

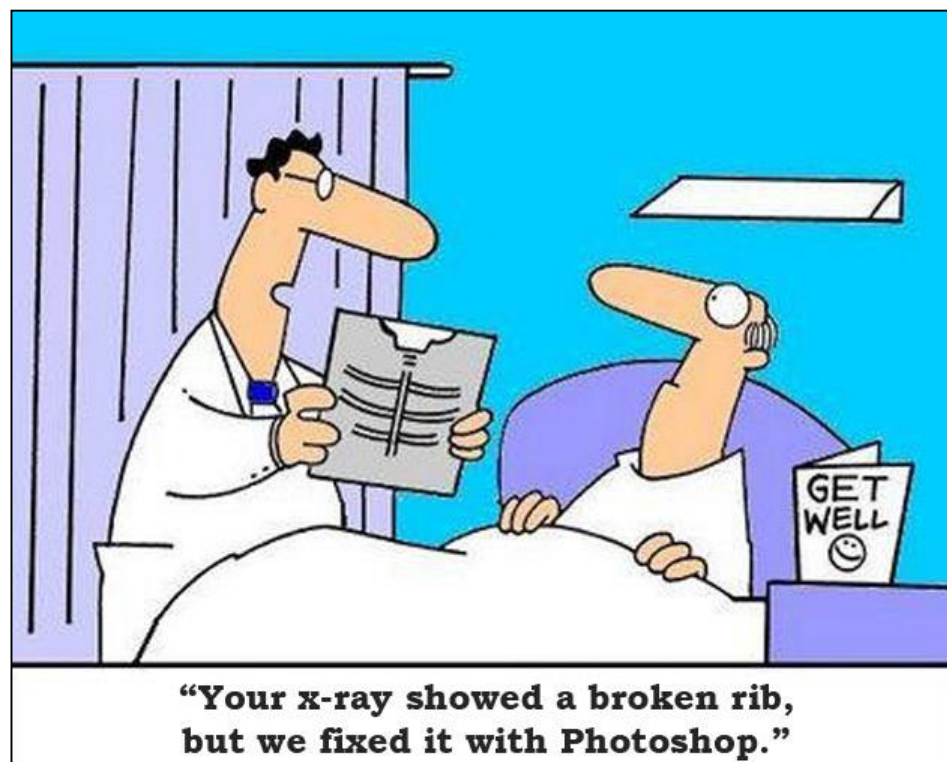
# X-rays

Dr Will Dooley



# Plan

- Chest X-Rays
- Abdominal X-Rays
- Exam approach
- Presentation skills



# EMQ

	Scenario
1	A 72 year man who becomes acutely short of breath after a total hip replacement. Pulmonary embolism is suspected.
2	A 65 year old woman who becomes short of breath and is suspected of having acute left ventricular failure
3	A 42 year old woman with rheumatoid arthritis who develops acute abdominal pain. A perforated peptic ulcer is suspected
4	A 22 year old woman develops acute colicky abdominal pain in the right upper quadrant and is suspected to have gallstones
5	A 15 year old boy develops abdominal pain 6 days after an appendicectomy. Small bowel obstruction is suspected

- A) Erect PA chest radiograph
- B) Supine AP chest radiograph
- C) Abdominal ultrasound scan
- D) Supine abdominal radiograph
- E) CT of thorax with IV contrast
- F) CT of abdomen with IV contrast
- G) CT of thorax without IV contrast
- H) CT of abdomen without IV contrast

# EMQ- answers

	Scenario	Answer
1	A 72 year man who becomes acutely short of breath after a total hip replacement. Pulmonary embolism is suspected.	E
2	A 65 year old woman who becomes short of breath and is suspected of having acute left ventricular failure	A
3	A 42 year old woman with rheumatoid arthritis who develops acute abdominal pain. A perforated peptic ulcer is suspected	A
4	A 22 year old woman develops acute colicky abdominal pain in the right upper quadrant and is suspected to have gallstones	C
5	A 15 year old boy develops abdominal pain 6 days after a appendicectomy. Small bowel obstruction is suspected	D

- A) Erect PA chest radiograph
- B) Supine AP chest radiograph
- C) Abdominal ultrasound scan
- D) Supine abdominal radiograph
- E) CT of thorax with IV contrast
- F) CT of abdomen with IV contrast
- G) CT of thorax without IV contrast
- H) CT of abdomen without IV contrast

# Chest X-Ray - Systematic Approach

- D Details
- R RIP – Image Quality

+/- OBVIOUS ABNORMALITY

- A Airways and mediastinum
- B Bones and soft tissue
- C Cardiac silhouette and vessels
- D Diaphragm
- E Extras and Edges

CLINICAL CORRELATION



# CXR - Systematic Approach

- **D** Details
- R RIP – Image Quality

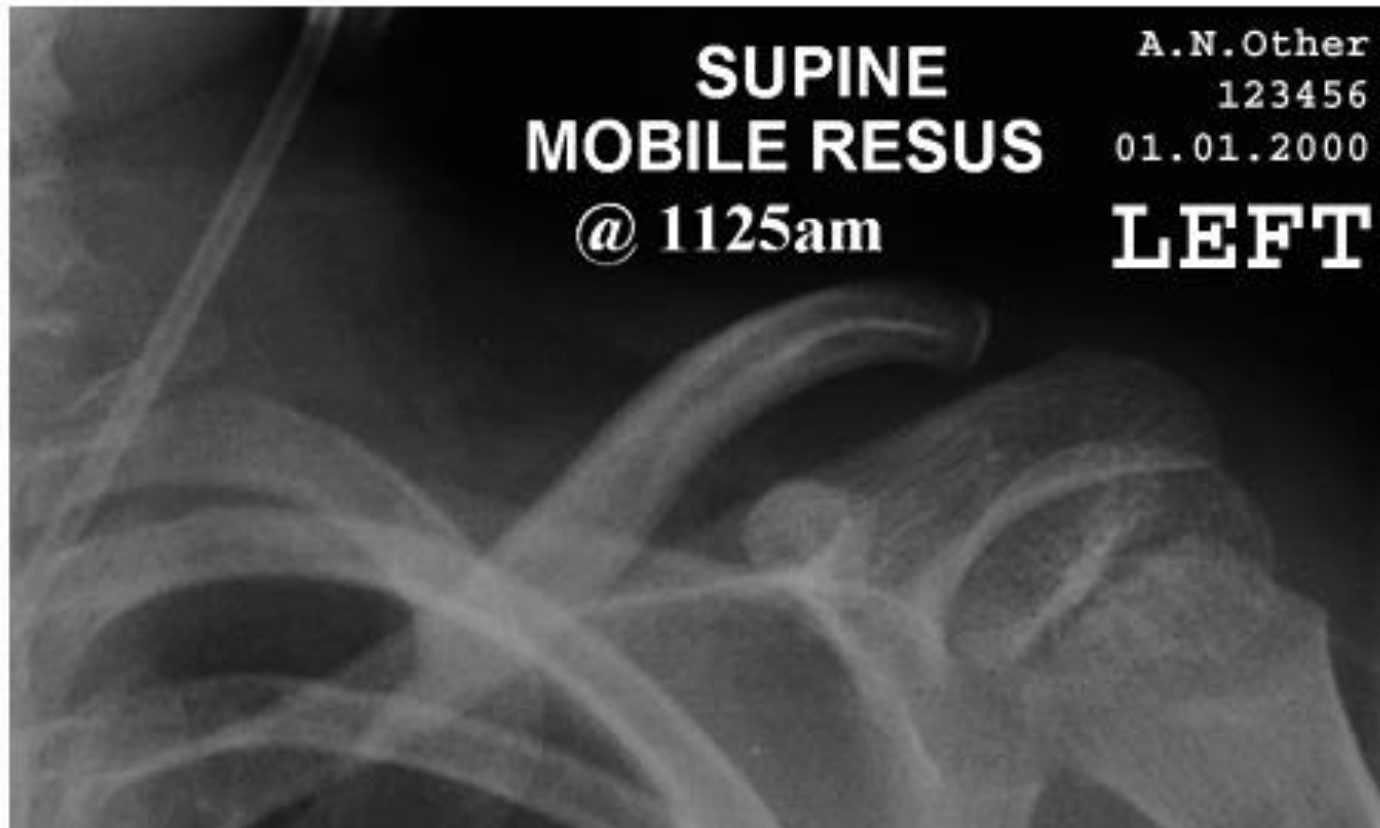
+/- OBVIOUS ABNORMALITY

- A Airways and mediastinum
- B Bones and soft tissue
- C Cardiac silhouette and vessels
- D Diaphragm
- E Extras and Edges

