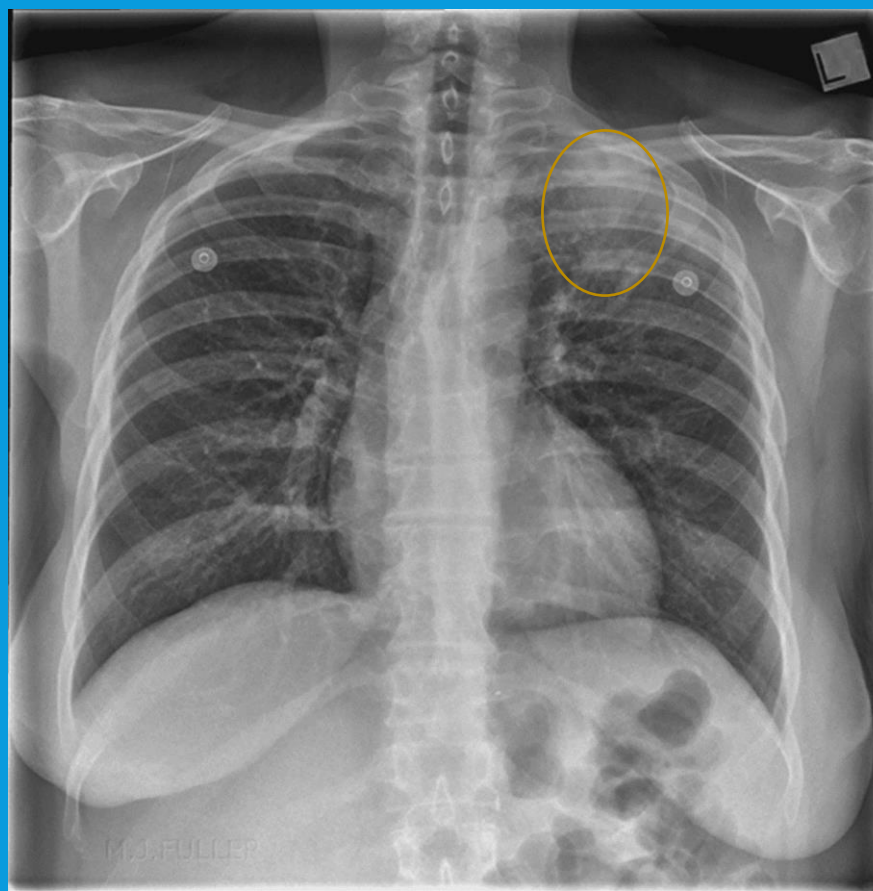


# Q: WHERE IS THE ABNORMALITY IN THIS CXR?

A: consolidation at the left upper lobe

**But how do we know it's pneumonia and not a malignancy?**

*It all comes down to patient history...  
(for the millionth time)*



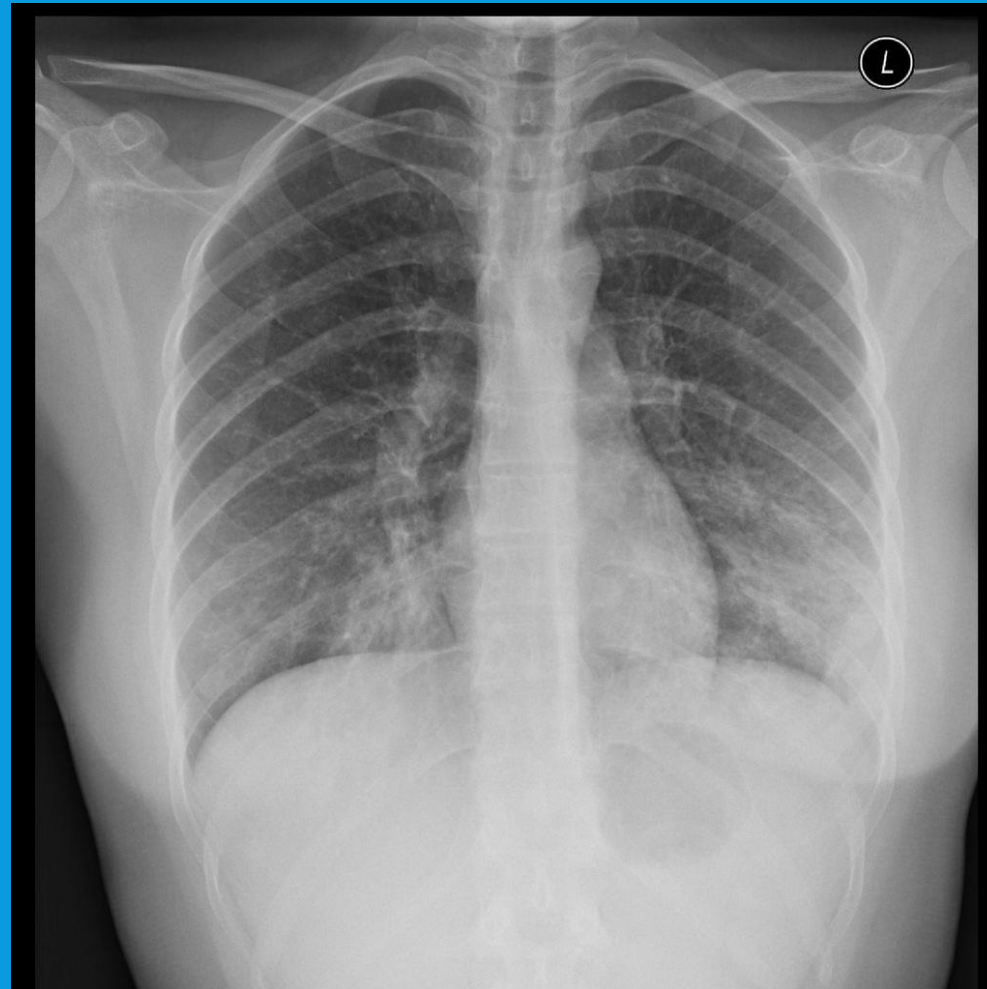
If pt presents with sxs like fever, chills, malaise, and the infection has an *acute/sudden onset...*  
→ suspect **pneumonia**

If *gradual onset* and accompanied by weight loss...  
→ suspect **malignancy**

\* Further testing is always an option

Q: WHICH OF THE 3 PATTERNS OF PNEUMONIA DOES THIS CXR SHOW?

