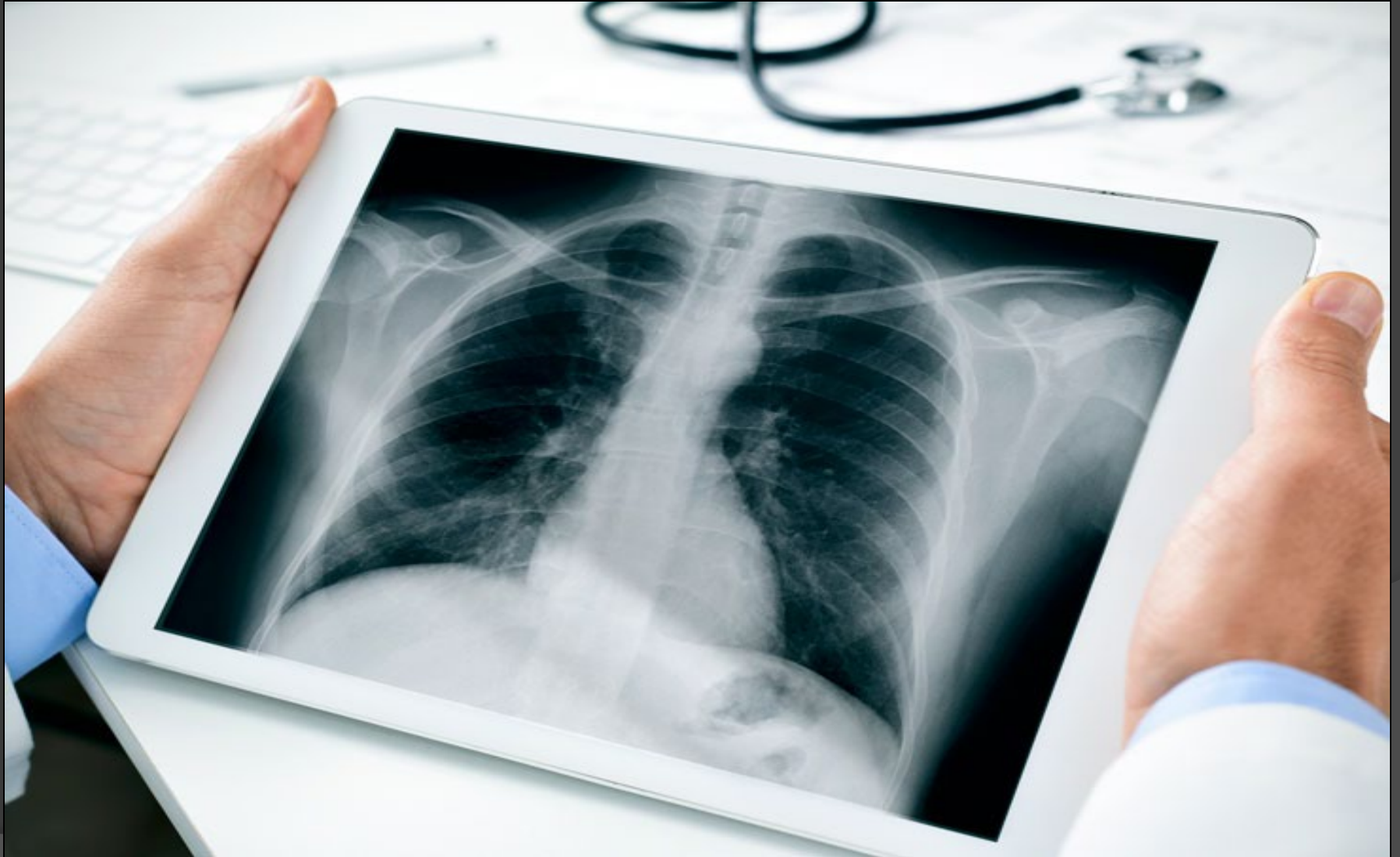


The ABC's of Reading a CXR

Kristie Hoch, DNP, CRNA



Objectives

- 1. Know the ABCDEF's of reading a Chest X-ray (CXR).
- 2. Understand the value of knowing how to assess an airway on a CXR
- 3. Evaluate Cardiac anatomy and the warning signs a CXR can reveal
- 4. Interpret various CXR's with skill.

CXR Series



Oblique View



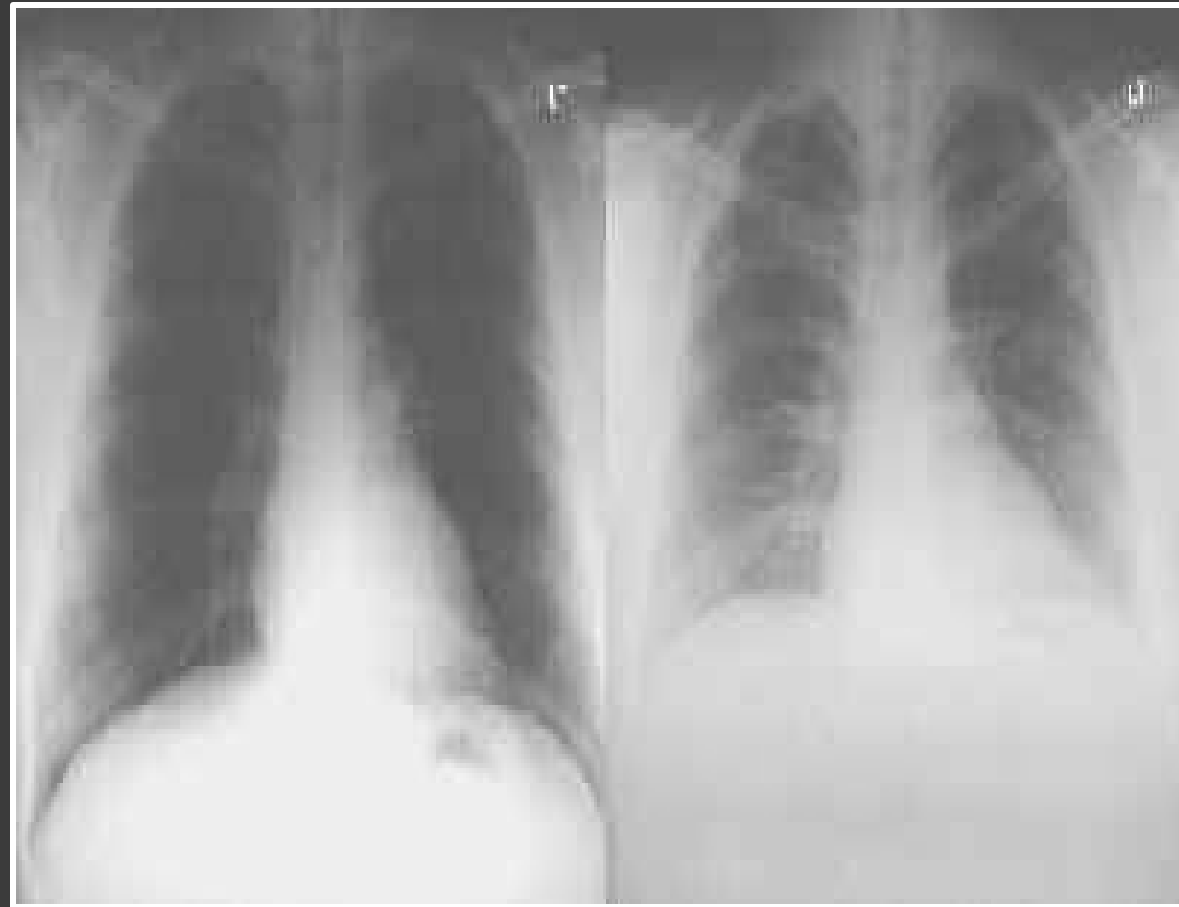
1. The side of interest is the side furthest from the “cassette”.
2. Used to localize a lesion or eliminate superimposed structures.

Identifying and aligning the CXR



1. Look for letter markers
2. Identify the position of the x-ray
3. Align it correctly

Assessing the Quality

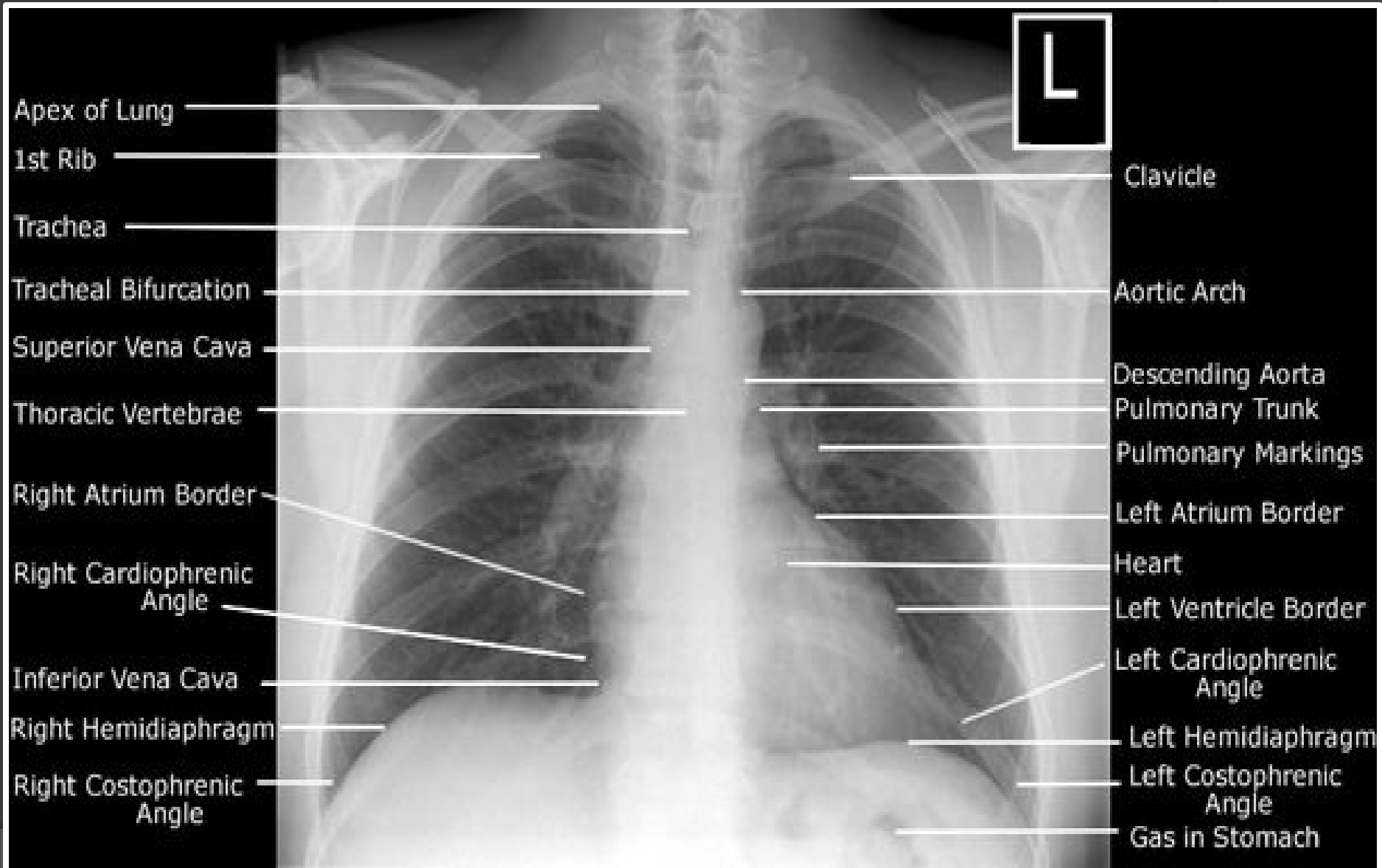


1. Is it on full inspiration?
2. 10 ribs
3. Exposure
4. Rotation

Anatomical Structures

1. Trachea and bronchi
2. Hilar structures
3. Lung zones
4. Pleura
5. Lung lobes and fissures
6. Costophrenic angles
7. Diaphragm
8. Heart
9. Mediastinum
10. Soft tissues
11. Bones

Structures to be Identified



Quick ABCDEF

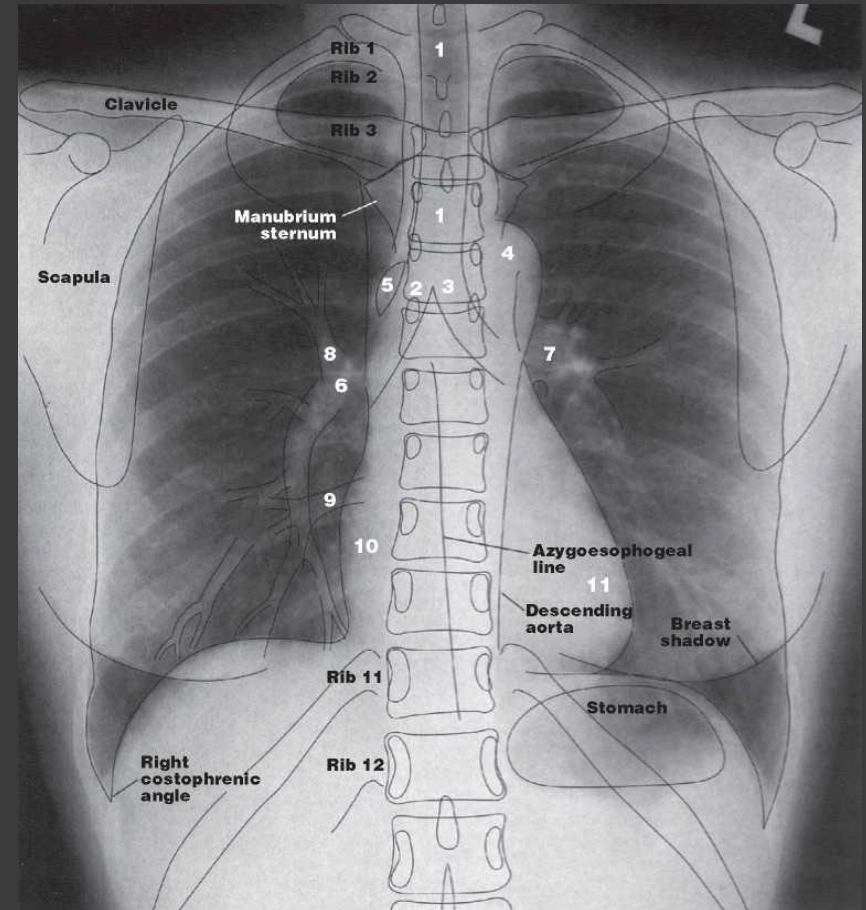
Anatomical structures to check

1. Trachea and bronchi
2. Hilar structures
3. Lung zones
4. Pleura
5. Lung lobes and fissures
6. Costophrenic angles

Airway

Bones/Breathing

Cardiac



Diaphragm

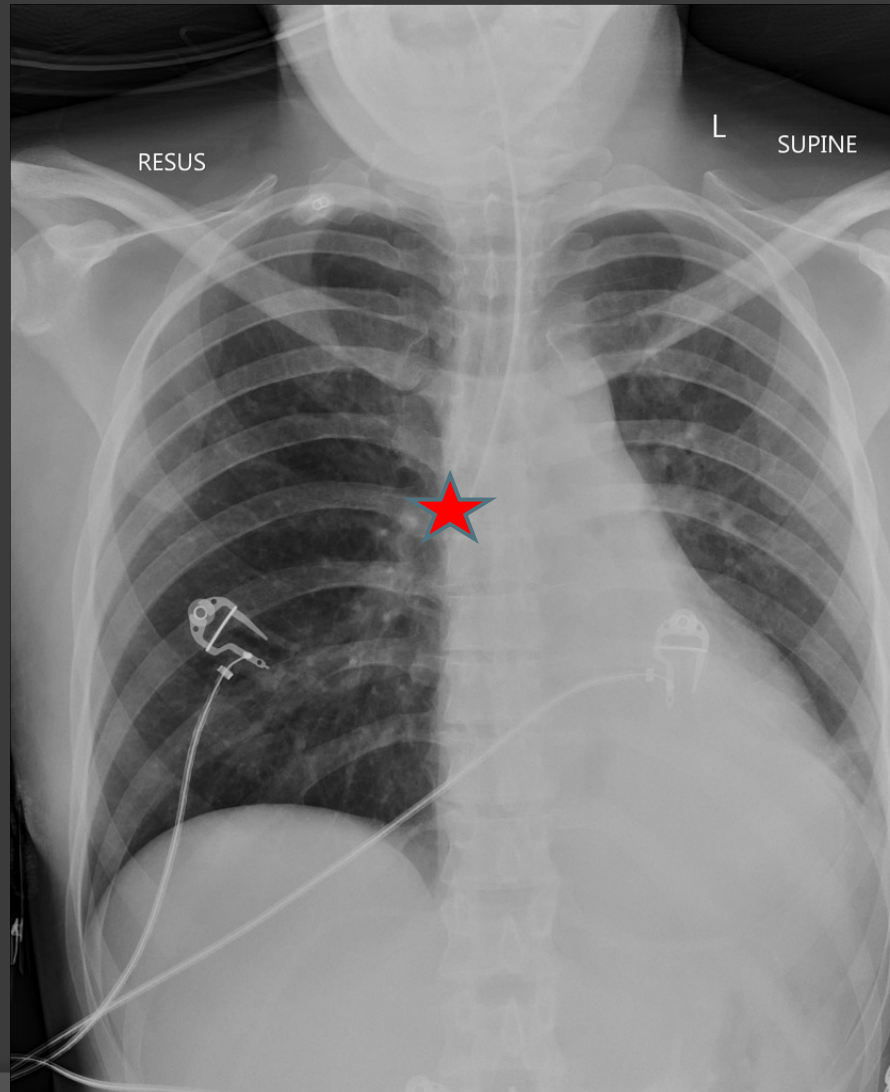
Exposure/Effusion

Fields/Fissures/Fractures

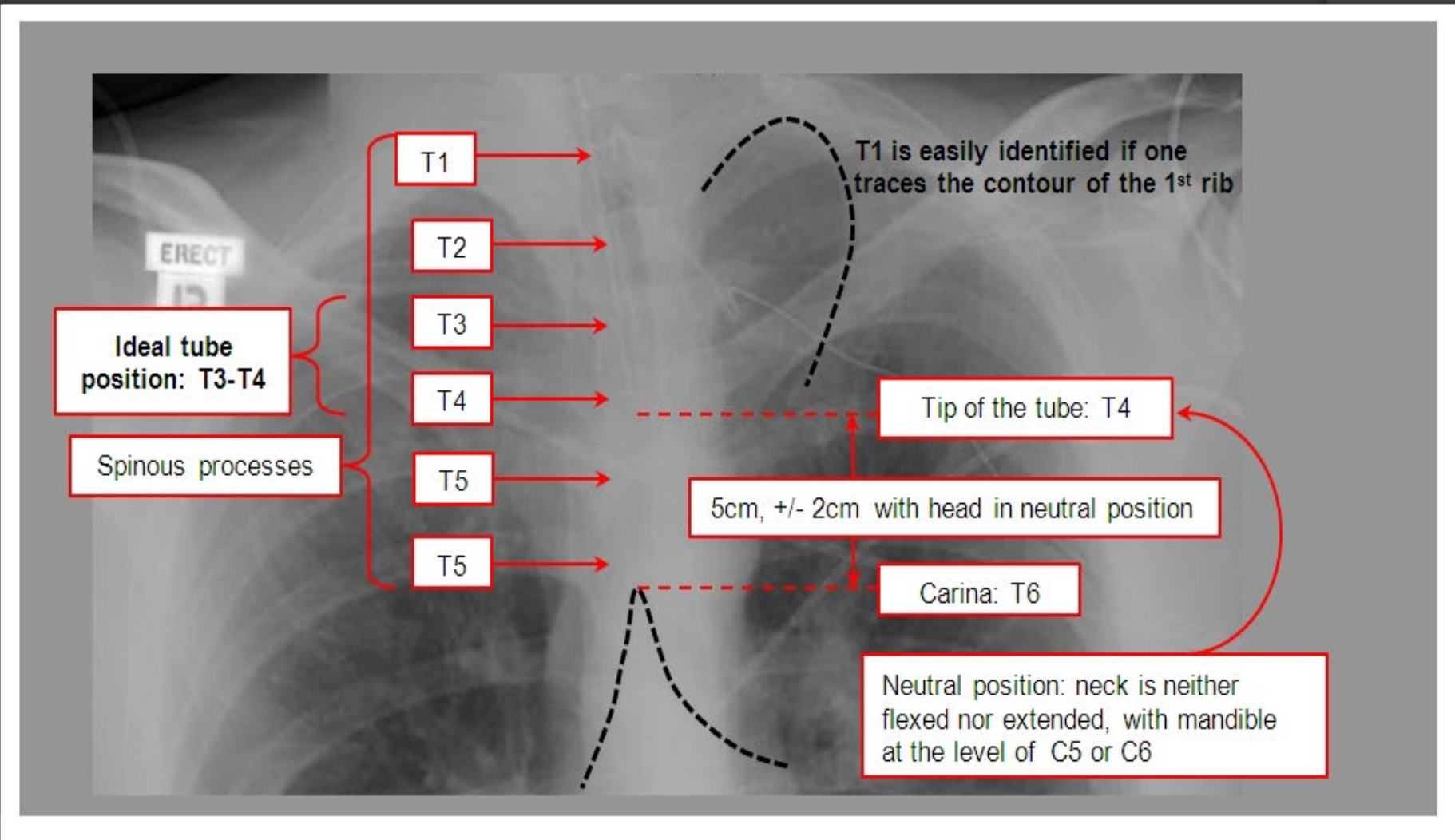
Why is being able to read a CXR important for the CRNA?