CLINICAL CORRELATION

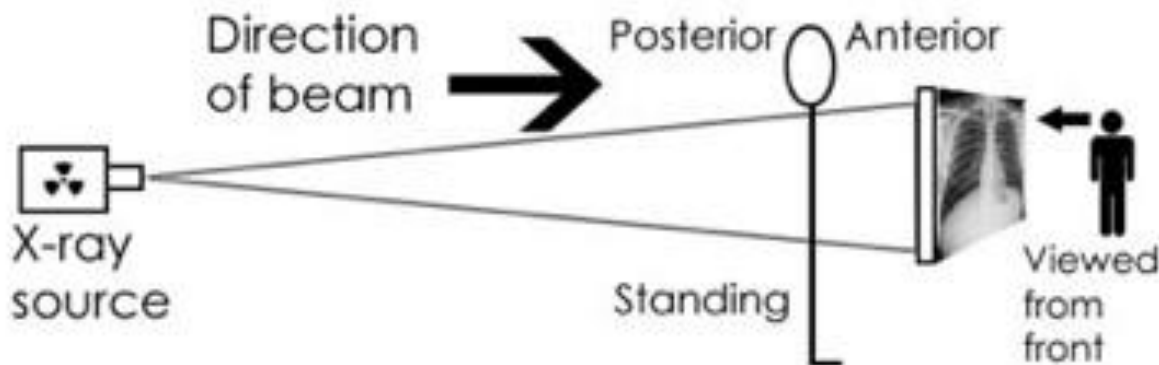


# Details



# Details: Image projection

## PA projection

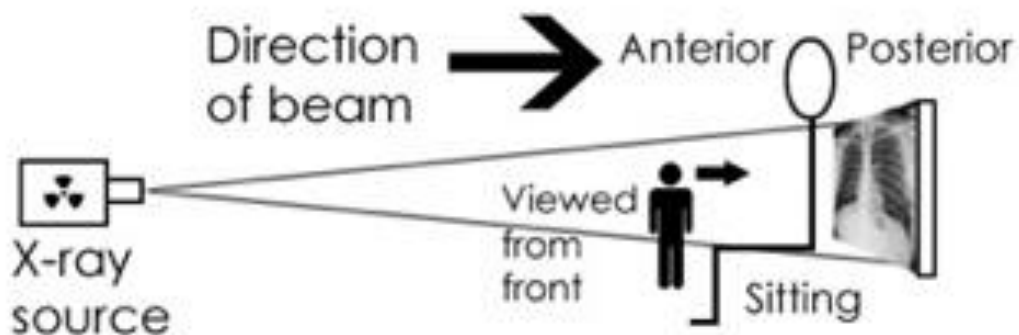


## PA CXR

Better quality

More accurate heart size

## AP projection



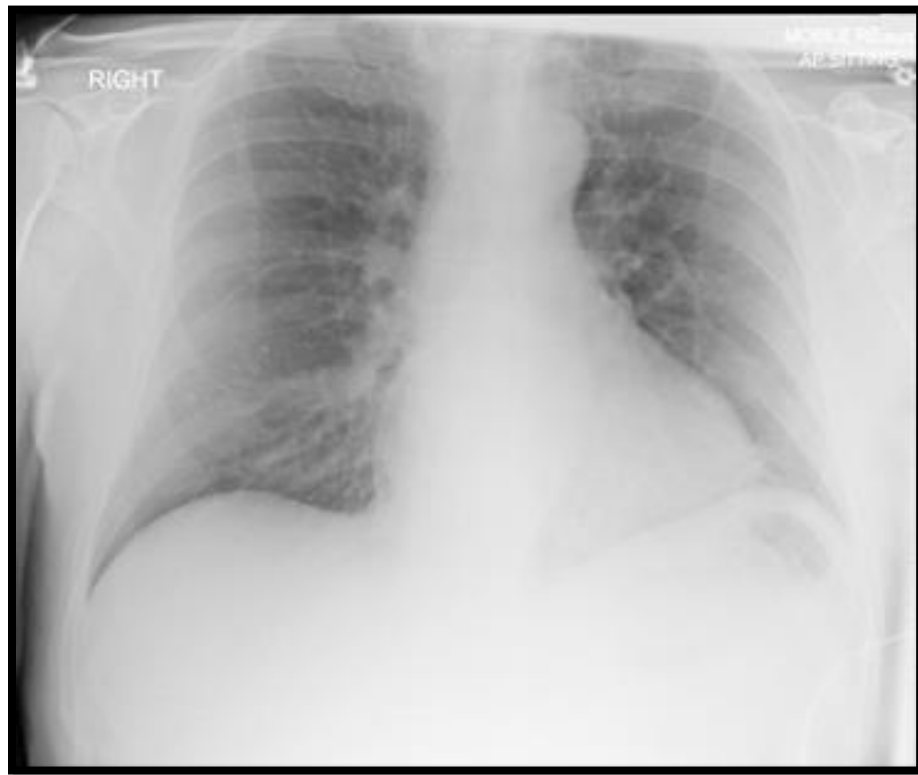
## AP CXR

Patient can sit or lie down

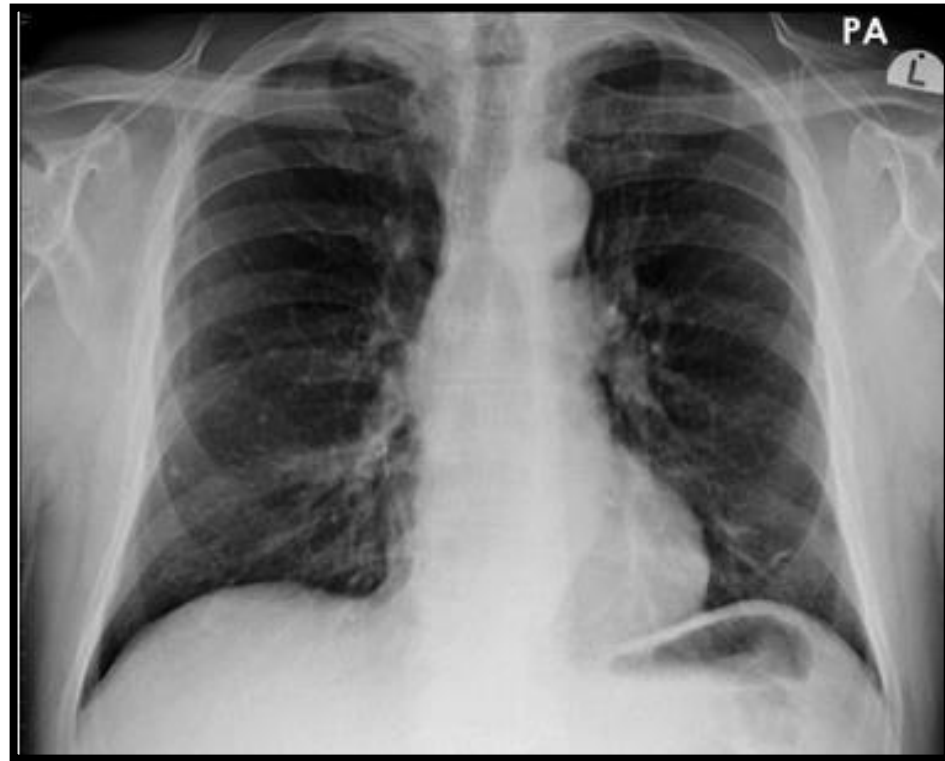


# Details: Image projection

AP



PA



# CXR - Systematic Approach

- D Details
- R RIP – Image Quality

+/- OBVIOUS ABNORMALITY

- A Airways and mediastinum
- B Bones and soft tissue
- C Cardiac silhouette and vessels
- D Diaphragm
- E Extras and Edges

CLINICAL CORRELATION



# Image Quality

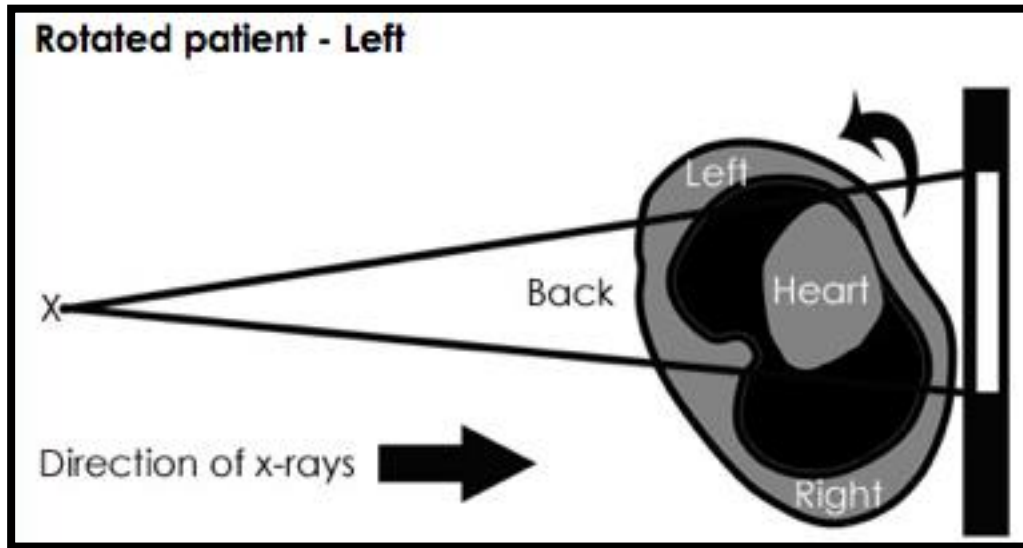
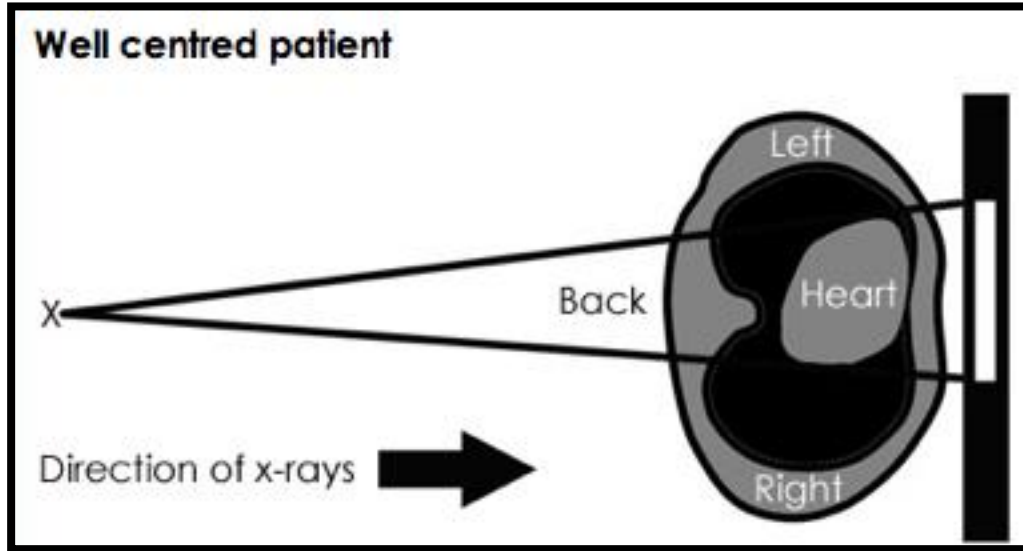
- R-otation
- I-nspiration
- P-enetration

Check quality first to avoid false reassurance or diagnosis

Can the clinical question still be answered?



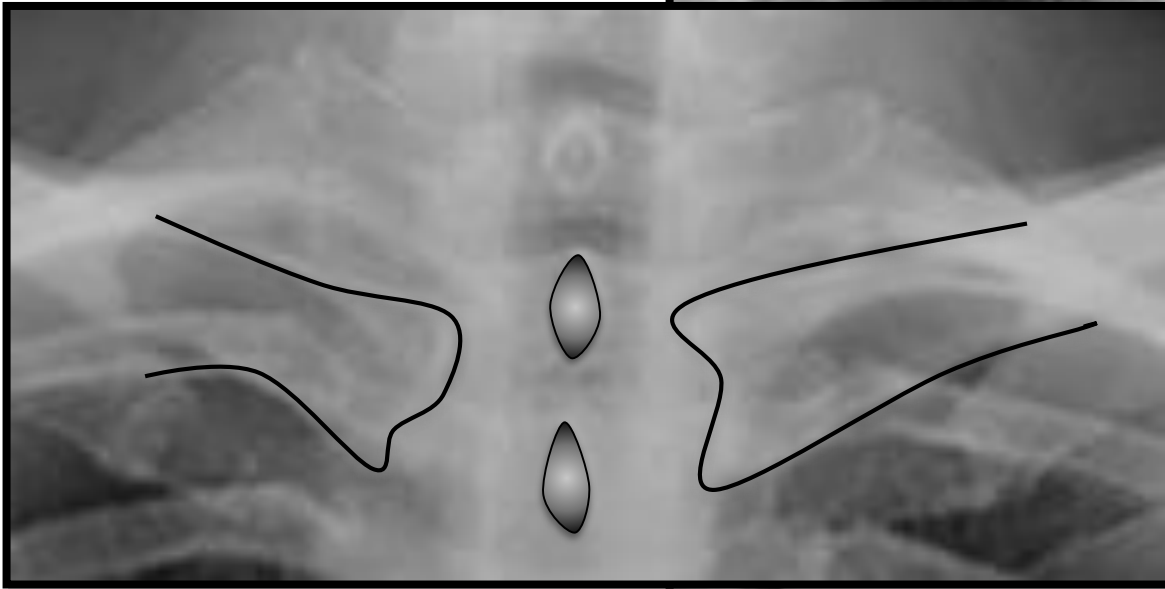
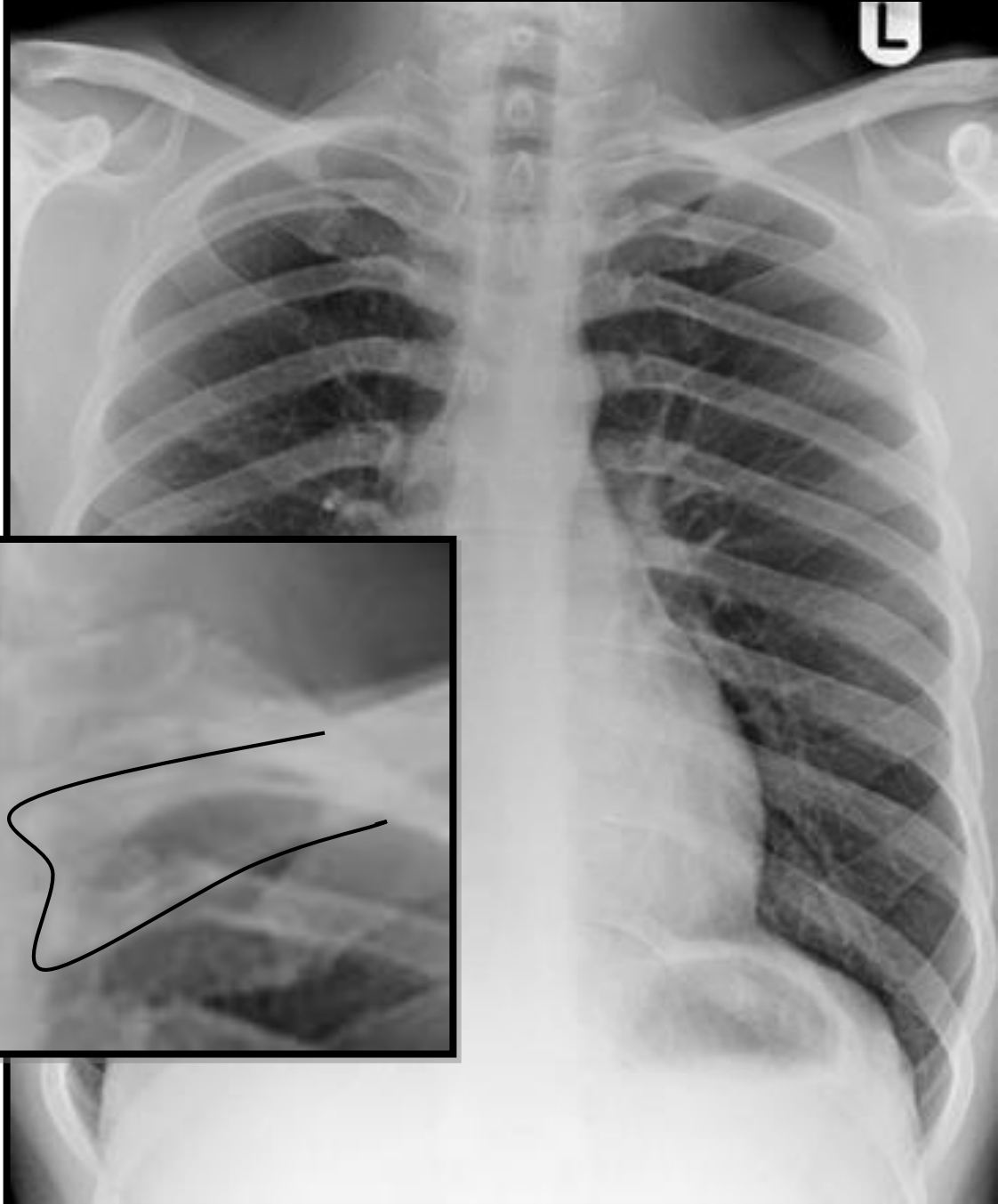
# Rotation