REMINDER: *LOBAR PNEUMONIA, BRONCHOPNEUMONIA, ATYPICAL PNEUMONIA*



# A: ATYPICAL PNEUMONIA, AKA "WALKING" PNEUMONIA

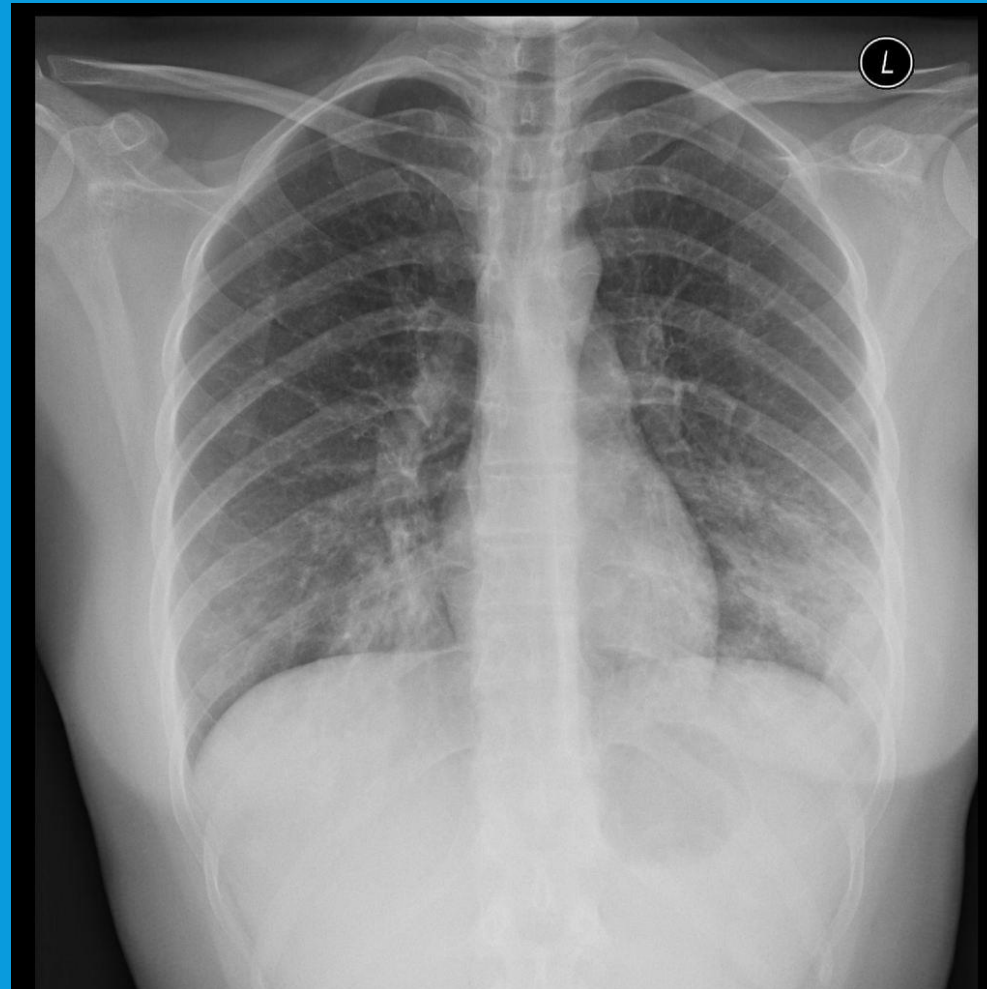
*NOTICE BILATERAL DIFFUSE, NON-SEGMENTAL OPACITIES, SUGGESTIVE OF ATYPICAL PNEUMONIA*

## **Patient history:**

35 y/o non-smoker presents to the office c/o dry cough x 2 wks...

## **What can we do to confirm that this is actually pneumonia?**

- Additional testing, i.e. a nasal swab DNA PCR (+ for *Mycoplasma pneumoniae*, most common cause of atypical pneumonia)

