Night Float Module Interpretation of Chest Radiographs

National Pediatric Nighttime Curriculum

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Goals And Objectives

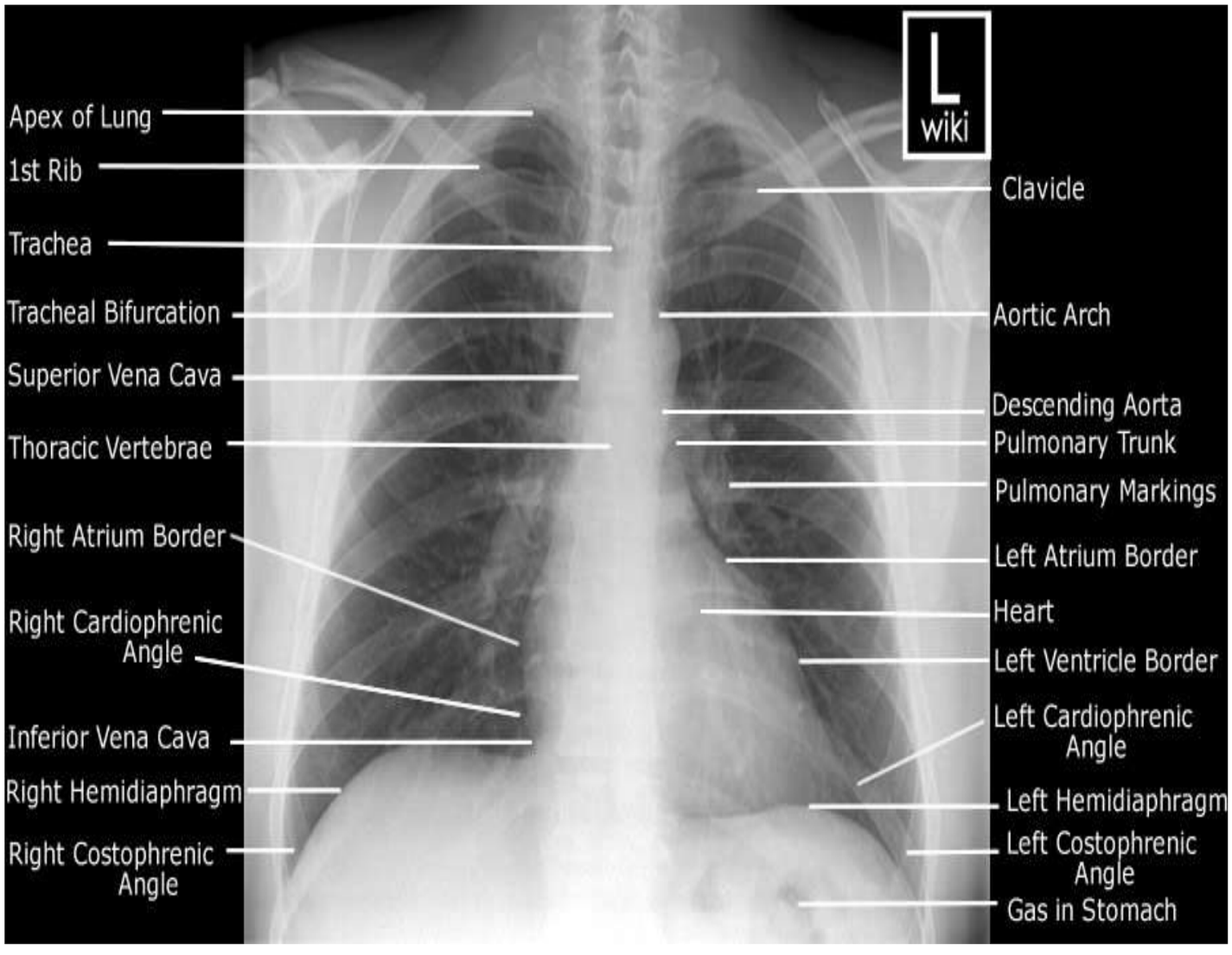
- Develop a comprehensive approach to reading chest x-rays
- Identify the following conditions on chest x-ray
  - pneumonia and its complications
  - pneumothorax
  - atelectasis
- Describe two radiographic features for both pneumonia and pneumothorax

Chest Radiography

- Proven and useful tool for the evaluation of…
  - Airways, lungs, pleura, and chest wall
  - Heart, pulmonary vessels, and mediastinum

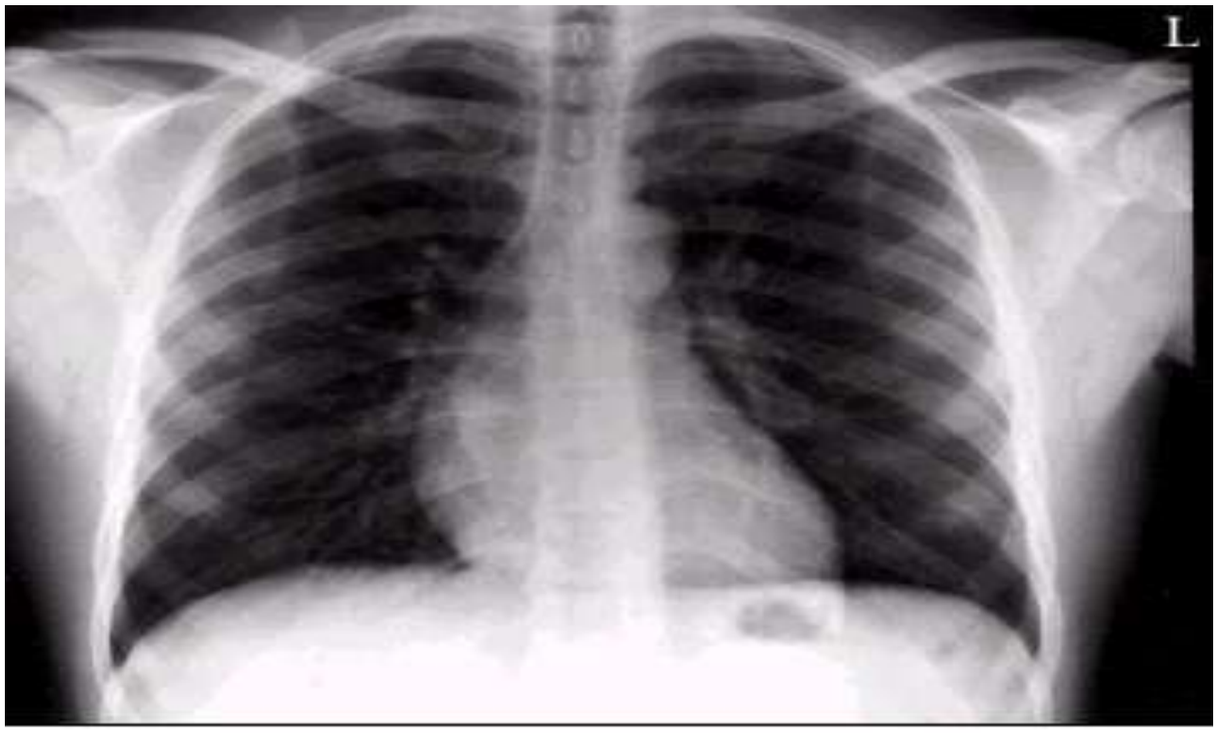
- Most common type is posteroanterior (PA):
  - x-rays enter through the posterior (back) aspect of the chest and exit out of the anterior (front) aspect of the chest)
- Anteroposterior (AP) and lateral films also common