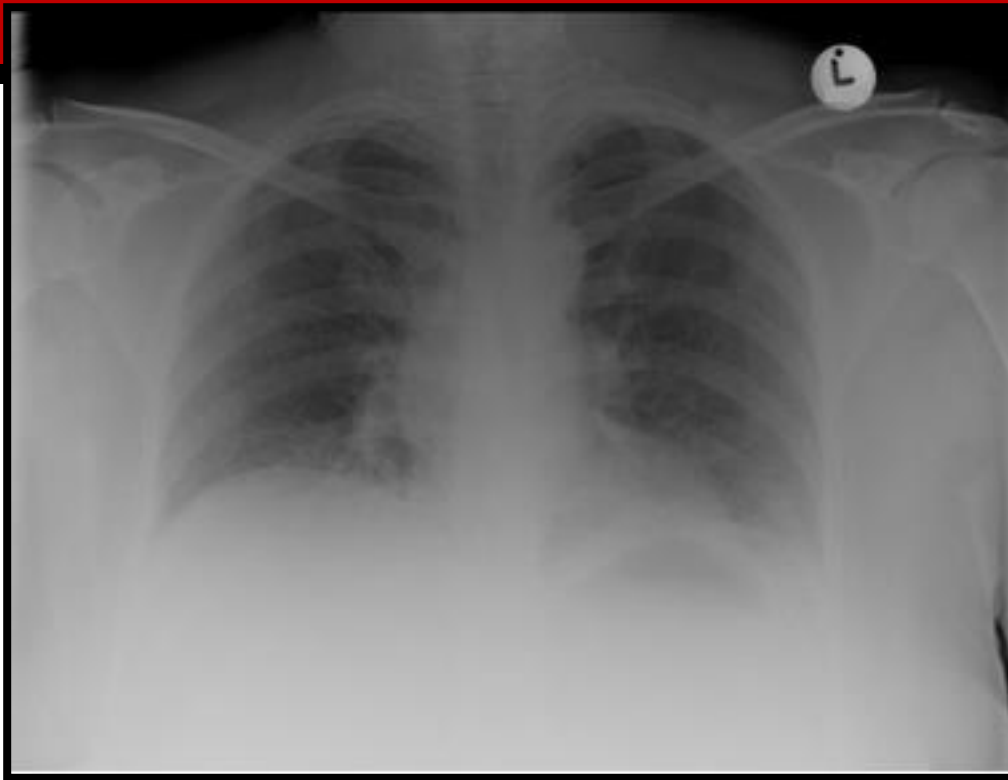


# Rotation

Normal rotation

Spinous processes of the thoracic vertebral bodies between the two clavicular heads





Expiration

Inspiration



# Penetration



Underpenetrated

Overpenetrated

# CXR - Systematic Approach

- D Details
- R RIP – Image Quality

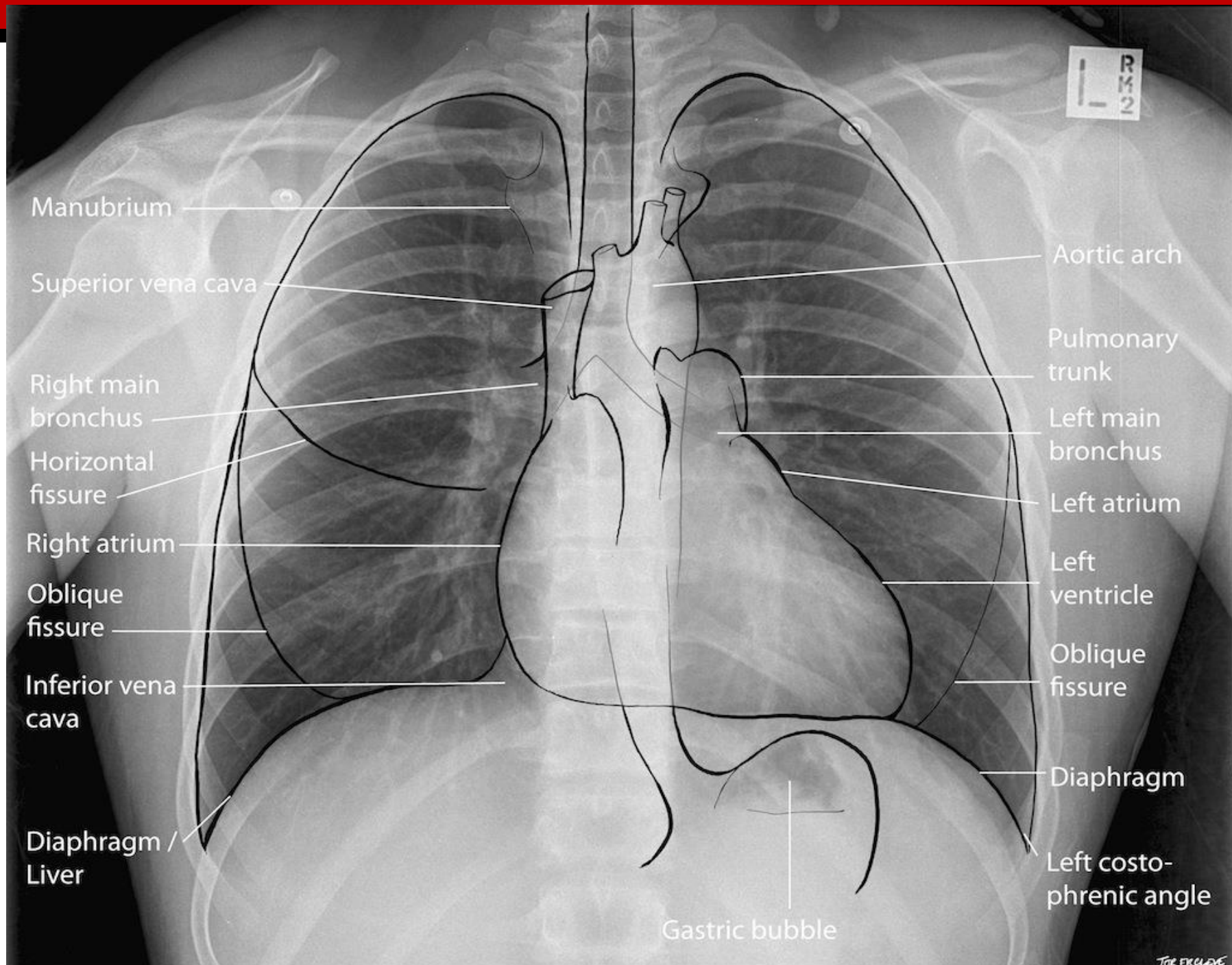
+/- OBVIOUS ABNORMALITY

- A Airways and mediastinum
- B Bones and soft tissue
- C Cardiac silhouette and vessels
- D Diaphragm
- E Extras and Edges

CLINICAL CORRELATION







## Bones and Soft Tissue

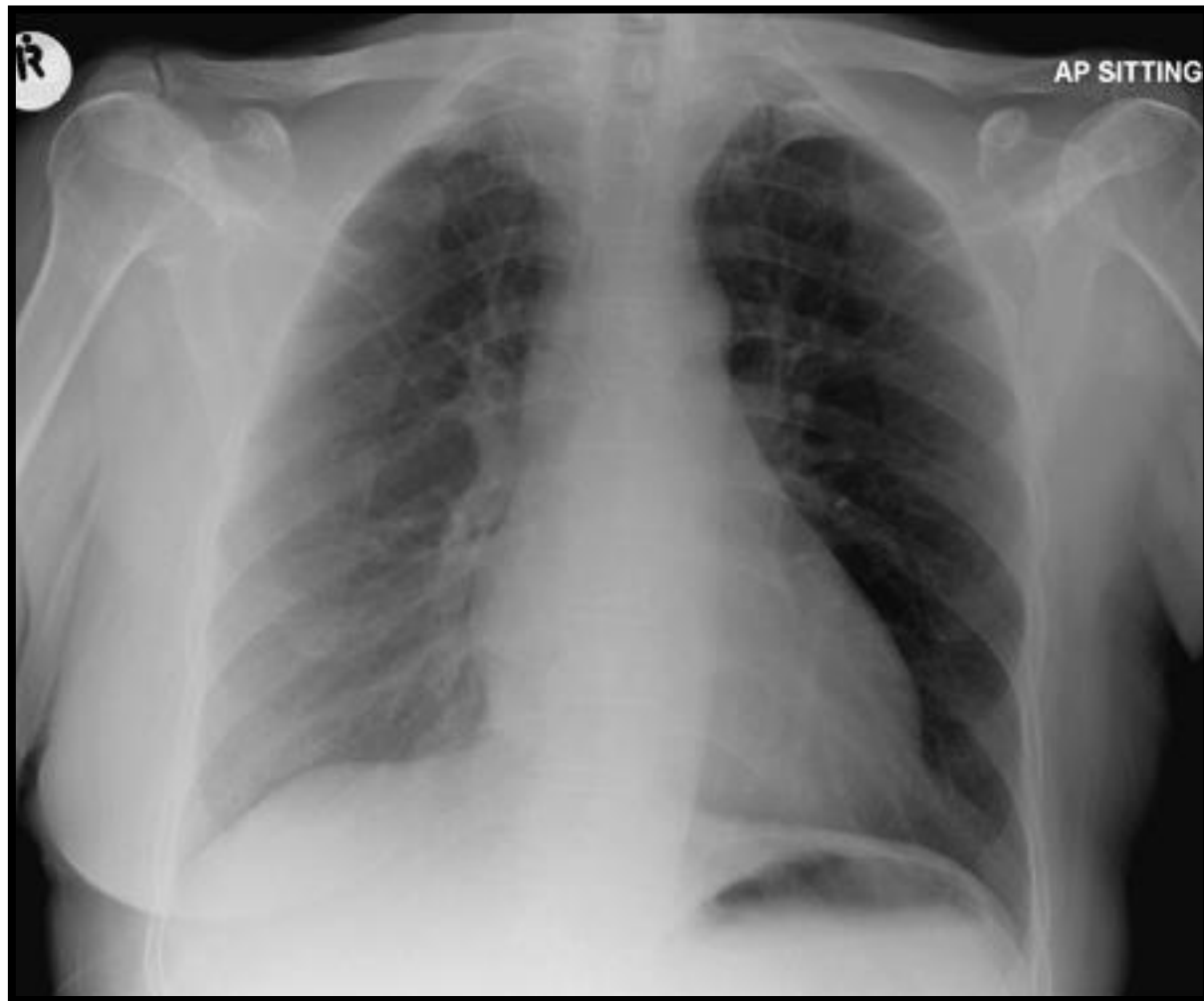
Asymmetry  
of lower zone soft tissue

+ on R

OR

- on L

Left mastectomy



# CXR - Systematic Approach

- D Details
- R RIP – Image Quality

## OBVIOUS ABNORMALITY

- A Airways and mediastinum
- B Bones and soft tissue
- C Cardiac silhouette and vessels
- D Diaphragm
- **E Extras and Edges**