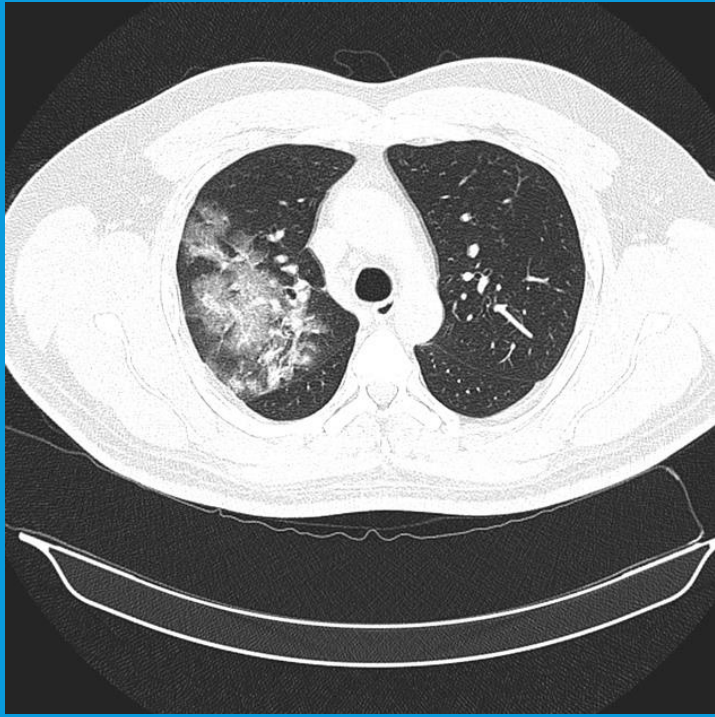




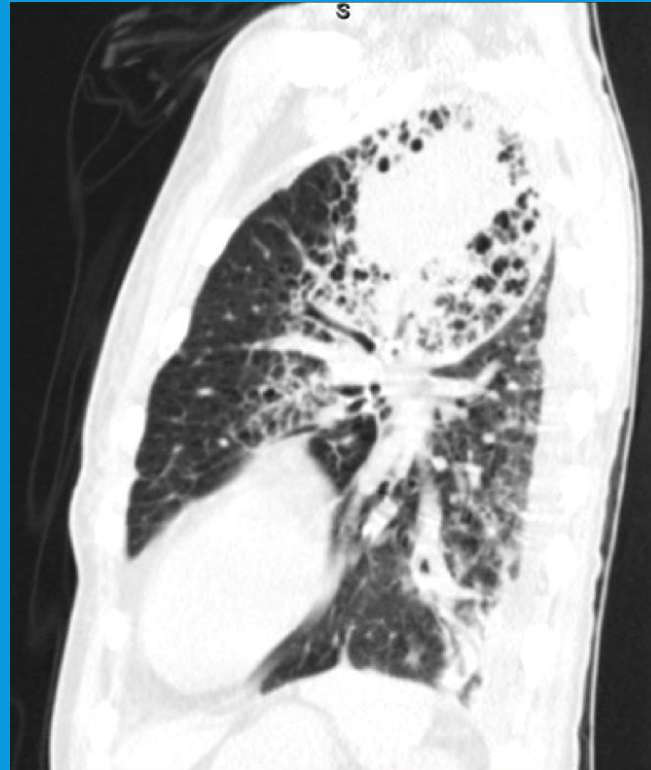


TIME FOR CHEST CTS

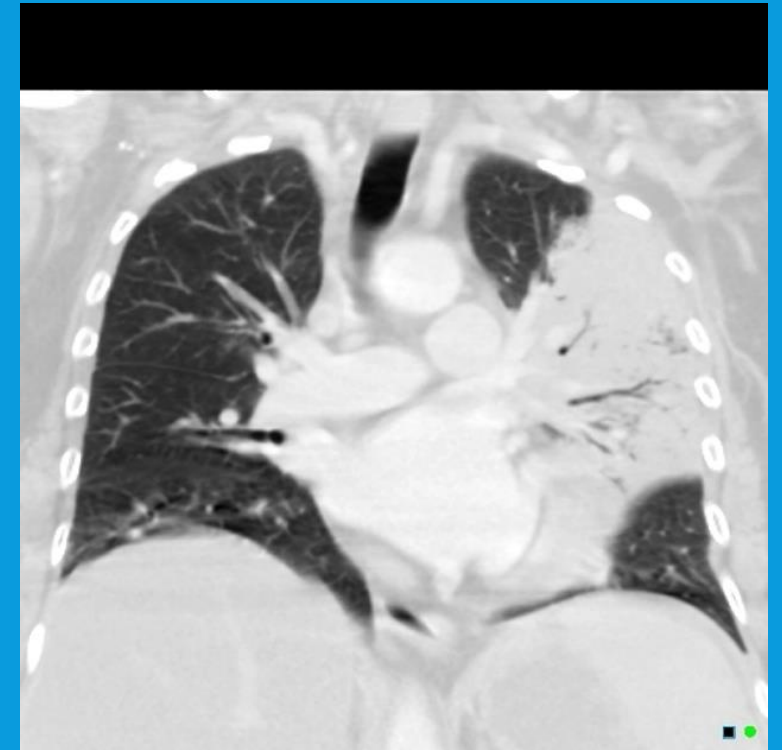
# FIRST, LET'S ORIENT OURSELVES...