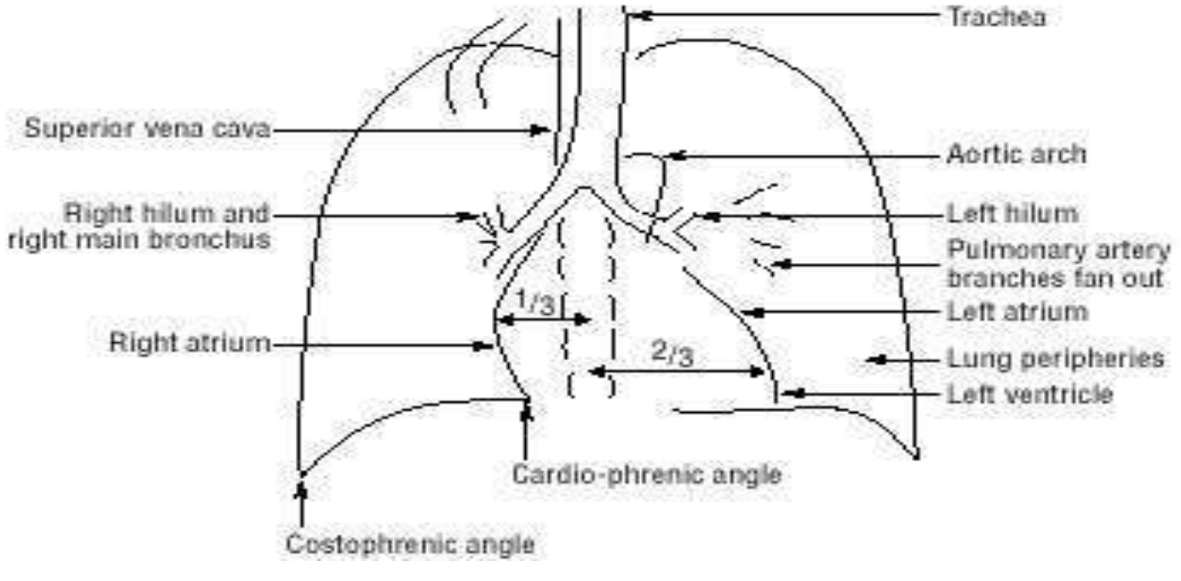
Components of a PA Chest X-Ray



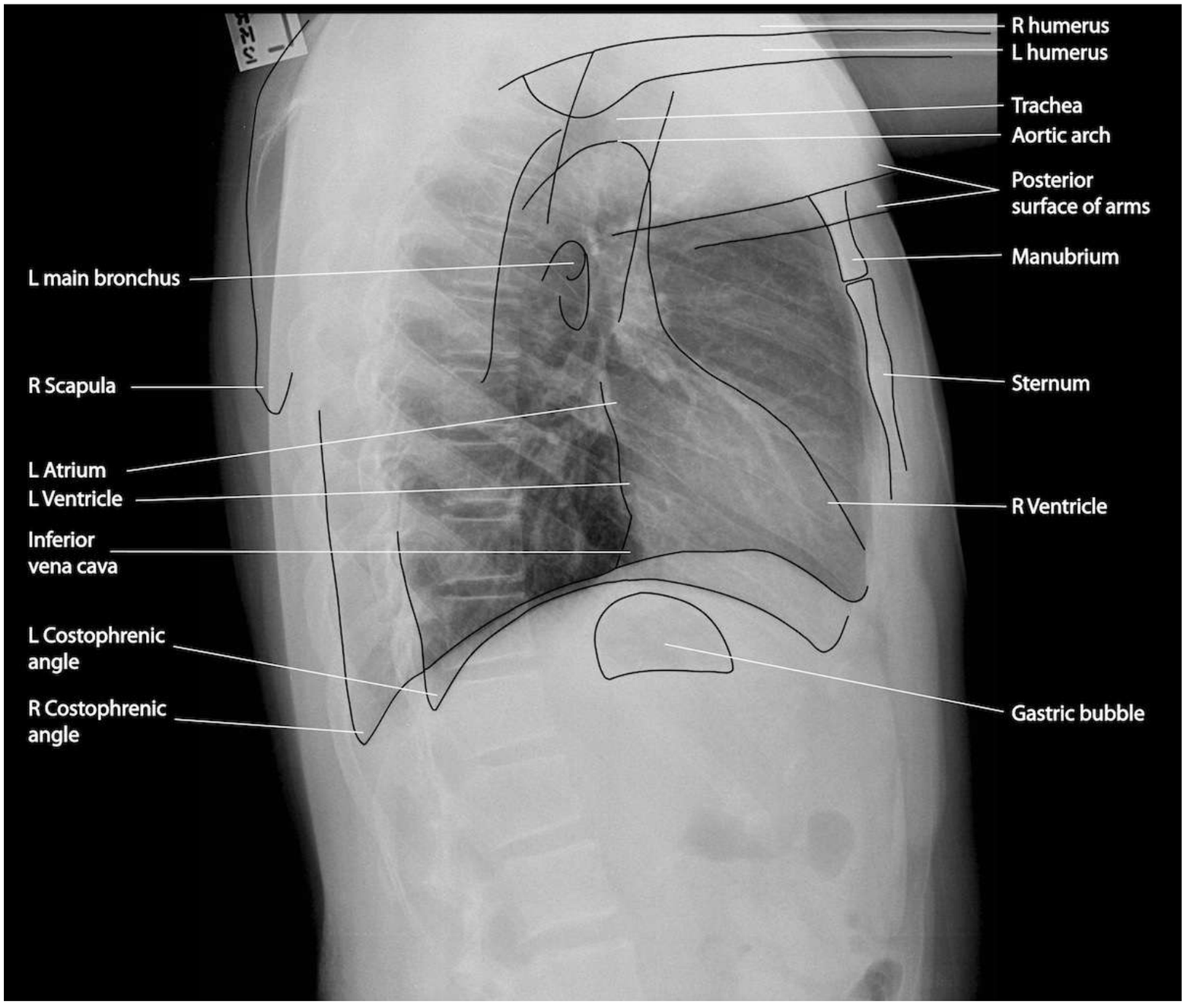
- Inclusive of following structures:
  - Both lung apices
  - Both costophrenic angles
  - Mid-thoracic vertebral bodies, centered on film
  - Left retro-cardiac pulmonary vessels
- Technical considerations:
  - Arms must be elevated to prevent scapula from obscuring lung fields (PA film) and upper arms from obscuring chest (lateral film)