## CLINICAL CORRELATION

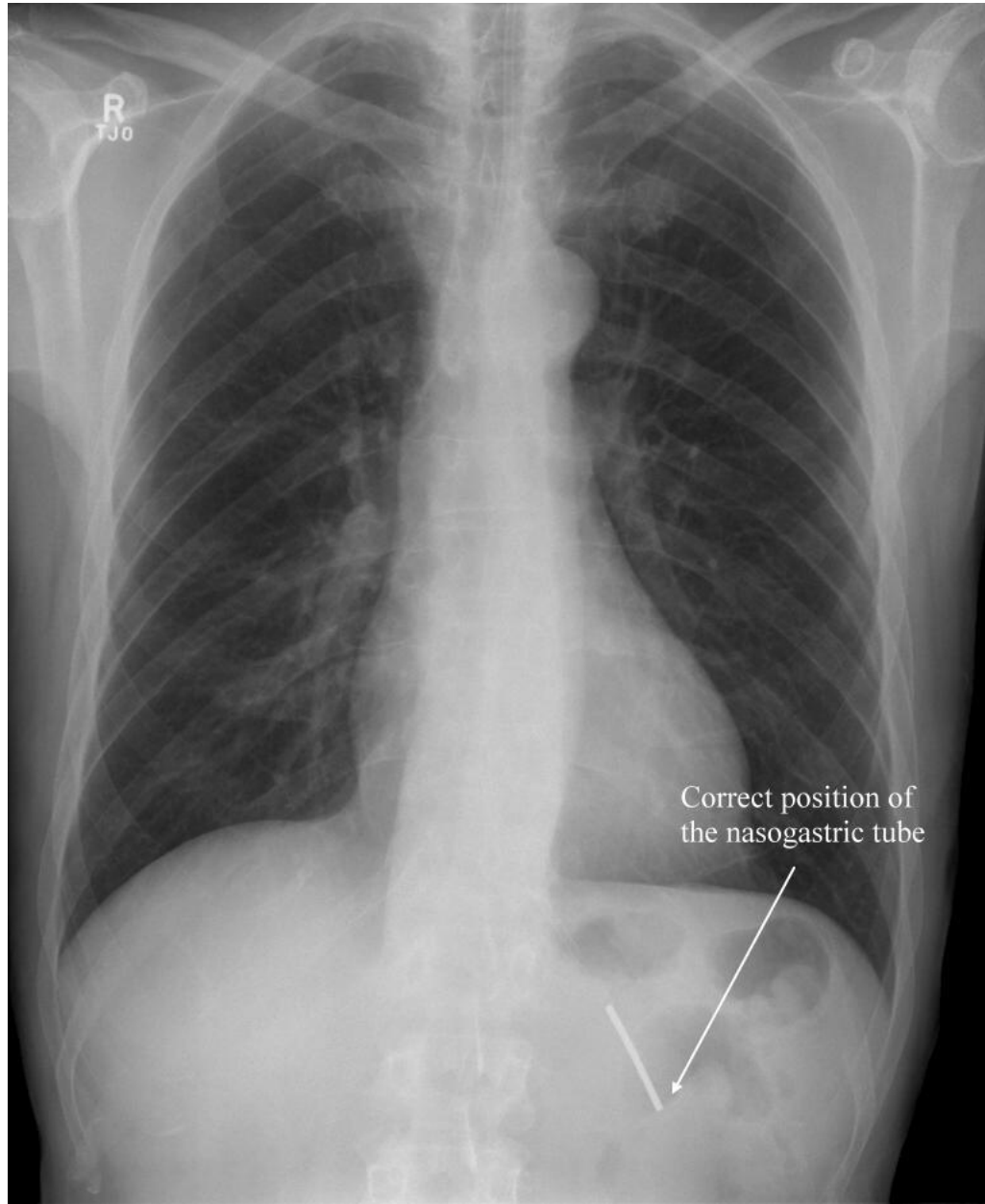


# Extras

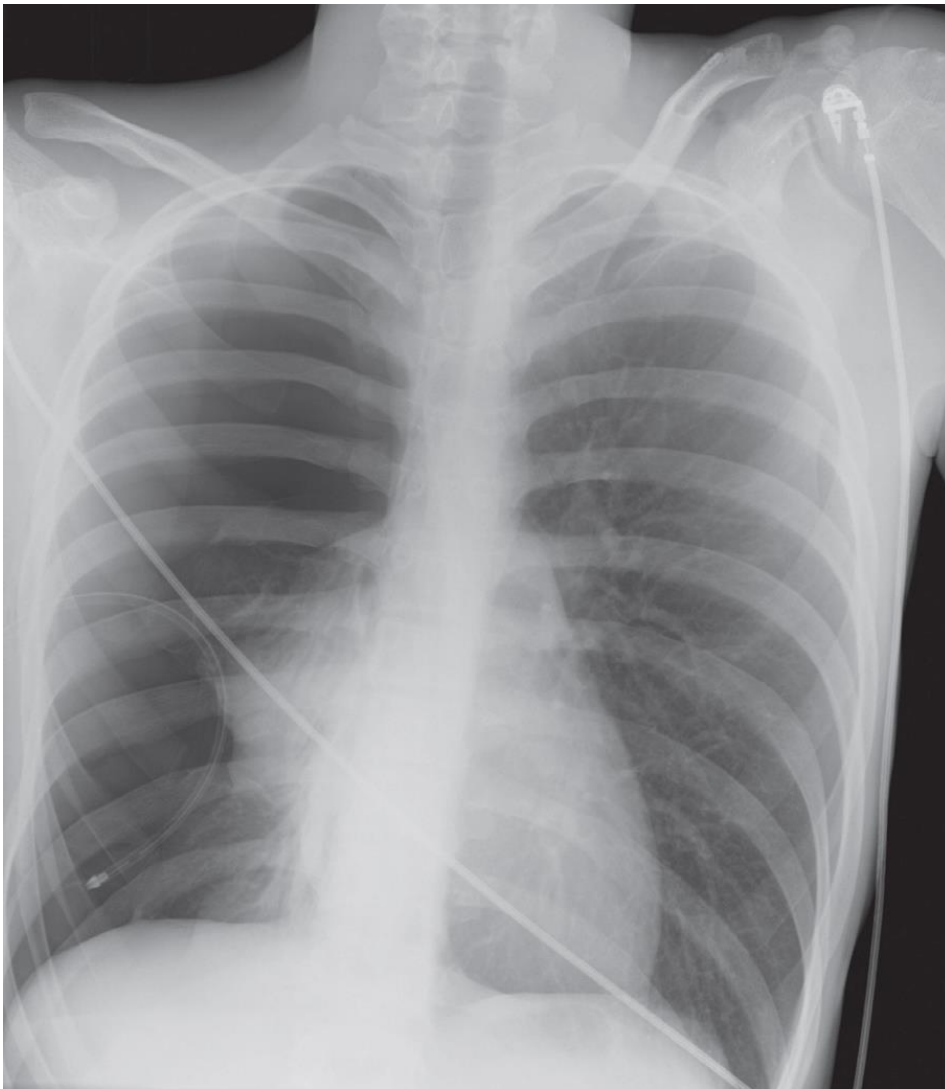


What tube?

In correct location?

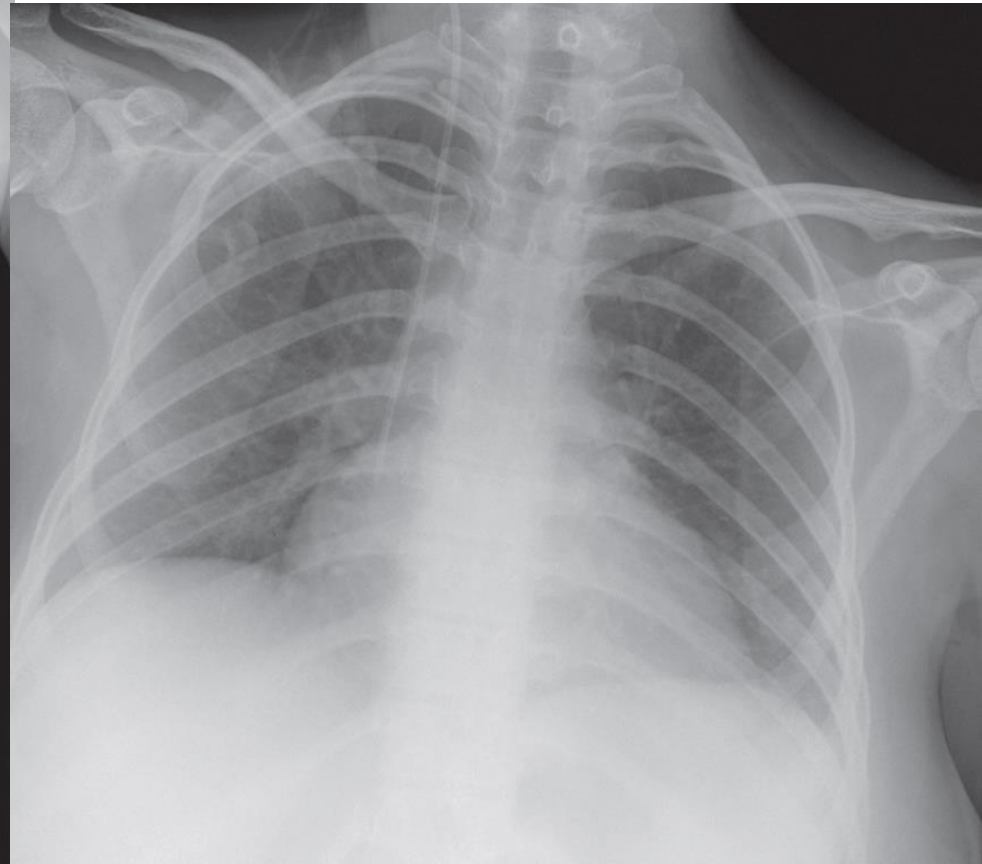






Chest Drain

Central Line



# CXR - Systematic Approach

- D Details
- R RIP – Image Quality

## OBVIOUS ABNORMALITY

- A Airways and mediastinum
- B Bones and soft tissue
- C Cardiac silhouette and vessels
- D Diaphragm
- E Extras and Edges

## CLINICAL CORRELATION



# Case Examples





**Clinical info**

Cough

Fever

Raised WCC

**Dx**

L Lower lobe pneumonia



CXR

L hemi-diaphragm obscured

Consolidation of L base

# Presenting CXR

## Intro:

This is a (AP/PA + Erect/mobile) chest radiograph of...  
Pt name / Age, taken at...  
Date / Time

READ THE QUESTION

## Image quality:

Adequate or inadequate (why- RIP?)

