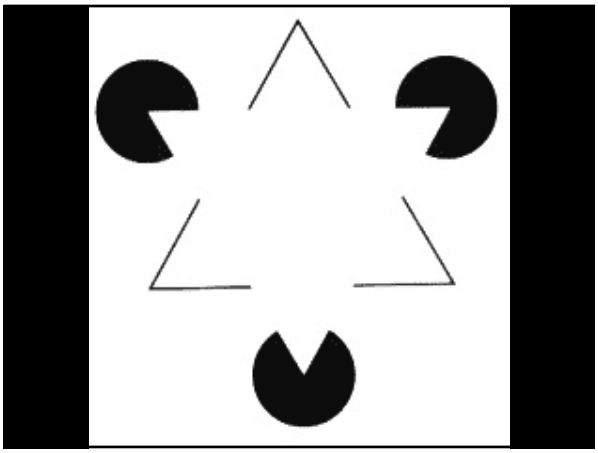
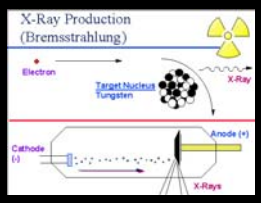
Chest and Abdominal Radiography for Medical Students

Kenneth L. Pierce, M.D.
Dept of Radiology
Loyola University Medical Center



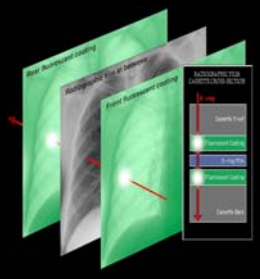
Physics

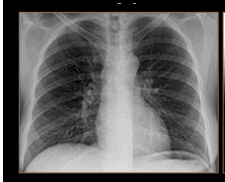
- Xray imaging
- Shoot electrons at tungsten target
- Emit xrays (photons)
- Directed at object/ detector

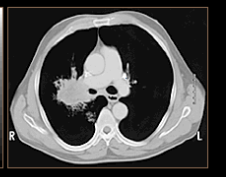


Physics

- Some of the photons absorbed by patient
- Photons that penetrate patient strike detector
- Different tissues have different xray absorption - contrast

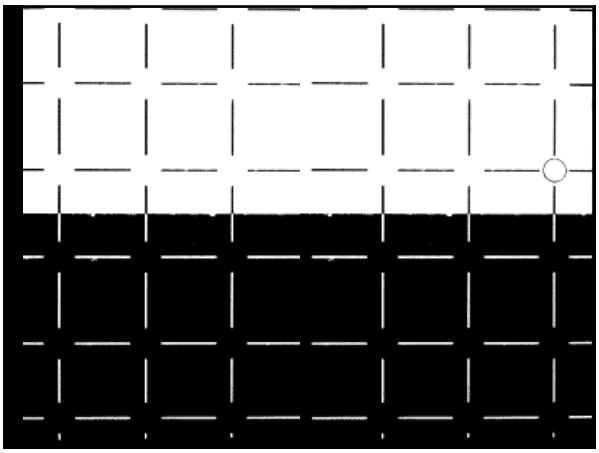


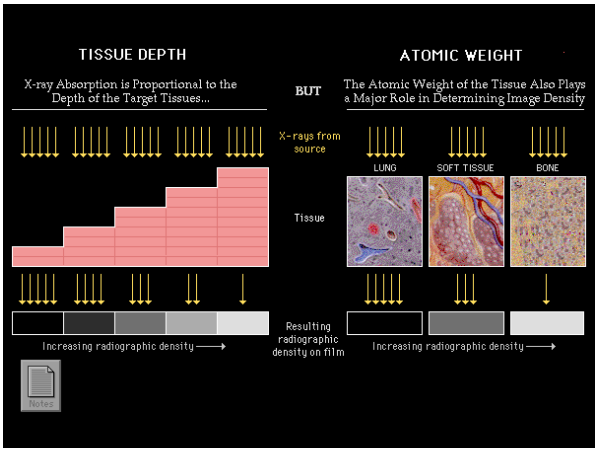


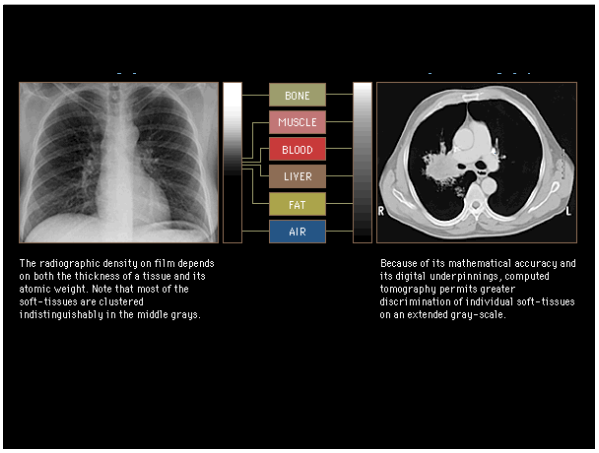


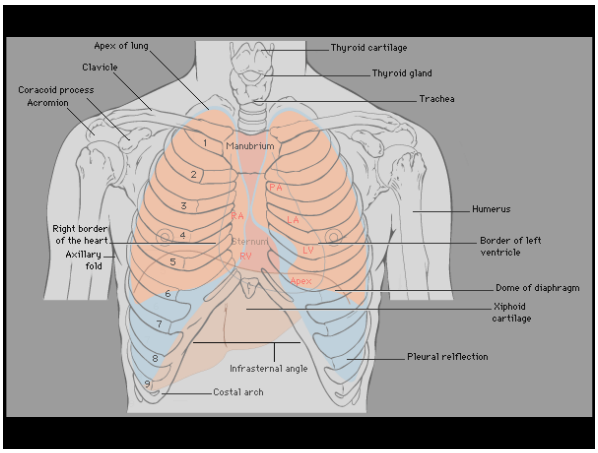
The radiographic density on film depends on both the thickness of a tissue and its atomic weight. Note that most of the soft-tissues are clustered indistinguishably in the middle grays.

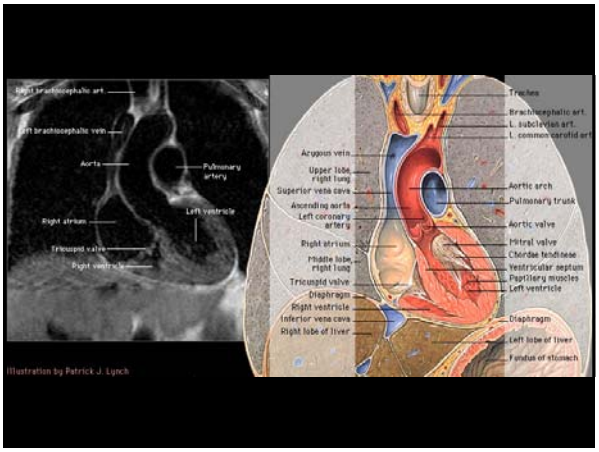
Because of its mathematical accuracy and its digital underpinnings, computed tomography permits greater discrimination of individual soft-tissues on an extended gray-scale.