Axial plane



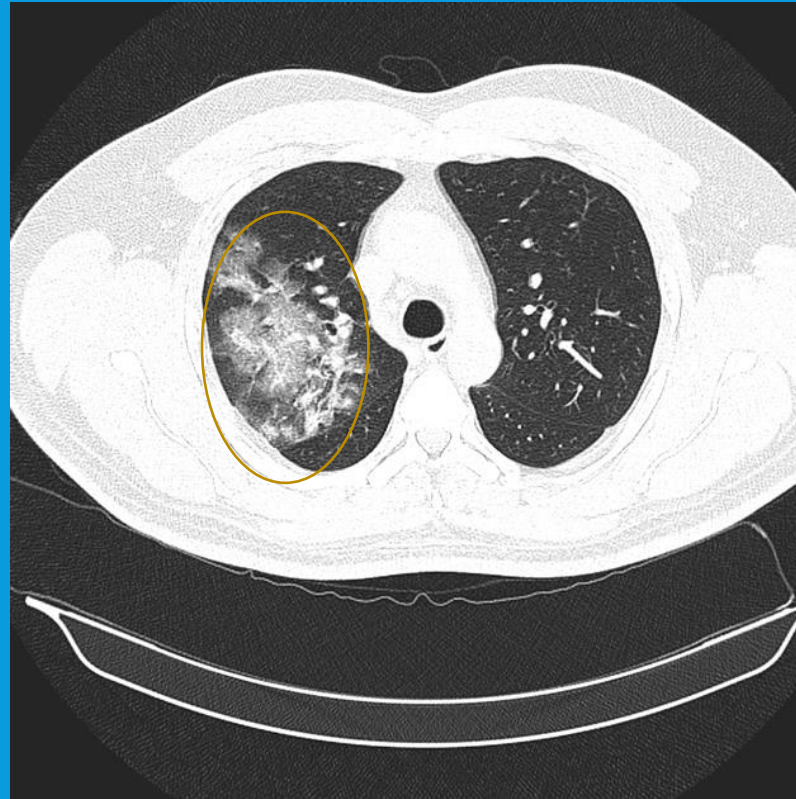
Sagittal plane



Coronal plane

# COVID-19 PNEUMONIA

**Patient History:**  
Pt presents with  
high fever, cough,  
difficulty expanding  
lungs, and dyspnea  
x 8 days<sup>1</sup>

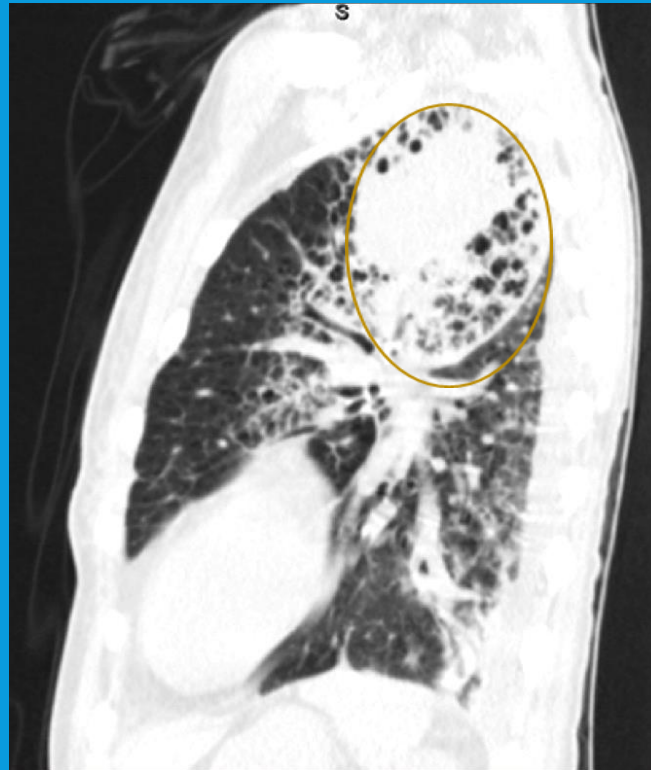


Axial plane

Areas of *ground-glass opacity*  
(increased attenuation) suggests  
infection, chronic interstitial  
disease, or acute alveolar disease<sup>2</sup>

