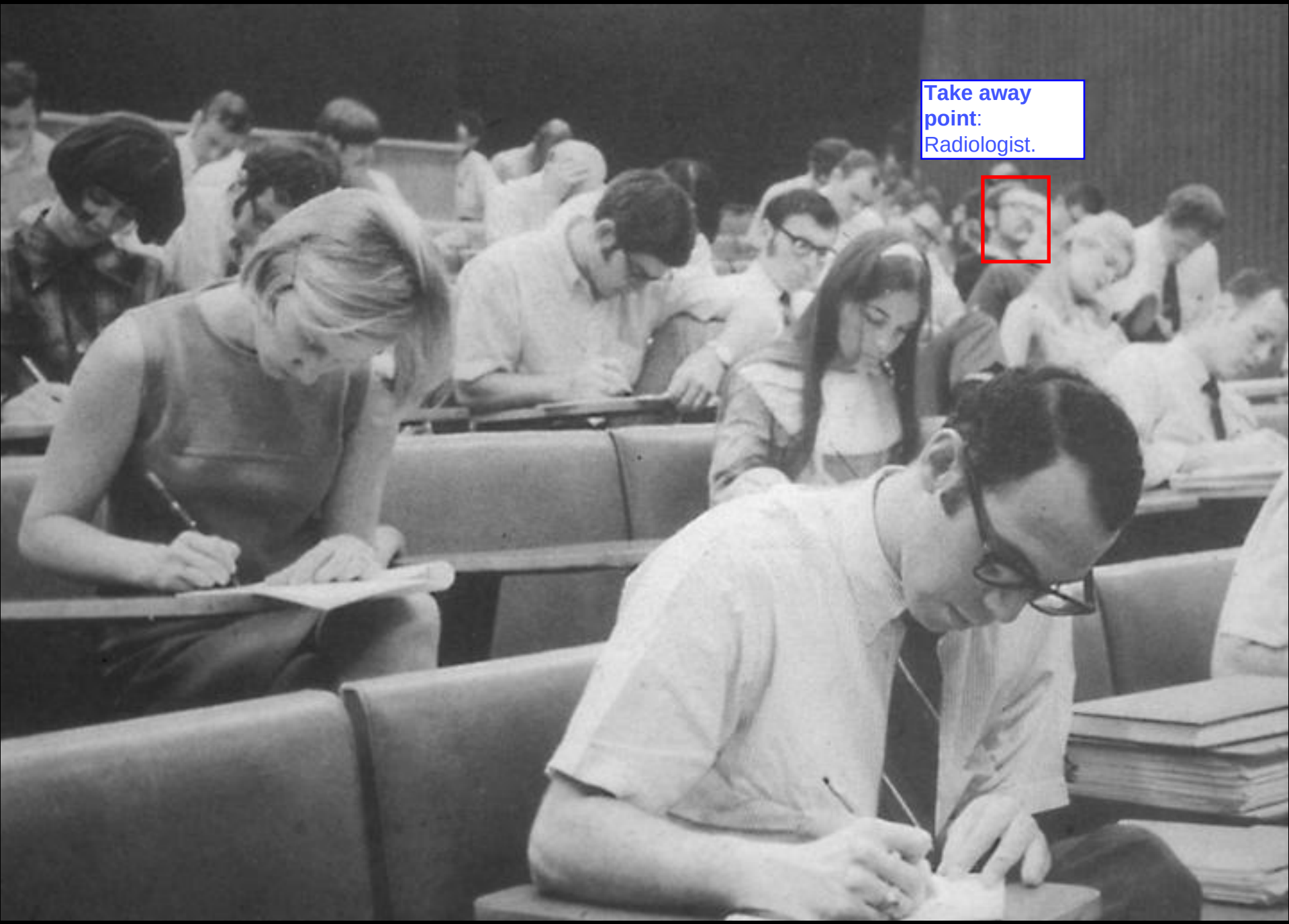
Objectives

- **Learn approach to the CXR**
- **Integrate aspects of etiology, pathogenesis, clinical history, and physical exam to CXR**
- **View variety of diseases**
- **Try to keep cursor out of LLQ**

Focus of this lecture: learn the basics of the chest x-ray.