TISSUE DEPTH
X-ray Absorption is Proportional to the Depth of the Target Tissues...
BUT
ATOMIC WEIGHT
The Atomic Weight of the Tissue Also Plays a Major Role in Determining Image Density
X-rays from source
LUNG
SOFT TISSUE
BONE
Tissue
Increasing radiographic density
Resulting radiographic density on film
Increasing radiographic density
Notes


BONE
MUSCLE
BLOOD
LIVER
FAT
AIR
R
L
The radiographic density on film depends on both the thickness of a tissue and its atomic weight. Note that most of the soft-tissues are clustered indistinguishably in the middle grays.
Because of its mathematical accuracy and its digital underpinnings, computed tomography permits greater discrimination of individual soft-tissues on an extended gray-scale.





How to Read a Chest Film

- "See everything on the film, learn all the diseases, and then it's easy." Terry Demos
- Probably the most difficult thing in radiology to teach
- Repetition is the key

How to Read Chest Films

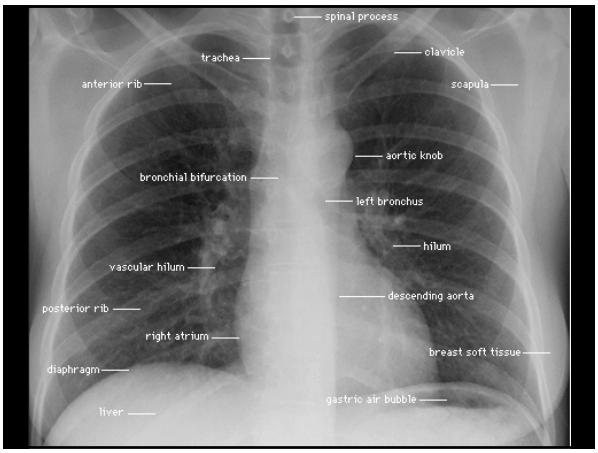
- Develop a System
  - Doesn't matter what it is, just make sure you look at EVERYTHING.
- Look at a lot of films
- Know the limits of the modality
  - Poor positioning, technique, motion, etc.
- Know some basic patterns

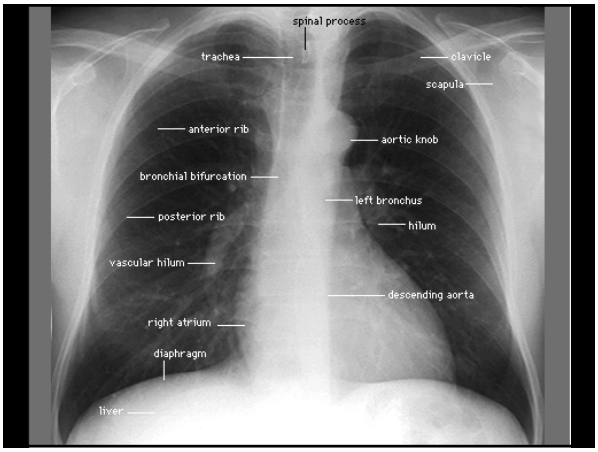
What You Should Recognize

- Normal
- CHF
- Consolidation
- Effusions
- Masses
- Atelectasis
- Pneumothorax

Normal

- Hardest film to read
  - Once it's called normal, out of the system
- Broad range of 'normal'
  - Between patients, radiologists
- Knowledge comes with experience


spinal process
trachea
clavicle
anterior rib
scapula
aortic knob
bronchial bifurcation
left bronchus
hilum
vascular hilum
descending aorta
posterior rib
right atrium
breast soft tissue
diaphragm
gastric air bubble
liver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trachea
clavicle
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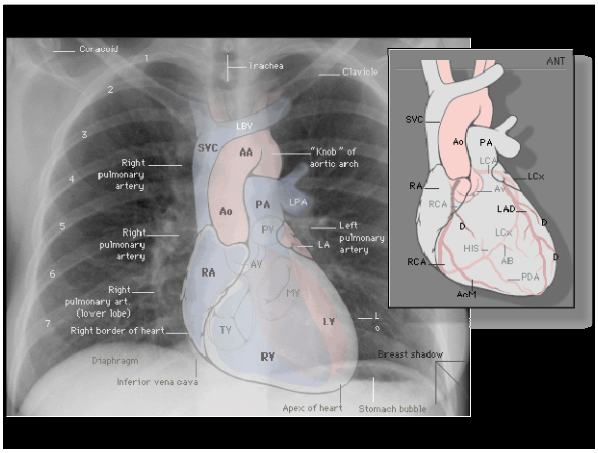
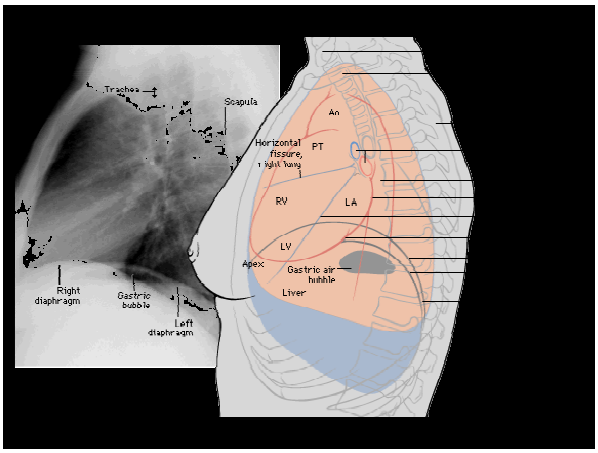
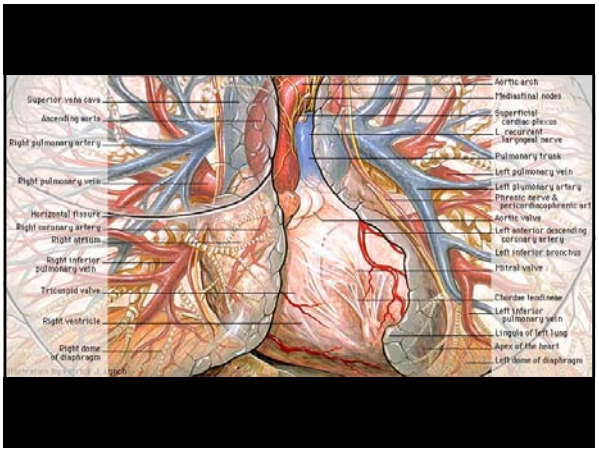
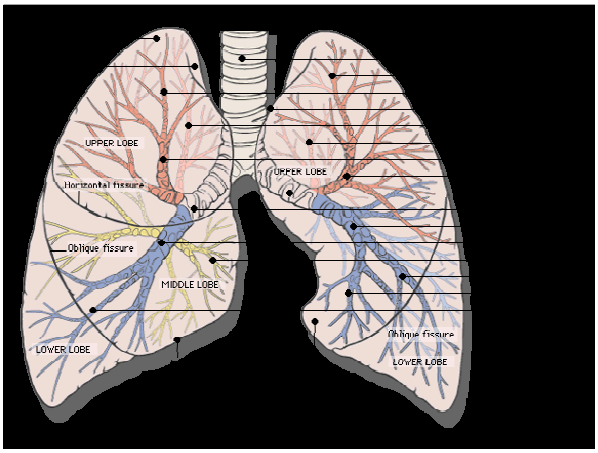
posterior rib
hilum
vascular hilum
descending aorta
right atrium
diaphragm
liver