# “RARE” TYPE OF PNEUMONIA

**Patient History:**  
56 y/o F with fever, chills,  
sweating, dyspnea, and  
decreased air entry x 1 day

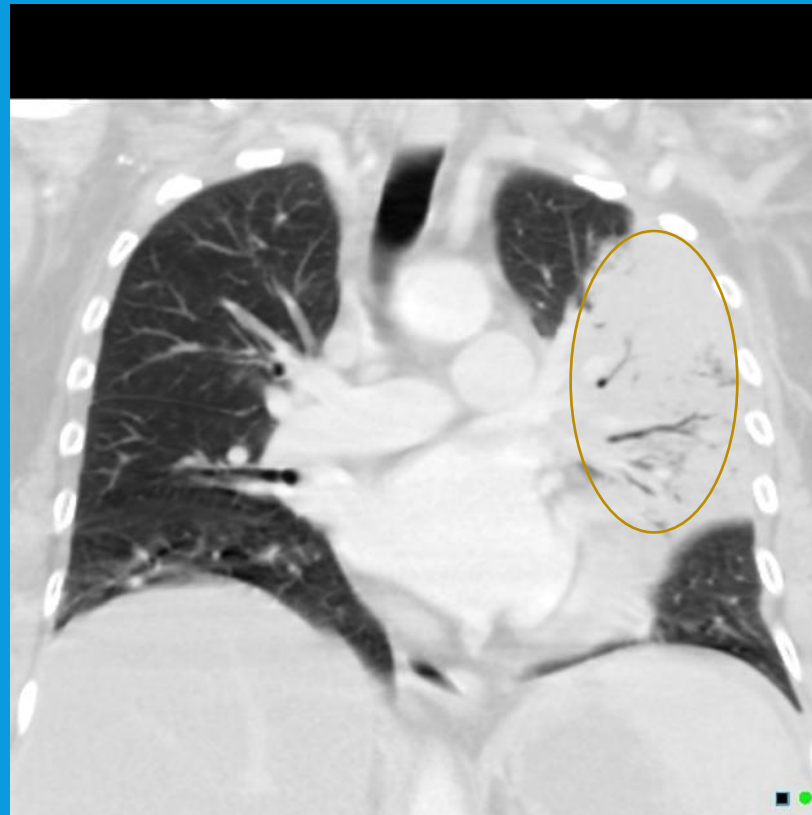


Sagittal plane

**Acute fibrinous organizing pneumonia (AOFP) —**  
left upper lobe  
*consolidation* (small  
airways filled with pus,  
blood, water, and fluid)