?Main abnormality- describe

Or/and: Using a **systematic approach**

- Trachea central?
- Mediastinum
- Upper / middle / lower zones
- Costophrenic angles
- Heart size and cardiophrenic angles
- Abnormalities of bones/soft tissues

## In summary:

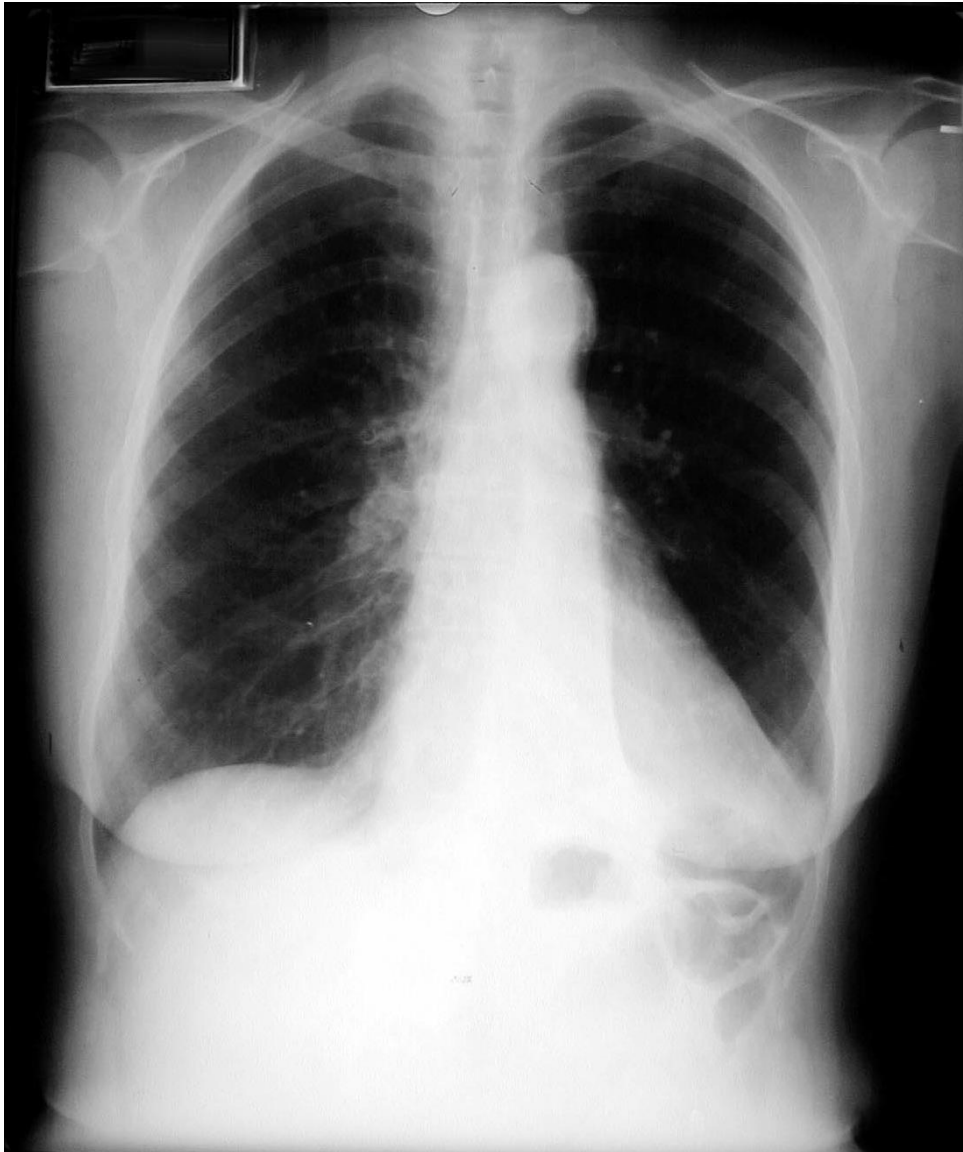
- This is a chest radiograph which demonstrates evidence of ... which is consistent with the given clinical picture

## Further investigations:

- Full history
- Bedside e.g. Sputum culture/peak flow
- Blood tests e.g. Inflammatory markers, BNP
- More imaging e.g. Further XR, CT
- Special tests e.g. Spirometry, echo

## Management





Sail Sign

Left lower lobe collapse

### Clinical info

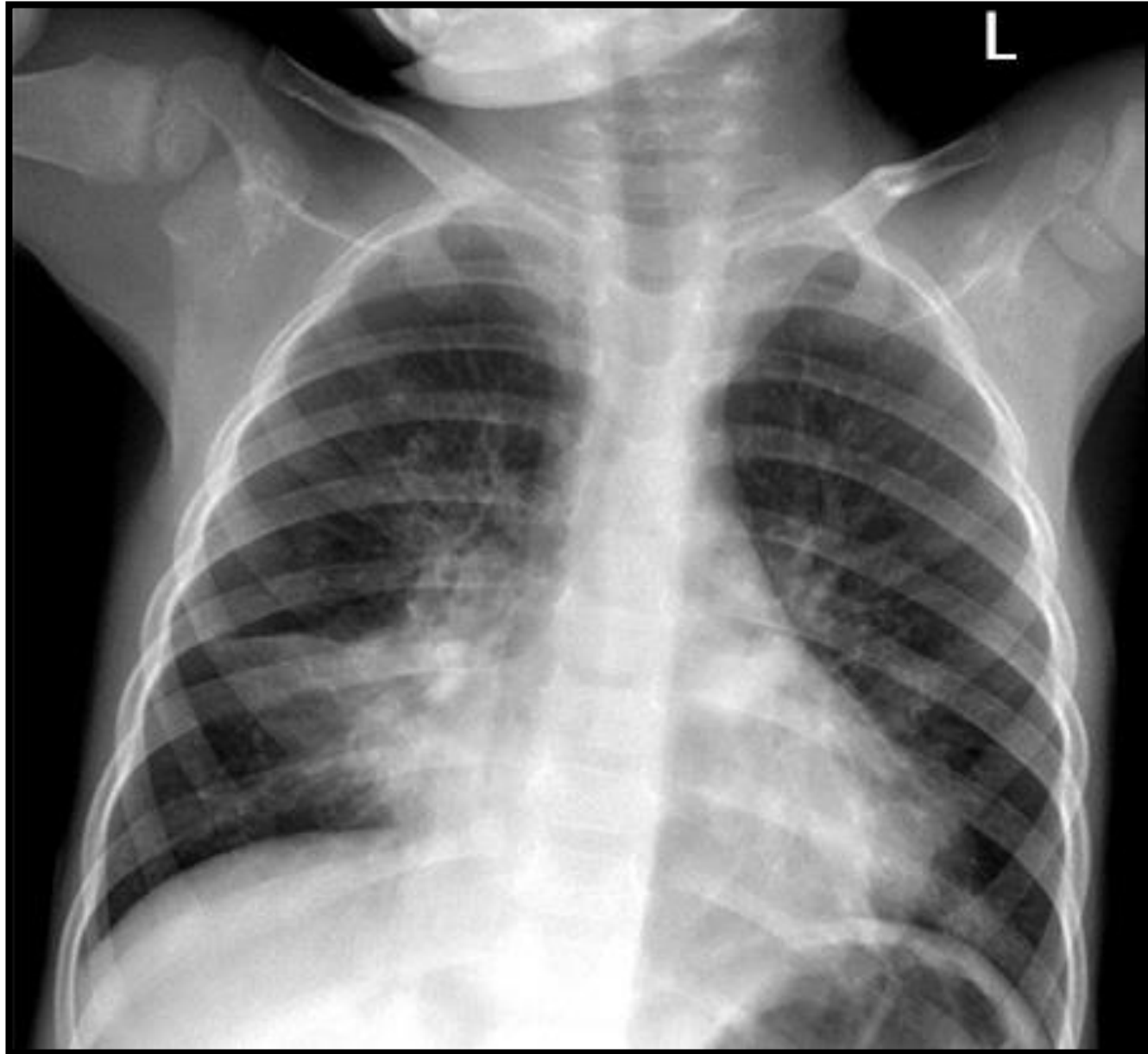
Fever

Productive cough

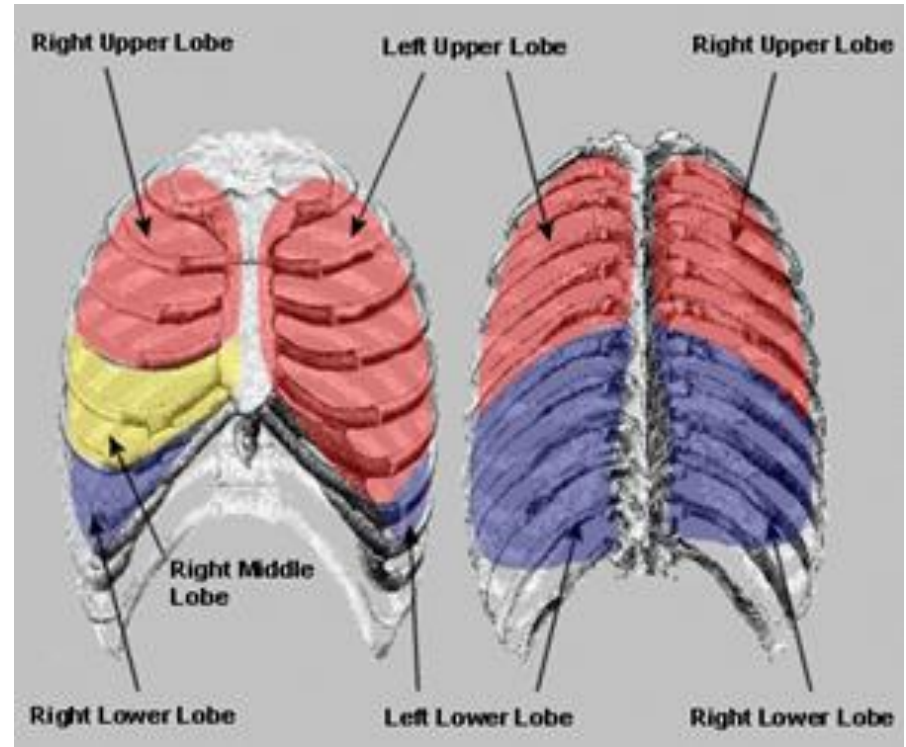
### Dx

R middle lobe  
consolidation

R heart border obscured  
Crisp line in horiz fissure  
Mild consolidation above



# Consolidation



Compare R with L  
Check costaphrenic angles  
Systematic check of fissures  
Check cardiophrenic margins