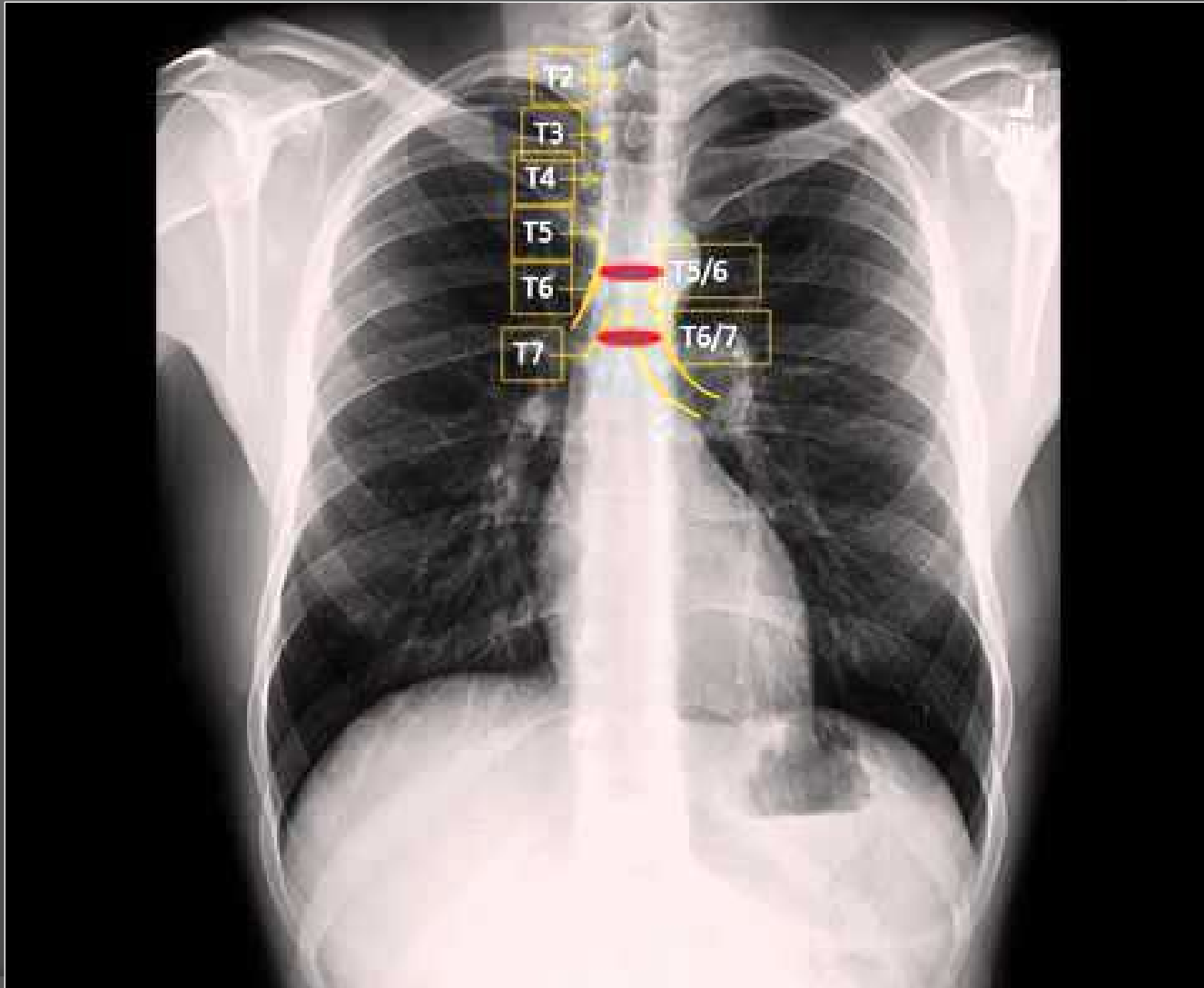
Airway ALL Day!



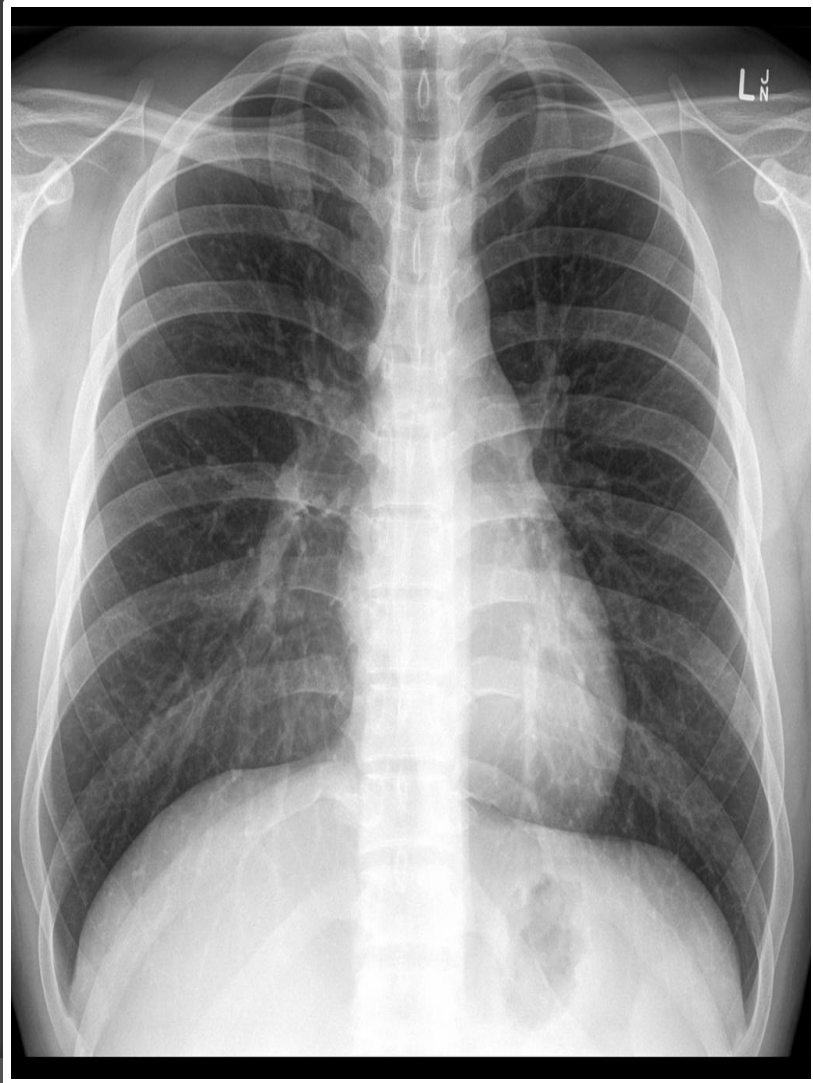
Correct ETT placement



Airway Assessment - ETT

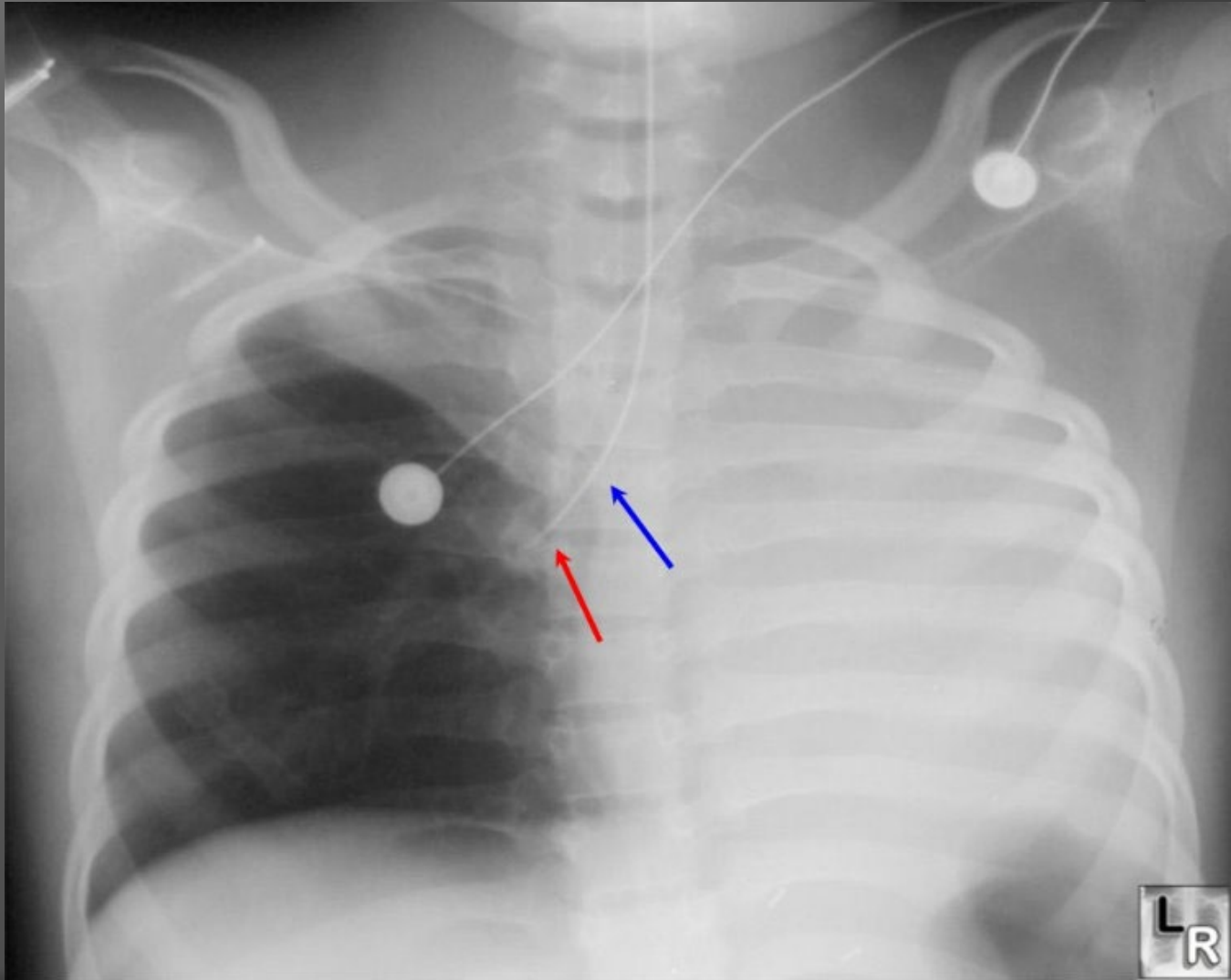


Airway - Trachea

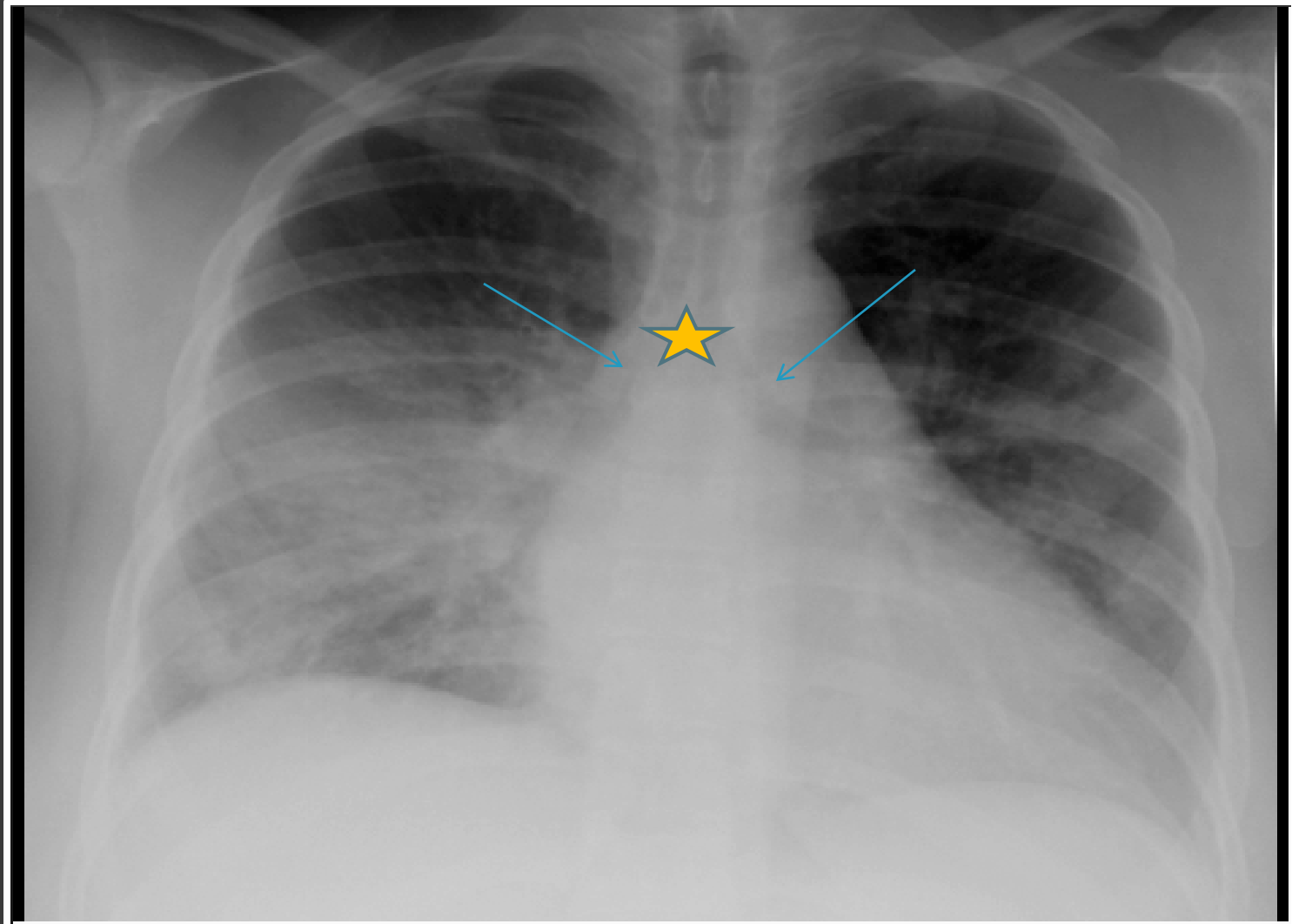


- The trachea should be central or slightly to the right.
- The trachea branches at the carina, into the left and right main bronchi.
- Is the trachea deviated – Incorrect position or pathology?
- The large airways are visible on most CXRs.

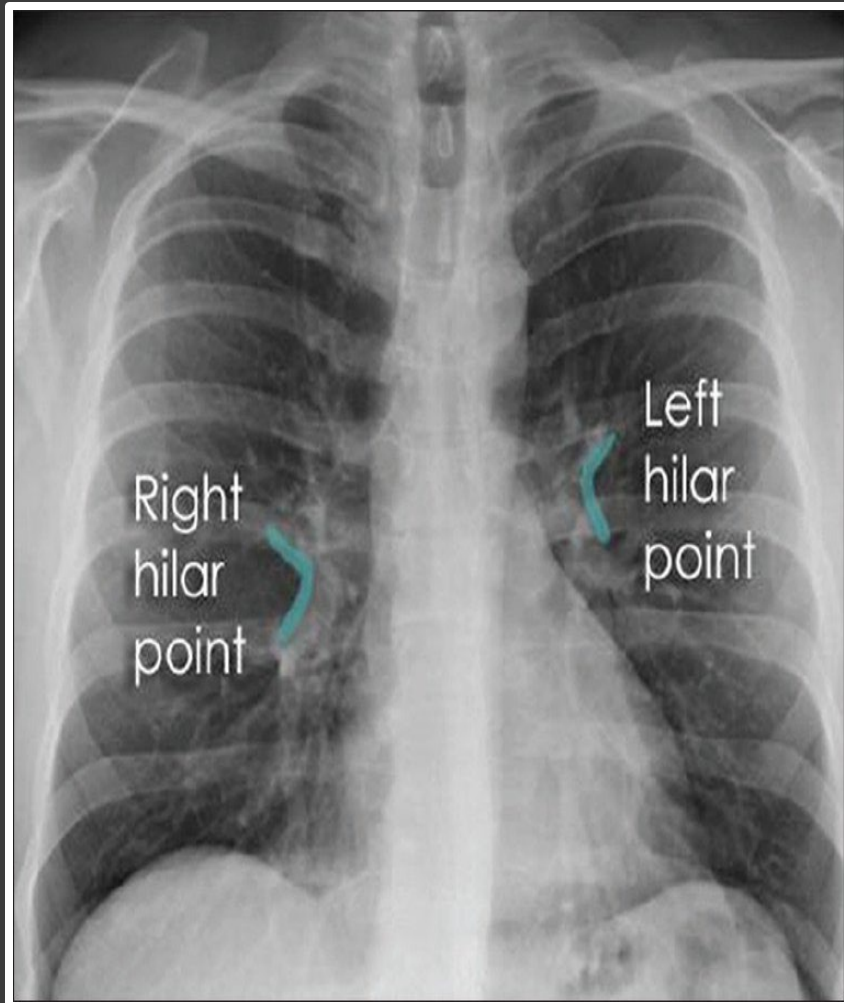
CORRECT POSITION?