# MORE BACTERIAL PNEUMONIA

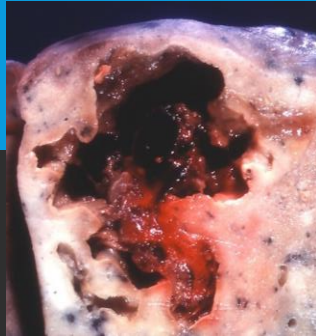
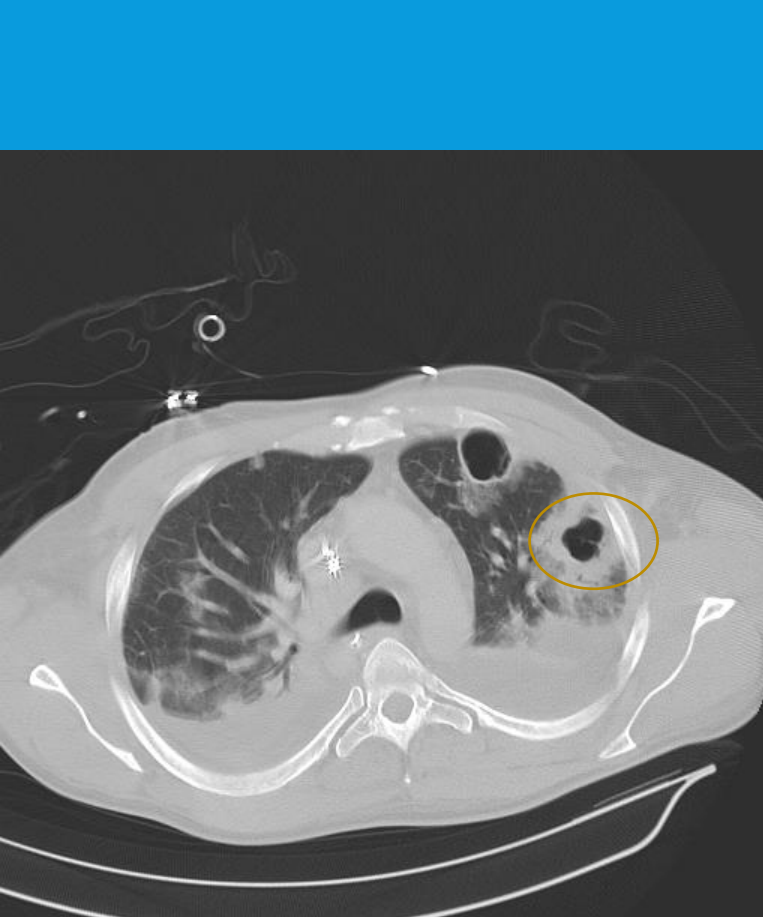
**Patient History:**  
55 y/o M smoker  
c/o chest pain,  
fever, and cough



Coronal plane

Left upper lobe — the lung is dense and has the appearance of a liver — “hepatization”

# PNEUMONIA — COMPLICATIONS



## Abscess/Cavitary Lesion

- Complications from necrotizing pneumonia
- Rare complication
- Rare in both pediatrics & adults



# REFERENCES

- Slide 2: See 'Notes' for multiple sources
- Slide 4: <https://emedicine.medscape.com/article/360254-overview>
- Slide 5: See 'Notes' for multiple sources
- Slide 6: See 'Notes' for multiple sources
- Slide 7: <https://alancam.com/study/path/view.php?url=Pulmonary%20Infections-%20Pathoma.html> (image & notes)
- Slide 8: See 'Notes' for multiple sources
- Slide 9: See 'Notes' for multiple sources
- Slide 10: See 'Notes' for multiple sources
- Slide 11: See 'Notes' for multiple sources
- Slide 12-13: Slide 28 of Pulmonary Imaging PowerPoint, courtesy of Dr. Bernard Beckerman
- Slide 14-15: <https://radiopaedia.org/cases/atypical-pneumonia-mycoplasma?lang=us> (image & notes)
- Slide 17: See 'Notes' for multiple sources
- Slide 18: See 'Notes' for multiple sources
- Slide 19: See 'Notes' for multiple sources
- Slide 20: [https://www.researchgate.net/figure/CT-Chest-showing-the-left-upper-lobe-consolidation-in-a-lateral-sagittal-view\\_fig7\\_316937874](https://www.researchgate.net/figure/CT-Chest-showing-the-left-upper-lobe-consolidation-in-a-lateral-sagittal-view_fig7_316937874)
- Slide 21: <https://radiopaedia.org/cases/lobar-pneumonia-ct-findings?lang=us>
- Slide 22: See 'Notes' for multiple sources