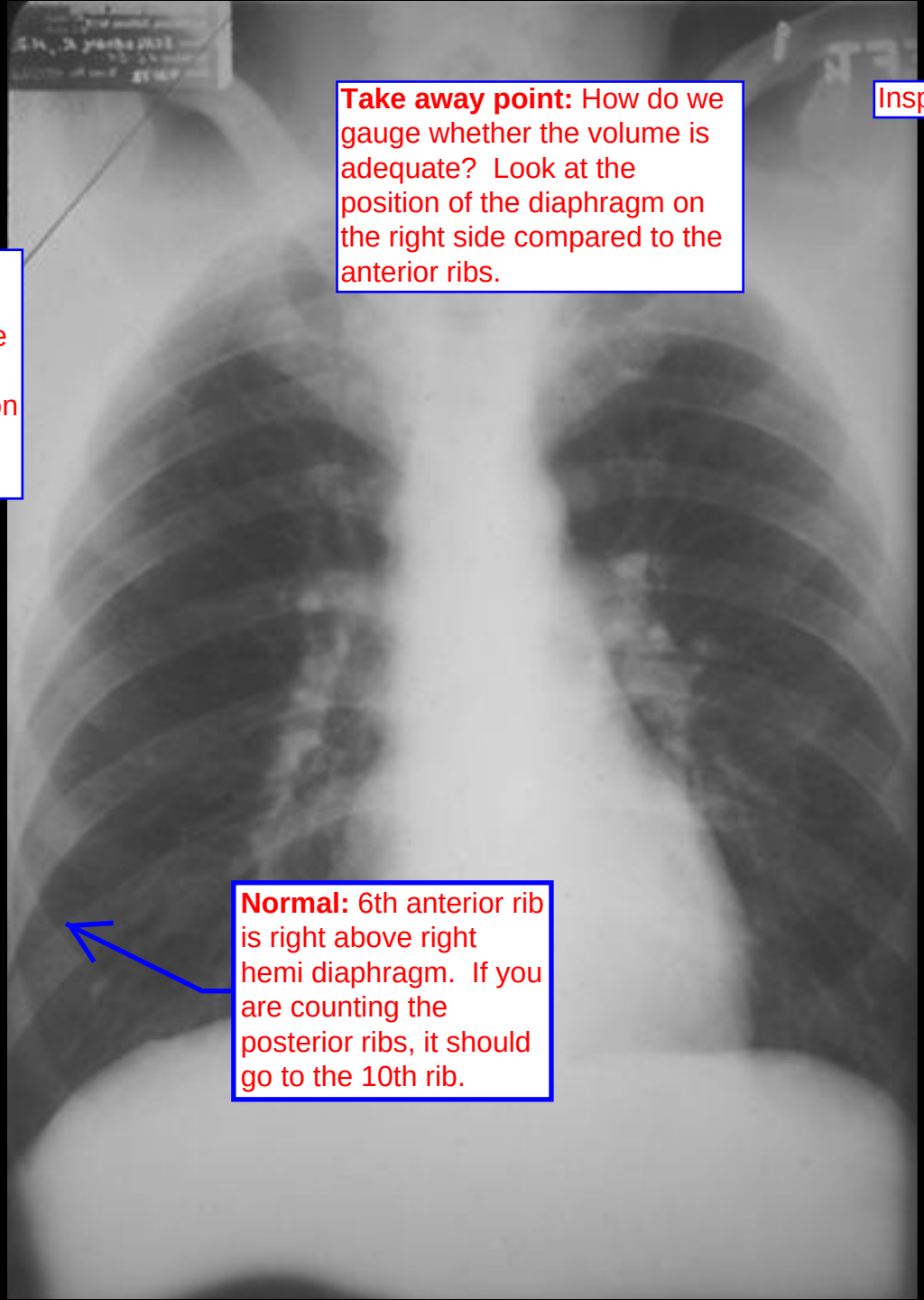

Take away point: If you sit in the back, you're going to stare off into space. If you sit in front, you'll pay attention and learn something.


Take away point:
Radiologist.

Quality Control

Take away point: There are 5 elements that dictate the quality of a film (Lung volume, Rotation, Projection, Position and Technique.) **You need high quality film to make the correct conclusions.** If you apply what you learned in this lecture to poor quality film, you'll get the wrong conclusions.

- **Lung volume**
- **Rotation**
- **Projection** AP or PA film
- **Position**
- **Technique** exposure



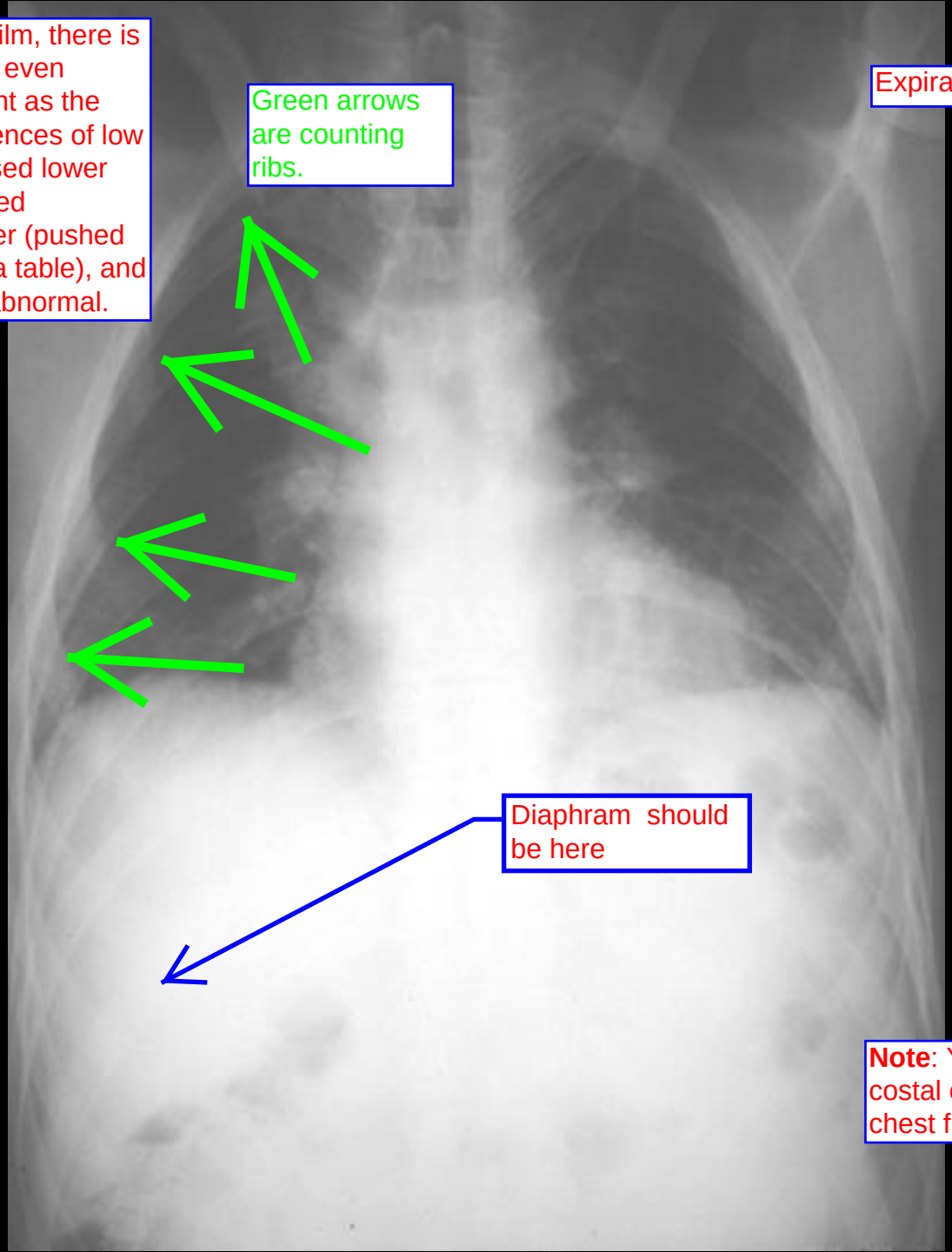
Take away point: How do we gauge whether the volume is adequate? Look at the position of the diaphragm on the right side compared to the anterior ribs.