## Clinical Info

Fall from 20 foot wall

Trauma to chest

## Dx

L pneumothorax

Secondary to rib fracture

?tension pneumothorax

**No evidence of tension pneumothorax**

- No shift of trachea
- No mediastinal shift

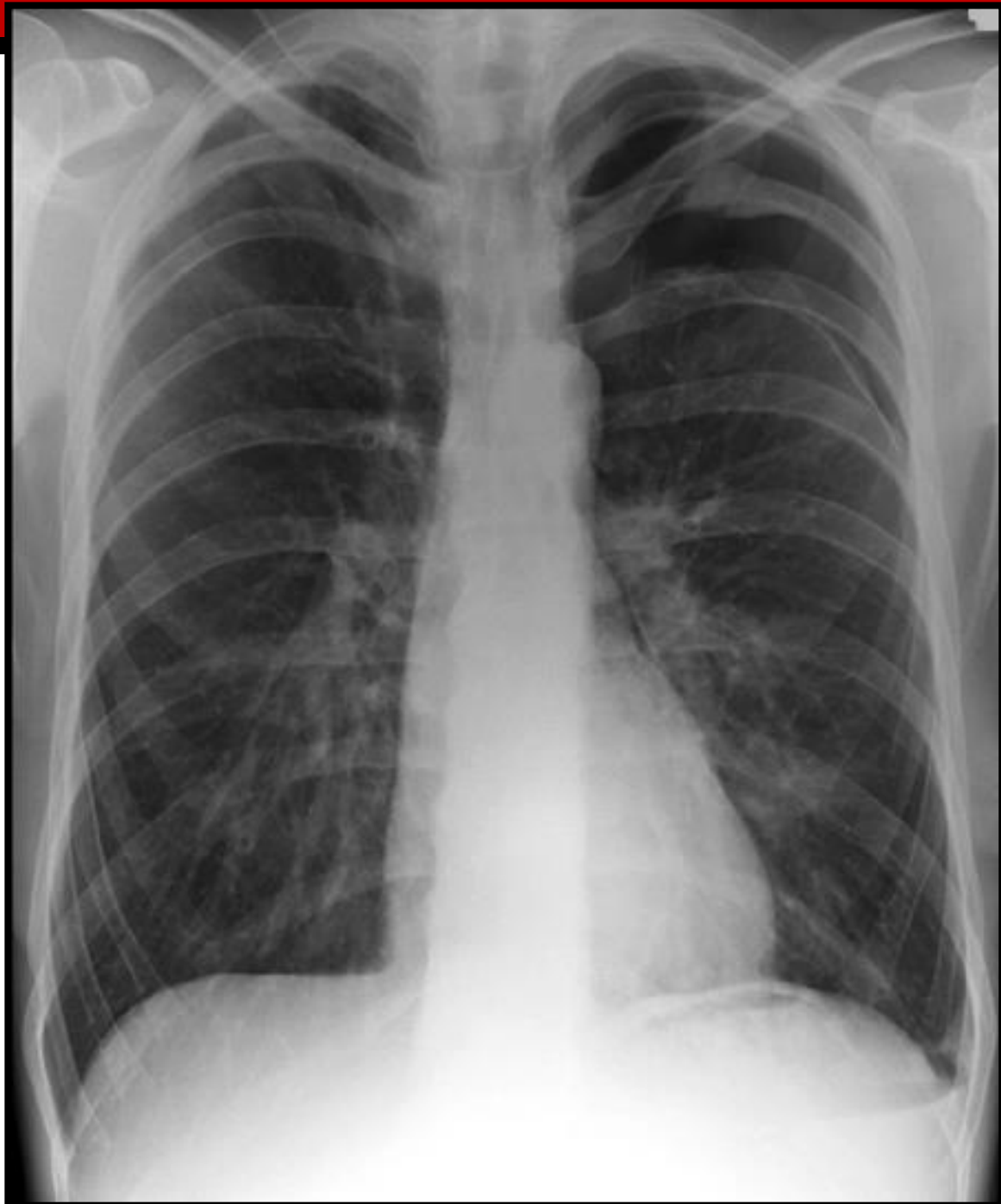
## CXR

Air in pleural space

Visible pleural edge

No lung markings

Rib fracture with callus



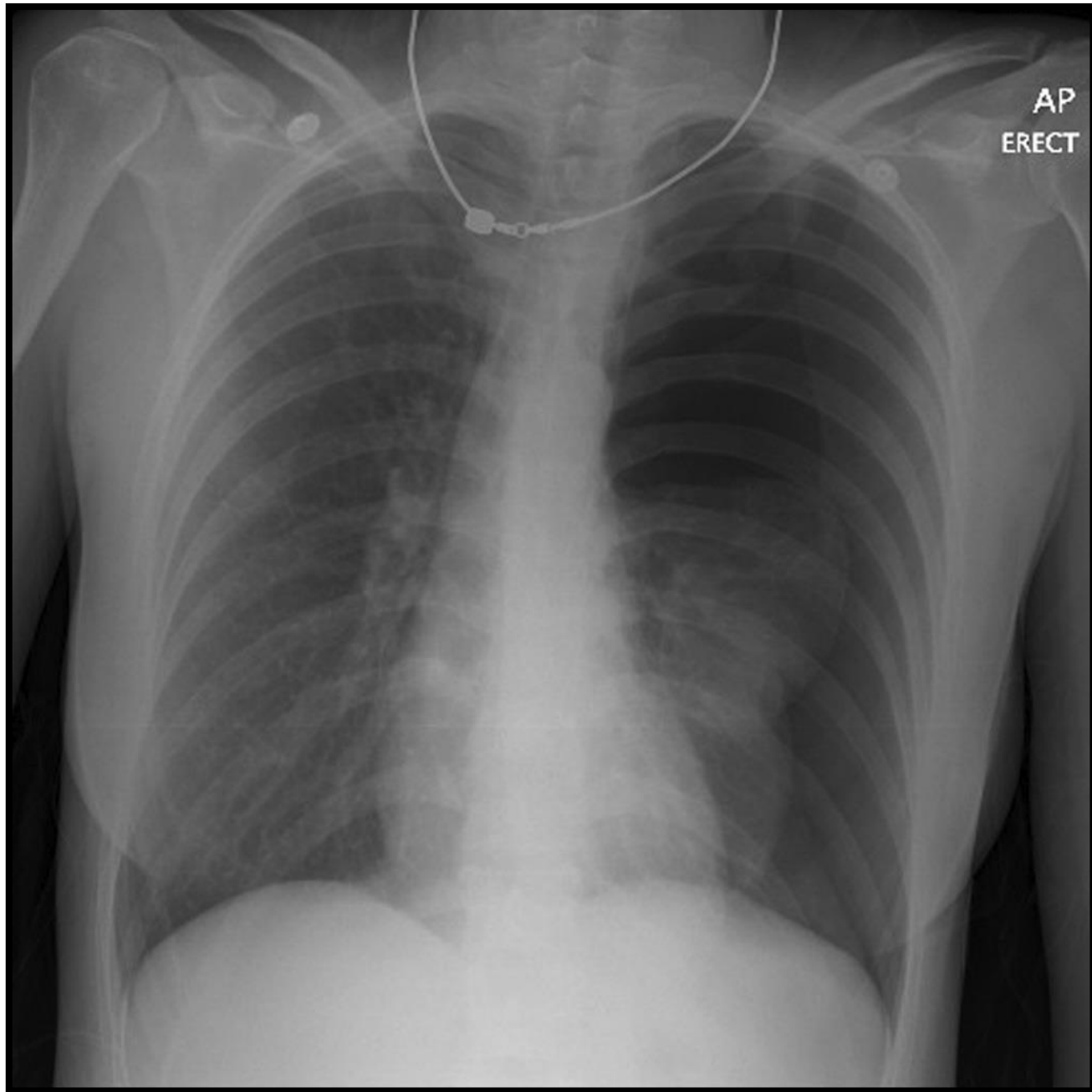


**CXR you should never see!**

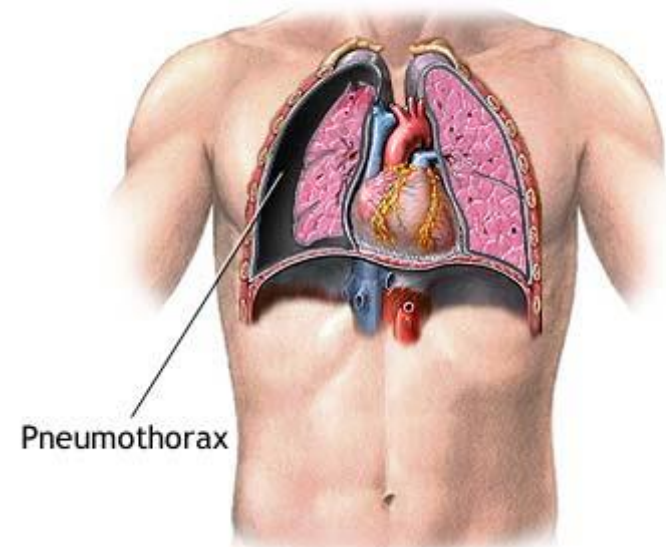
R Tension pneumothorax

Mediastinal shift

Loss of lung markings



# Pneumothorax



Compare R with L

- Evidence of tension pneumothorax
- Underlying bone lesion or chest drain



### **Clinical info**

Life long smoker

Weight loss

Increasing SOB