Airway – Carina & Bronchi

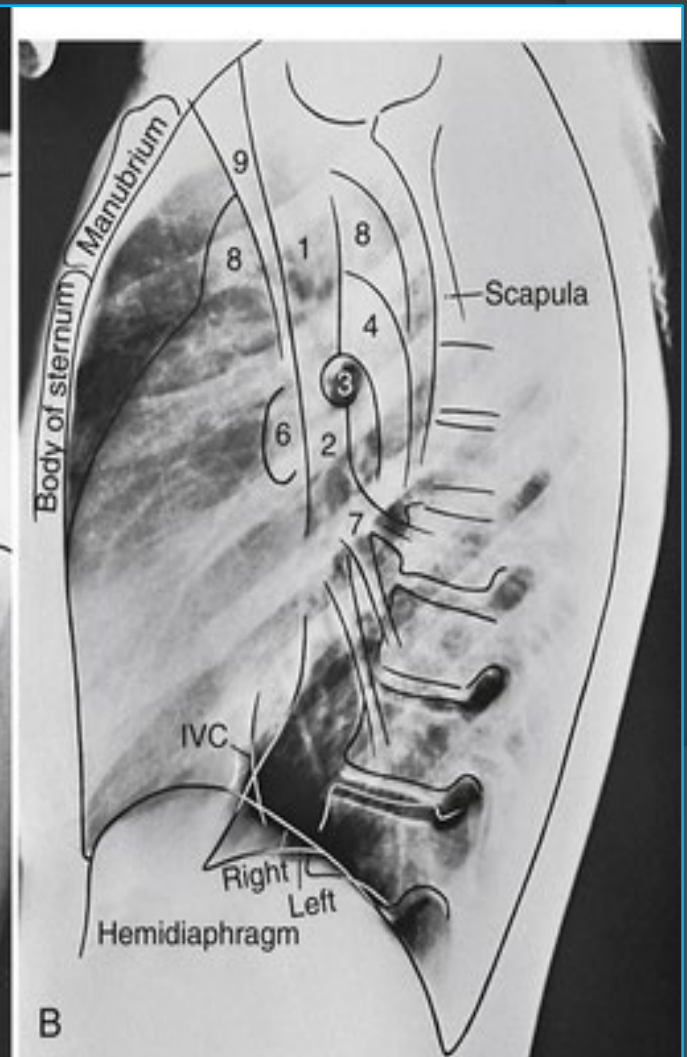
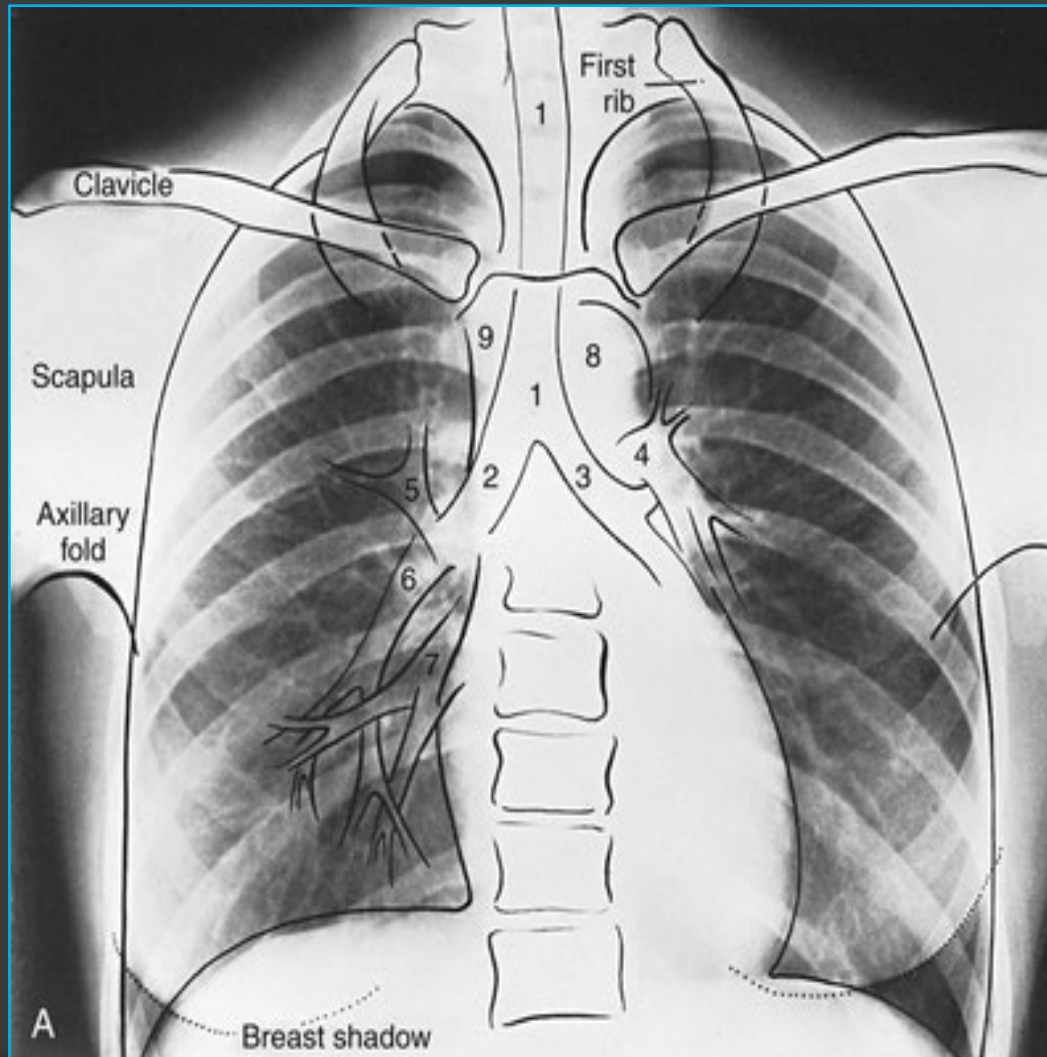


Airway - Hila

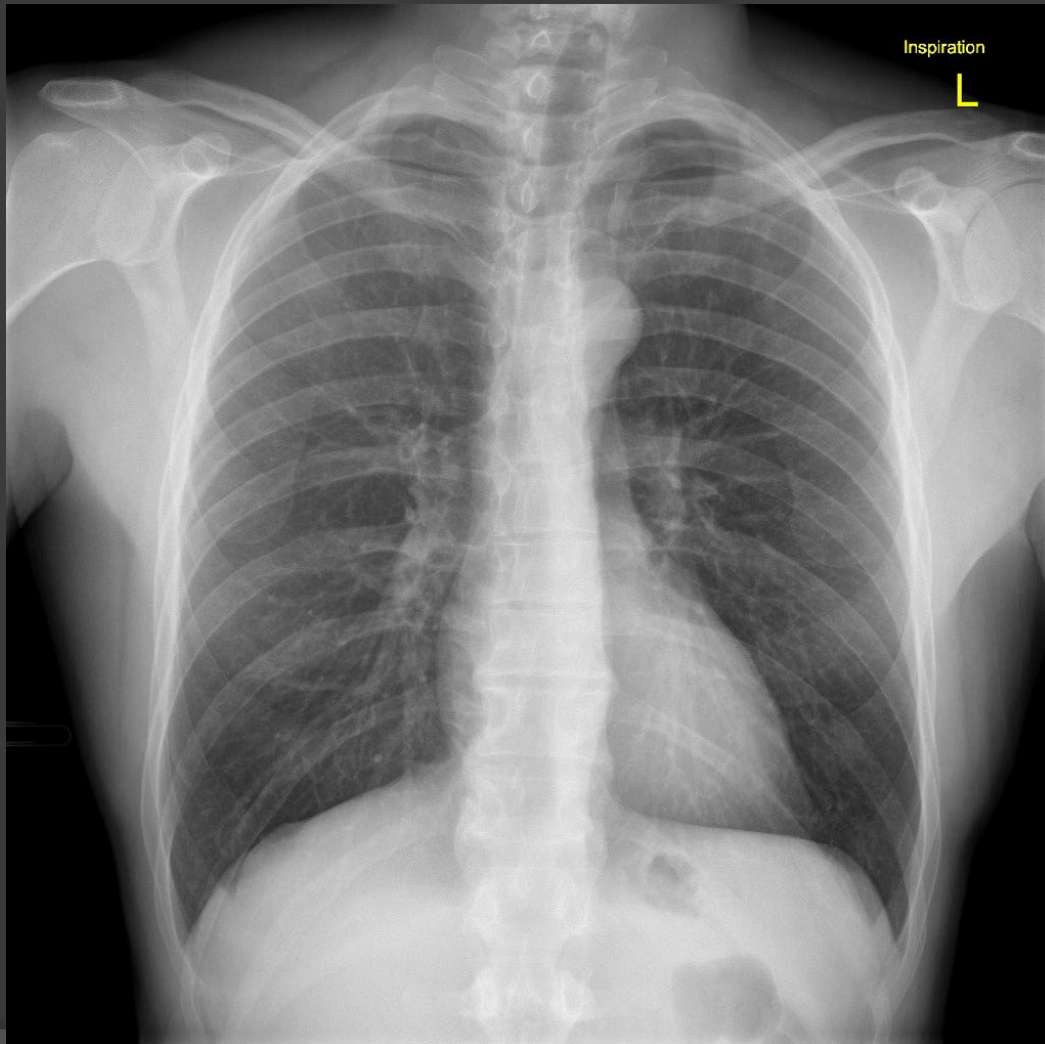


- The hila consists of the major bronchi and the pulmonary veins and arteries.
- Not symmetrical
- Commonly the left hilum is higher than the right.
- Should be of similar size and density.

Bones & Soft Tissue

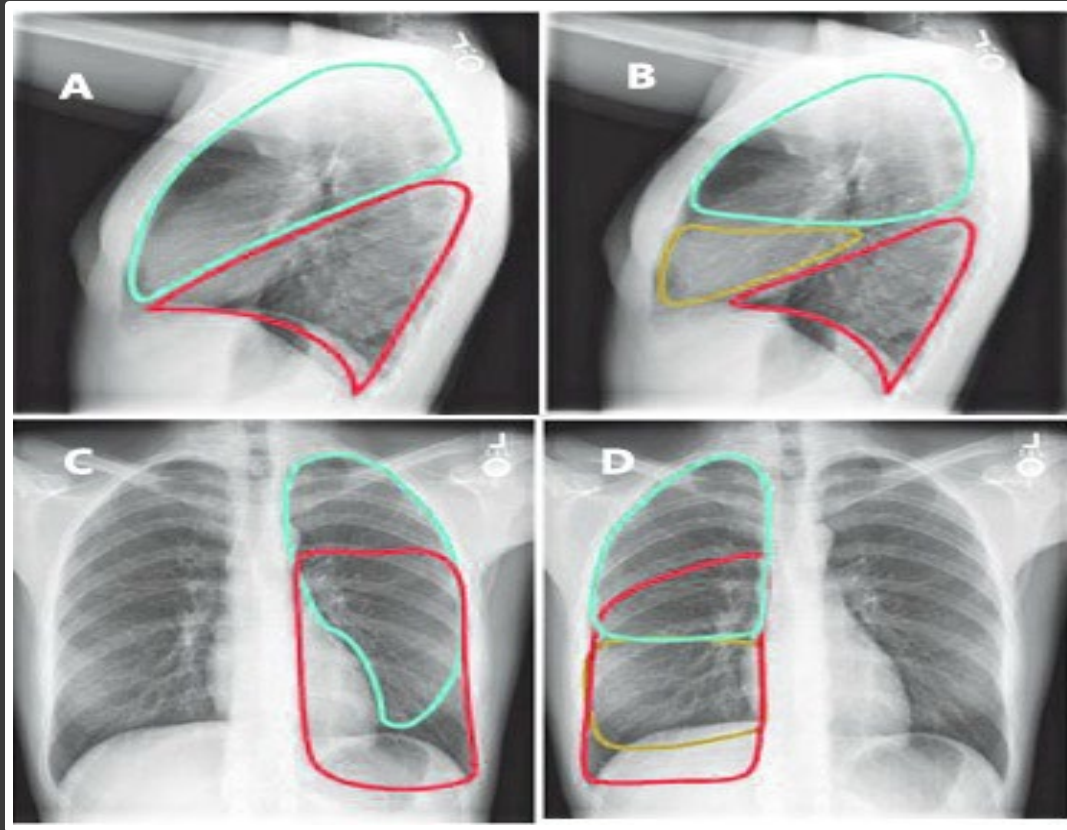


Bones



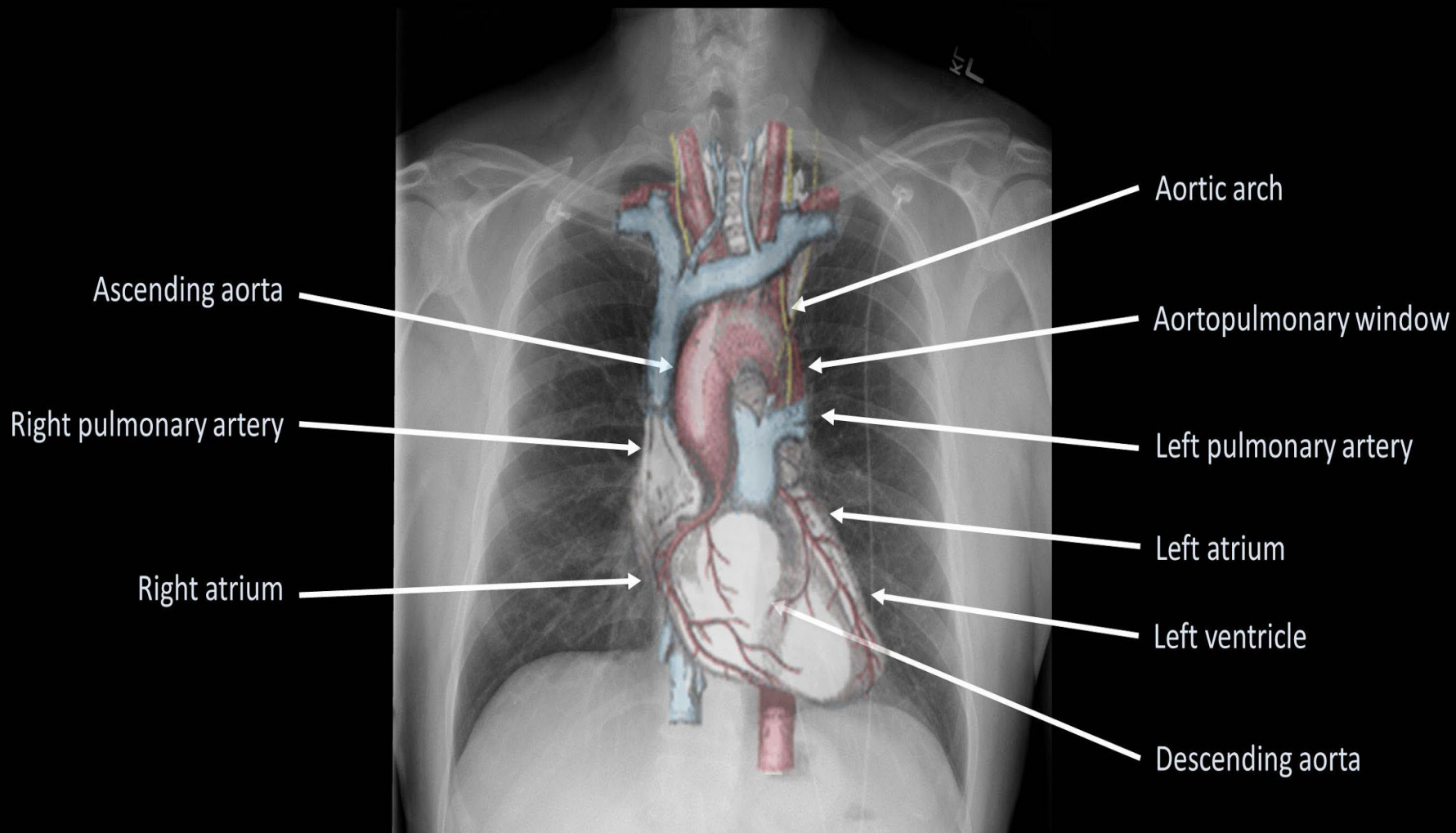
- ✓ Are there 10 visible ribs?
- ✓ Clavicles
- ✓ Scapula
- ✓ Fractures?