Coracoid
Trachea
Clavicle
LBV
SVC
AA
"Knob" of aortic arch
Right pulmonary artery
Ao
PA
LPA
PV
Left pulmonary artery
LA
RA
AV
MV
LV
TV
RV
Right pulmonary artery
Right pulmonary art. (lower lobe)
Right border of heart
Diaphragm
Inferior vena cava
Apex of heart
Breast shadow
Stomach bubble
ANT
SVC
Ao
PA
LCA
LCx
RA
RCA
AV
LAD
D
LCX
HIS
AB
PDA
AoM

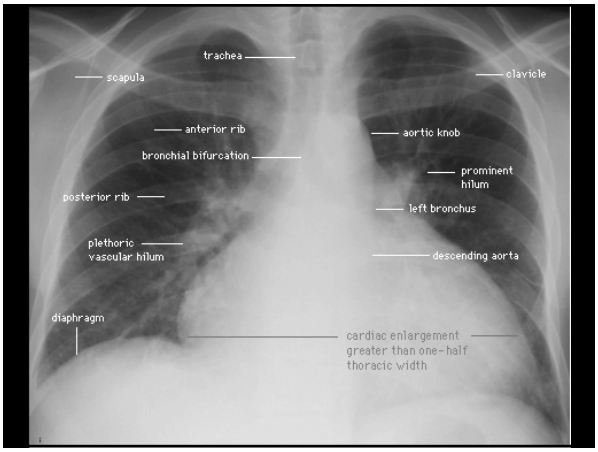

Trachea
Scapula
Horizontal fissure, right lung
PT
Ao
RV
LA
LV
Apex
Gastric air bubble
Liver
Right diaphragm
Gastric bubble
Left diaphragm

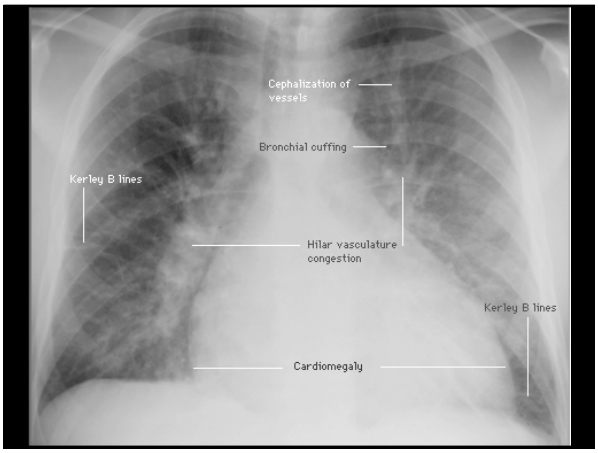

Superior vena cava
Ascending aorta
Right pulmonary artery
Right pulmonary vein
Horizontal fissure
Right coronary artery
Right atrium
Right inferior pulmonary vein
Tricuspid valve
Right ventricle
Right dome of diaphragm
Aortic arch
Mediastinal nodes
Superficial cardiac plexus
L recurrent laryngeal nerve
Pulmonary trunk
Left pulmonary vein
Left pulmonary artery
Phrenic nerve & pericardiacophrenic art
Aortic valve
Left anterior descending coronary artery
Left inferior bronchus
Mitral valve
Chordae tendineae
Left inferior pulmonary vein
Lingula of left lung
Apex of the heart
Left dome of diaphragm

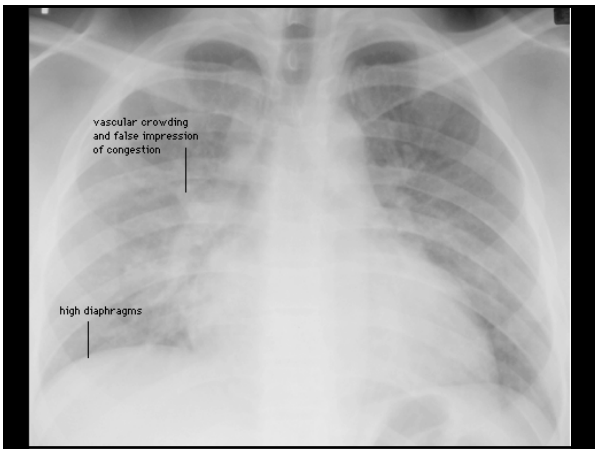

UPPER LOBE
Horizontal fissure
Oblique fissure
MIDDLE LOBE
LOWER LOBE
UPPER LOBE
Oblique fissure
LOWER LOBE

CHF

- Thickening of the interlobular septa - Kerley B lines
- Peribronchial cuffing- Wall is normally hairline thin
- Thickening of the fissures - Fluid in the subpleural space in continuity with interlobular septa
- Pleural effusions