PA Chest X-Ray: Anatomic Correlation





Lateral Chest X-ray: Anatomic Correlation



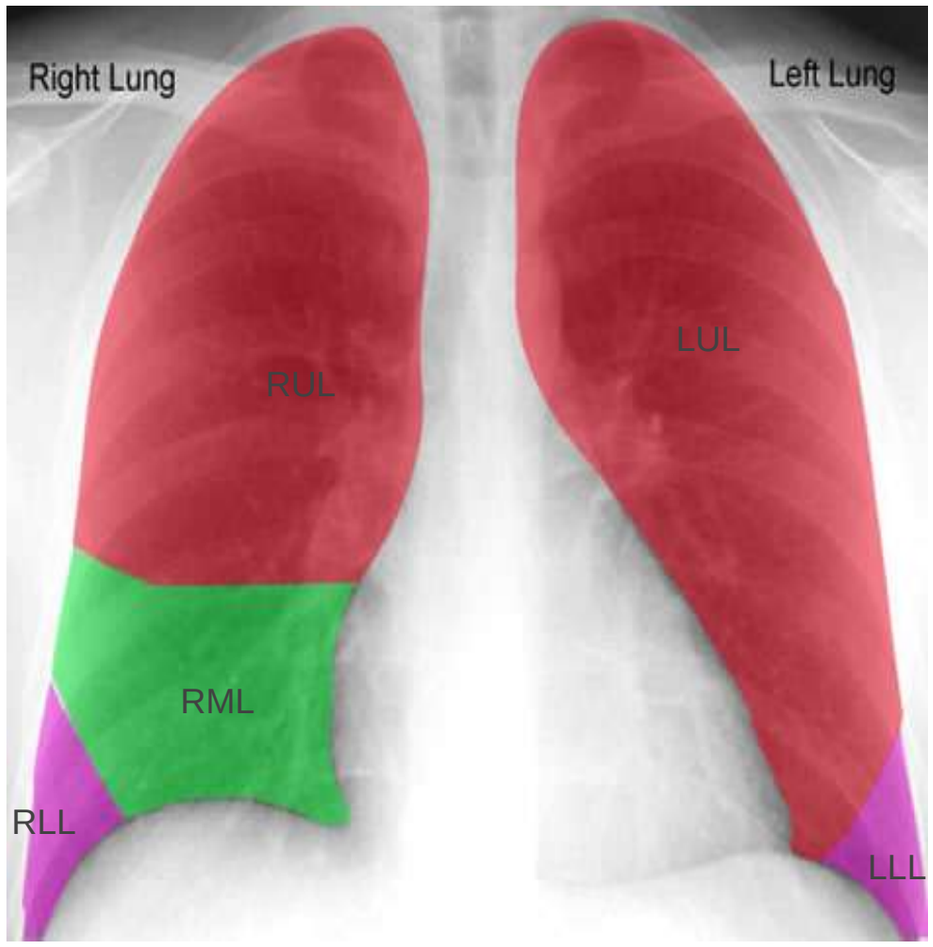
Approach to Interpretation of Chest X-ray: “Top to Bottom”

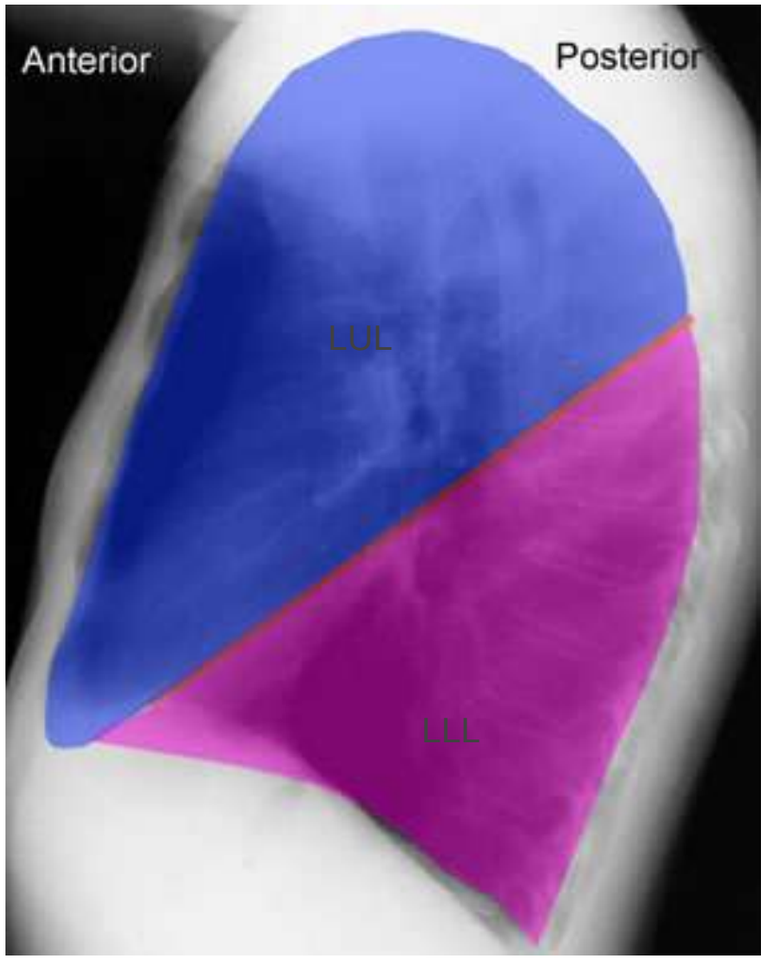
- Airway:
  - Evaluate Trachea and thoracic inlet (should be centrally located)
- Lungs:
  - Look at expansion and inspiratory effort (should be able to count 11 ribs)
  - Look for opacities, consolidation, fissures, fluid, air bronchograms
  - Compare the right and left lung
- Heart and Large Vessels:
  - Evaluate heart size and shape
  - Evaluate the location and prominence of vessels

Approach to Interpretation of Chest X-ray: "Top to Bottom"