Breathing - Lung Zones

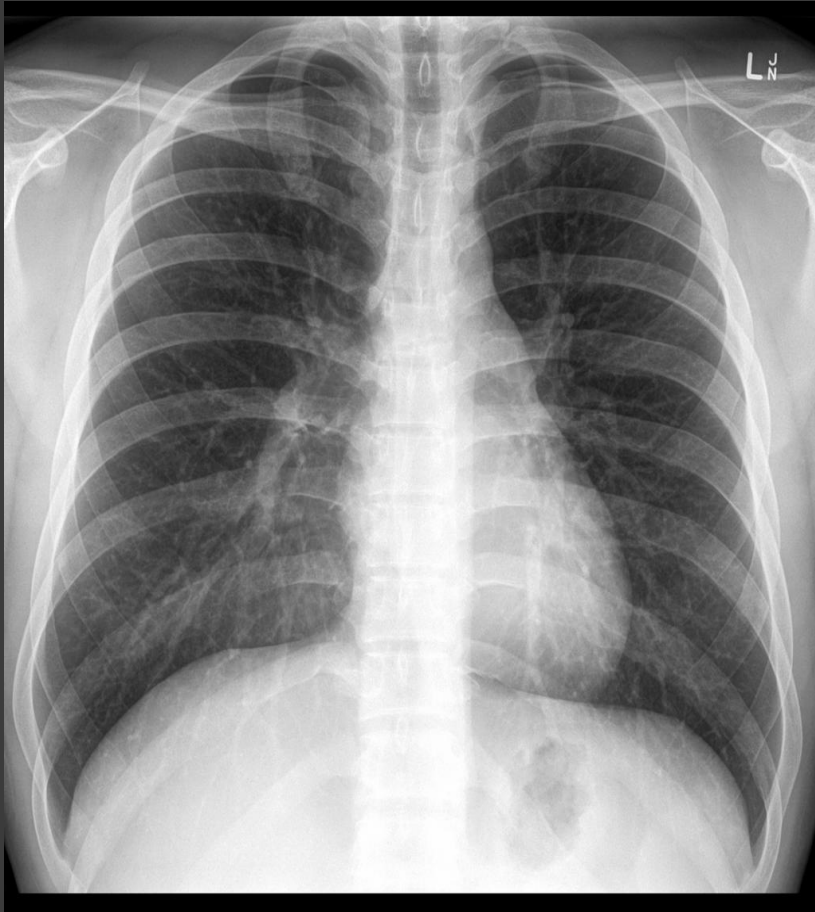


- Lung zones are described by dividing them into upper, middle and lower zones.
- Compare left with right
- Compare any abnormality with the rest of the lung on the same side

Anatomy – Cardiac Silhouette and Mediastinum

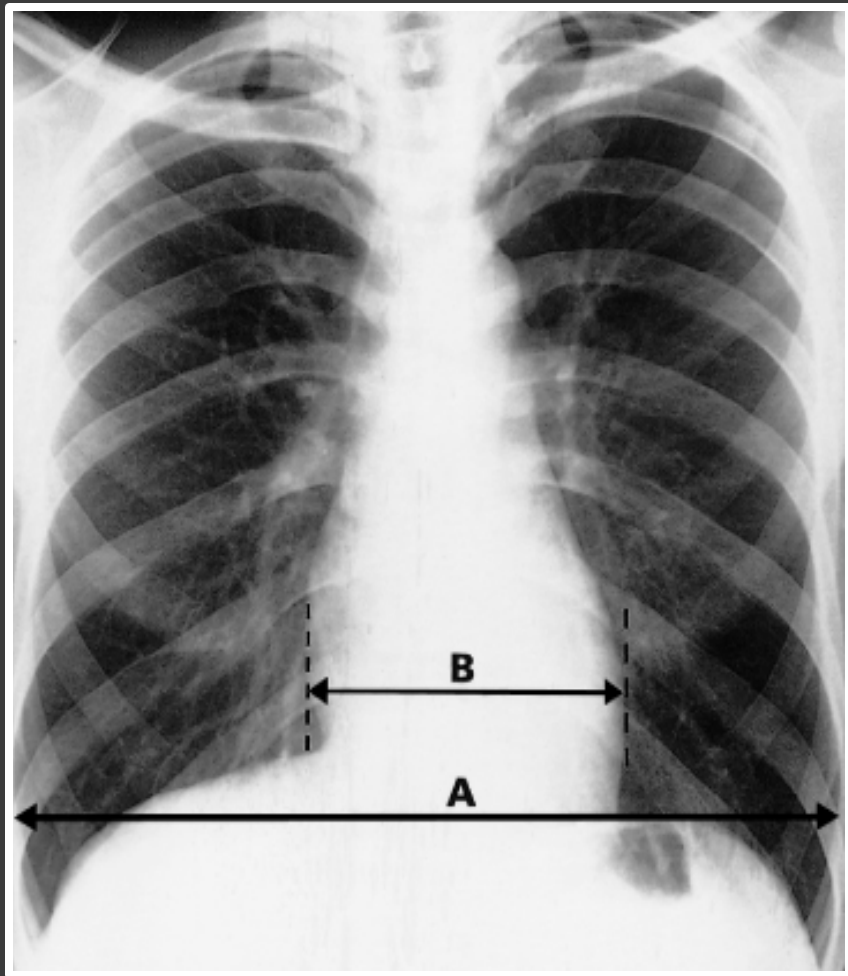


C – Cardiac/Circulation



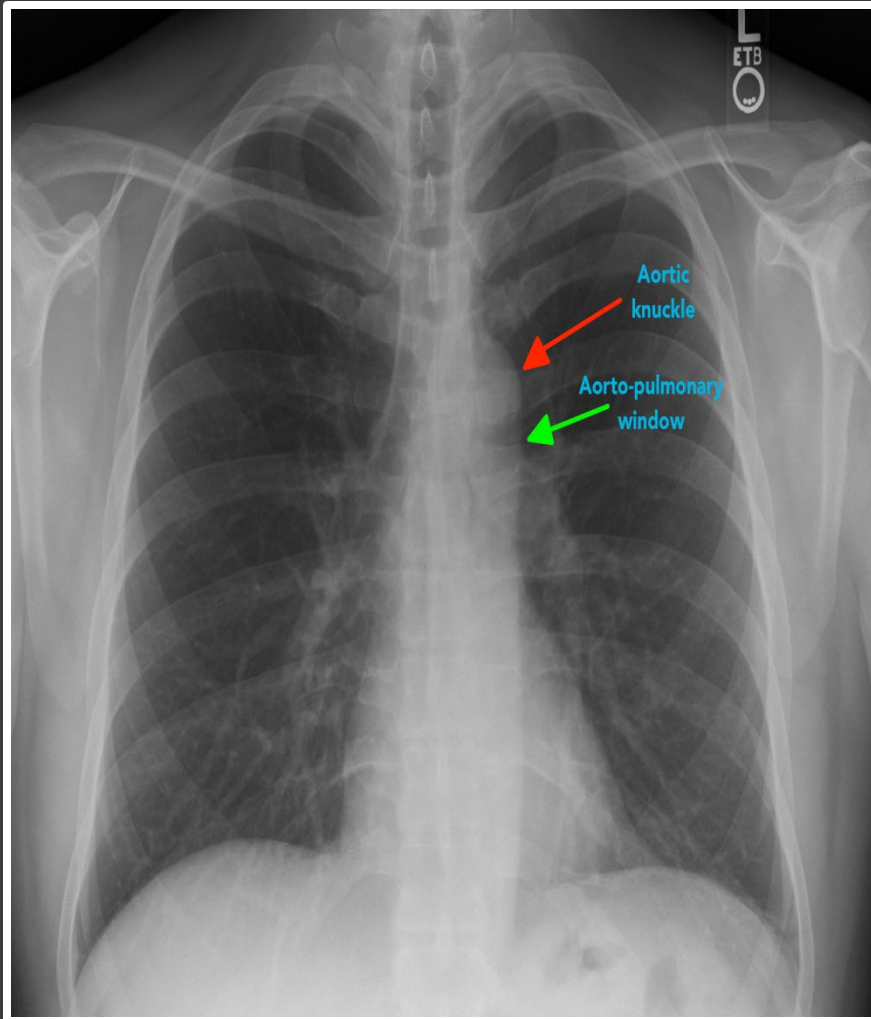
- The heart size is assessed by the cardiothoracic ratio (**CTR**)
- A CTR of $>50\%$ is abnormal - PA view only
- The left hemi-diaphragm is visible behind the heart.
- The spine can be seen through the heart, indicating adequate X-ray penetration.

Cardiothoracic ratio (CTR)



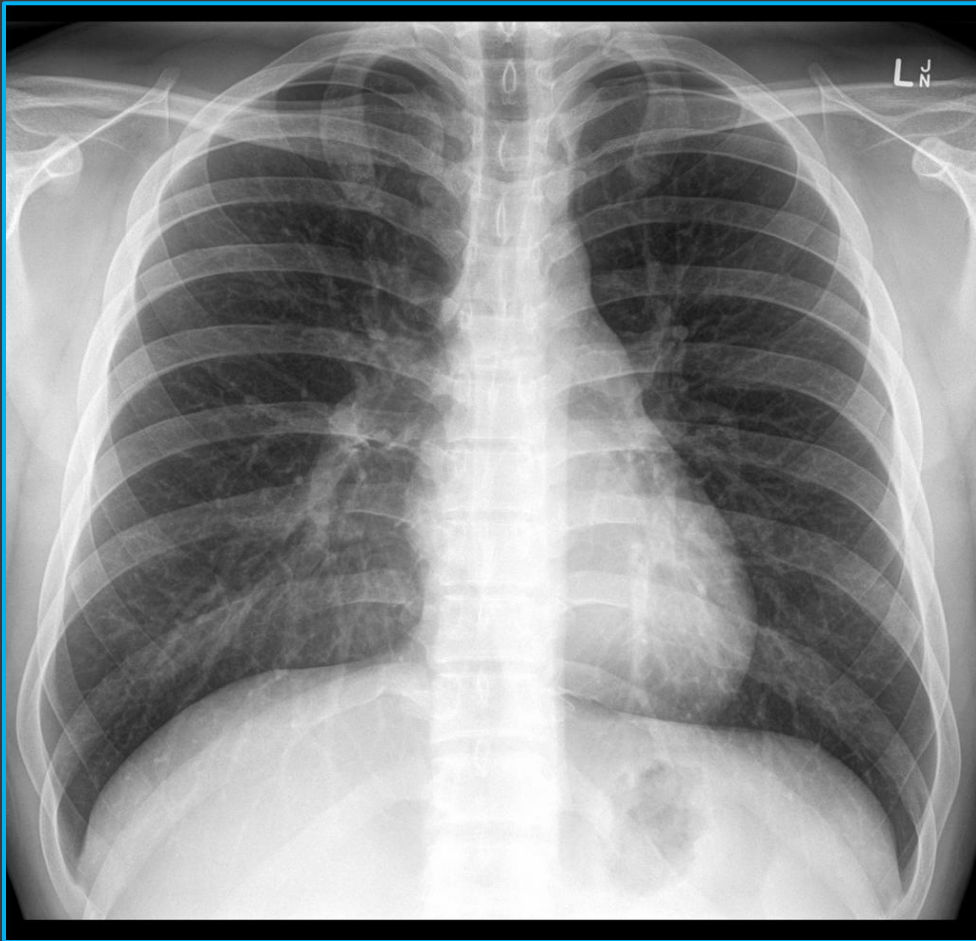
- (B) = **Cardiac size** – is measured by drawing vertical parallel lines down the most lateral points on each side of the heart, and measuring in cm between them.
- (A) = **Thoracic width** - is measured by drawing vertical parallel lines down the inner aspect of the widest points of the rib cage, and measuring in cm between them.
- The normal limit = 50%.

Aortic Structures



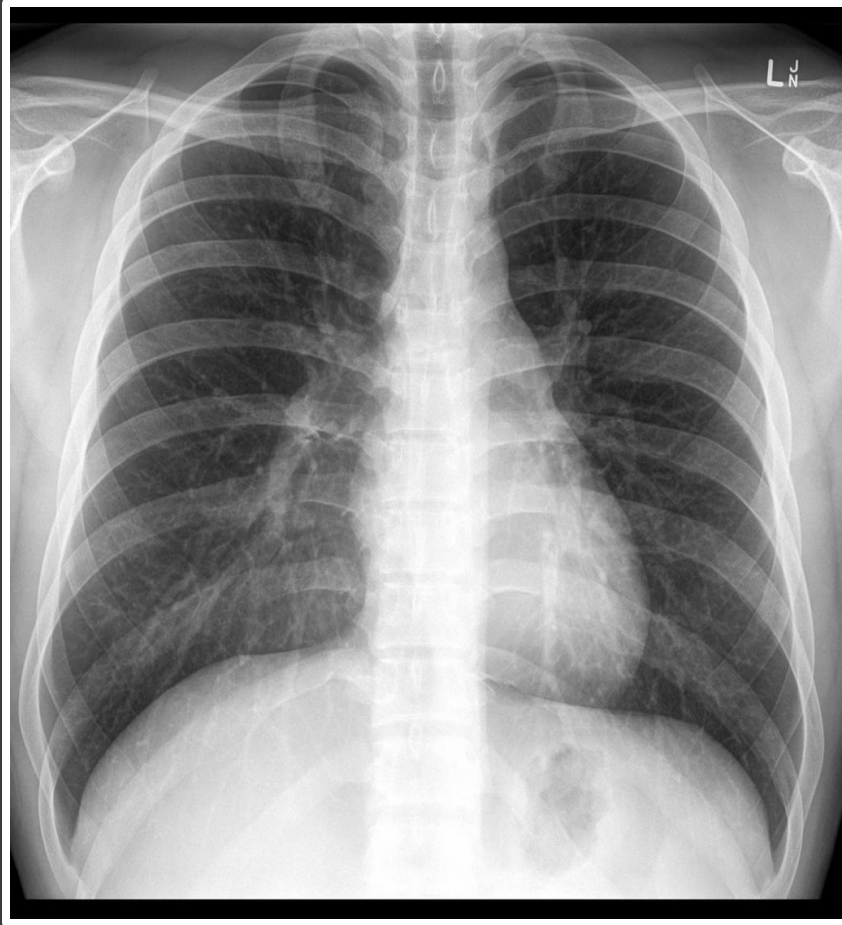
- The aortopulmonary window lies between the arch of the aorta and the pulmonary arteries.
- This is a potential space in the mediastinum.
- Abnormal enlargement of lymph nodes can be seen on a CXR.

Circulation - Heart



- The left hemidiaphragm is visible behind the heart.
- The spine can be seen through the heart, indicating adequate X-ray penetration.

Circulation - Mediastinum

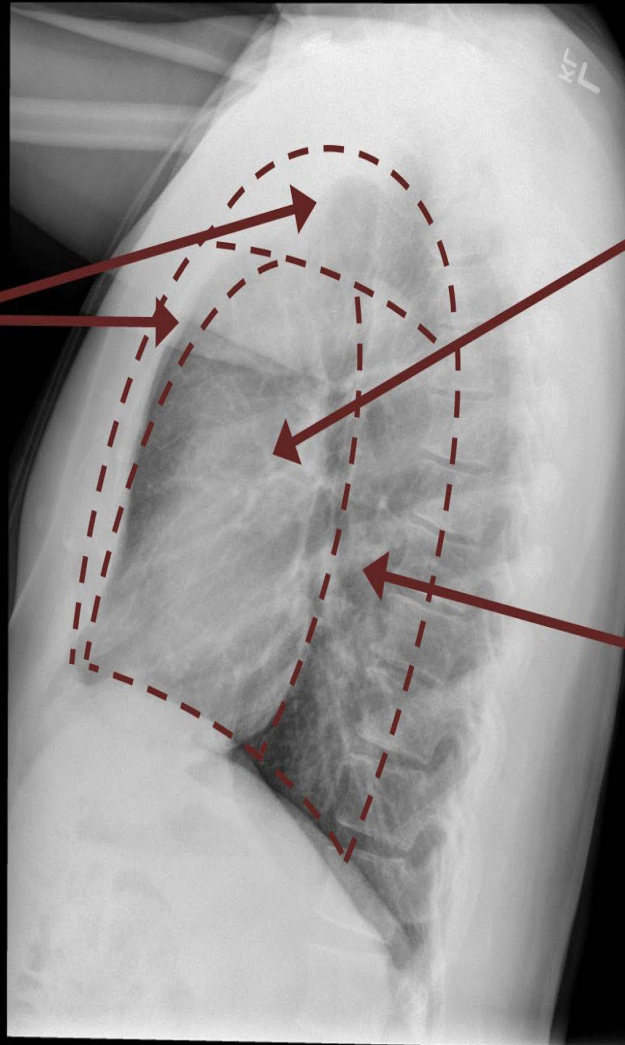


- The mediastinal space can be used to describe the location of disease processes.
- The middle mediastinum contains the heart.
- Diseases can change the appearance of the aortic knuckle, the aorto-pulmonary window and the right para-tracheal stripe.

Mediastinal Masses

Anterior / Superior

Lymphoma
Thyroid
Thymus
Teratoma
Aortic aneurysm
(superior only)



Middle

Lymphadenopathy
Aortic aneurysm
Pericardial cysts
Dilated esophagus
Hiatal hernia

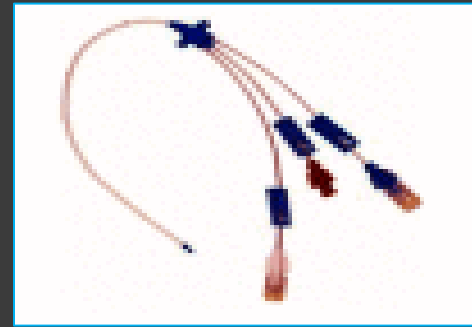
Posterior

Neurogenic tumors
Extension of spinal
masses
(e.g. tumors, infection)

Central Lines

Placement sites

- Internal jugular
- Femoral
- Subclavian
 - Right internal jugular & left subclavian are the most direct paths to the right atrium via the superior vena cava
 - Femoral vein is compressible & may be the most appropriate for coagulopathy issues
 - Subclavian - > risk for pneumothorax

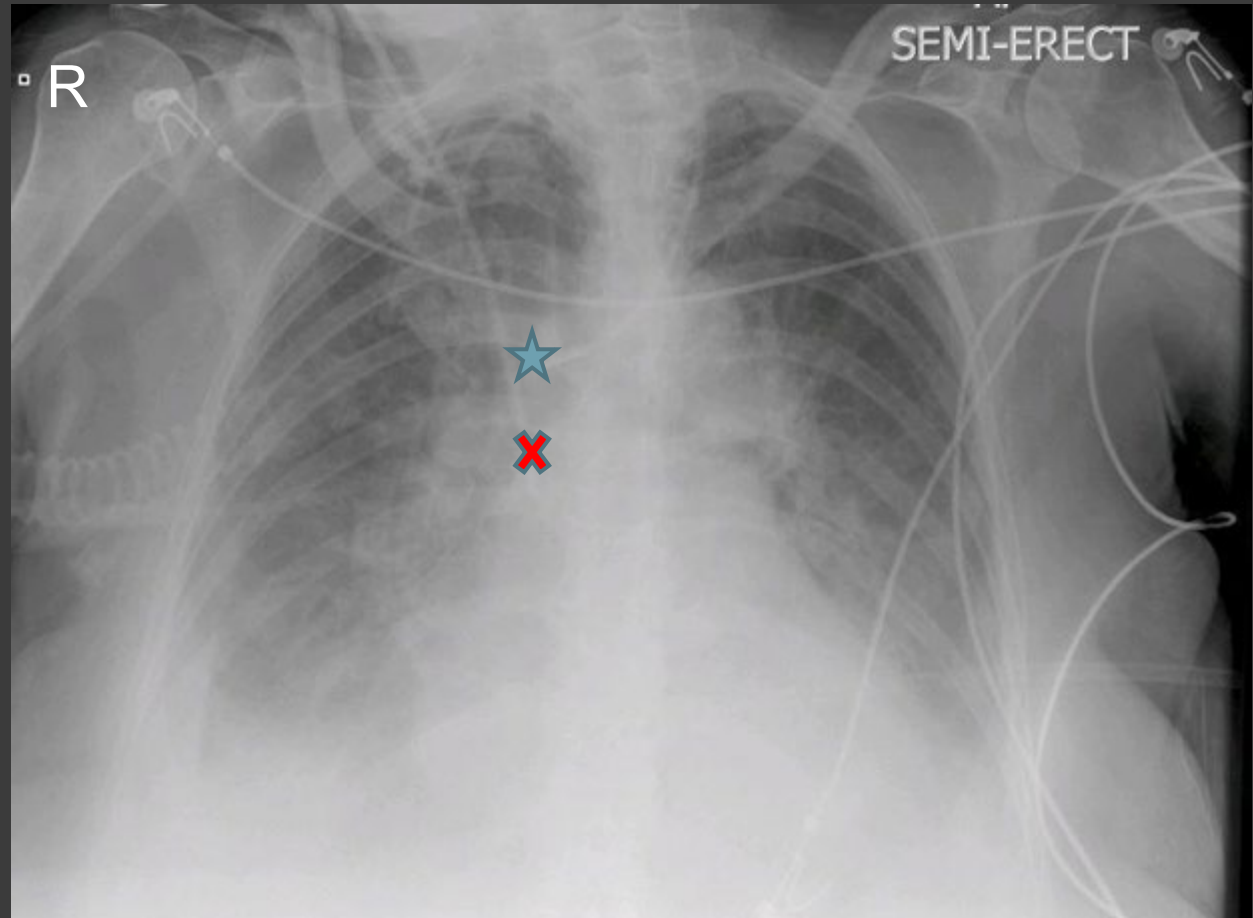


Central Lines

Confirmation:

- The central venous catheter (CVC) should lie **within the superior vein cava (SVC)**, above its junction with the right atrium and parallel to the vessel walls
- Use the carina as a radiologic landmark for CVC position