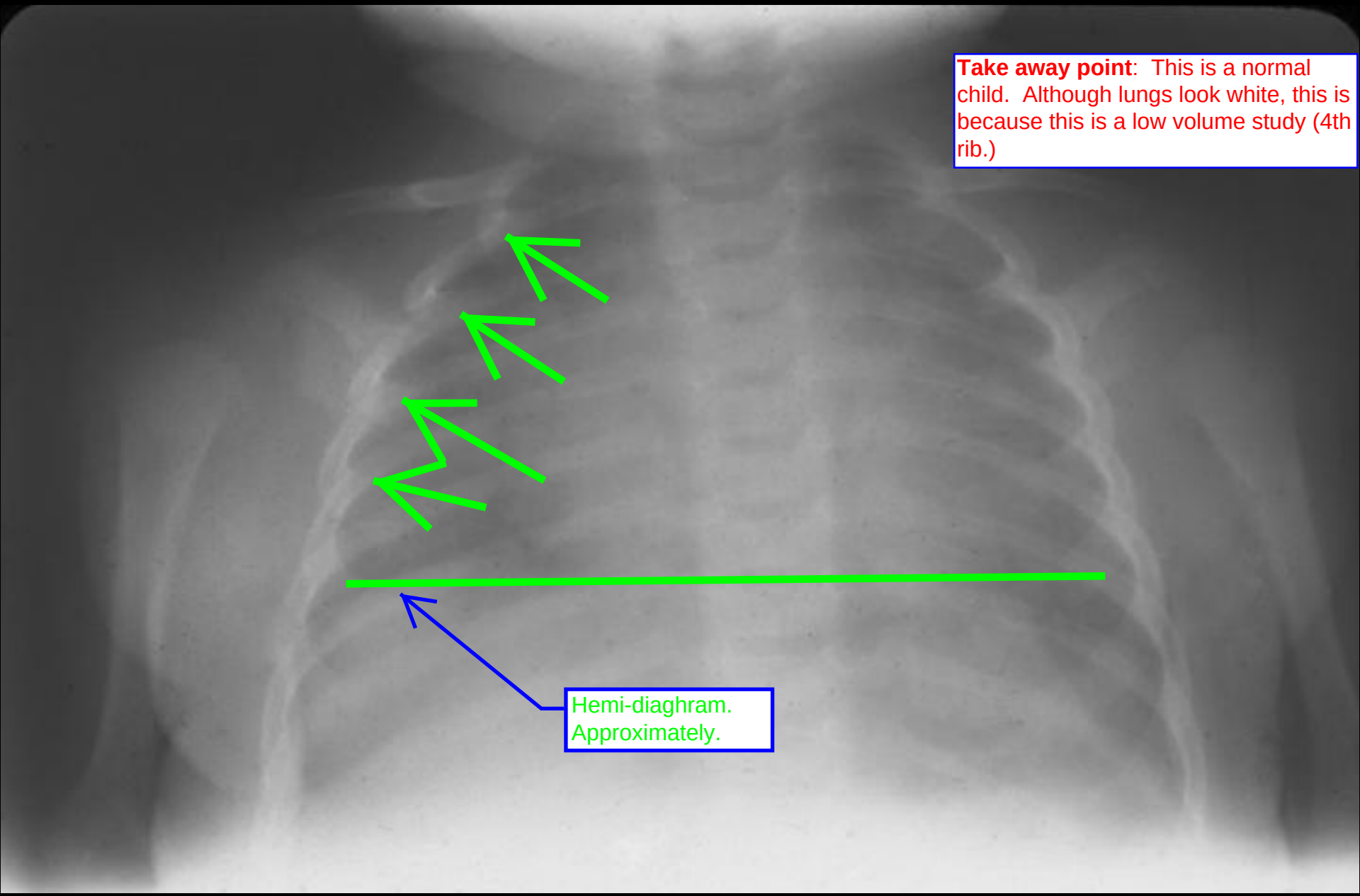
Inspiration.