### **Dx**

Large L pleural effusion

?Underlying bronchogenic carcinoma

### **Pleural effusion**

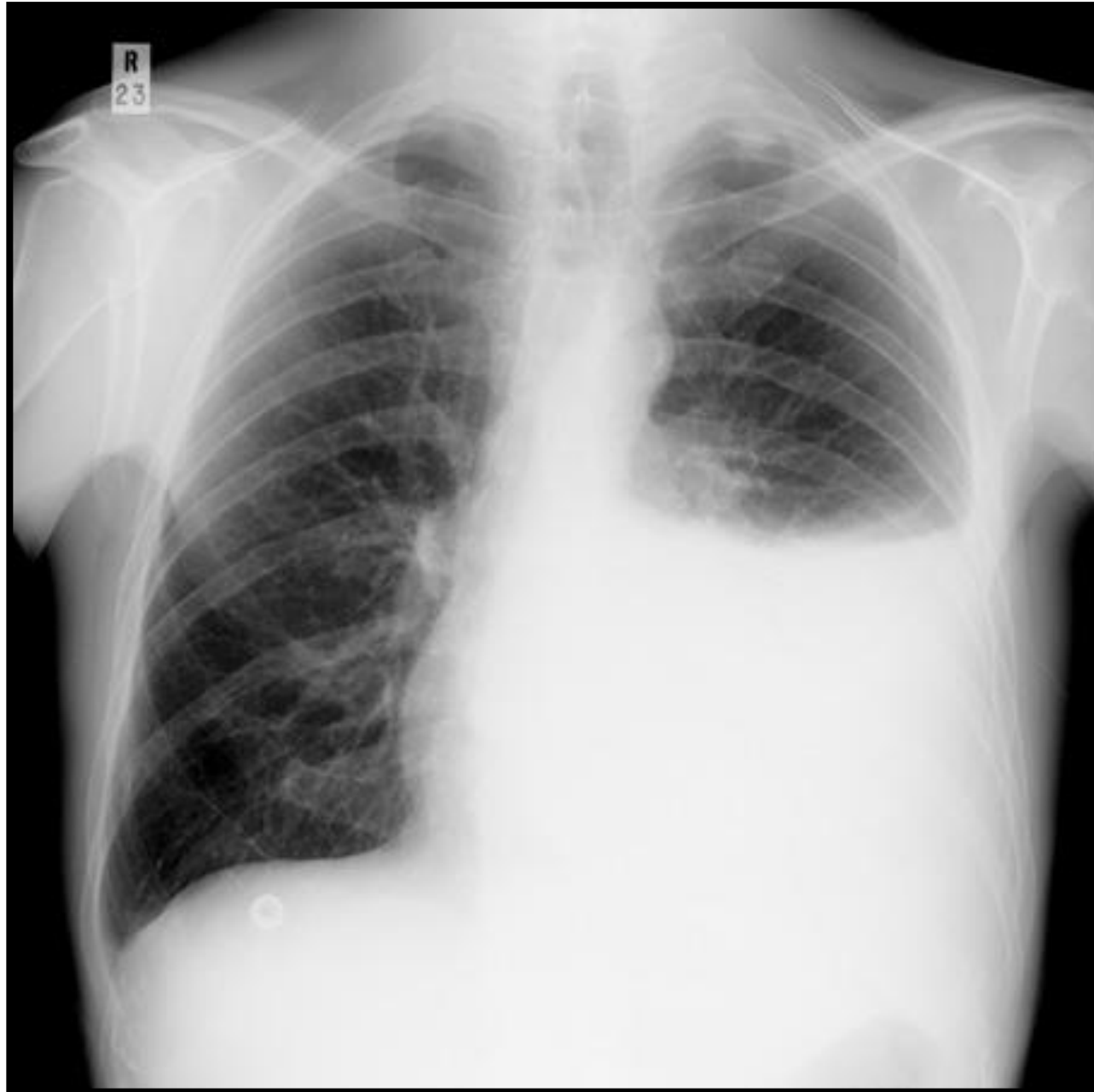
L lower zone white

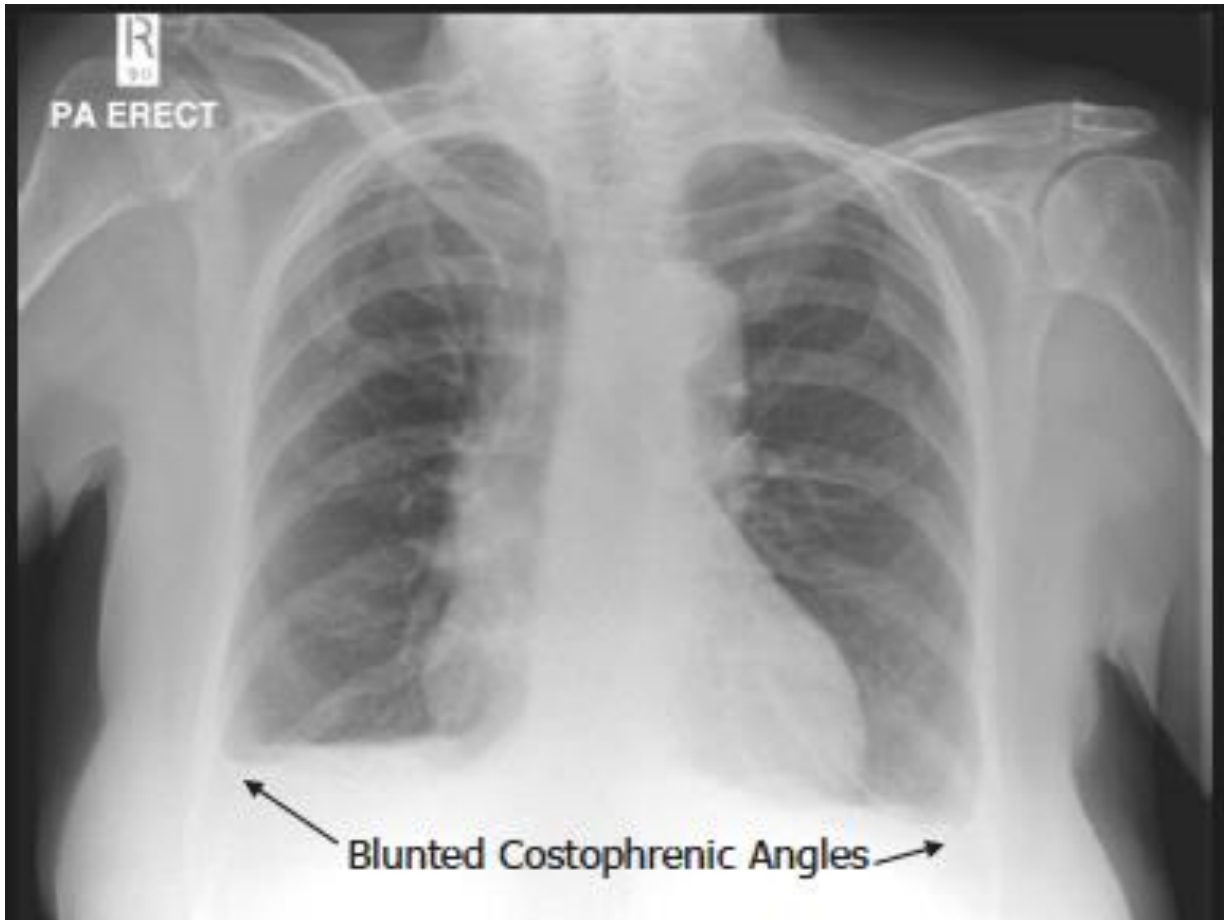
Obscured costophrenic angle  
and L hemidiaphragm

Blunting of R CP angle

Concave edge on top

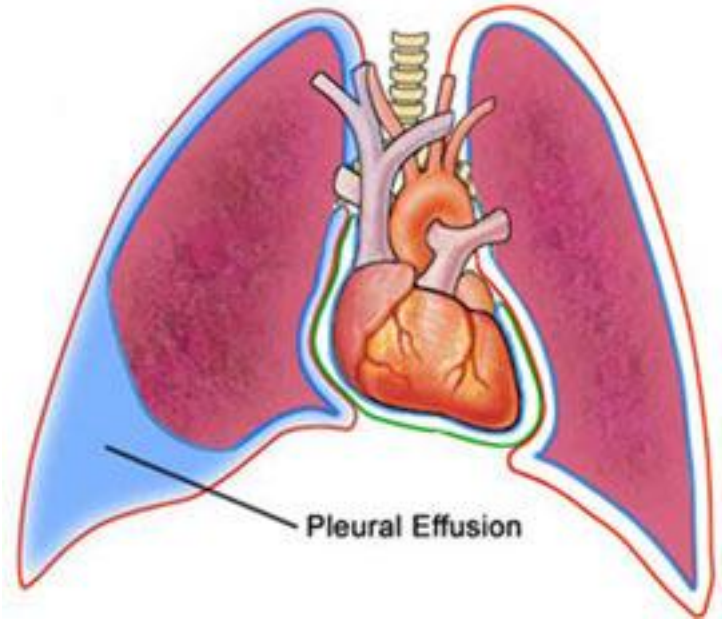
“meniscus sign”





Small bilateral pleural effusions

# Pleural Effusion



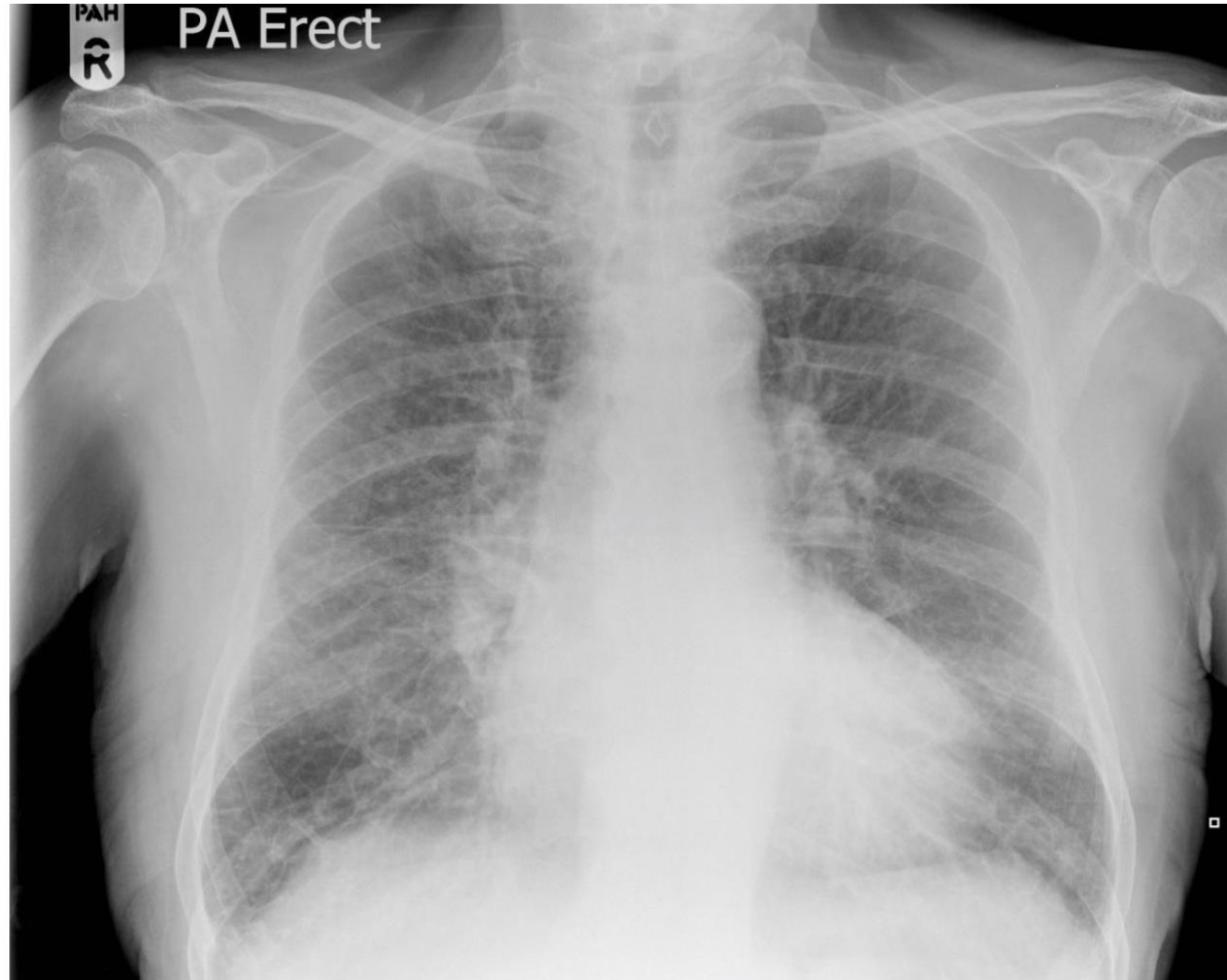
**OSCE:**

**History: A 69 yo male smoker with progressive shortness of breath and decreased exercise tolerance**

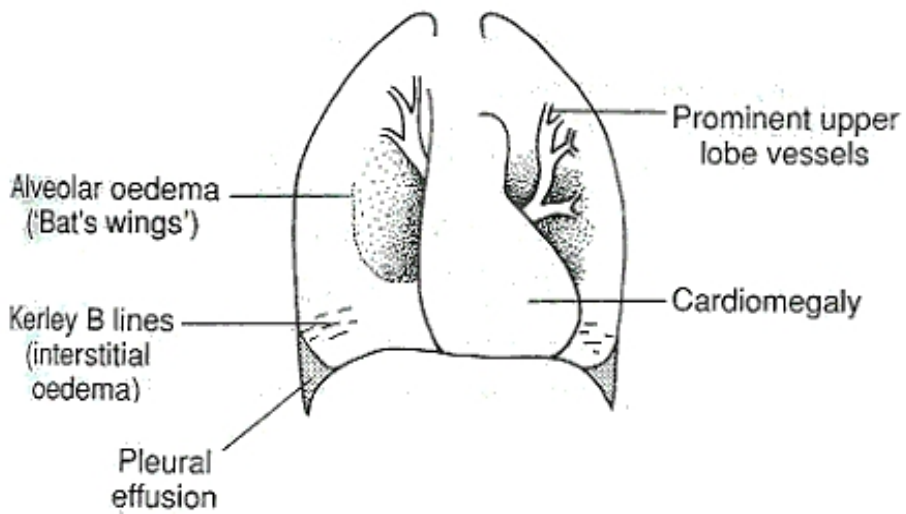
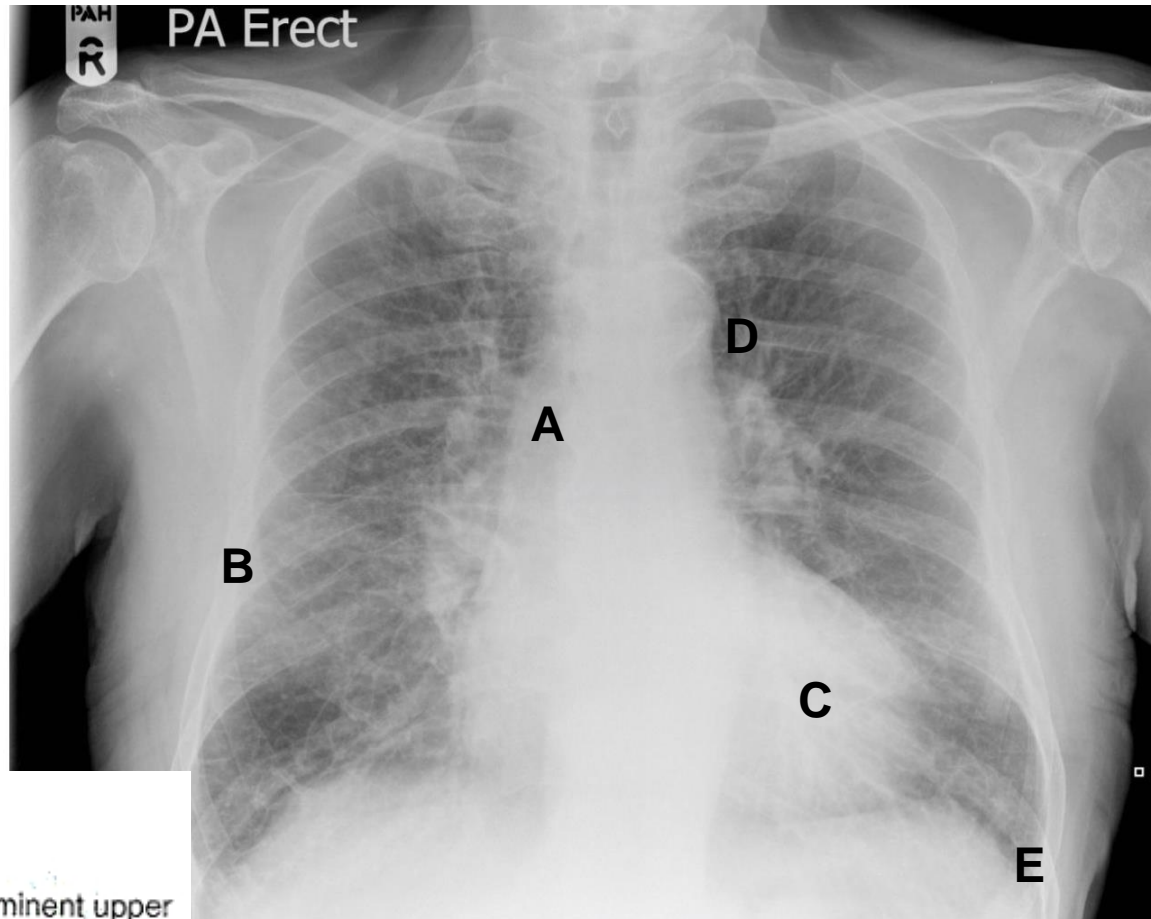
**1: What imaging abnormalities can be seen in this radiograph?**