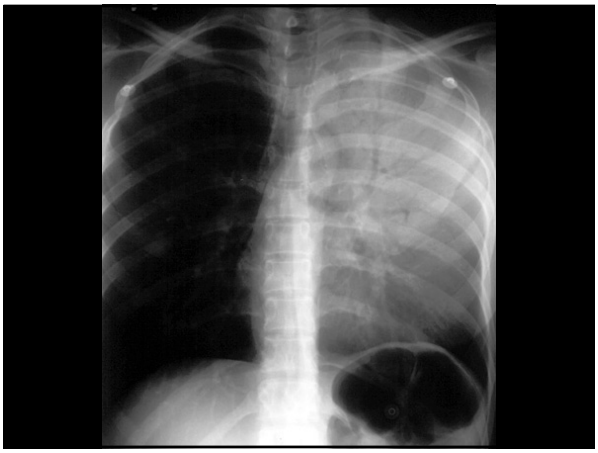


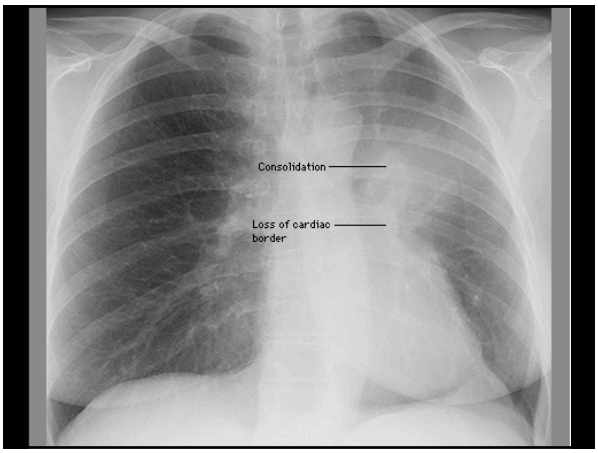


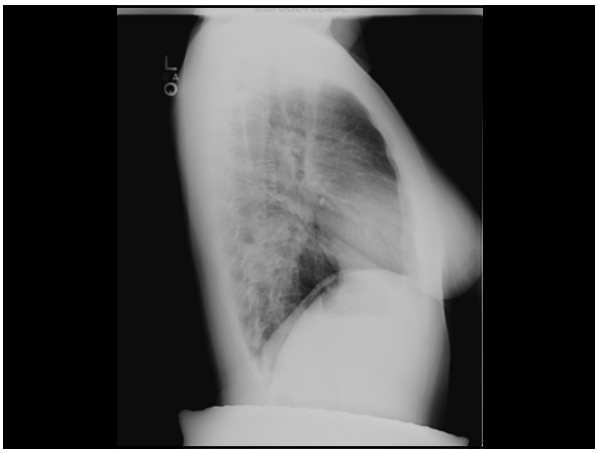


Consolidation

- Air bronchogram
  - Bronchi - air filled
  - Alveoli - fluid-filled
- Lobar anatomy
- Silhouette sign
  - No contrast between fluid-filled structures
  - Heart, diaphragm




Consolidation
Loss of cardiac border

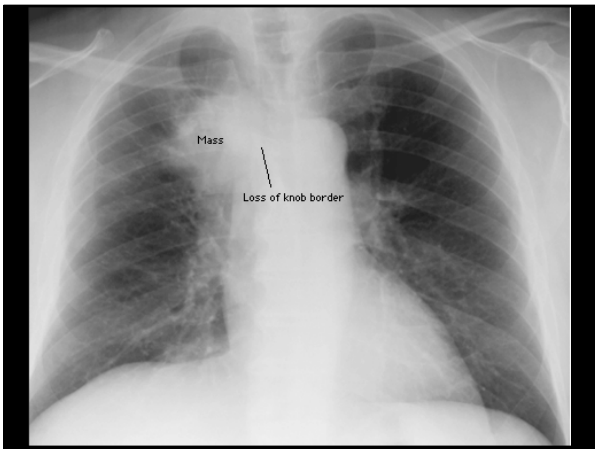


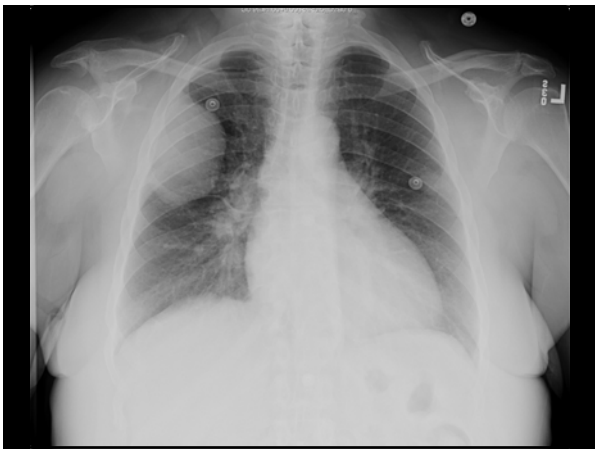
Effusions

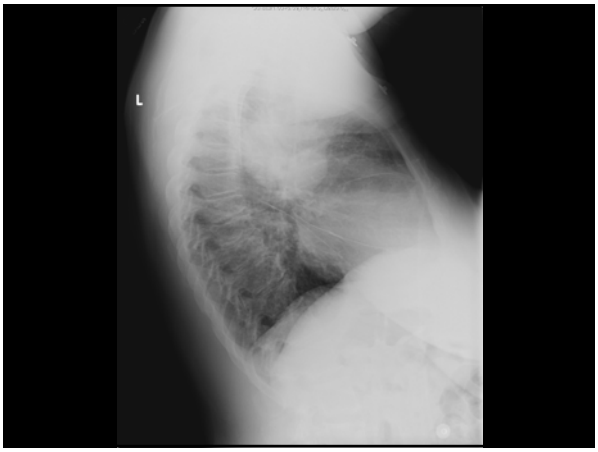
- Fluid in the pleural space
- Pleura can hold a lot of fluid
  - Need around 250 cc's to see
- Meniscus sign – balloon in a cylinder of water
- Usually free-flowing, but can be loculated, sub-pulmonic, infected

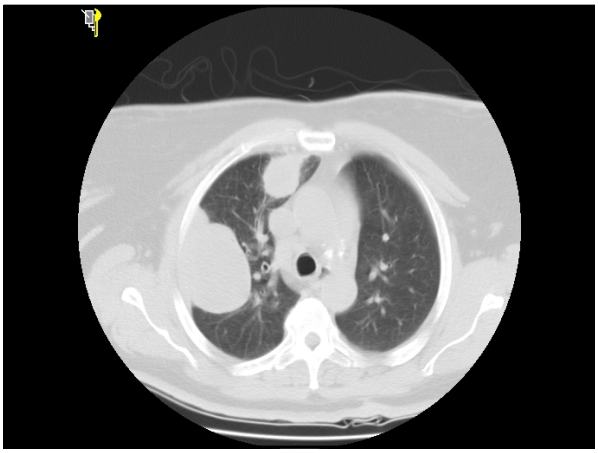
Masses

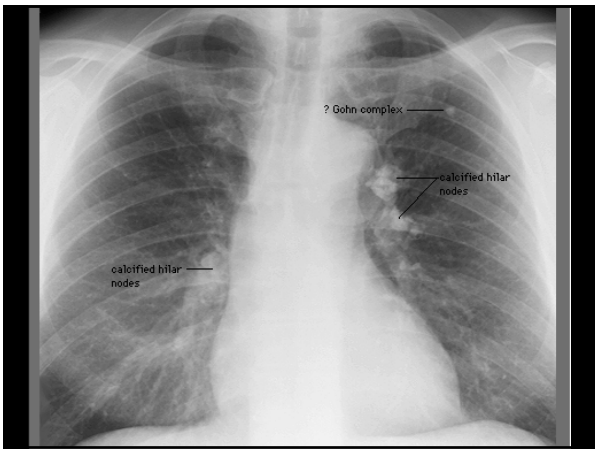
- Can be round, spiculated, cavitated, ill-defined, multiple
- Cancer – spiculated, cavitated, extend to adjacent structures
- Vascular- rounded with linear extensions
- Multiple - metastases