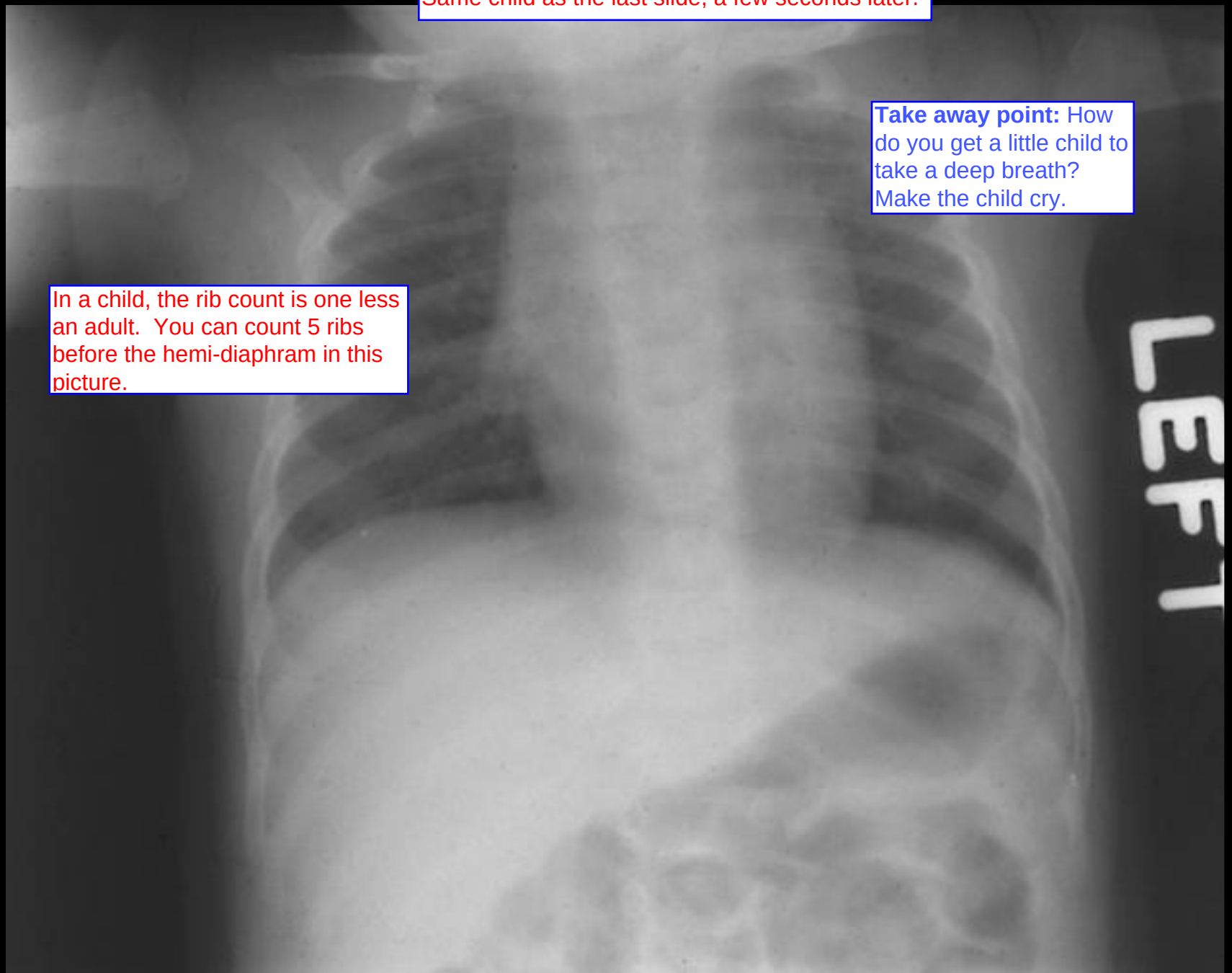
The **posterior ribs** are the ribs that appear horizontal and go to the spine. The **anterior ribs** runs in the direction of your hands going into your pockets.

Convention: look at chest films like you are looking at patient standing in front of you. Our right is the patient's left.

Normal: 6th anterior rib is right above right hemi diaphragm. If you are counting the posterior ribs, it should go to the 10th rib.


Take away point: In this film, there is not adequate lung volume, even though it is the same patient as the slide before. The consequences of low volume film include increased lower lobe density (vessels pushed together), heart looks bigger (pushed up like a water balloon on a table), and the mediastinum will look abnormal.
Green arrows are counting ribs.
Expiration
Diaphram should be here
Note: You don't see the costal cartilage on the chest film.

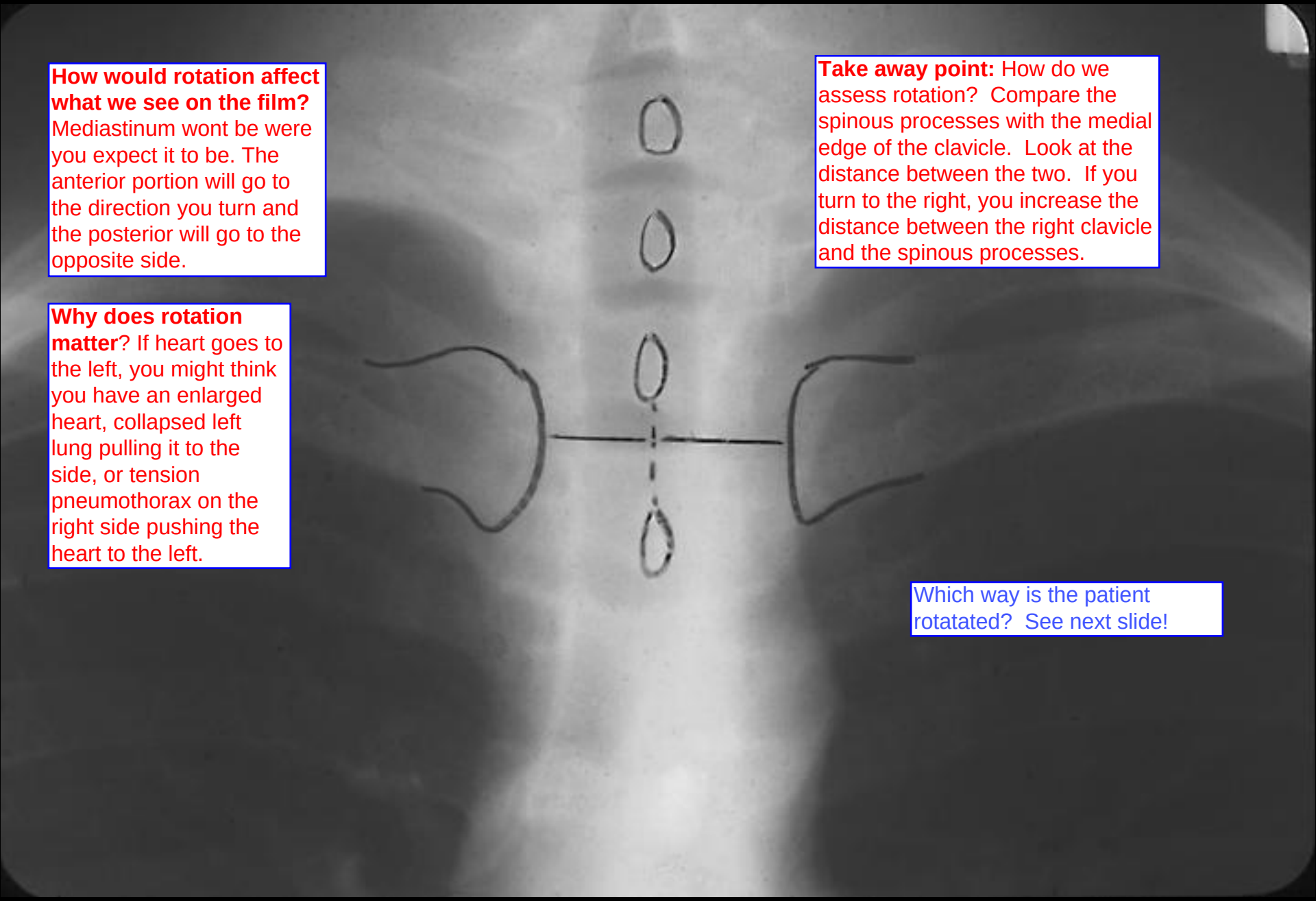

Take away point: This is a normal child. Although lungs look white, this is because this is a low volume study (4th rib.)
Hemi-diaghram. Approximately.