Central Lines



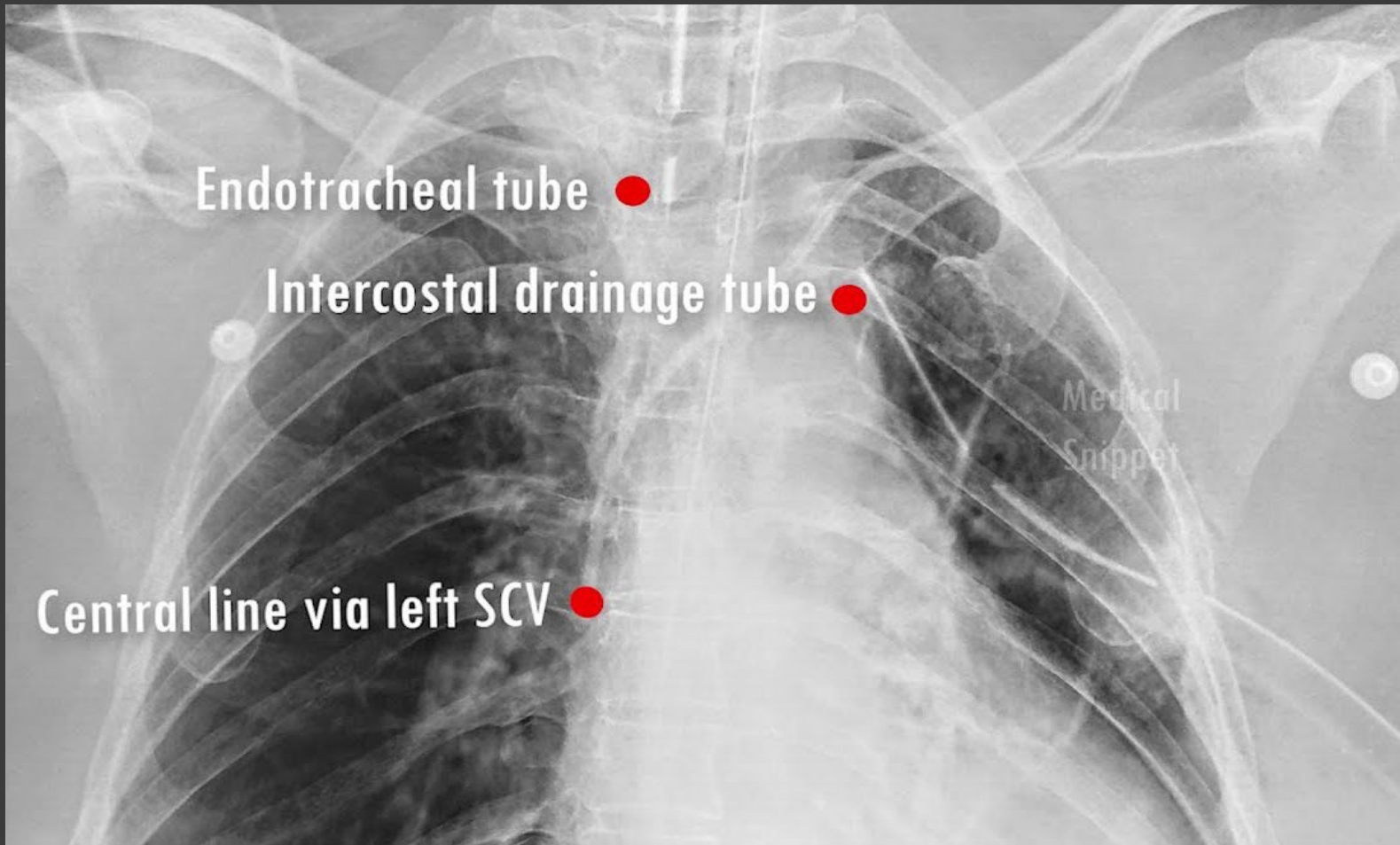
Internal Jugular Vein – Right

- The tip of the catheter should lie just above the level of the carina – the junction of the right & left innominate veins with the SVC

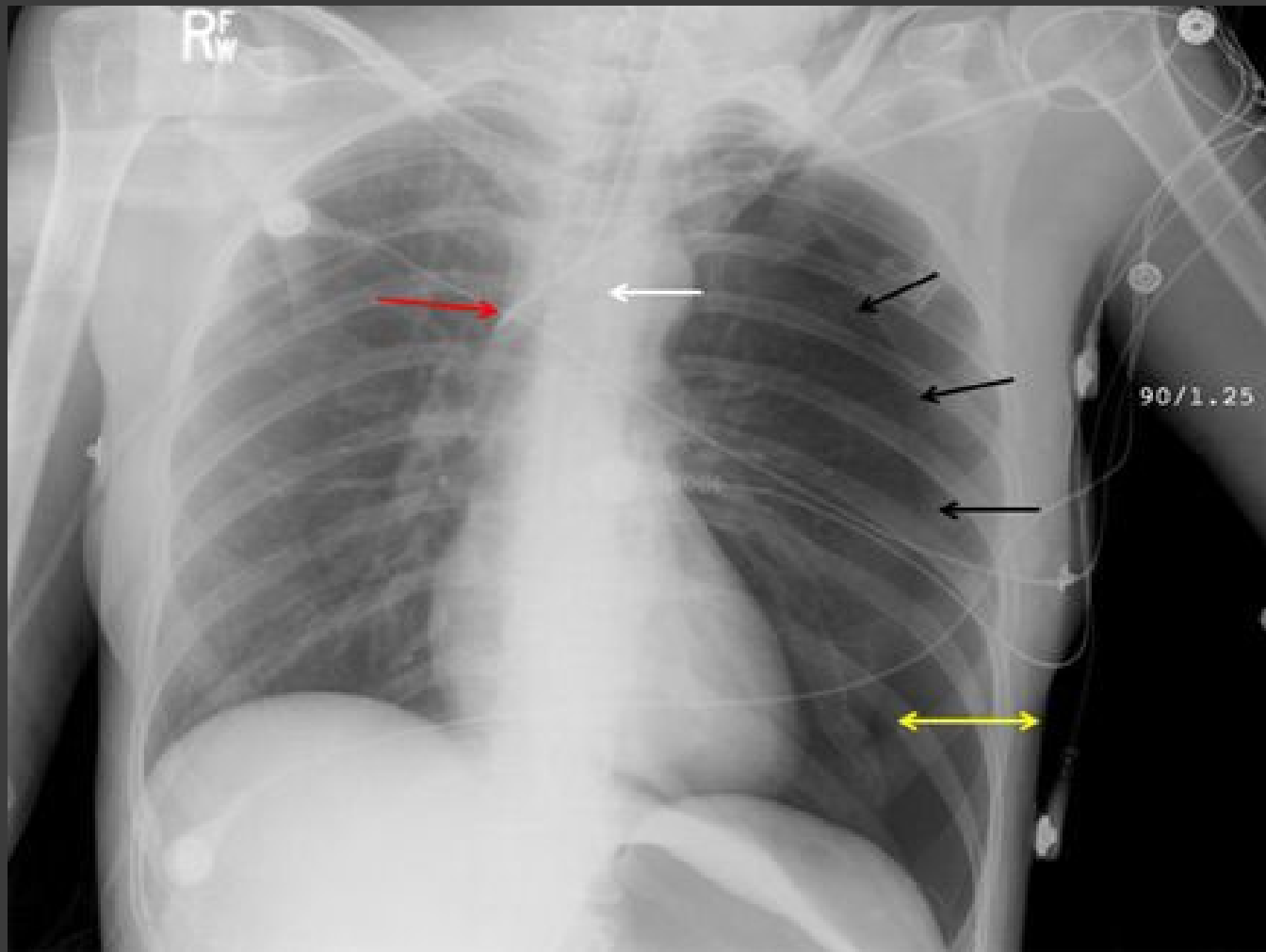
Internal Jugular Vein – Left

- The tip of the catheter should lie just below the level of the carina – the junction of the right & left innominate veins with the SVC

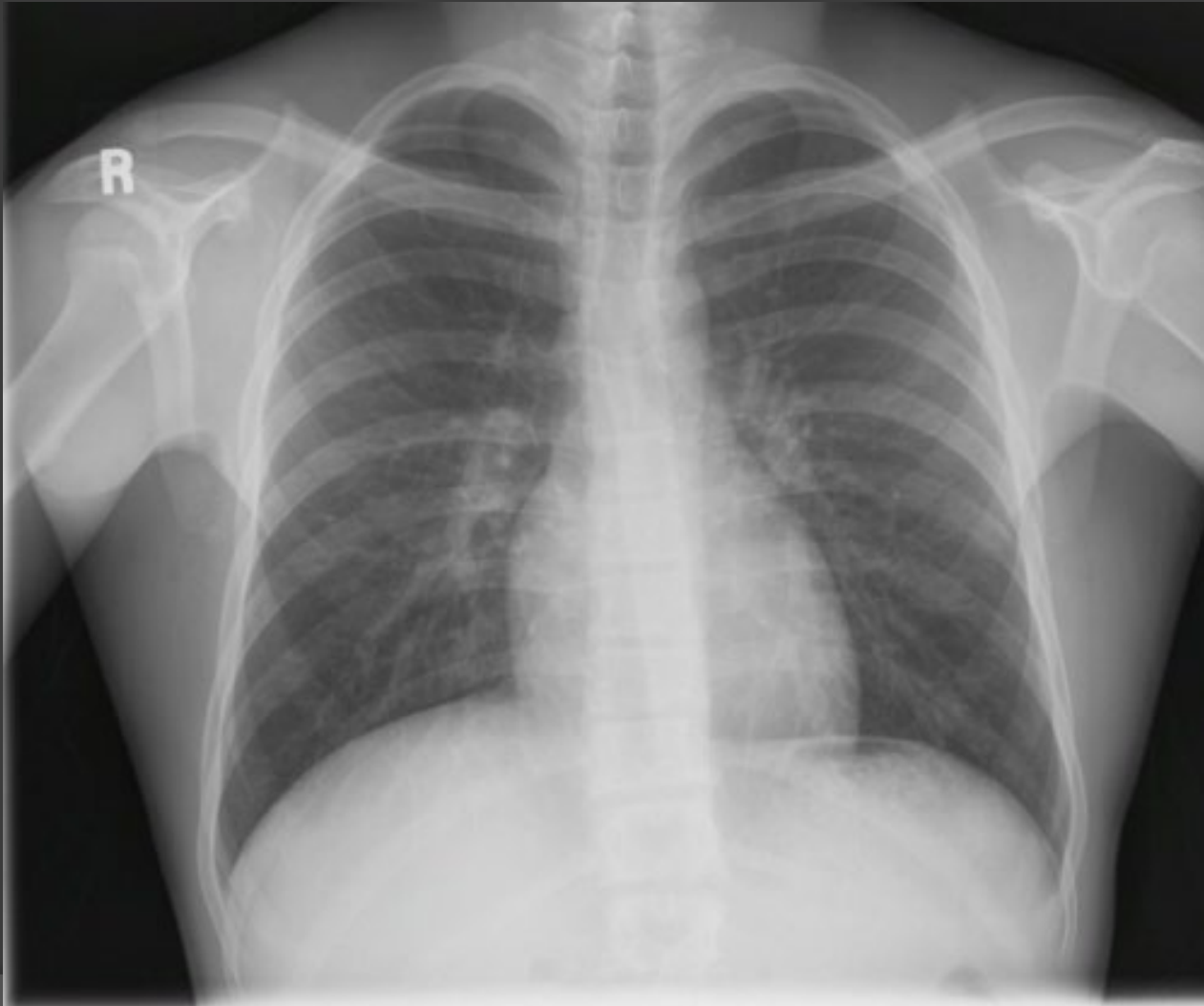
Central lines



PICC lines



D – Diaphragm

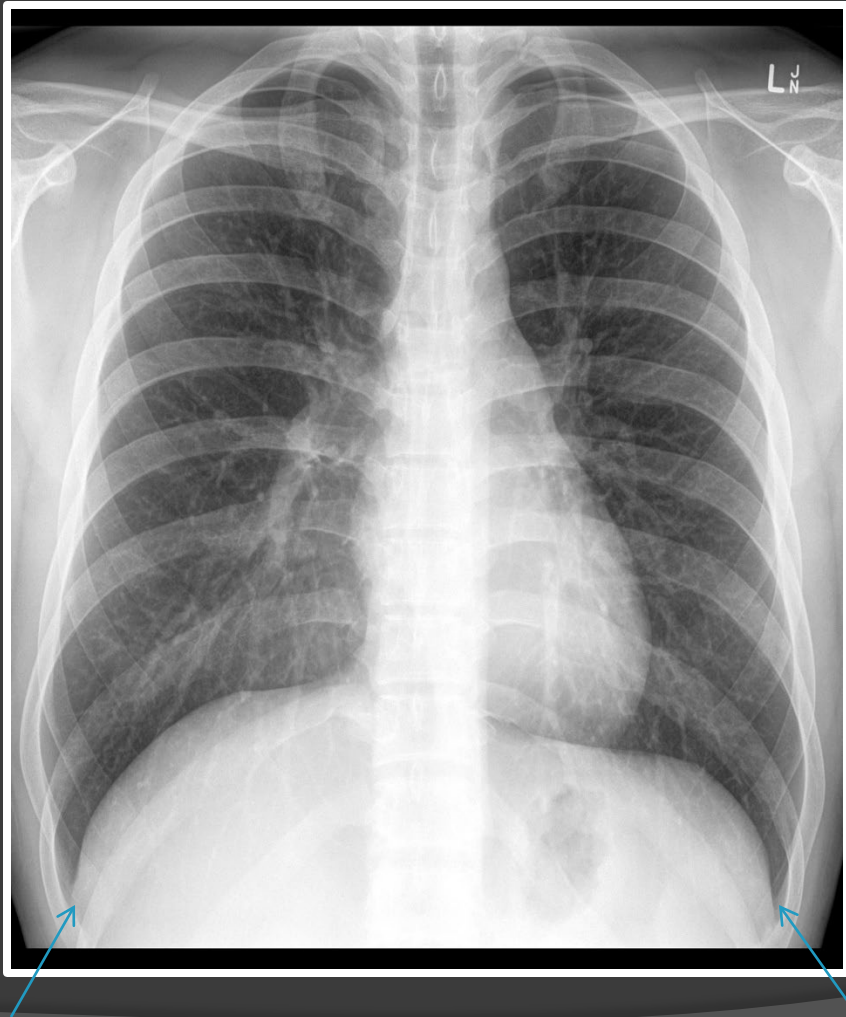


Diaphragm



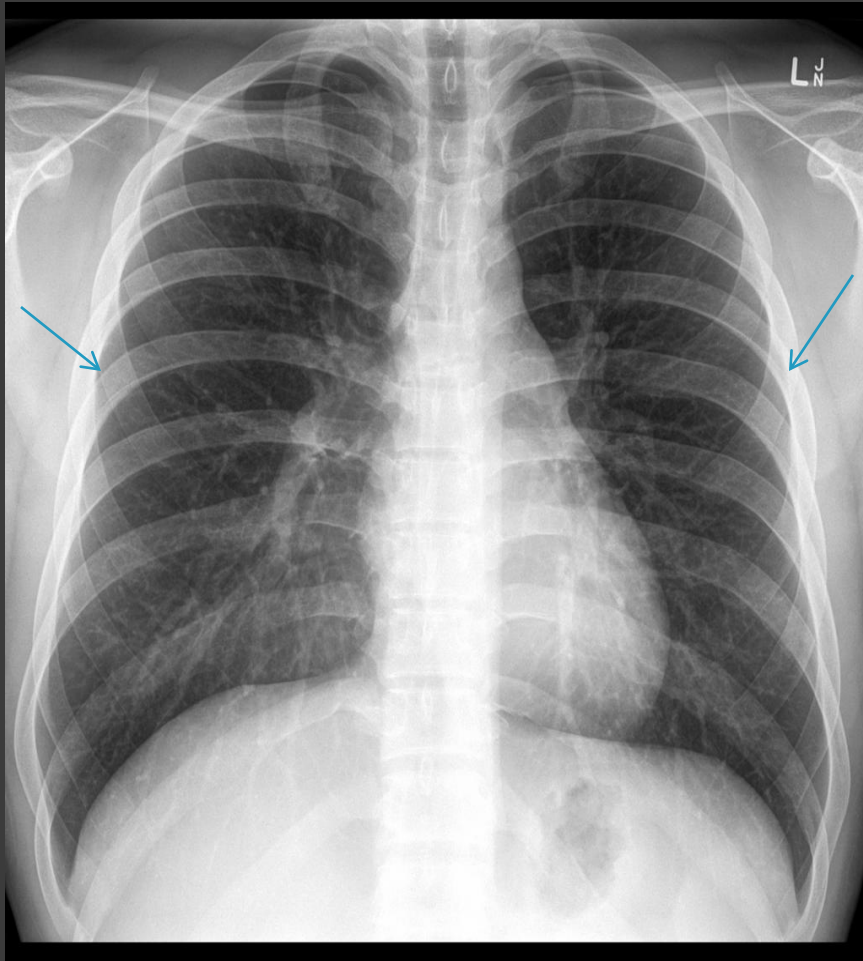
- The hemi-diaphragms are domed structures.
- The right hemi-diaphragm is slightly higher than the left.
- The liver is located immediately inferior to the right hemi-diaphragm.
- The stomach bubble can be seen below the left hemi-diaphragm

Costophrenic angles



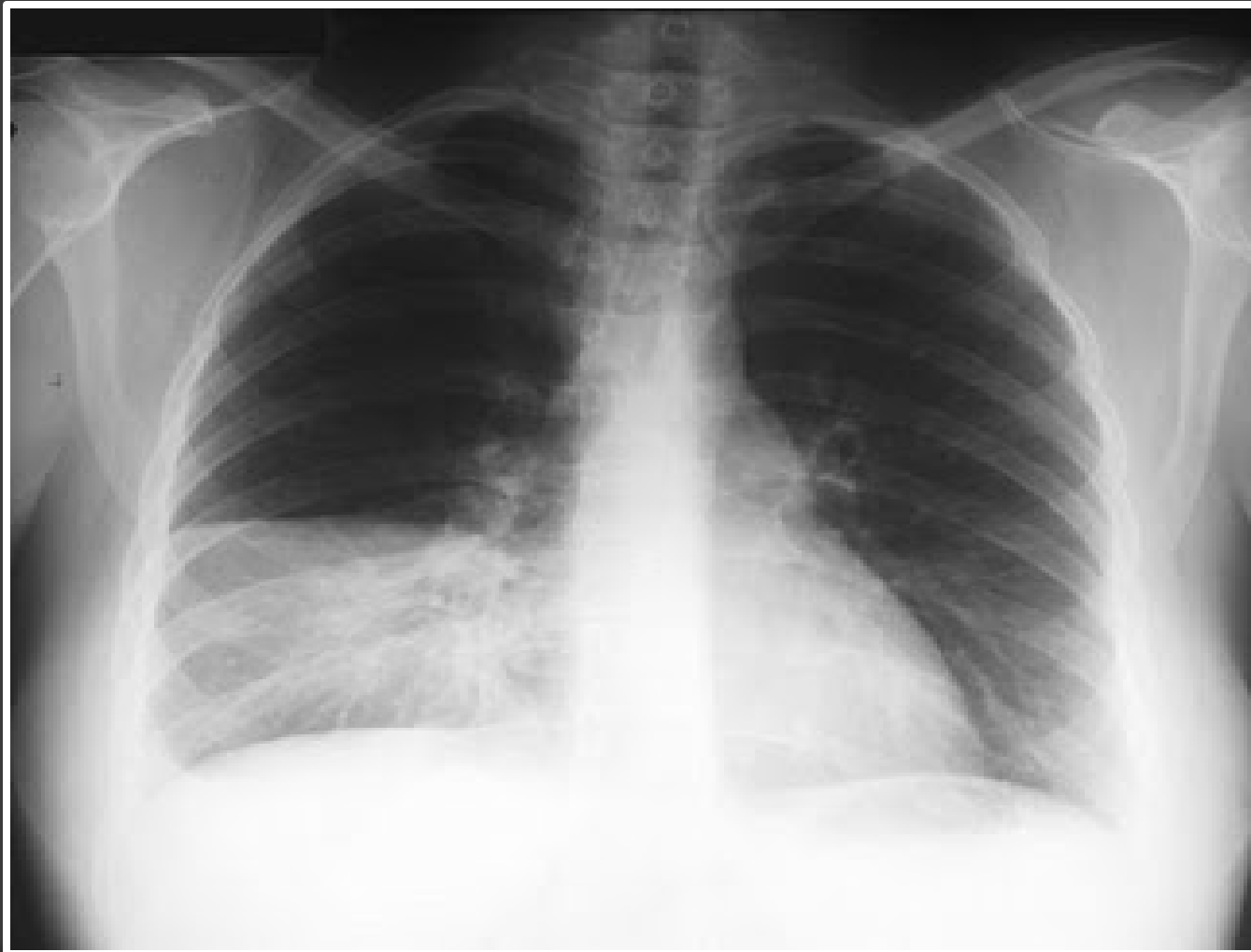
- The costophrenic angles are formed by the hemidiaphragms and the chest wall.
- Costophrenic angles should be sharp.