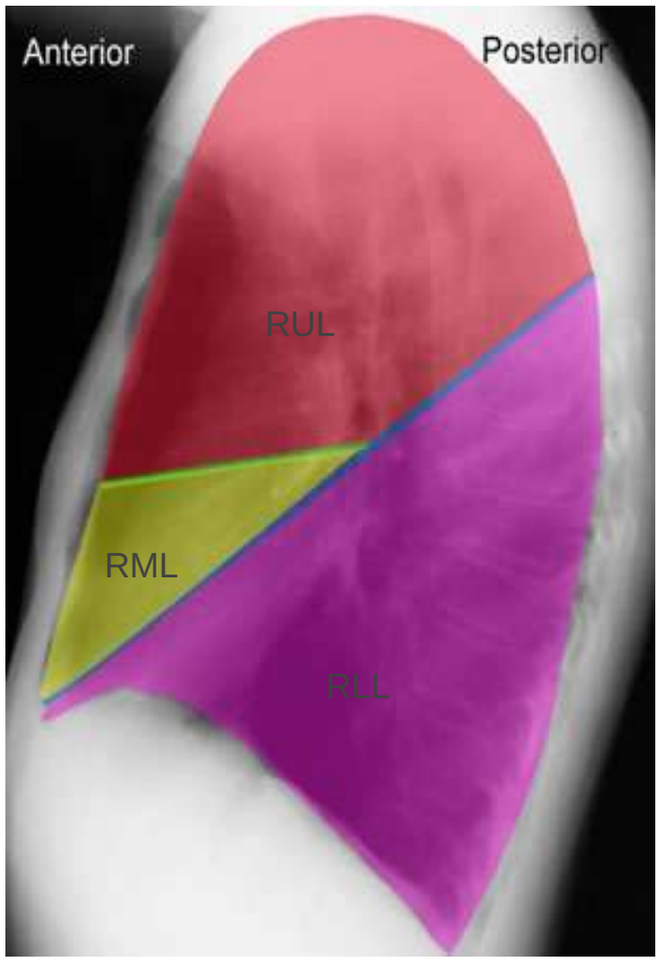
- Diaphragm:
  - Look at elevation bilaterally
  - Evaluate for free air underneath
- Bones:
  - Look for fractures and deformities
  - Evaluate bone density
- Upper Abdomen:
  - Look for stomach bubble
  - Evaluate liver size

Lobes and Fissures





Left Lateral View



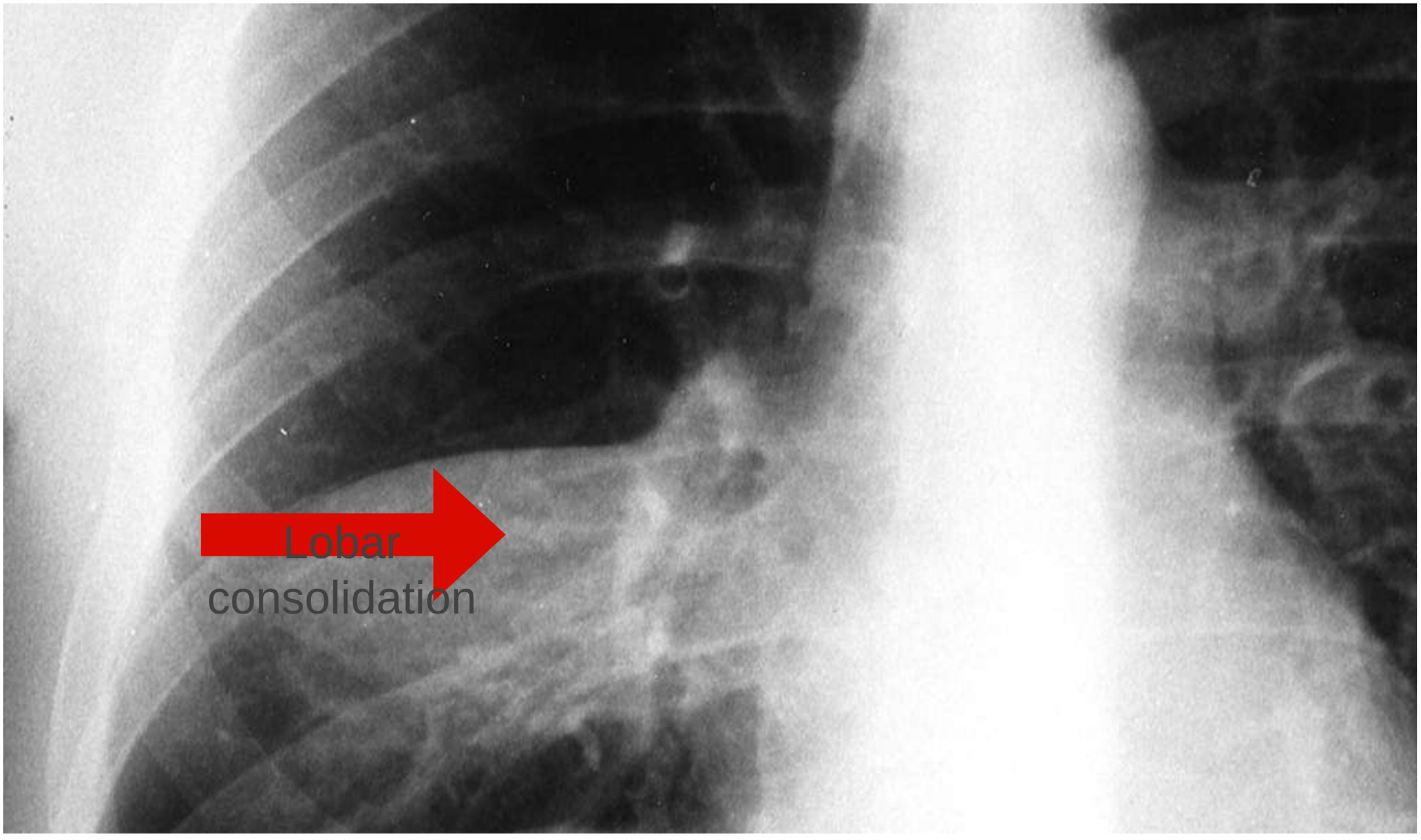
Right Lateral View

http://www.wikiradiography.com/page/Chest+Radiographic+Anatomy

Intern Case

- 4 year old male with 2 weeks of cough, rhinorrhea and a one day history of tactile fevers, brought to the emergency department for increased WOB and hypoxia.
- Vitals Temp 38.8 HR 130 RR 40 BP 101/50 Pulse Ox 92%

- What are the top three diagnoses on your differential?
- Is it appropriate to obtain a Chest X-ray in this situation?
- What factors would support obtaining a Chest X-ray?
- What factors would deter you from obtaining a Chest X-ray?