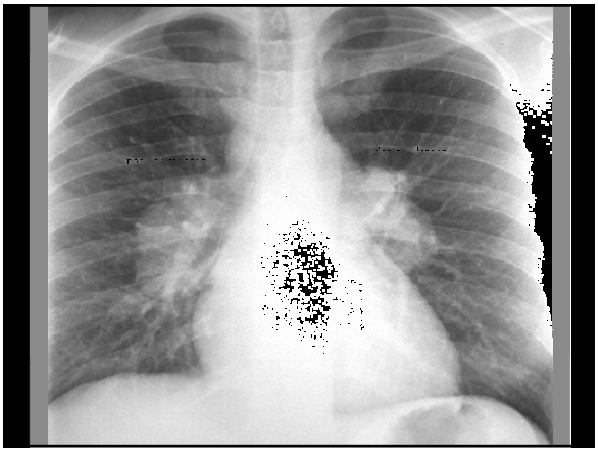


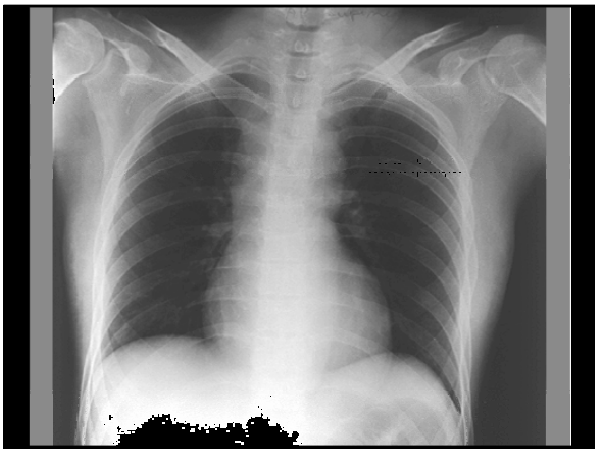


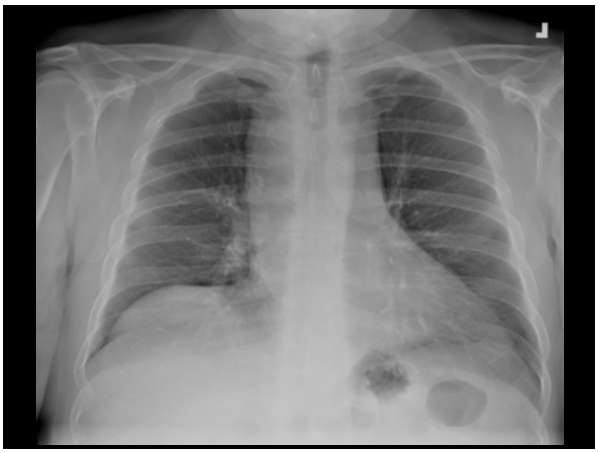


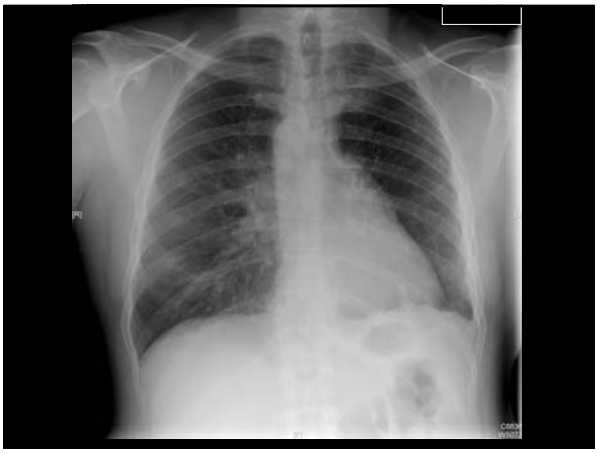


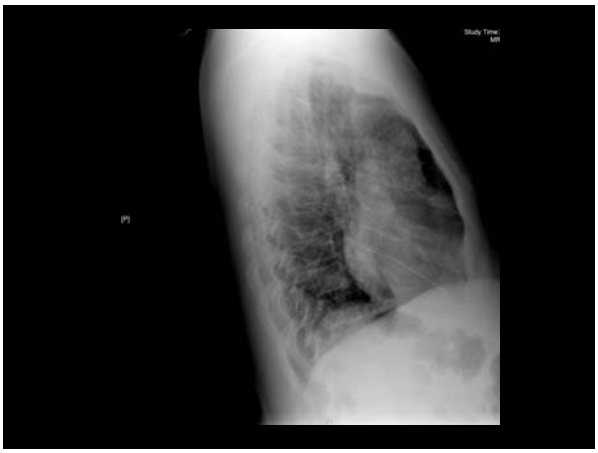

? Gohn complex
calcified hilar nodes
calcified hilar nodes

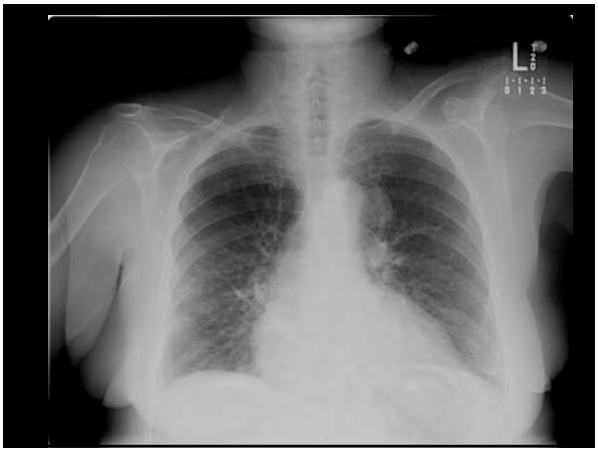




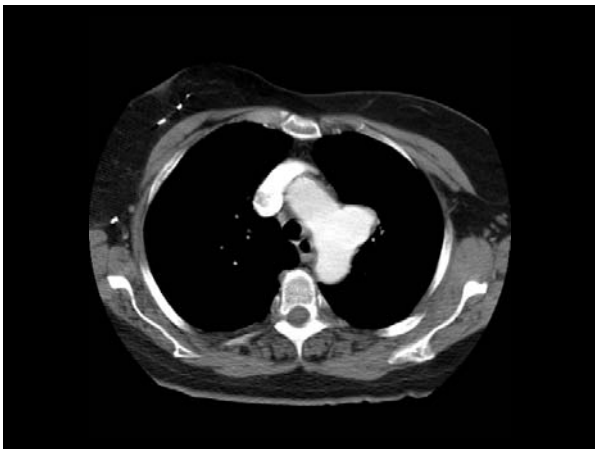


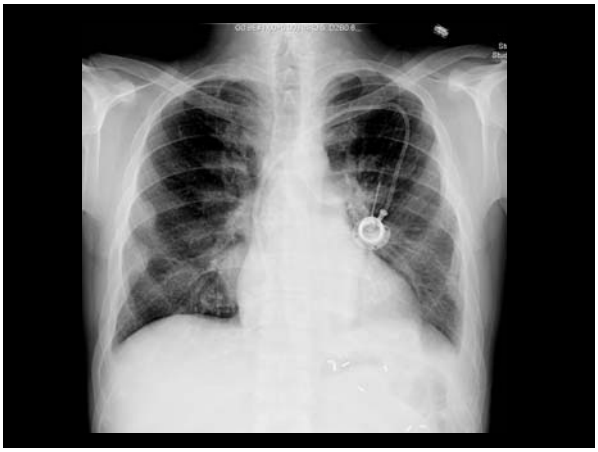


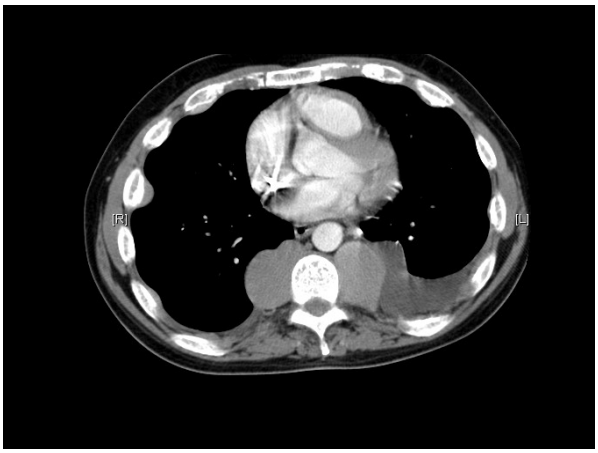





UPRIGHT