E – Effusion = Pleura

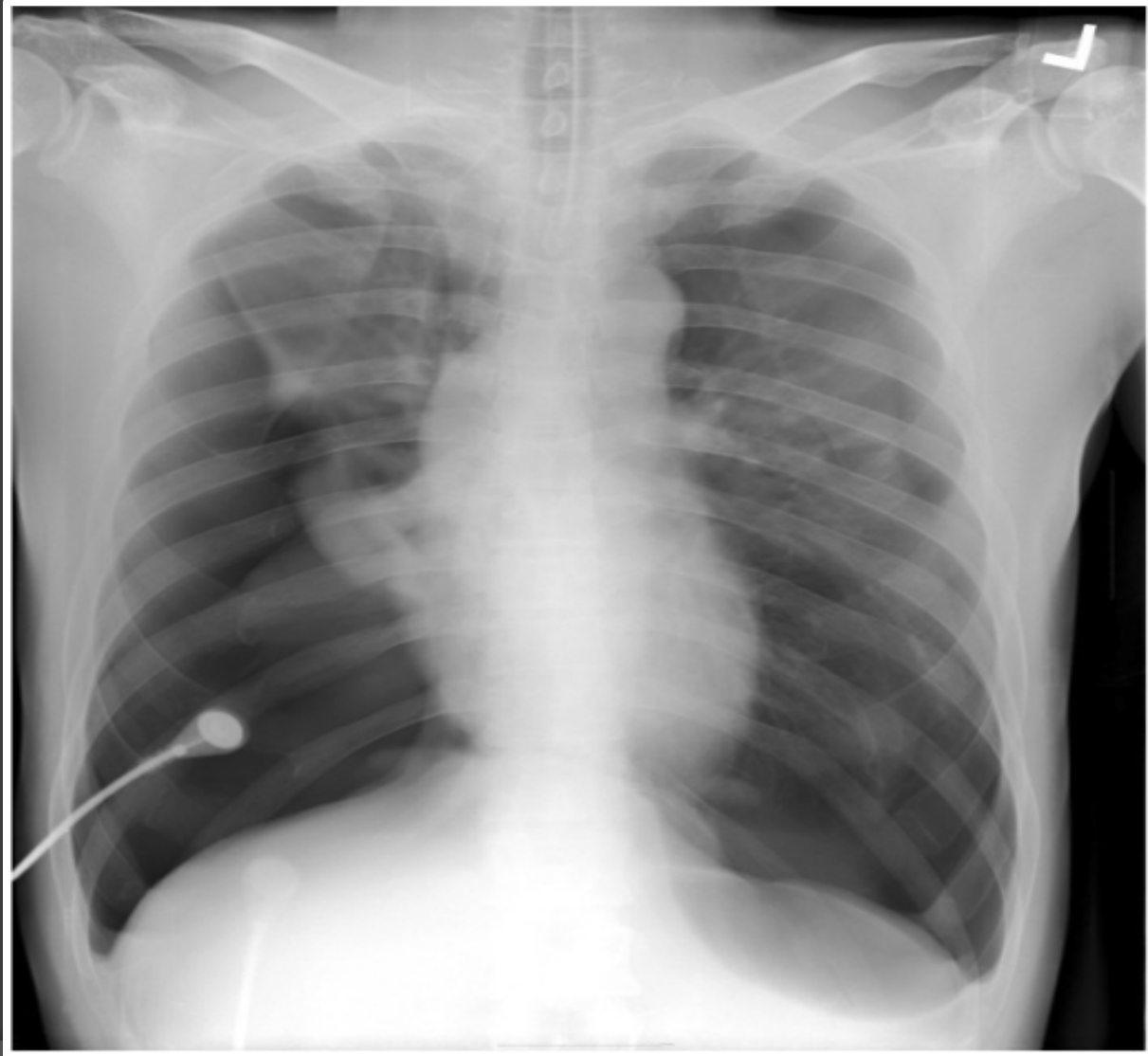


- The pleura are only visible when there is an abnormality present.
- Some diseases cause pleural thickening, and others lead to fluid or air gathering in the pleural spaces.

What major concern may cause the pleura to be abnormal?



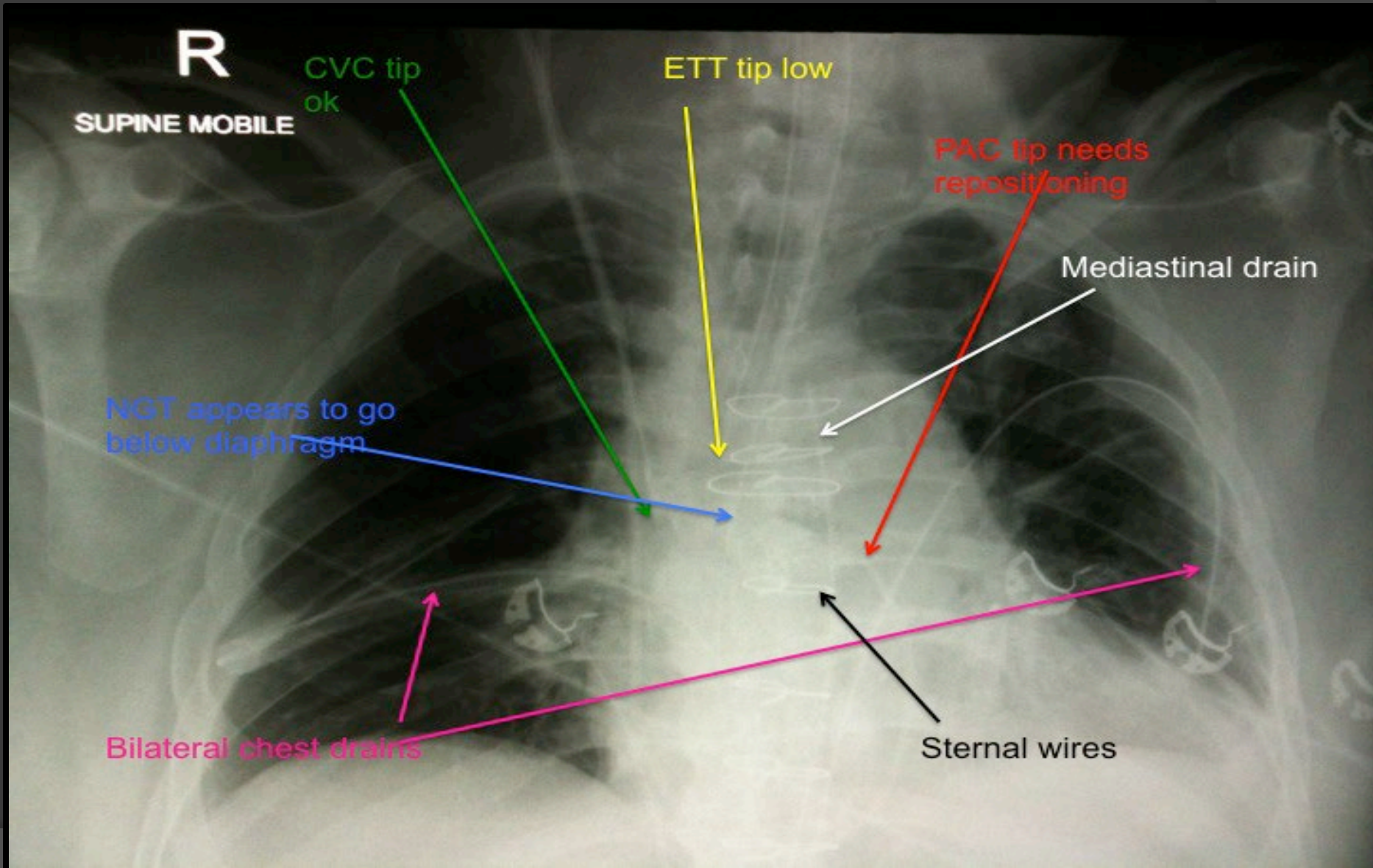
Blunted Costophrenic angles



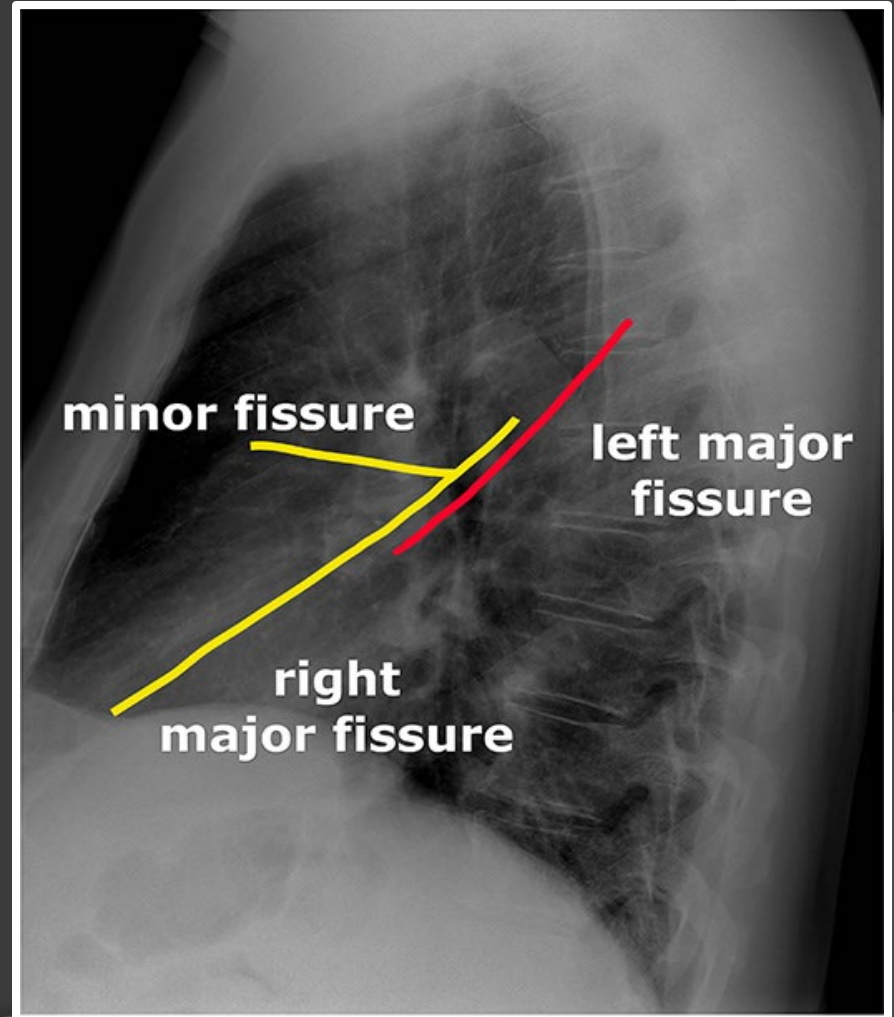
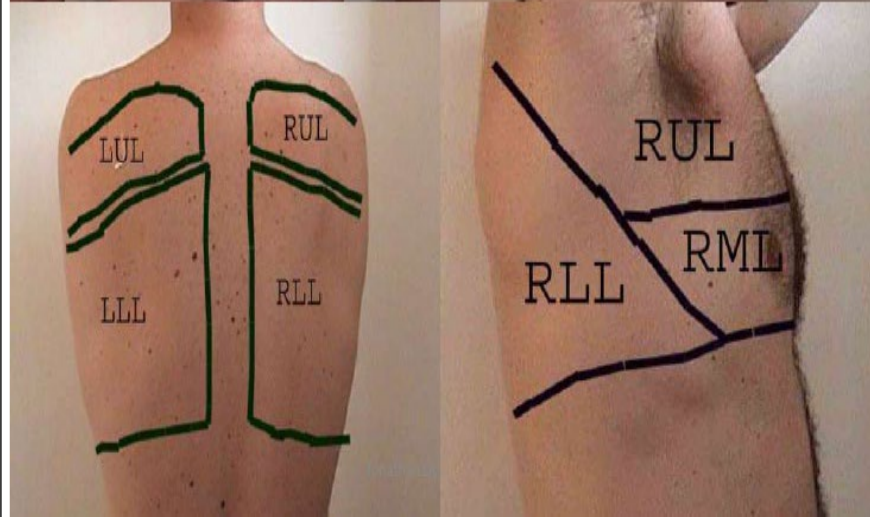
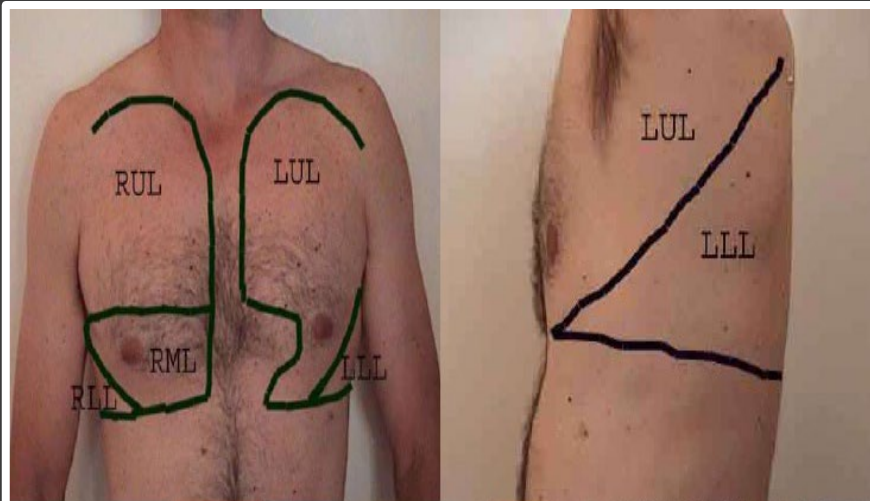
F – Fields, Fractures & Fissures



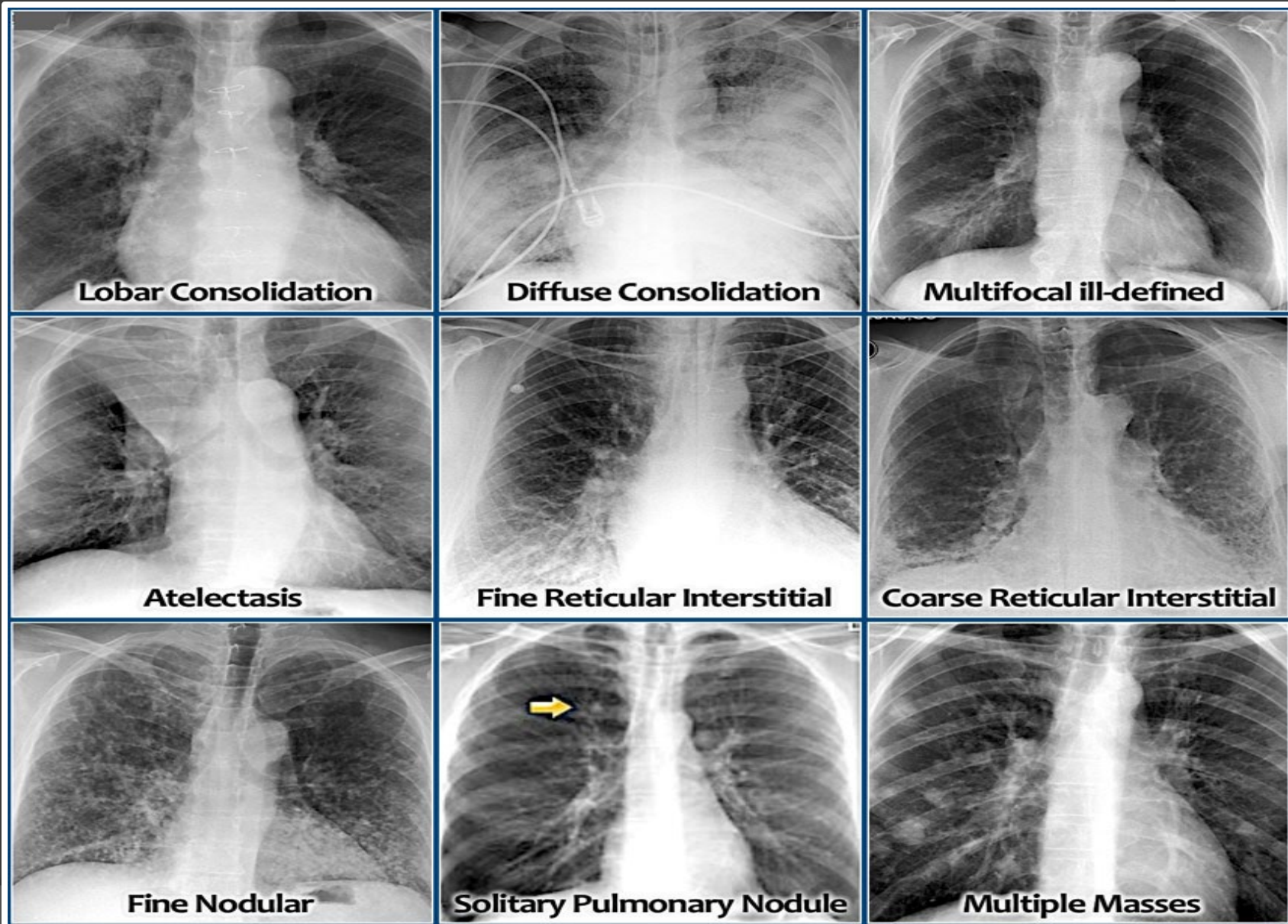
Lions & Tigers & Bears – Oh My!