What Do You See?

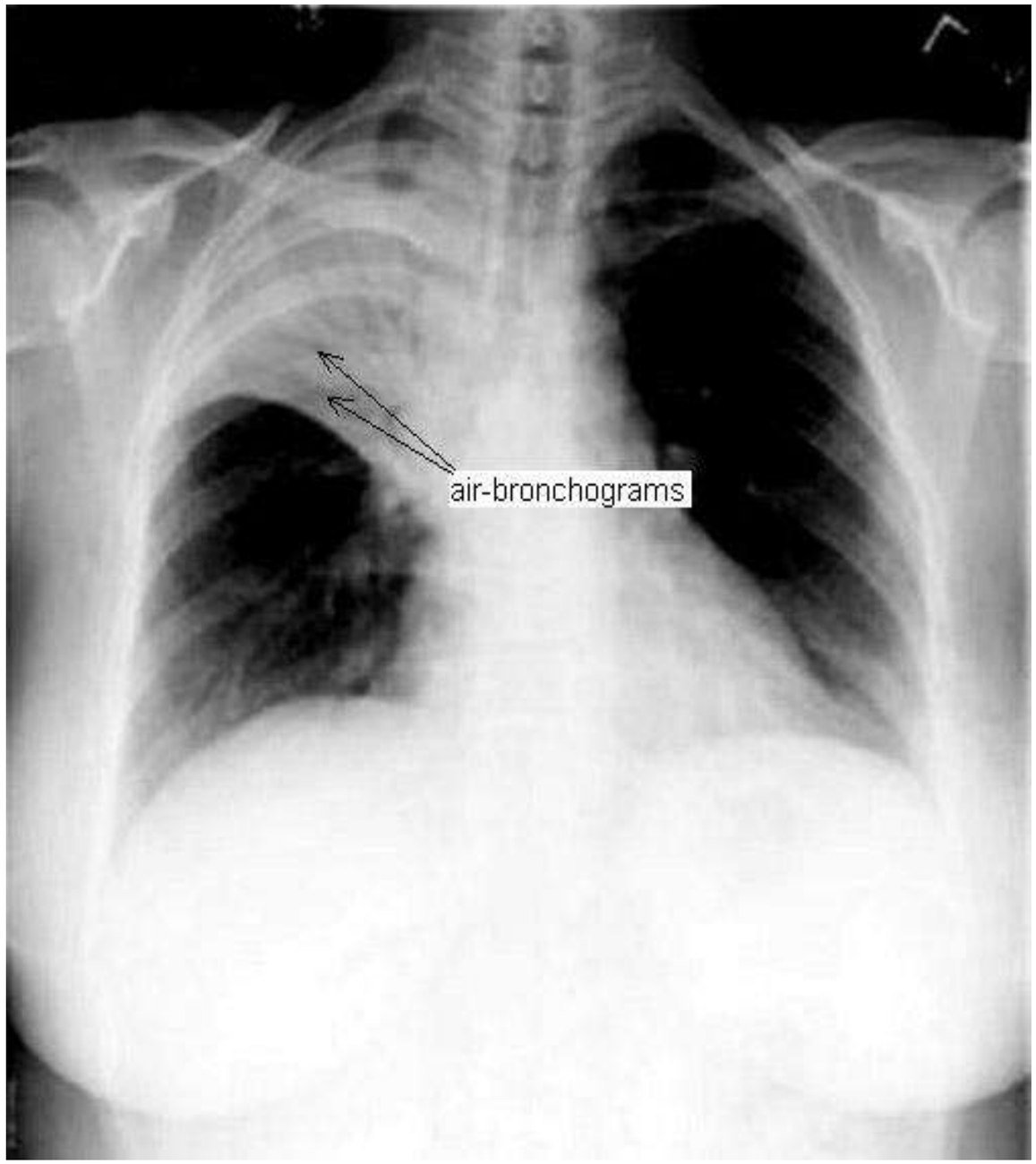
http://radiology.rsna.org/content/210/2/339/F1.large.jpg

Radiographic Findings in Pneumonia

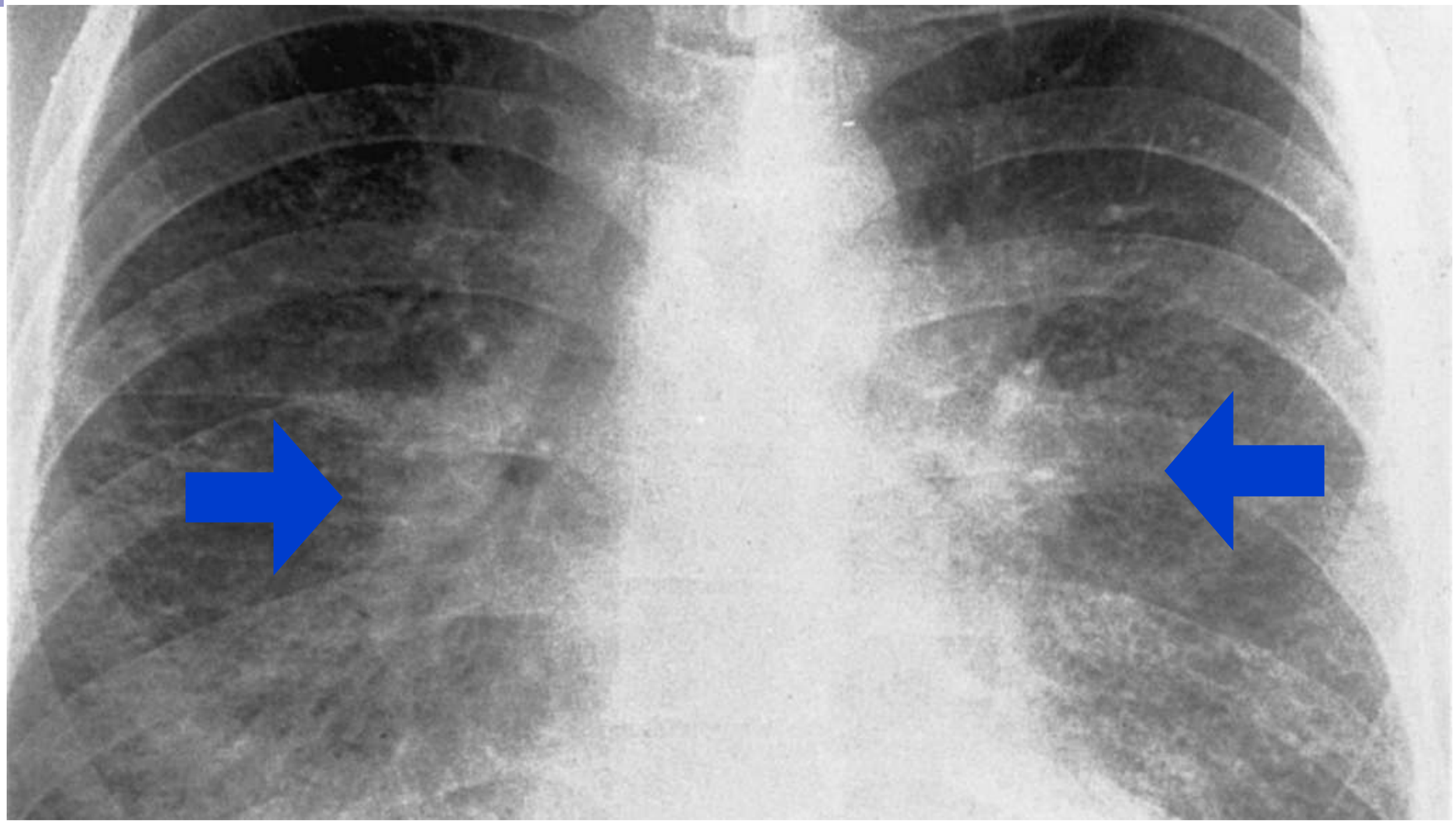
- Air bronchograms = most correlative
- New or worsening lung opacities
- Assymmetric focal findings
- Interstitial disease, especially in viral or atypical pneumonia
- Cavities, indicative of necrotizing pneumonia