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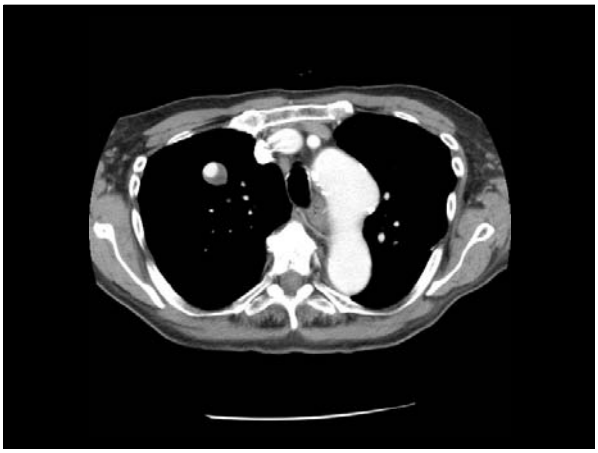
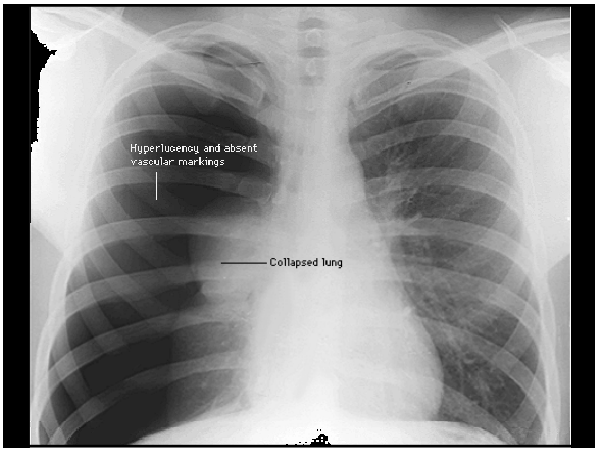
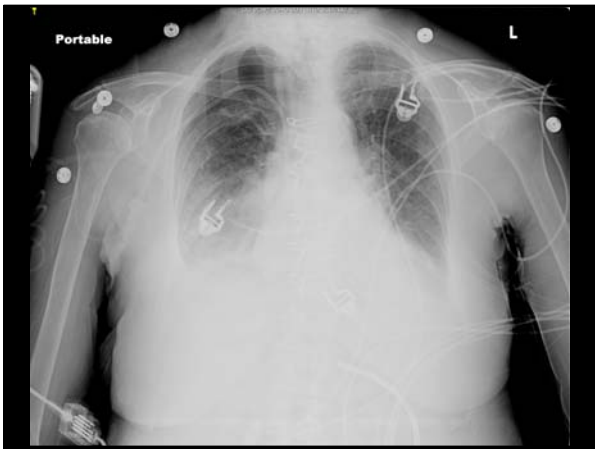


Pneumothorax

- Air enters between visceral and parietal pleura
- Tension – shift of mediastinum, good lung compressed
- Recognize white line of ptx
  - Can be confused with skin fold



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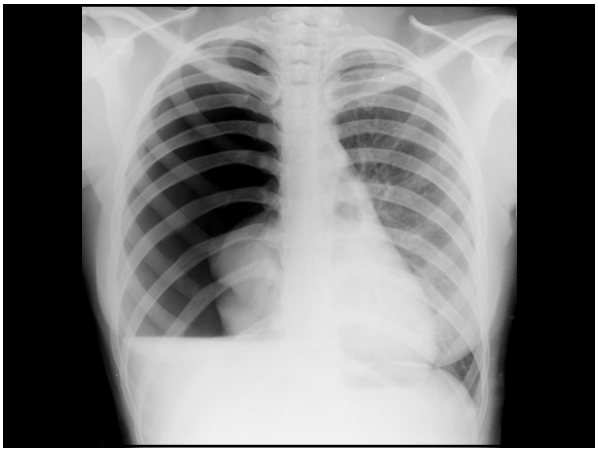