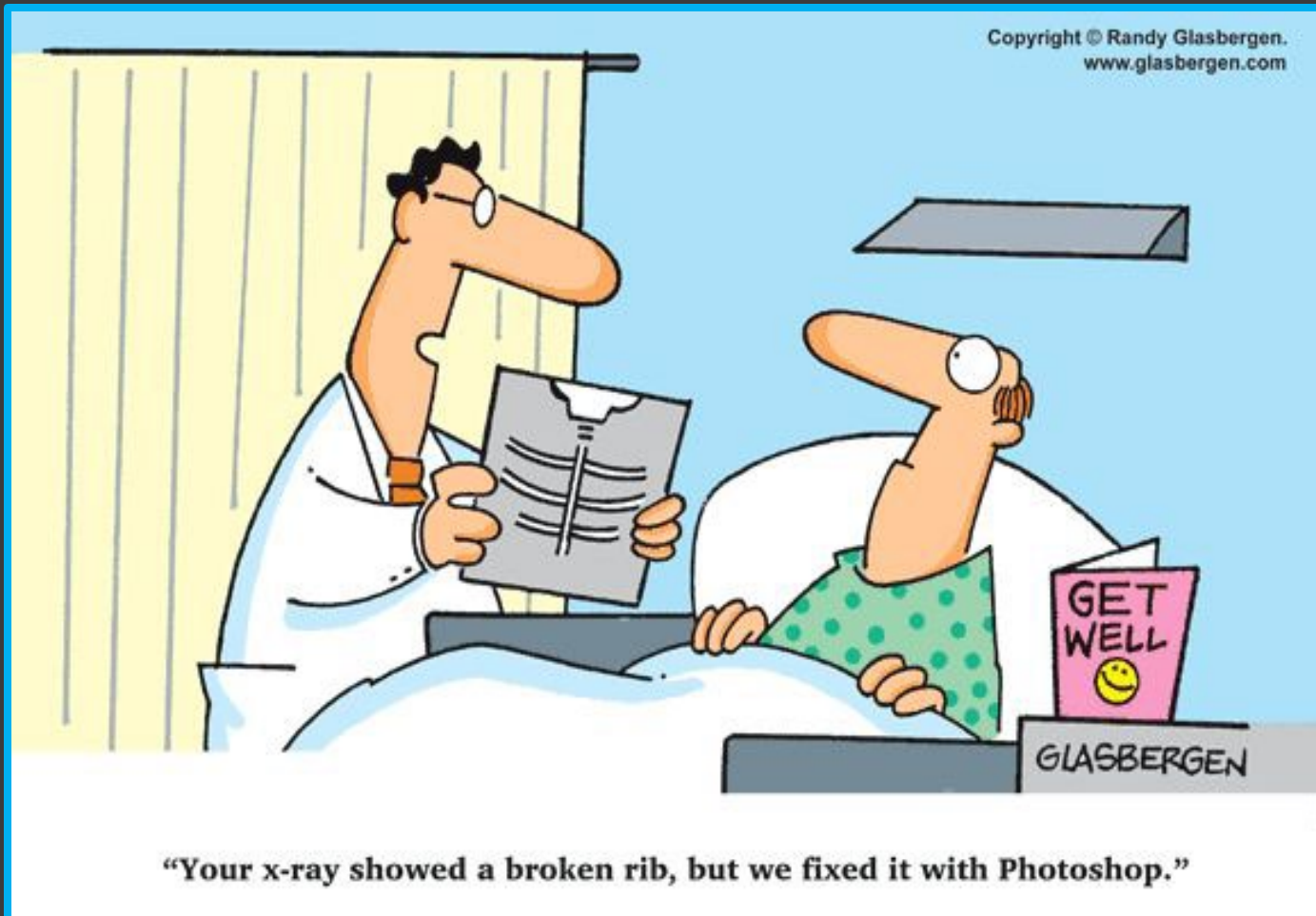
Lung Fissures



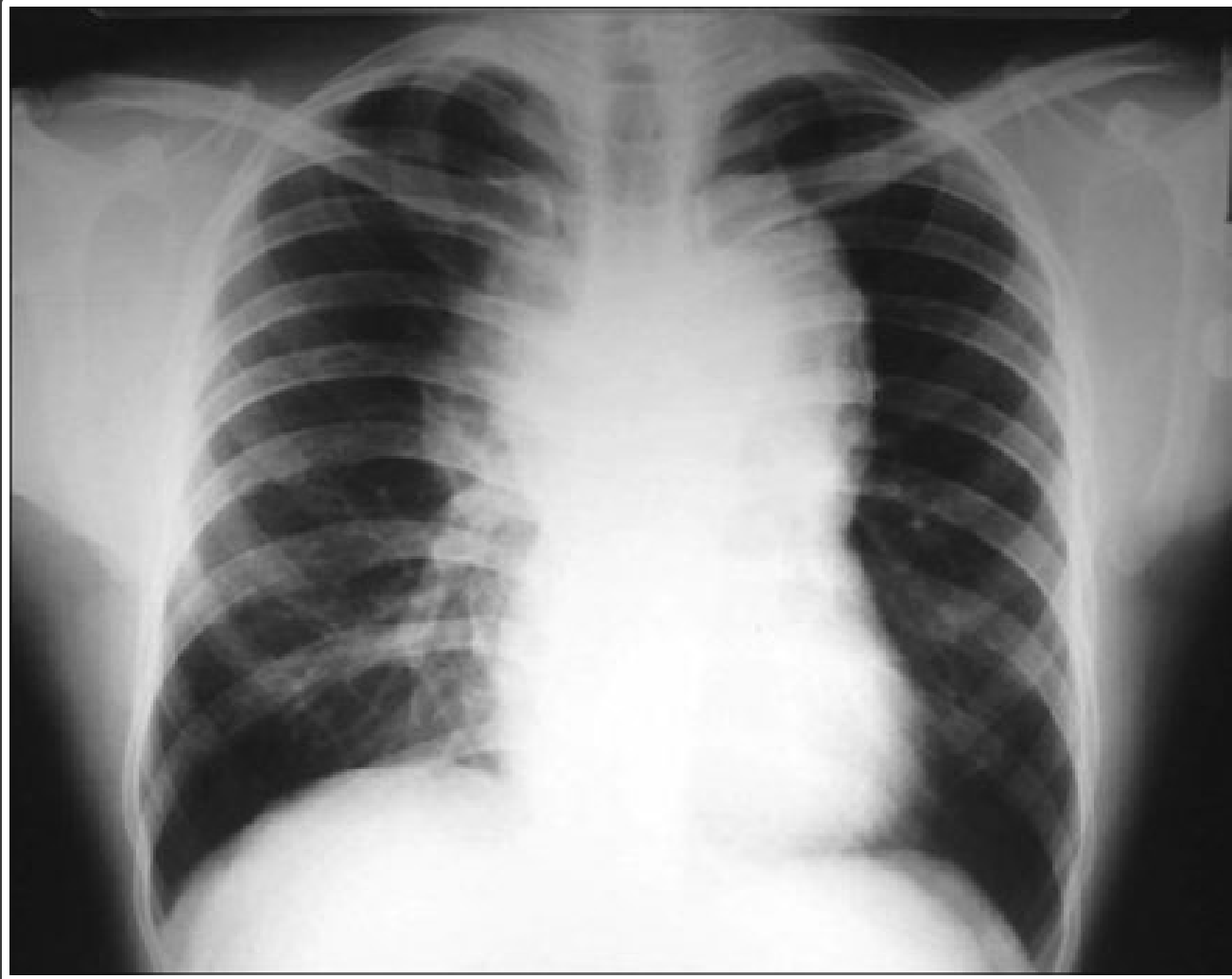
Fields - Nodules



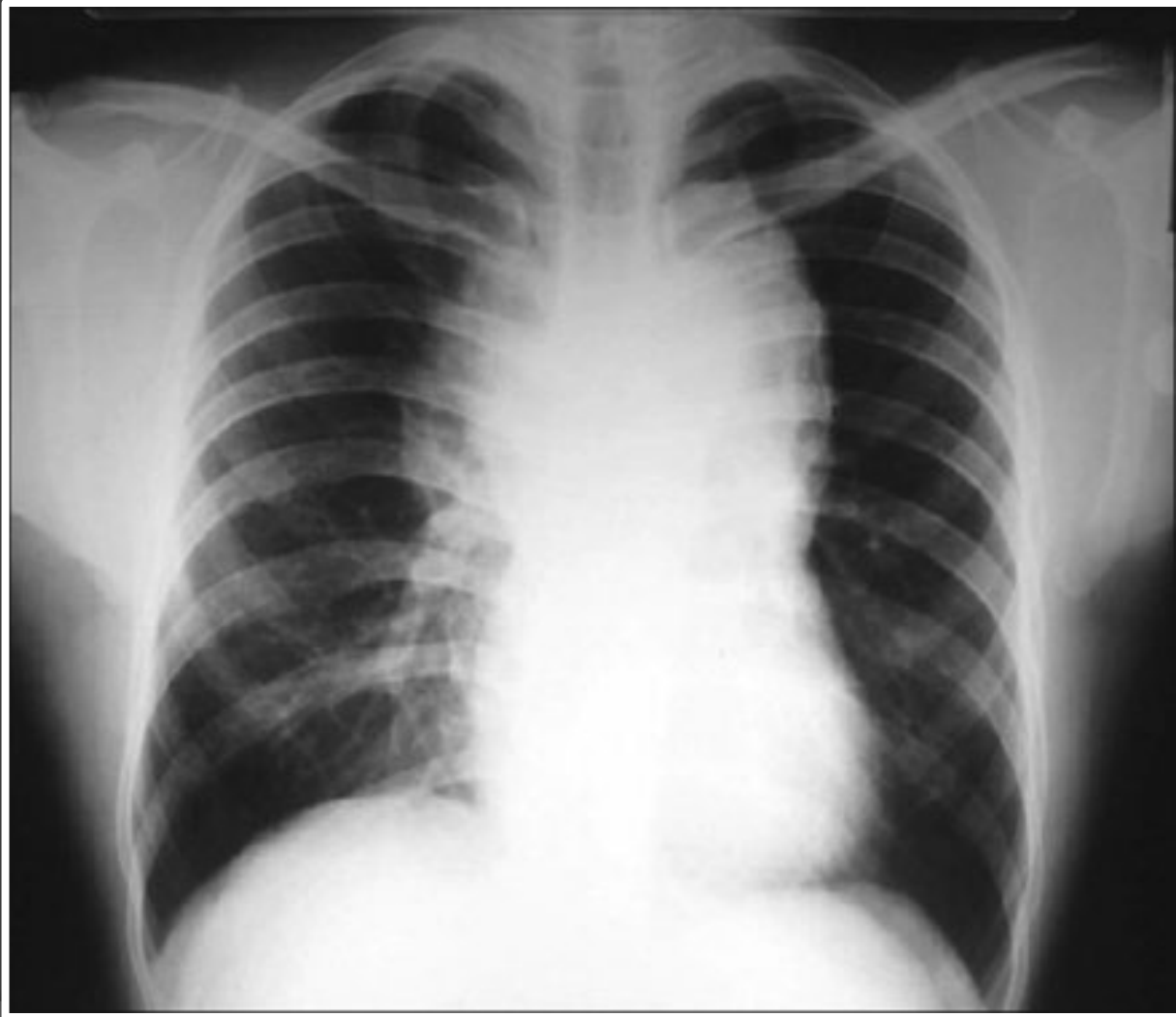
Practice reviewing a Chest X-Ray



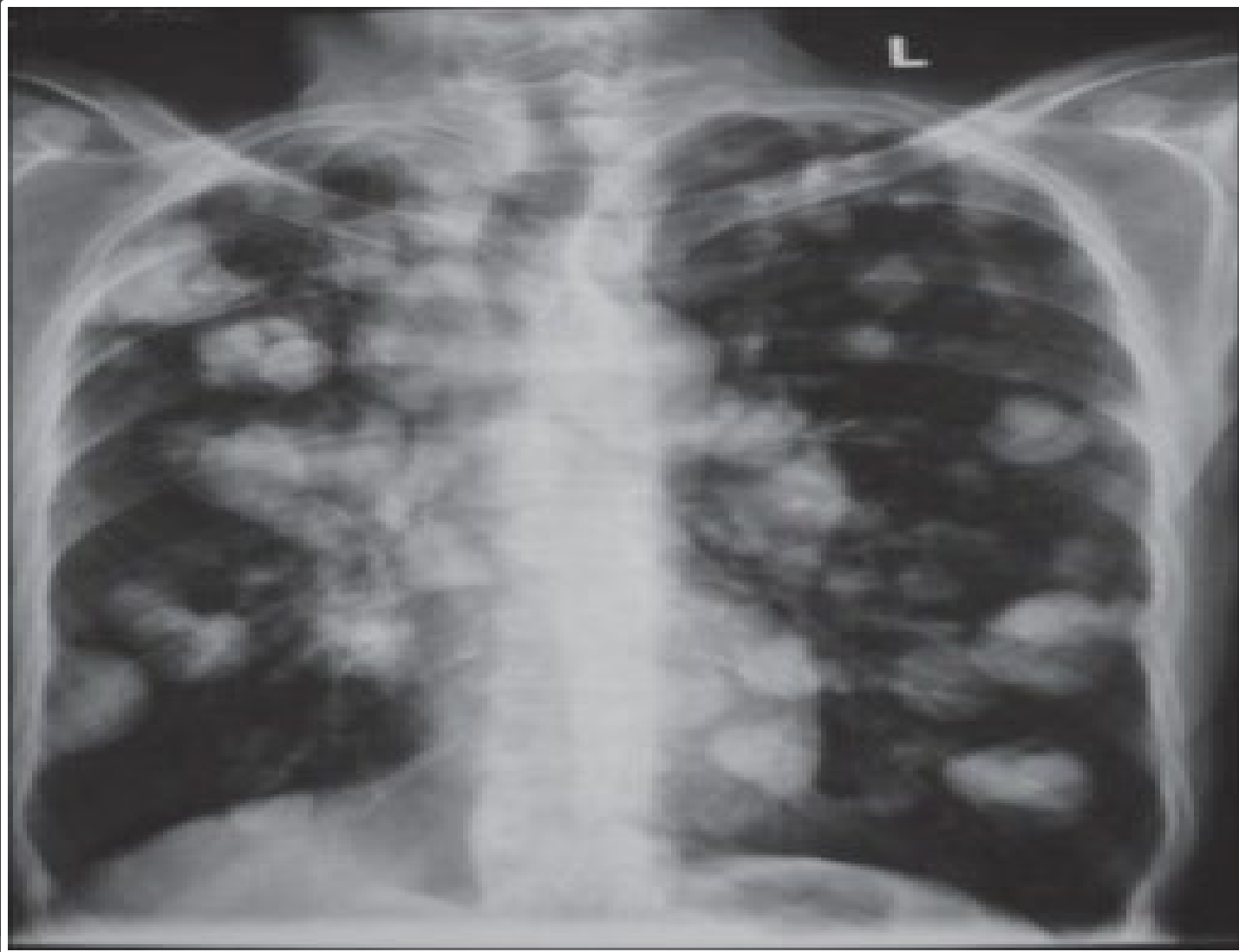
What's going on here?



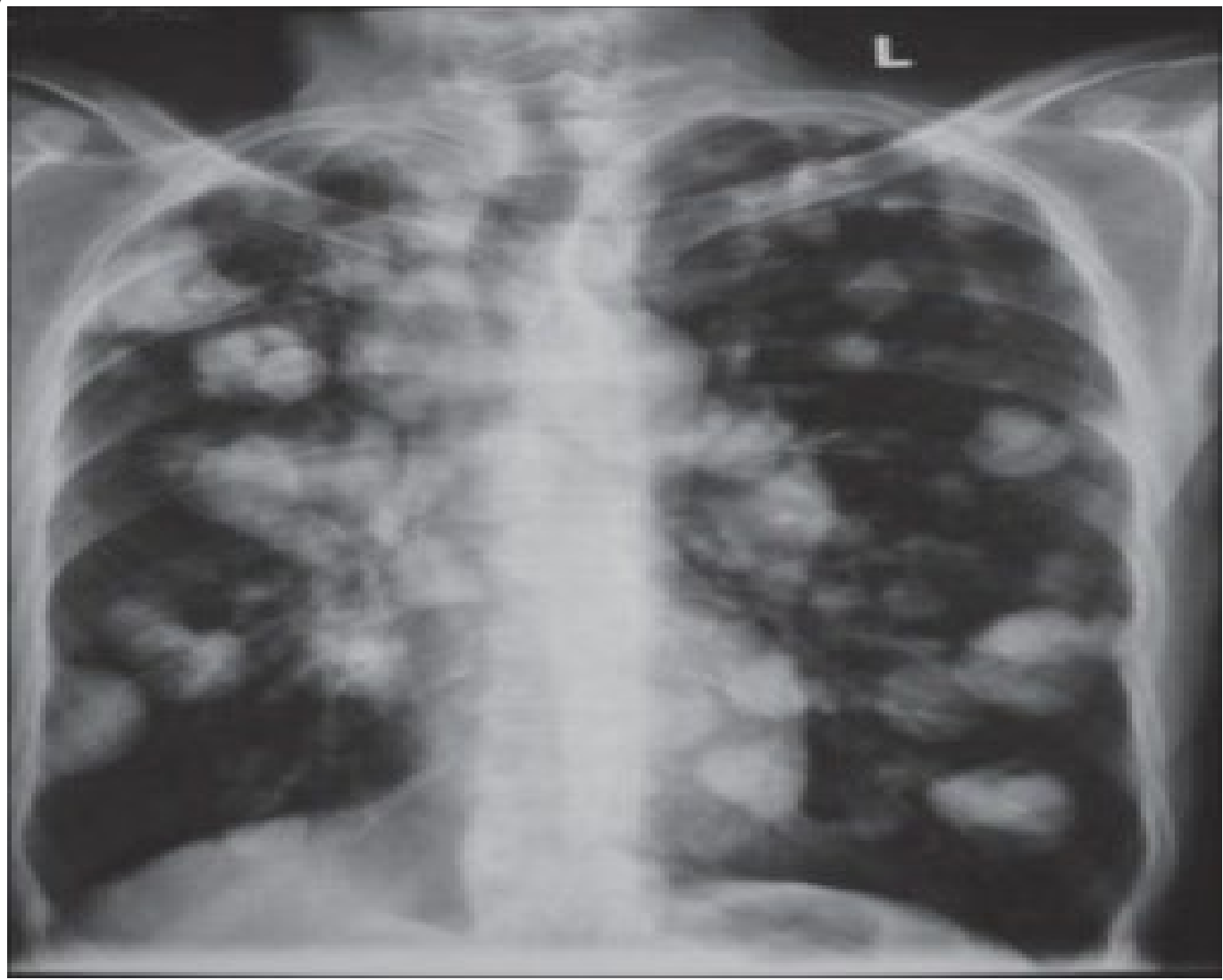
Mediastinal Mass



Here?



Lung Cancer



Another One?