Air Bronchograms

- Indicates airspace disease
- Visualized when an air-filled bronchus is surrounded by opacified alveoli
- Can be seen with :
  - pulmonary consolidation
  - pulmonary edema
  - non-obstructive atelectasis
  - severe interstitial disease
  - neoplasm
  - pulmonary infarction
  - normal expiration

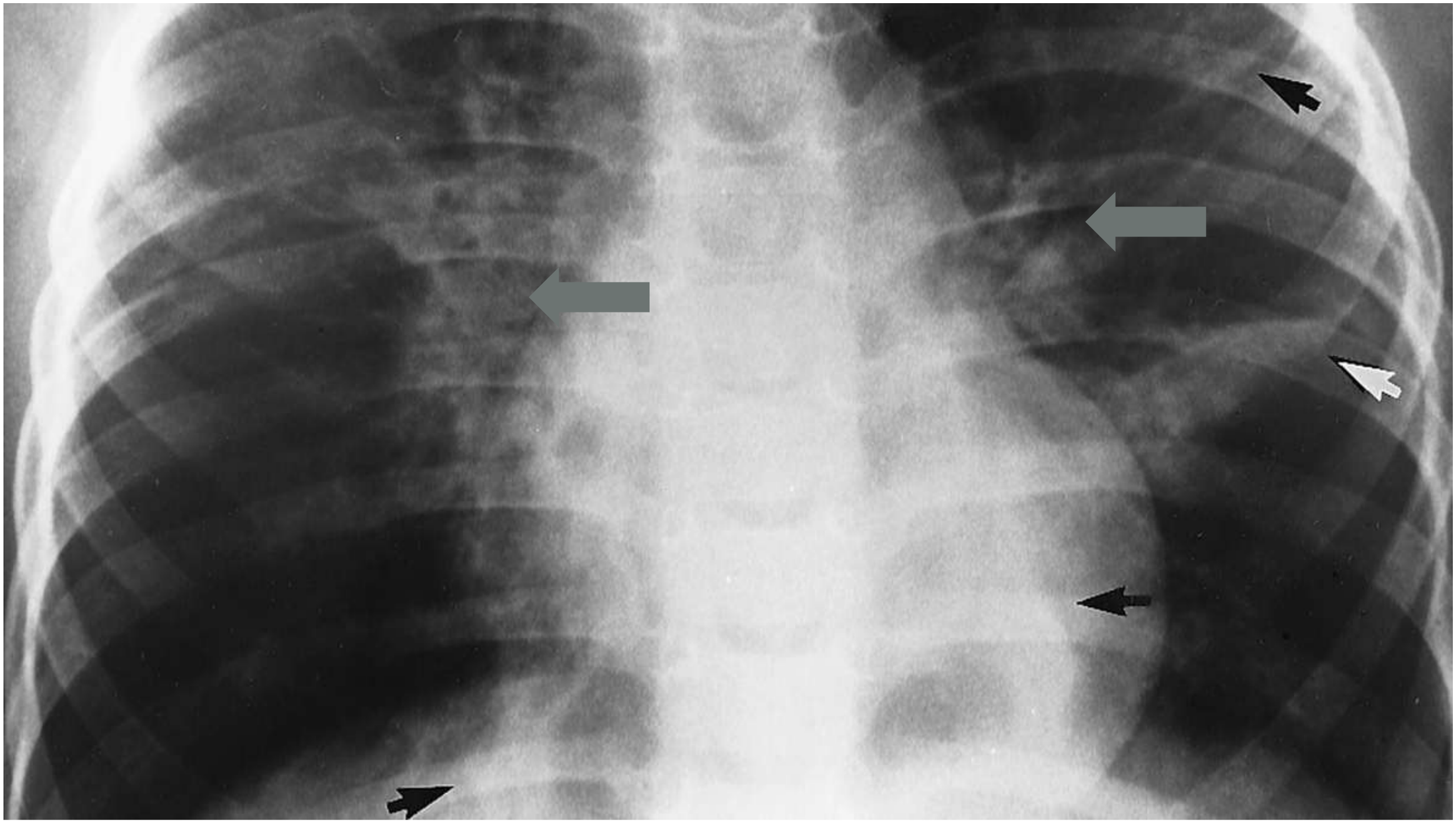


http://medicalfinals.co.uk/RadiologyQuizFebruary2007.html



Viral Pneumonia

http://radiographics.rsna.org/content/22/suppl_1/S137/F25.large.jpg

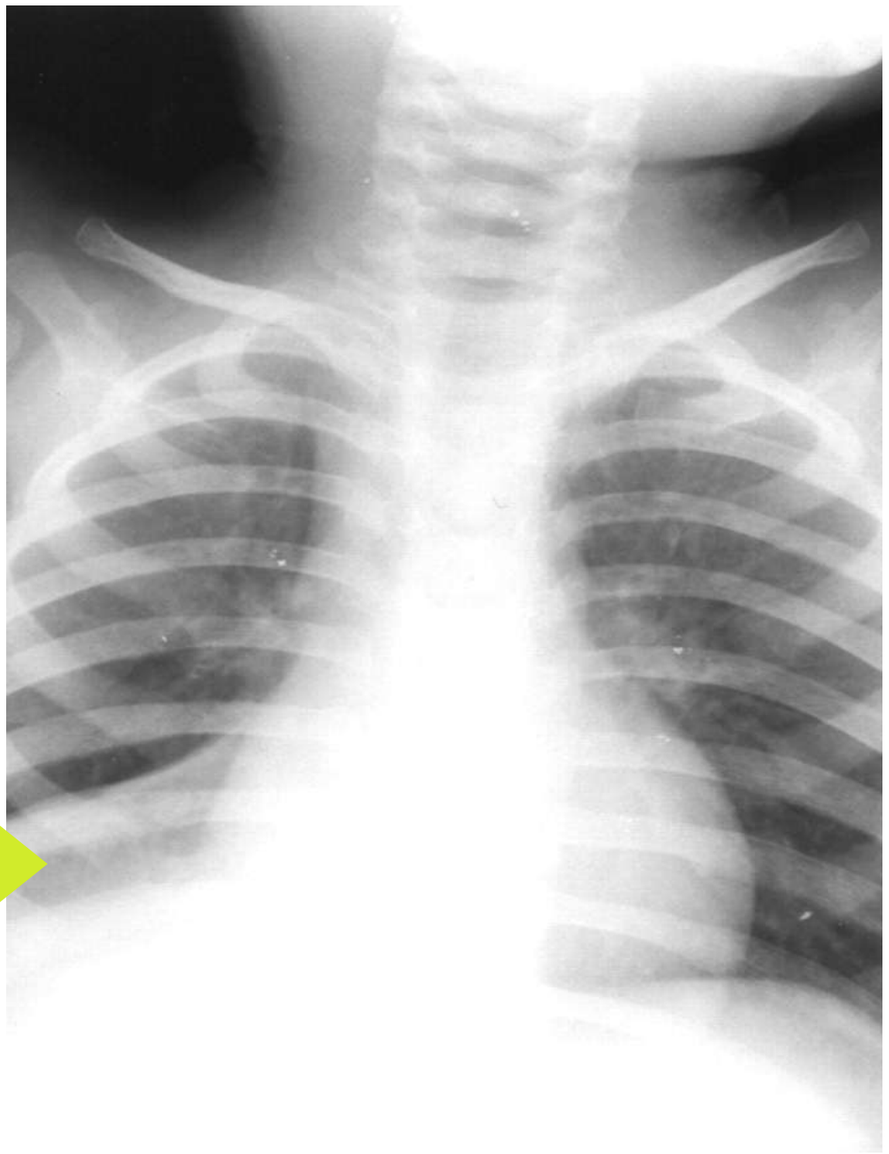


Atypical Pneumonia