Same child as the last slide, a few seconds later.

Take away point: How do you get a little child to take a deep breath? Make the child cry.

In a child, the rib count is one less an adult. You can count 5 ribs before the hemi-diaphram in this picture.

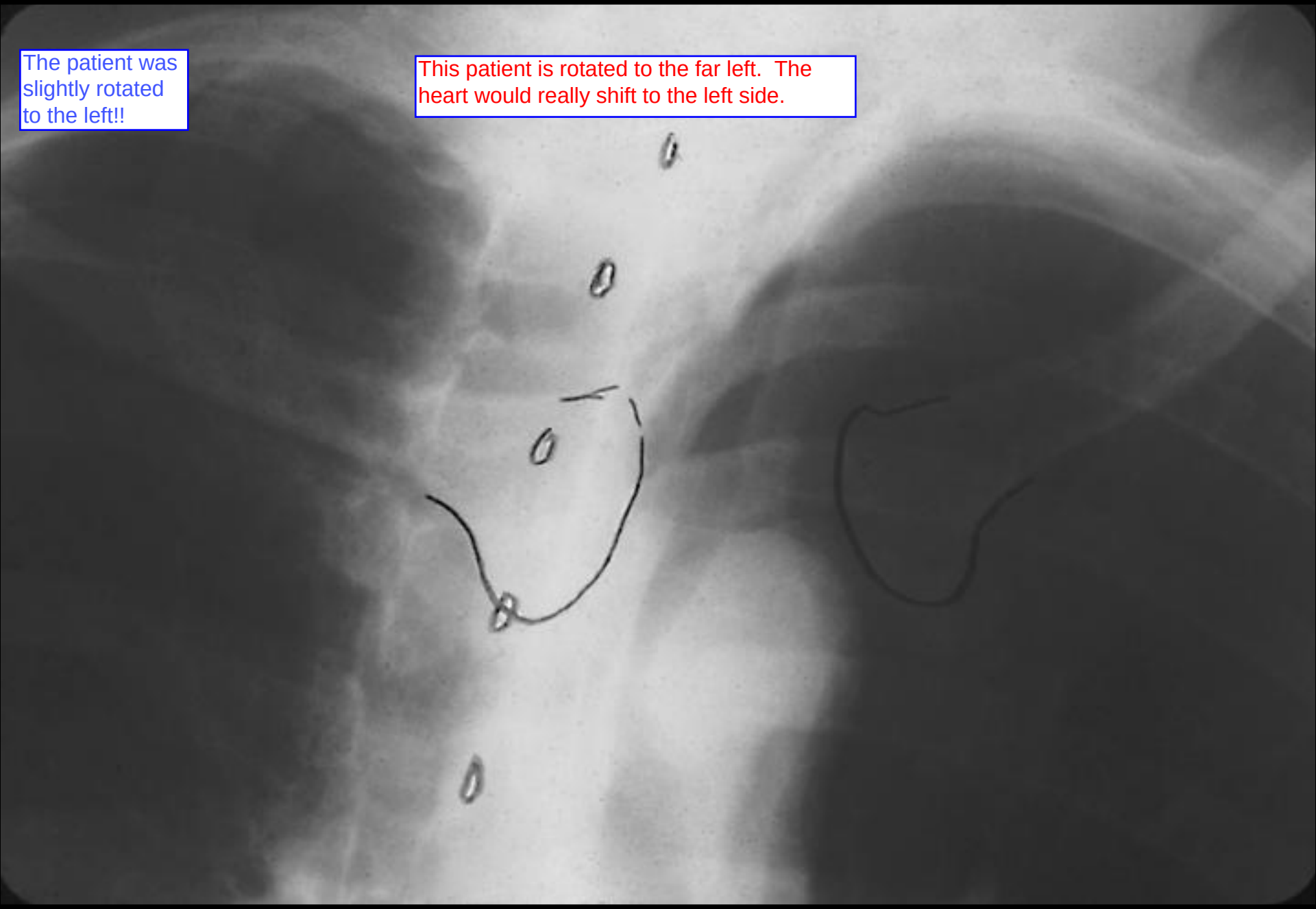


How would rotation affect what we see on the film? Mediastinum wont be were you expect it to be. The anterior portion will go to the direction you turn and the posterior will go to the opposite side.

Why does rotation matter? If heart goes to the left, you might think you have an enlarged heart, collapsed left lung pulling it to the side, or tension pneumothorax on the right side pushing the heart to the left.

Take away point: How do we assess rotation? Compare the spinous processes with the medial edge of the clavicle. Look at the distance between the two. If you turn to the right, you increase the distance between the right clavicle and the spinous processes.

Which way is the patient rotatated? See next slide!


The patient was slightly rotated to the left!!
This patient is rotated to the far left. The heart would really shift to the left side.

Projection

- **PA = Posteroanterior**
- **AP = Anteroposterior**

Xray enters posteriorly, exits anteriorly and hits the film. This is most common film.

Opposite.