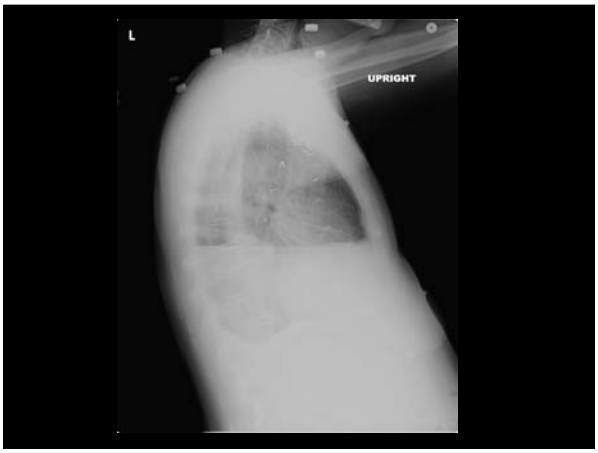
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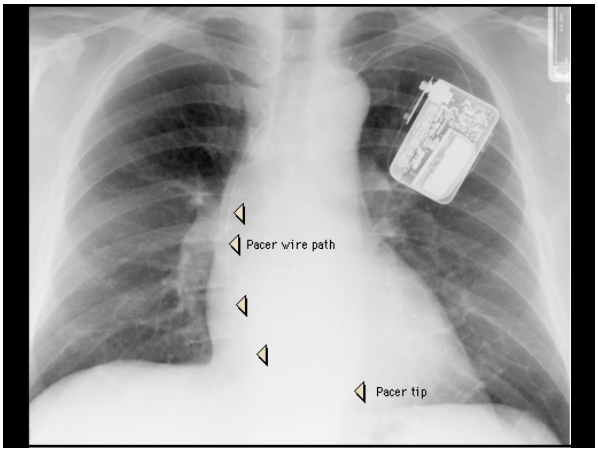
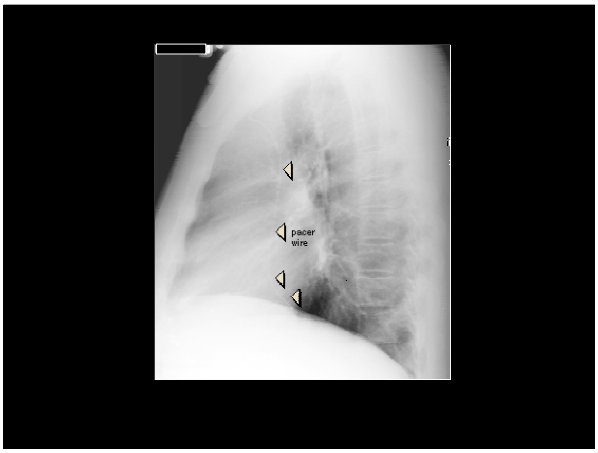
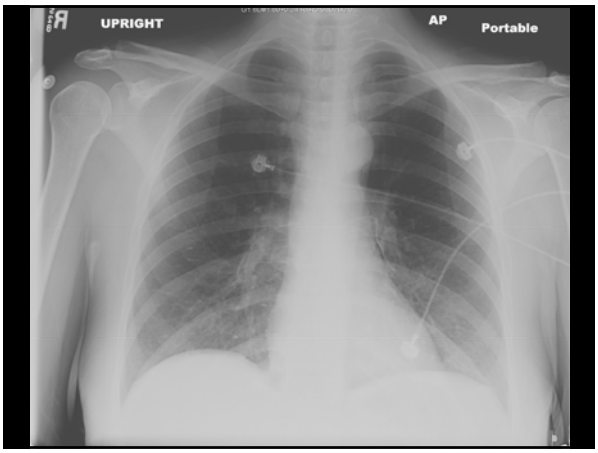
Lines, tubes, etc,

- Check for complications
- Must follow anatomy
- Responsible for the bulk of portable ICU films
- “on” or “in” patient






UPRIGHT
AP
Portable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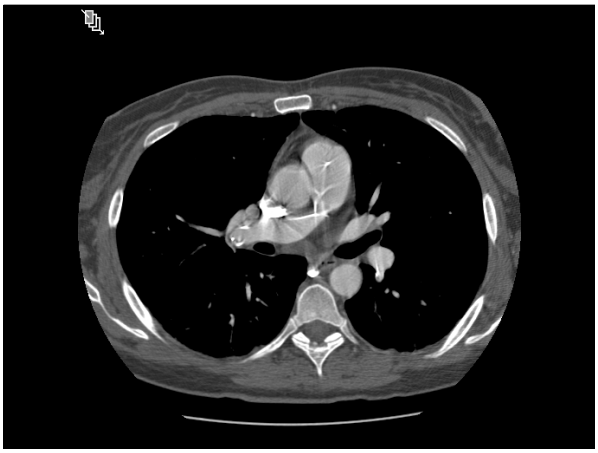