http://radiographics.rsna.org/content/21/1/121/F10.expansion

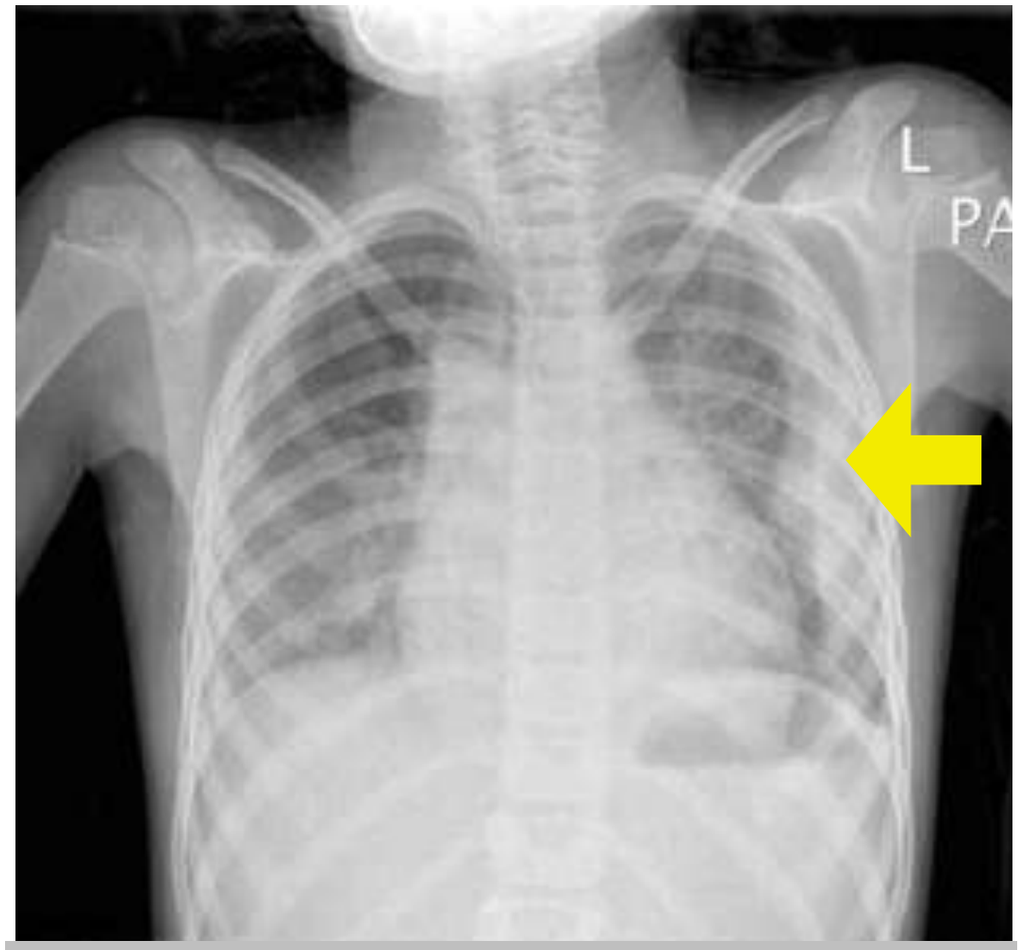
Atelectasis

- Volume loss with displacement of fissures
- White out of lobe or lung
- If large volume of lung involved, may get elevation of hemi-diaphragm and displacement of mediastinal structures
- Radiographic findings resolve within hours to days



http://www.ajronline.org/content/vol183/issue6/images/large/12_03_0142_02A.jpeg

Complications of Pneumonia on Chest X-ray



Pleural Effusion

•Appears as white density within lung field
• If not loculated, will layer out on lateral decubitus film