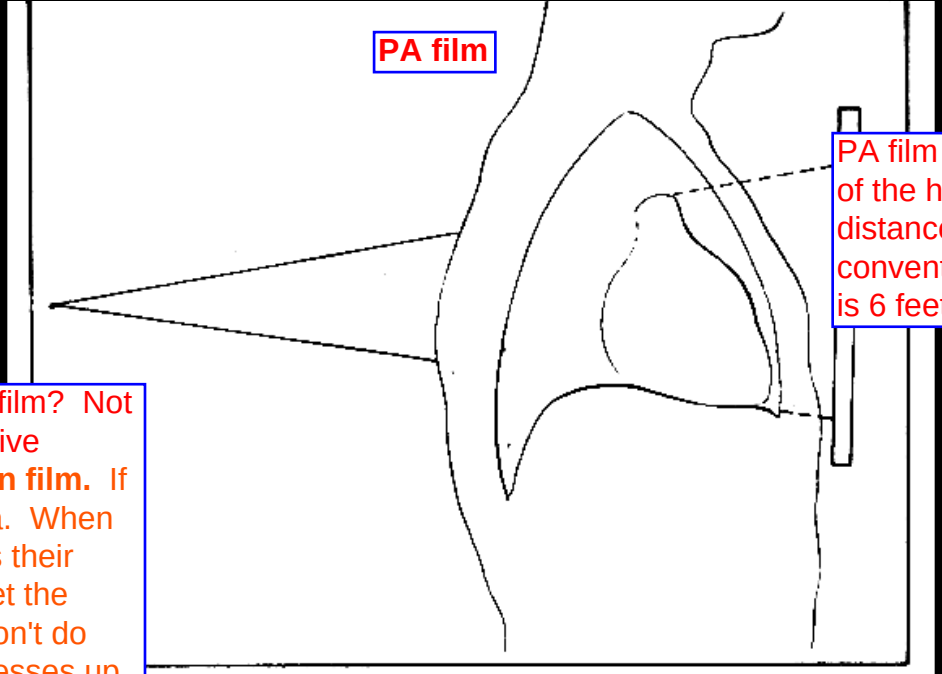
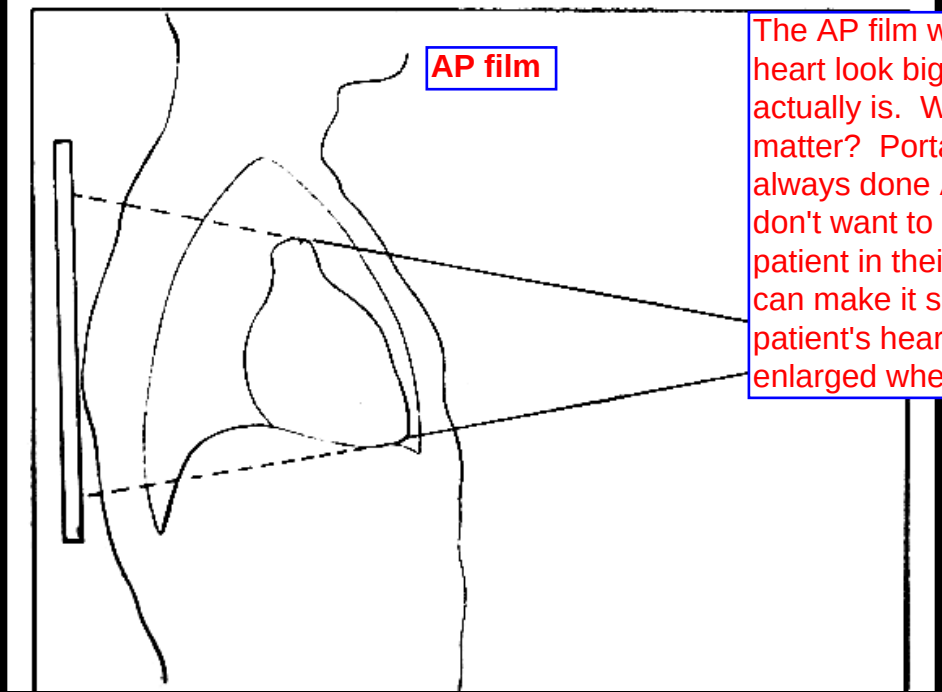


Figure 2a.

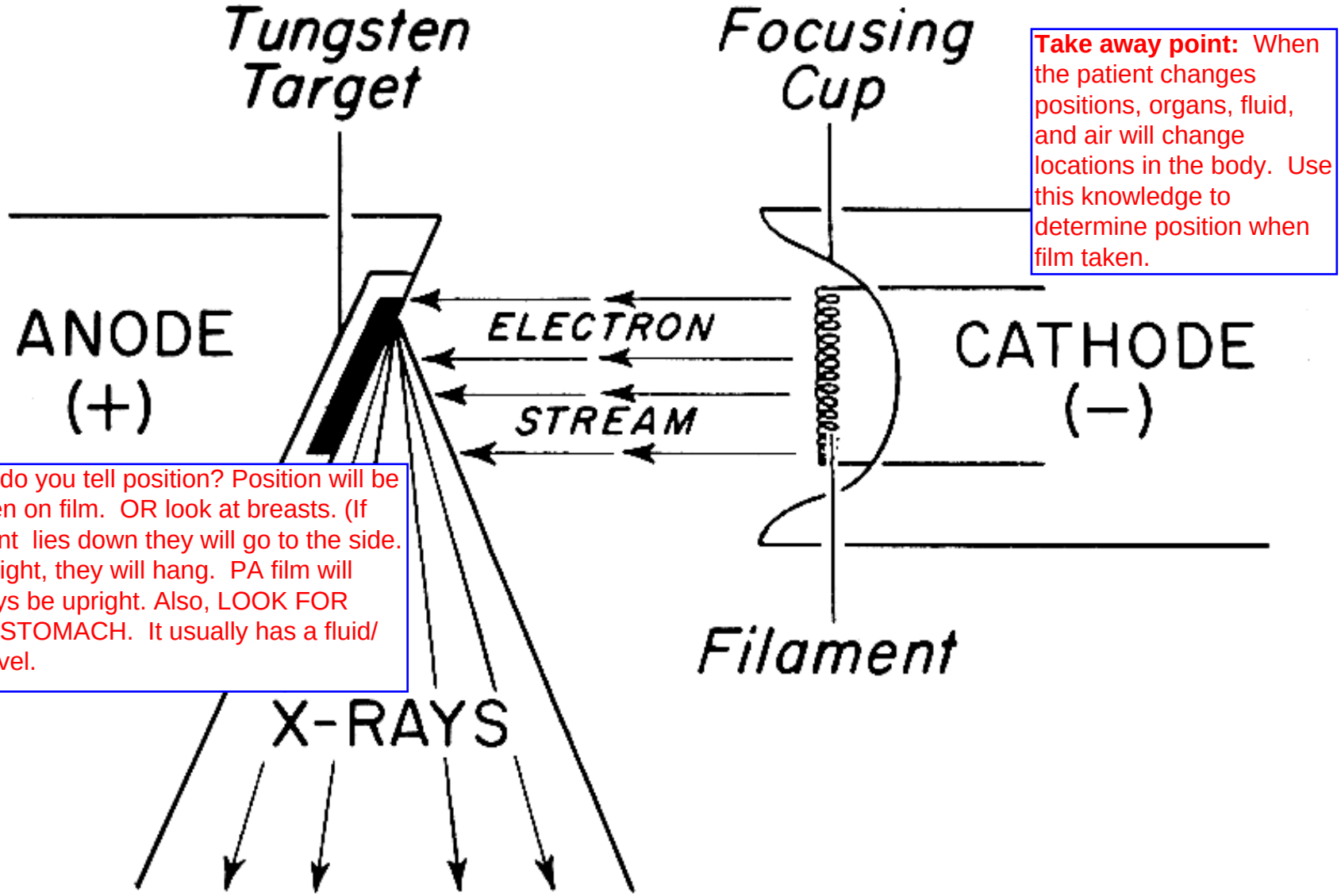
PA film gives a more accurate image of the heart size because there is less distance for the beam to diverge. The conventional distance for the PA x-ray is 6 feet.