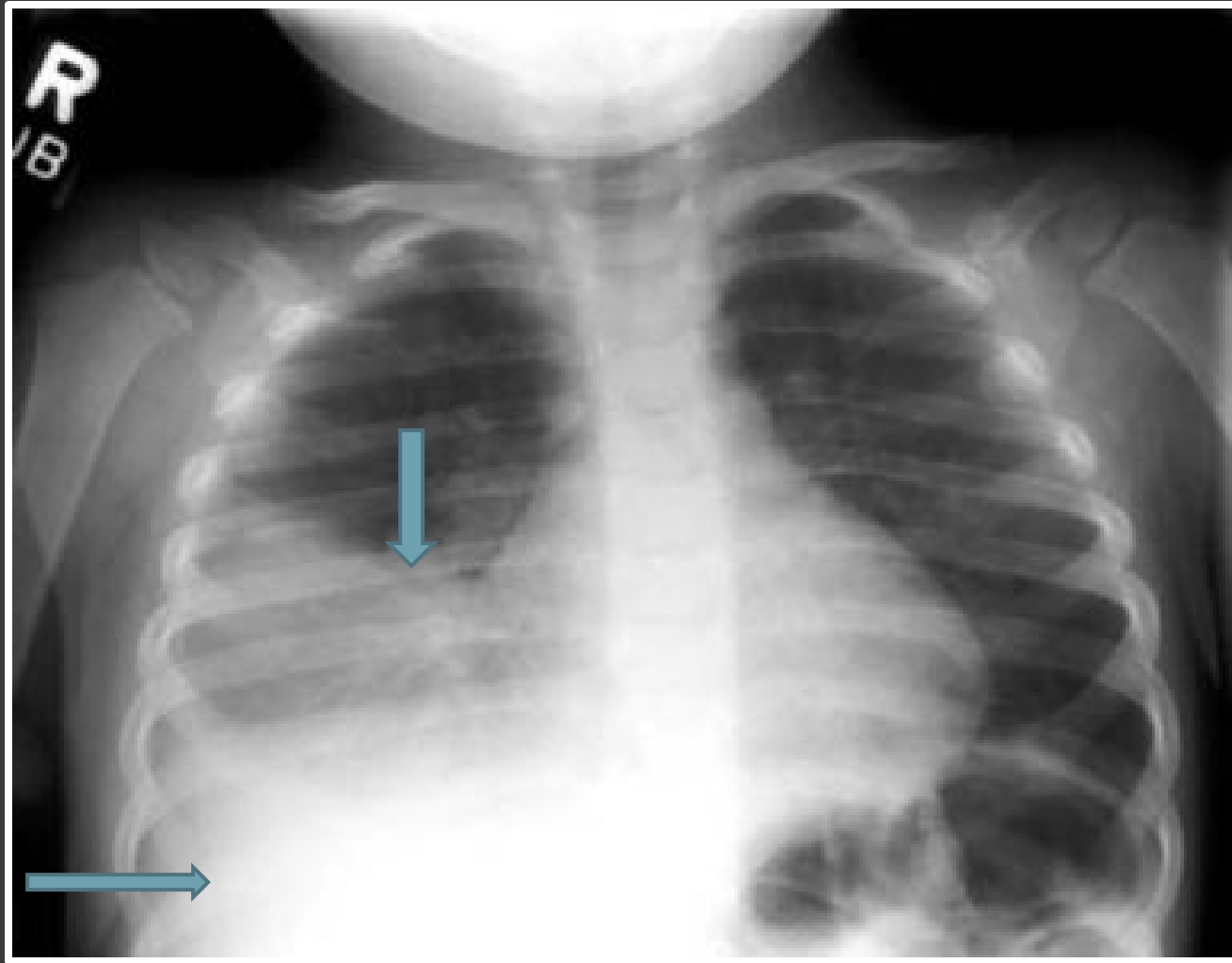
Sarcoidosis



What's going on here?



Right middle and lower lobe pneumonia



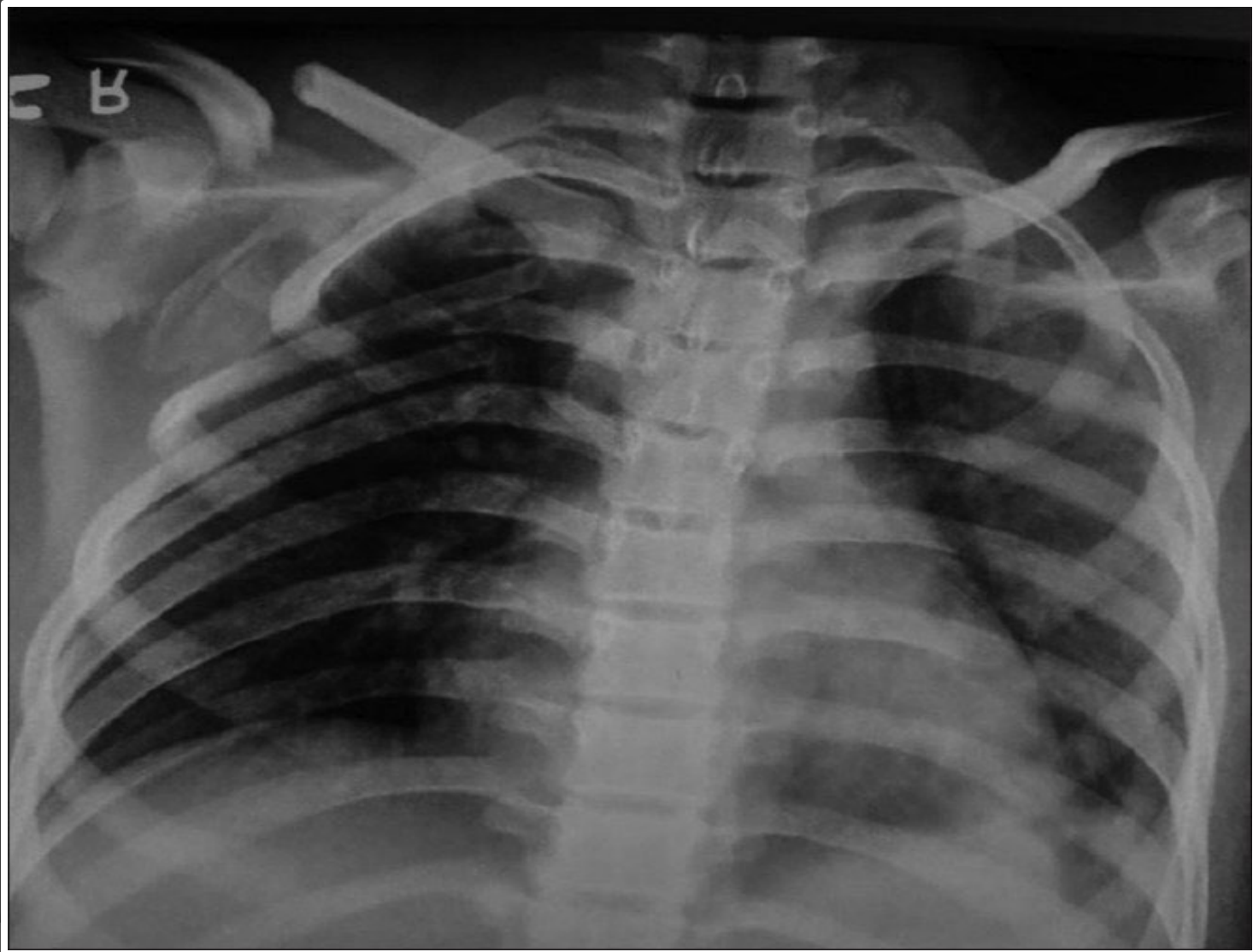
What's going on here?



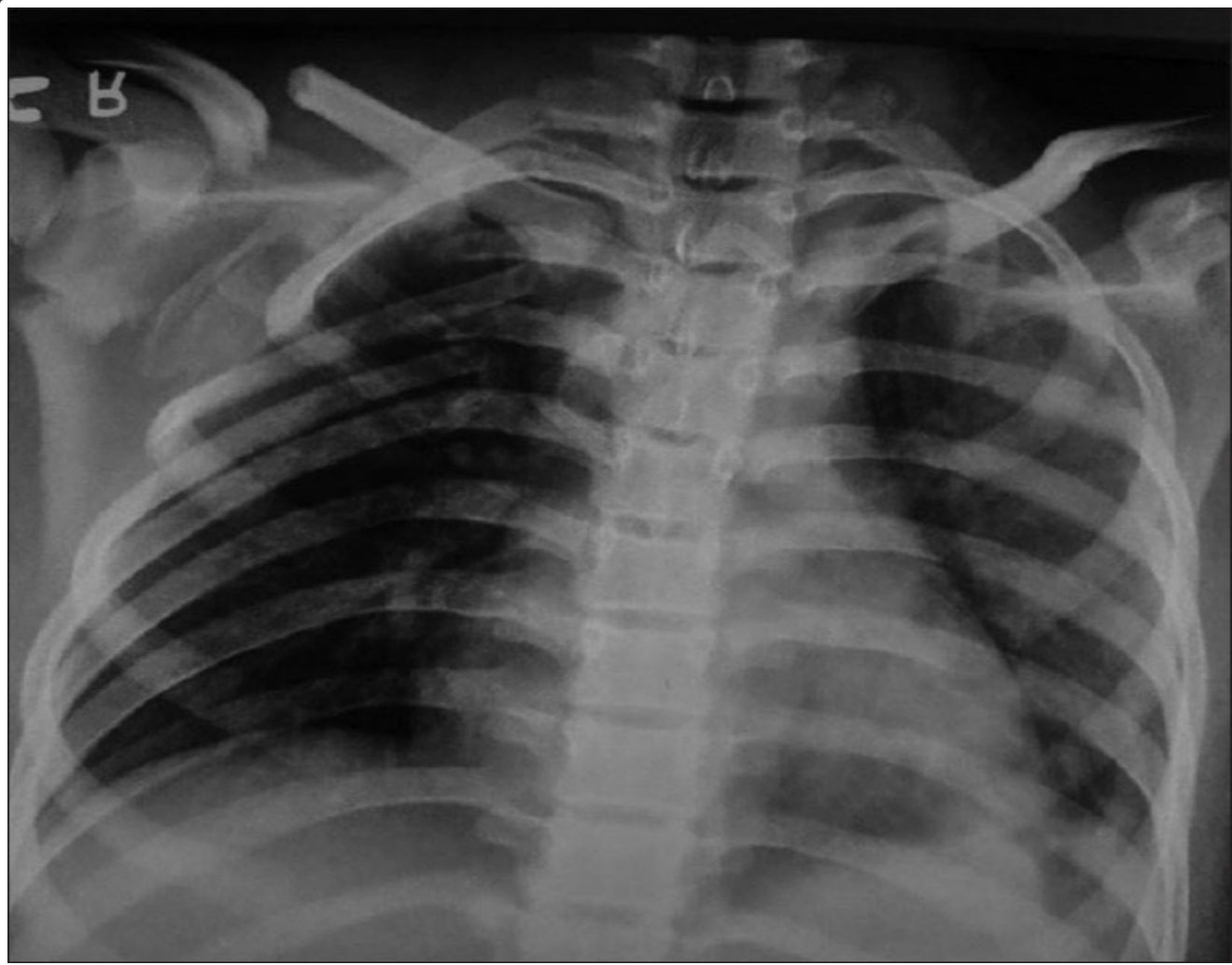
Pneumothorax



What's going on here?



Fractures



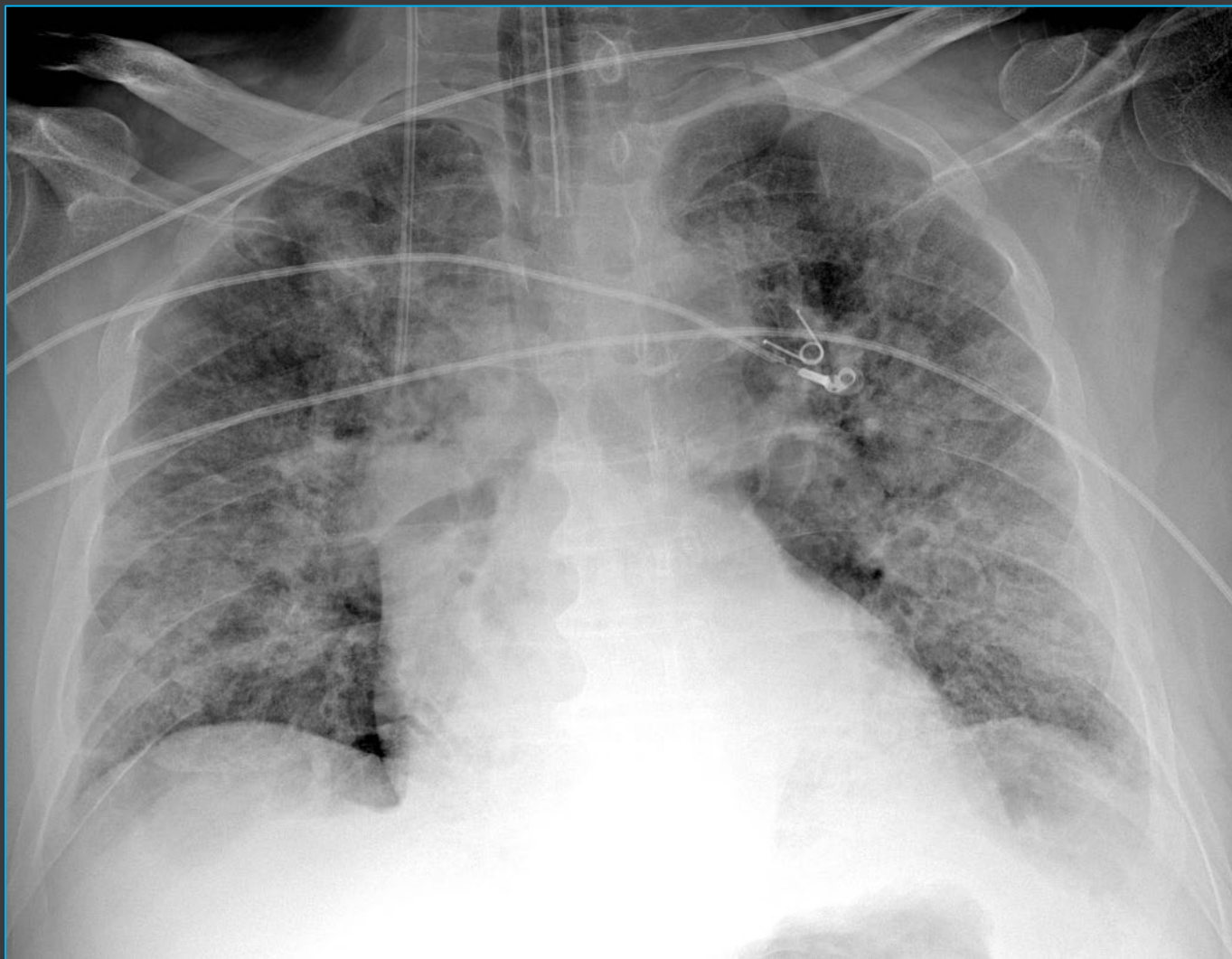
What's going on here?



Diaphragmatic hernia



What about this CXR?

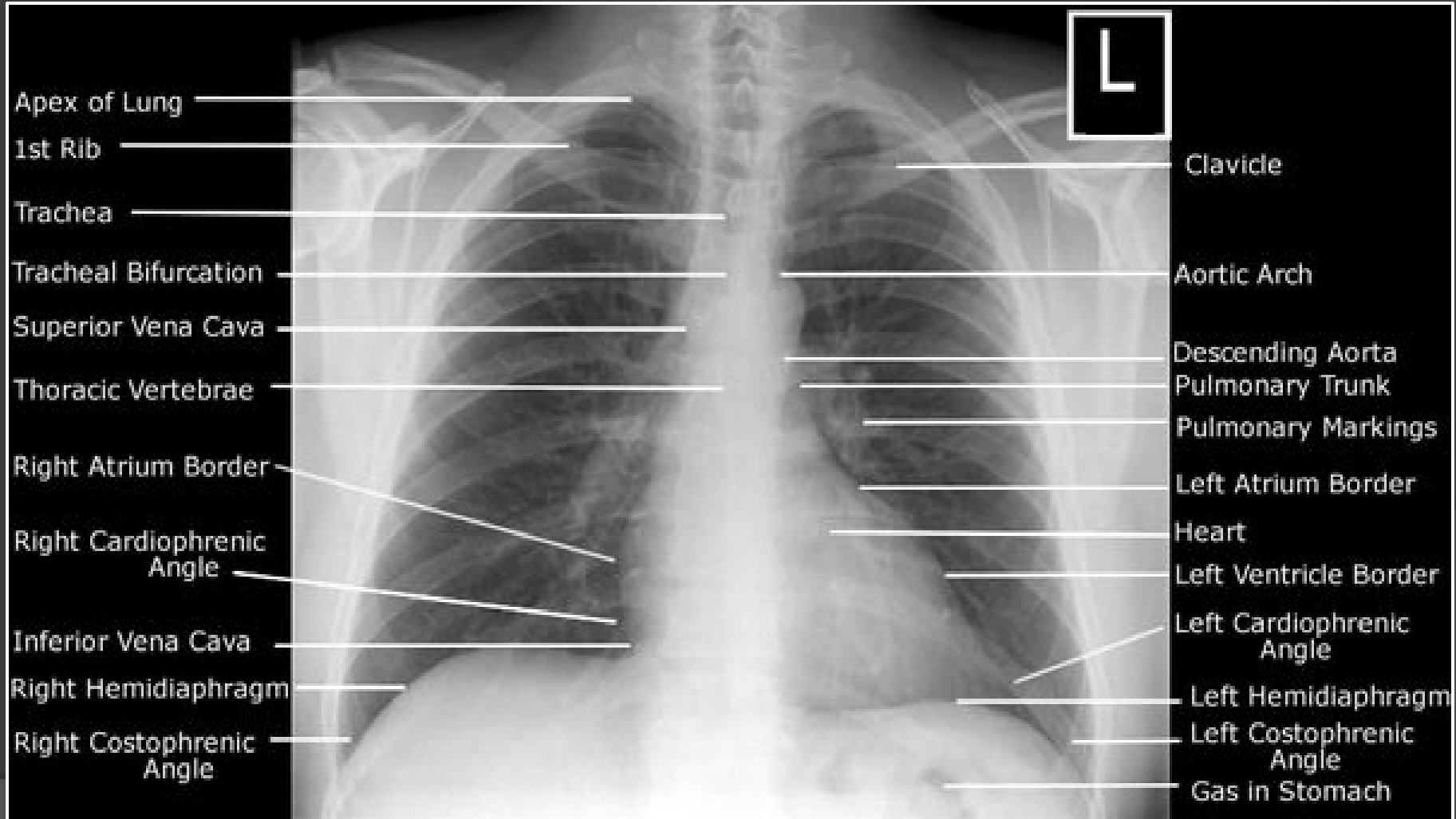


COVID - 19 Pneumonia



Remember this CXR from the beginning

– Can you better identify the structures now?



Questions ?



References

1. http://www.radiologymasterclass.co.uk/tutorials/chest/chest_home_anatomy/chest_anatomy_page3
2. <https://annsjoerdsma.com/2016/02/18/coming-tomorrow-lung-cancer-annual-screening-should-be-considered-for-longtime-heavy-smokers-who-quit-up-to-30-years-ago/>
3. https://clinicalgate.com/wp-content/uploads/2015/06/B9780323100298000101_f10-02ab-9780323100298.jpg
4. <http://www.startradiology.com/uploads/images/class-x-thorax-fig7a-fissure-lateral-view-met.jpg>
5. <http://images.radiopaedia.org/images/157210/332aa0c67cb2e035e372c7cb3cea2.jpg>
6. <https://www.ceessentials.net/images/critiqueChest/image007.jpg>
7. <https://www.nde-ed.org/EducationResources/CommunityCollege/.../history.htm>
8. <http://img.medscapestatic.com/pi/meds/ckb/66/21866tn.jpg>
9. Melarkode, K & Latoo, M.Y. (2009). Pictorial essay: central venous catheters on chest radiographs. *British Journal of Medical Practitioners*. 2(2) 55-56.
10. Tse A, Schick MA. Central Line Placement. [Updated 2021 Jul 29]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK470286/>