http://pediatrics.aappublications.org/cgi/content/full/122/4/e945/F1

Empyema

•Appears as solid white consolidate that blunts the costophrenic angle

•May not layer out on lateral decubitus

http://www.ajtmh.org/cgi/content/full/75/6/1234/F1

Lateral Decubitus

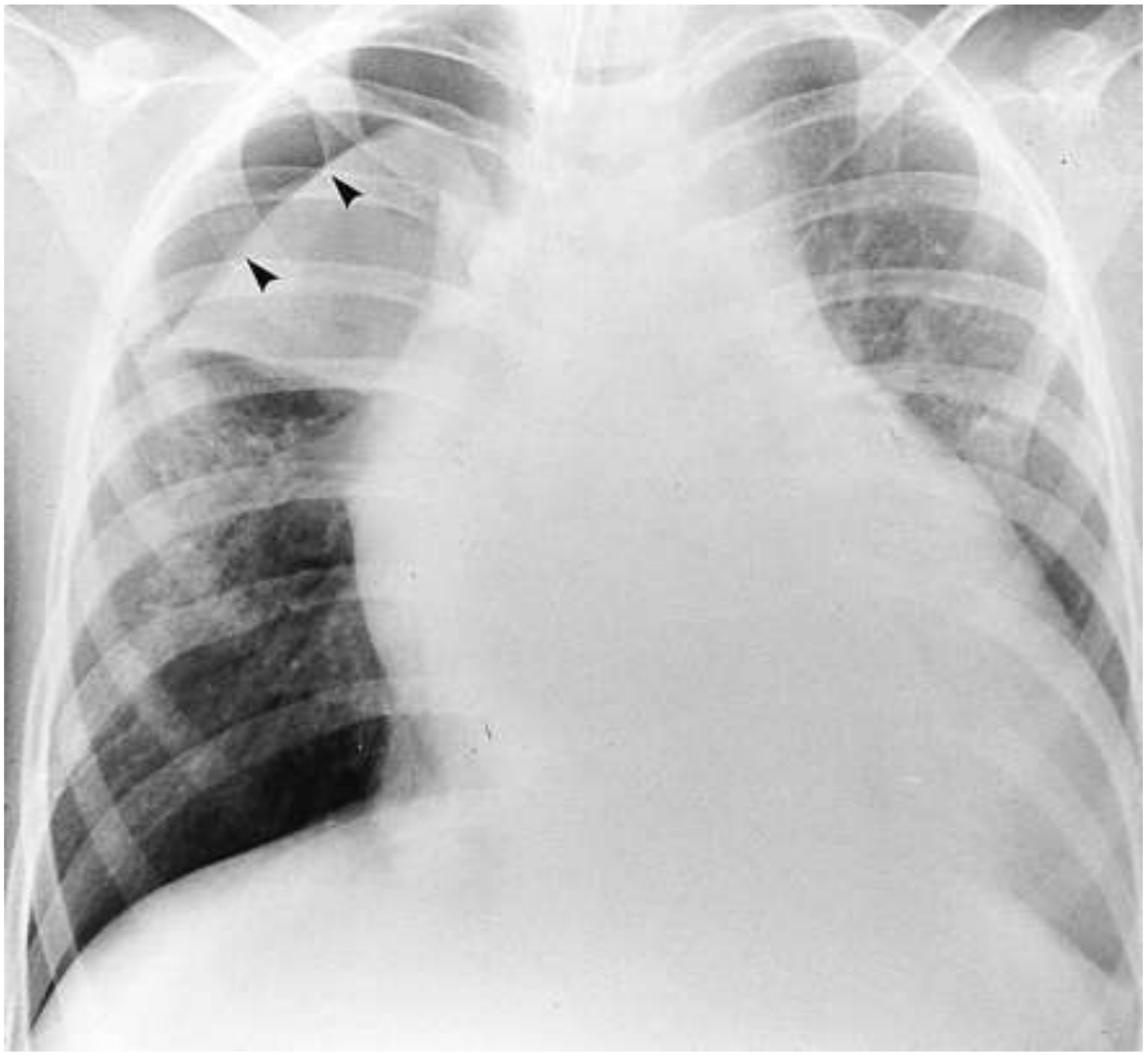
- Assess volume of pleural effusion
- Determine if effusion is mobile or loculated

http://www.med-ed.virginia.edu/courses/rad/cxr/technique4chest.html

Senior Case

- 12 year old tall thin male admitted overnight for monitoring after having a complicated eye surgery.
- 3 Hours into your shift you receive a consult from Ophthalmology to evaluated the patient
- He is complaining of a sharp, persistent chest pain and shortness of breath. You note on exam long fingers and thin skin

- What are the top three diagnoses on your differential?
- Is a Chest X-ray Indicated?
- Should it be ordered routine or stat?



http://bjr.birjournals.org/cgi/content/full/74/877/89/F13

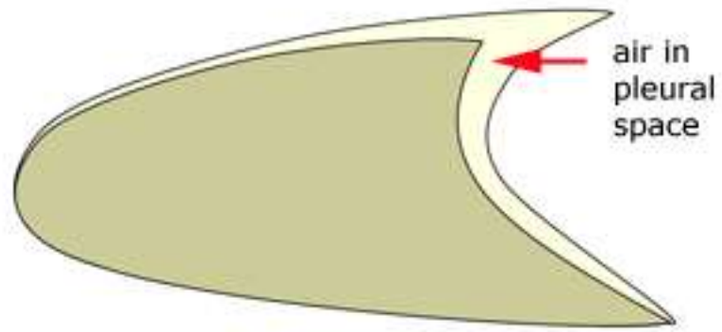
What Do You See?

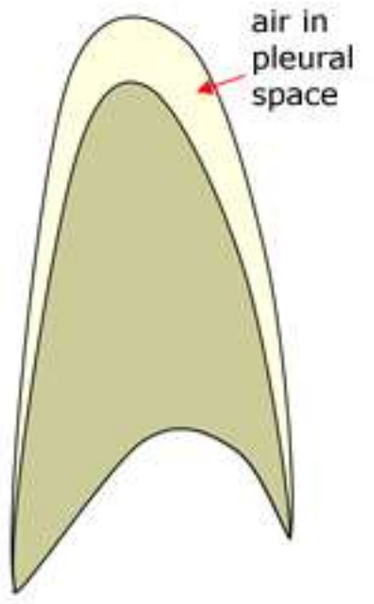
Note the lung is removed from borders of the pleural cavity

Area of lucency around diaphragm

Pneumothorax on Chest X-ray

- Consider if the X-ray is supine or erect
- Supine
  - Air tends to accumulate in the posterior chest wall
  - May appear near diaphragm first
- Erect
  - Air accumulates near the apices





Take Home Points

- A chest x-ray is a simple test that can be used in the diagnosis of many diseases.
- Pneumonia is a clinical diagnosis. Chest x-ray can be a useful tool to support the diagnosis and identify complications.
- When pneumothorax is suspected, chest x-ray should be obtained to determine its size and location and help guide management decisions.

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