How do we know if it is AP or PA film? Not between density of ribs. Not relative comparison of size. **Read label on film.** If this doesn't work, look for scapula. When you get a PA film, the patient puts their hands on their hips and tries to get the scapula out of the picture. You don't do this on AP film because the air messes up the image.



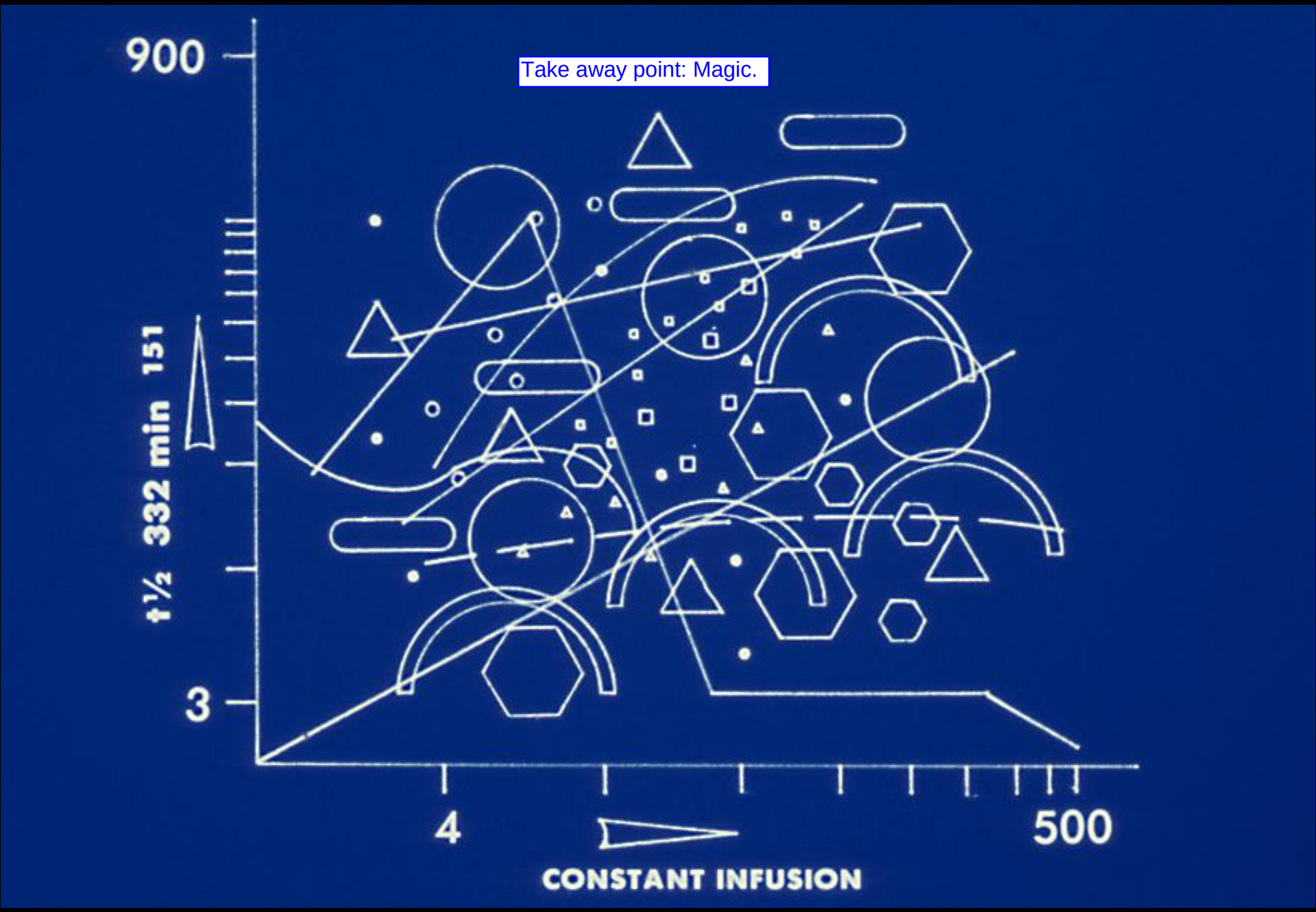
The AP film will make the heart look bigger than it actually is. Why does this matter? Portable films always done AP (You don't want to suffocate the patient in their bed.) This can make it seem that the patient's heart became enlarged when it didn't.