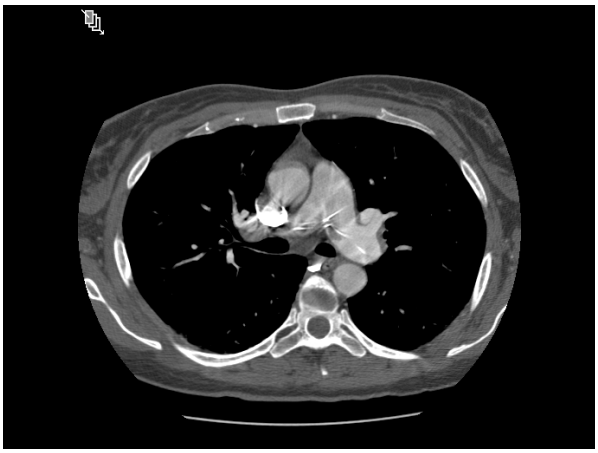

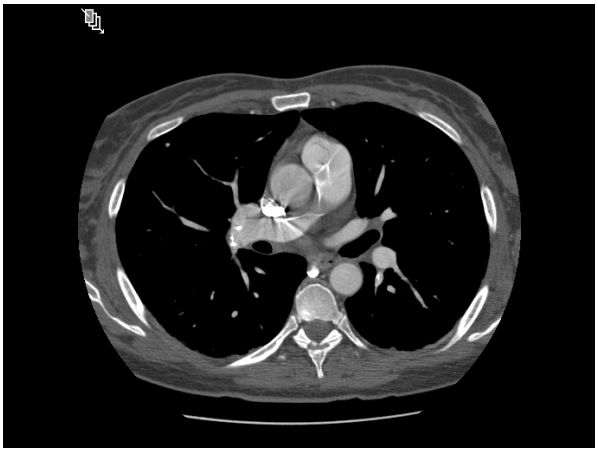

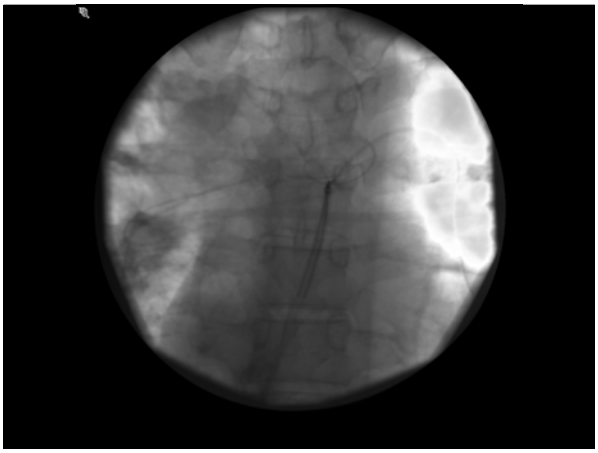

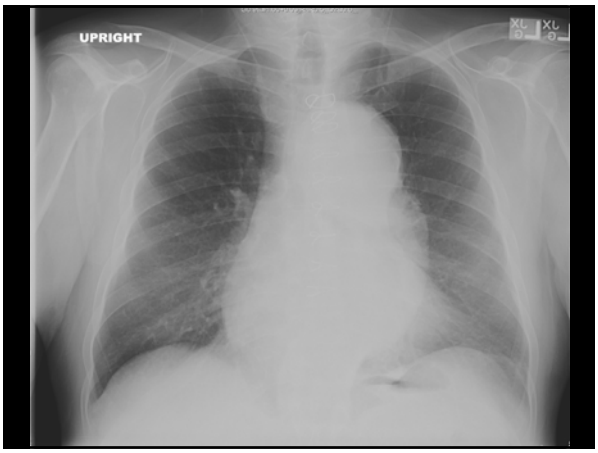
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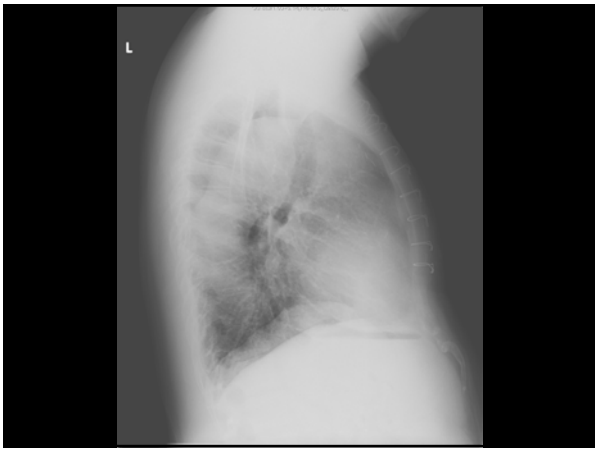
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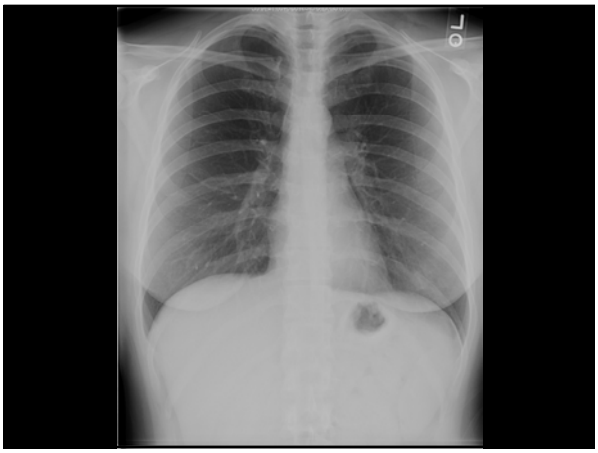
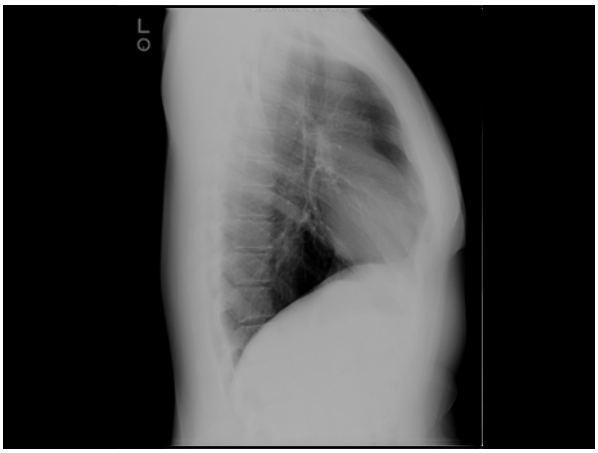




Abdominal Plain Films

- Surgical abdomen, 4 view, flat plate
- 4 view - supine, upright, left lateral decubitus, PA chest
- 2 most important films
  - Supine abdomen
  - Upright chest

Interpretation of Abdominal Film

- Gas Pattern
- Calcification
- Soft tissue
- Bones
- Everything else

Gas Pattern

- Normal
  - Bowel loops air/fluid filled <3cm for small bowel, larger for colon
  - Air in stomach/rectum/cecum
- Abnormal
  - Obstruction
  - Ileus

Obstruction

- Small Bowel
  - Dilated loops> 3cm
  - Air/fluid levels
  - Non-distended colon
- Large Bowel
  - As above
  - Distended colon/non-distended rectum


R
SUPINE

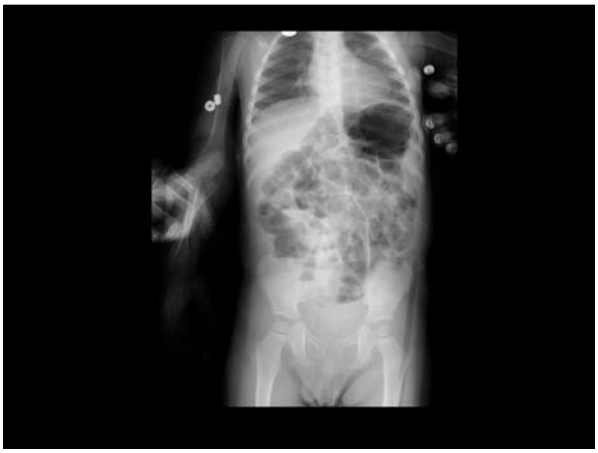

SUPINE

Causes of Obstruction

- Small Bowel
  - Adhesions – most common
  - Hernia
  - Intussusception
- Large Bowel
  - Mass/tumor - most common
  - Volvulus
  - Hernia
  - Inflammation

Ileus

- Localized
  - Adjacent inflammatory process causing local irritation/dilation
  - Pancreatitis, appendicitis, diverticulitis, ulcer
- Generalized
  - Gas in small and large bowel, symmetric air/fluid levels
  - Post-operative



Calcification

- Urinary stones
  - Kidney, ureteral, bladder
- Gall stones
- Vascular
  - Aortic wall, aneurysm
  - Phleboliths
- Masses


SUPINE


R
SUPINE

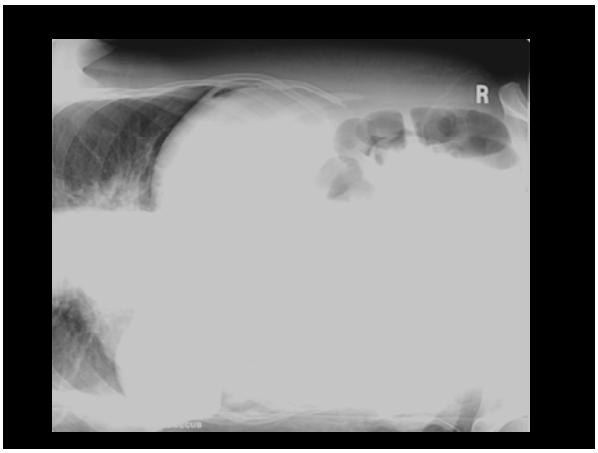

L
SUPINE

Soft Tissue

- Hepatomegaly/splenomgaly
- Ascites
  - Bulging flanks
- Mass effect
  - Displaced bowel loops
- Psoas sign – loss of psoas shadow – appy

Free Air

- Usually perforated viscus
- Post-op up to a week
- Need only a few cc's of air to see it
  - Best film? Upright chest
- Air under diaphragm
  - Over liver margin on LLD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Portable


UPRIGHT