Can't get 6 feet for PA film with portable x-ray because ceiling isn't high enough



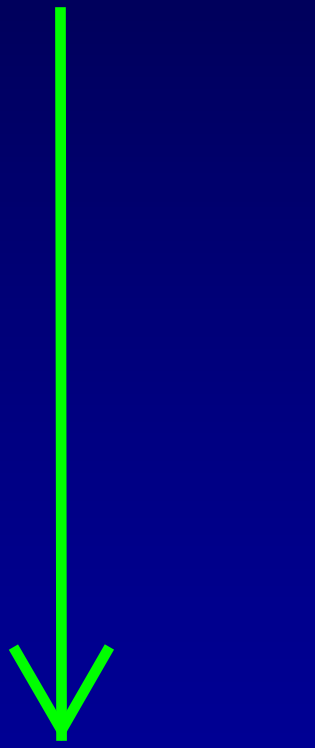
Take away point: When the patient changes positions, organs, fluid, and air will change locations in the body. Use this knowledge to determine position when film taken.

How do you tell position? Position will be written on film. OR look at breasts. (If patient lies down they will go to the side. If upright, they will hang. PA film will always be upright. Also, LOOK FOR THE STOMACH. It usually has a fluid/ air level.


Take away point: Magic.
900
$t_{1/2}$ 332 min 151
3
4
500
CONSTANT INFUSION

Different X-ray Densities

From least dense to most dense.



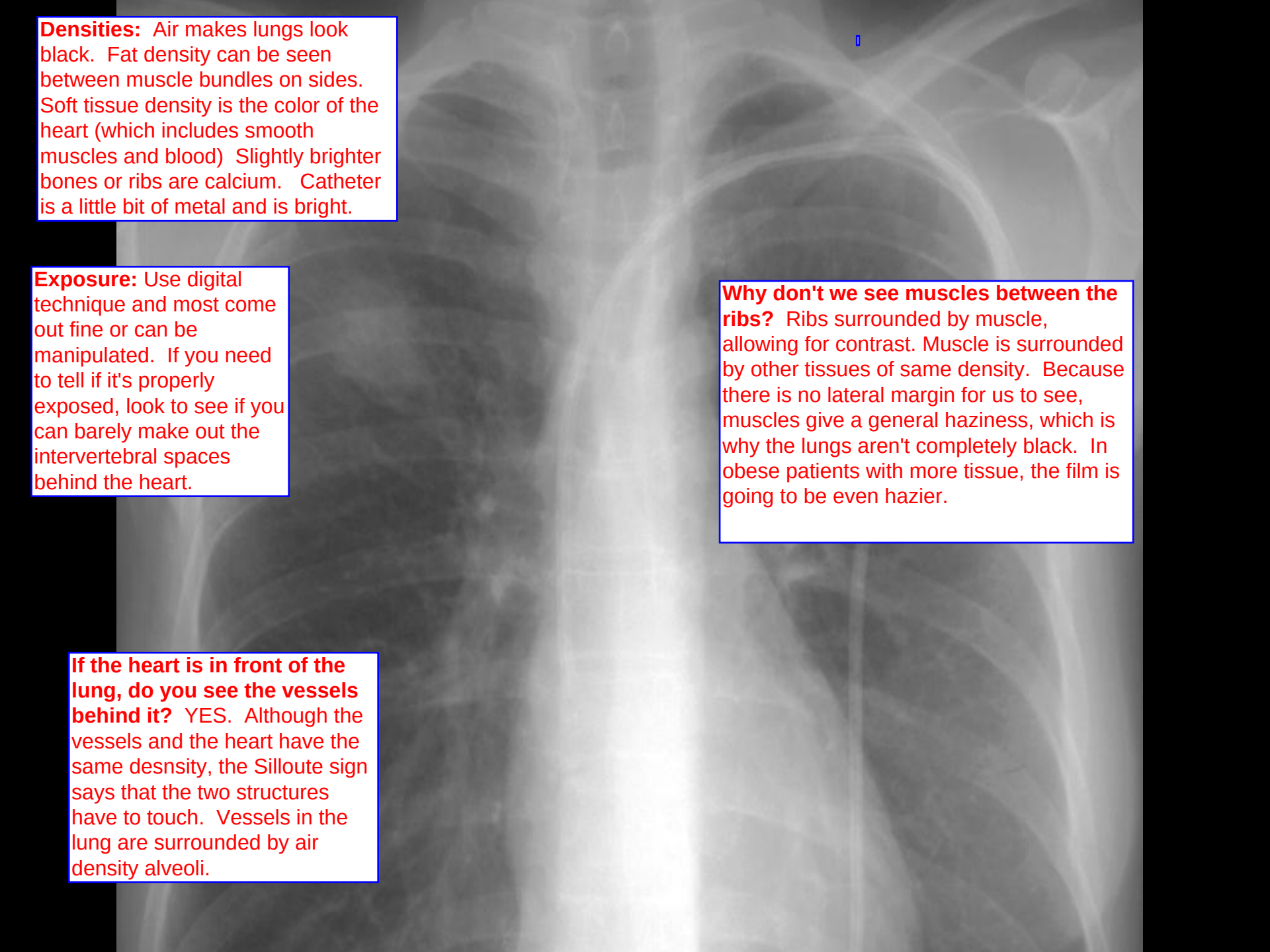
Air Black on film.

Fat

Soft Tissue or Water

Calcium

Metal Makers made of metal will be white.



Densities: Air makes lungs look black. Fat density can be seen between muscle bundles on sides. Soft tissue density is the color of the heart (which includes smooth muscles and blood) Slightly brighter bones or ribs are calcium. Catheter is a little bit of metal and is bright.

Exposure: Use digital technique and most come out fine or can be manipulated. If you need to tell if it's properly exposed, look to see if you can barely make out the intervertebral spaces behind the heart.

Why don't we see muscles between the ribs? Ribs surrounded by muscle, allowing for contrast. Muscle is surrounded by other tissues of same density. Because there is no lateral margin for us to see, muscles give a general haziness, which is why the lungs aren't completely black. In obese patients with more tissue, the film is going to be even hazier.

If the heart is in front of the lung, do you see the vessels behind it? YES. Although the vessels and the heart have the same desnsity, the Silloute sign says that the two structures have to touch. Vessels in the lung are surrounded by air density alveoli.

Silhouette Sign

Take away point:
Know this. It let's you know if things are touching.. or not.

- **When two structures of the same radiographic density touch, you don't see borders**
- **When two structures of dissimilar density touch, you do see borders**