**2: What is the most likely cause of this abnormality?**

**3: What is the most appropriate imaging follow up technique?**



# Heart failure



## Clinical info

Chronic smoker

Progressive SOB

Chronic cough

No infective symptoms

## Dx

COPD

## CXR

Hyper-expansion

Both CP angles blunt

Flattened diaphragm

Distorted lung markings





## Clinical hx

Chronic cough

Haemoptysis

Night sweats

## Dx

Tuberculosis

Staph infection

Squamous cell carcinoma

Lung infarct

Rheumatoid arthritis



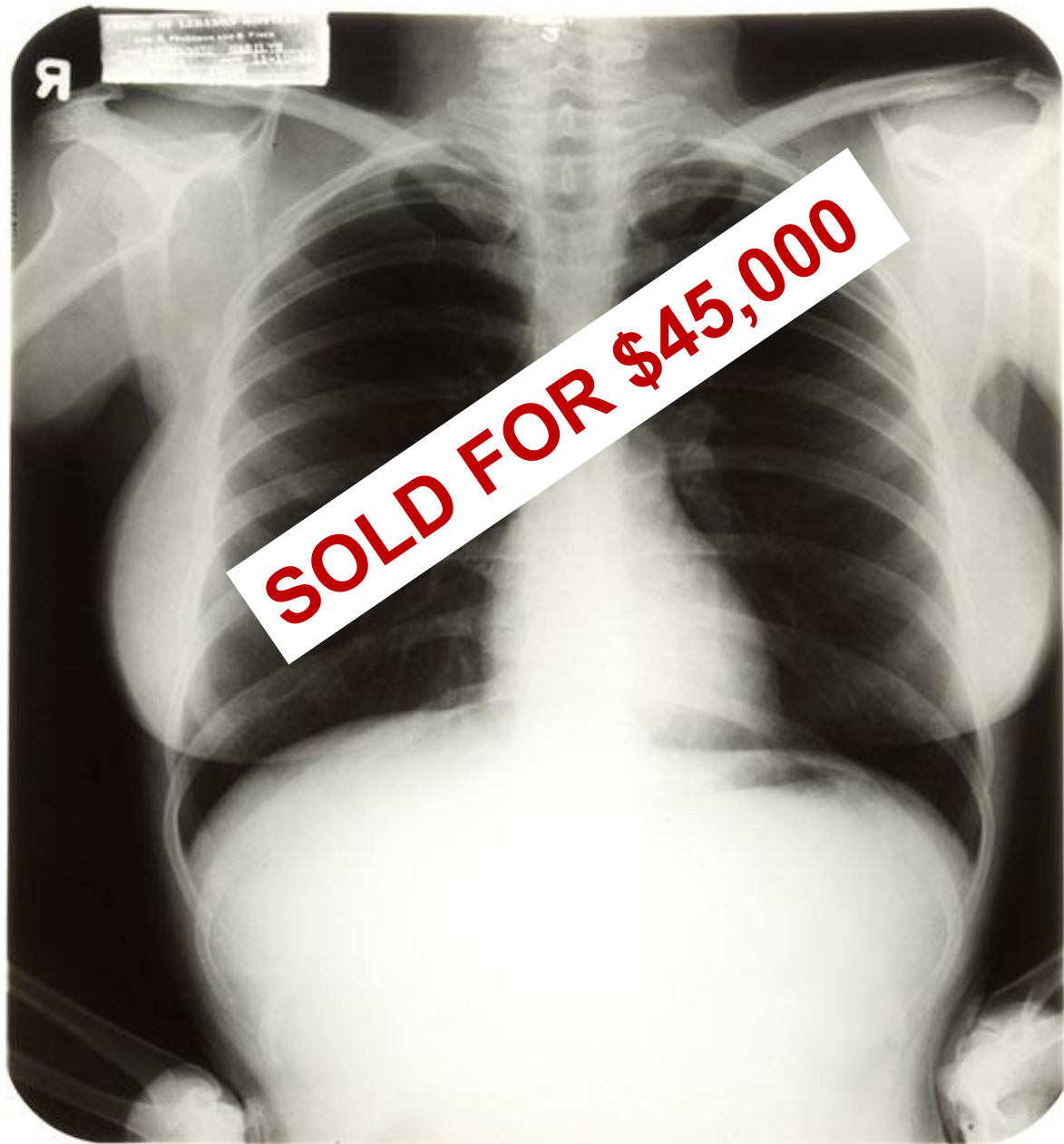
Central area of necrosis in cavitating lesion on L middle zone

# OSCE marks CXR

- **Correctly identifies patient**
- **Correctly notes time and date**
- **Correctly states PA or AP**
- **Comments on image quality**
- **Comments on medical devices - O<sub>2</sub> tube/pacemaker etc**
- **Assesses lung expansion**
- **Accurately assesses heart size**
- **Comments on salient abnormality using correct terminology**
- **States correct diagnosis**
- **Offers appropriate management plan**
- **Requests appropriate next image**







**Marilyn Monroe**  
**Chest and Pelvic Xray**  
**1954**

# Abdominal X-Ray



## Clinical

Acute severe abdo pain

Guarding

High ETOH intake

L-Term NSAIDs use

## Dx

Pneumoperitoneum

## Erect CXR

Pt should be upright for  
10-20 mins for air to rise

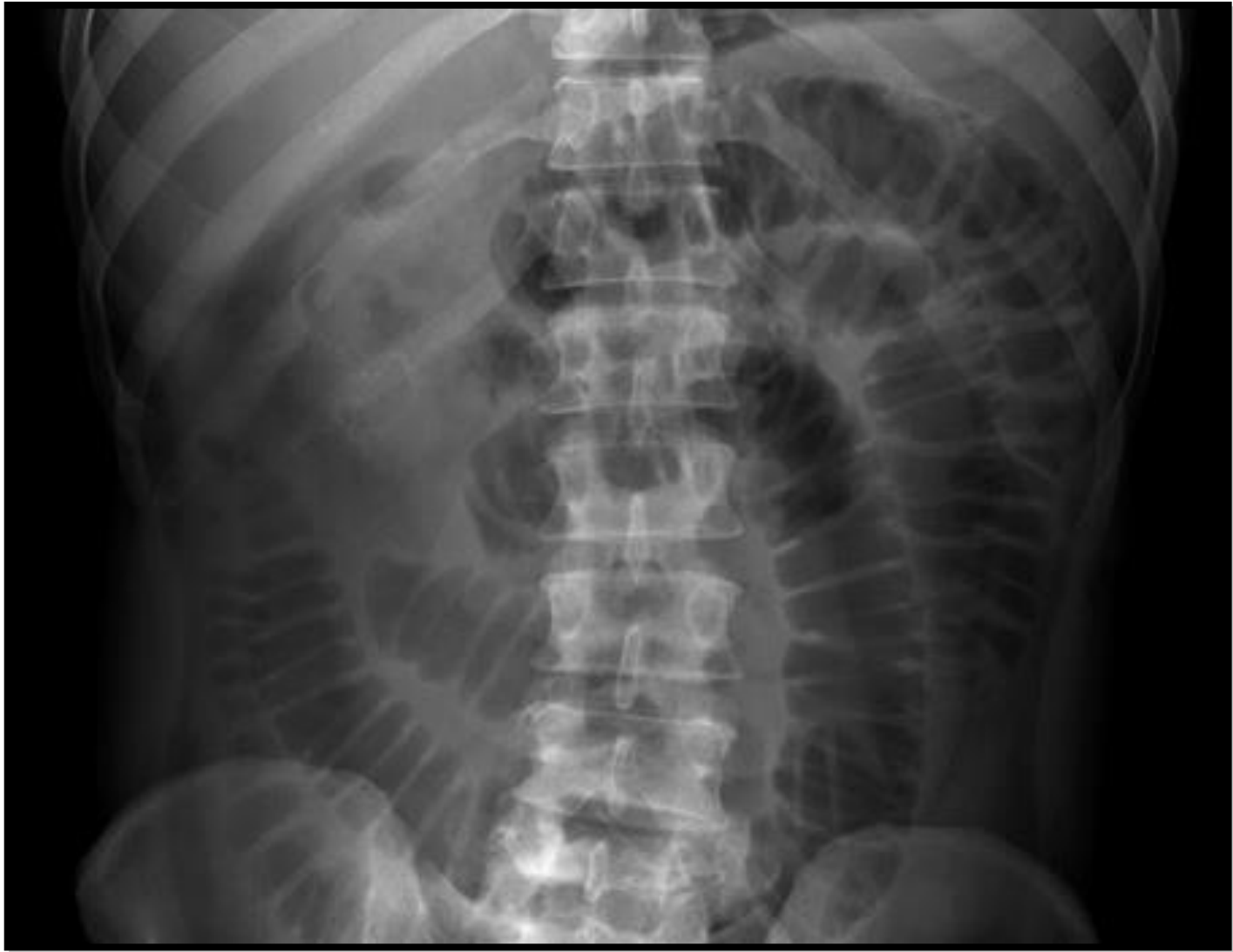


## Question 2: SBA for Small Bowel Obstruction

A 65 year old woman presents with abdominal pain and distension with vomiting. She reports that she had some “bowel surgery” 20 years ago.

Her AXR reveals:





What is the most likely underlying cause?

- A) Inguinal hernia
- B) Adhesions
- C) Volvulus
- D) Haemorrhoids
- E) Colonic carcinoma

**Main causes of SBO**

Adhesions

Malignancy

Hernia

**65 yo man with weight loss,  
abdominal pain and vomiting?**

**Single Best Answer Question:**

**What is the most likely cause of this abnormality?**

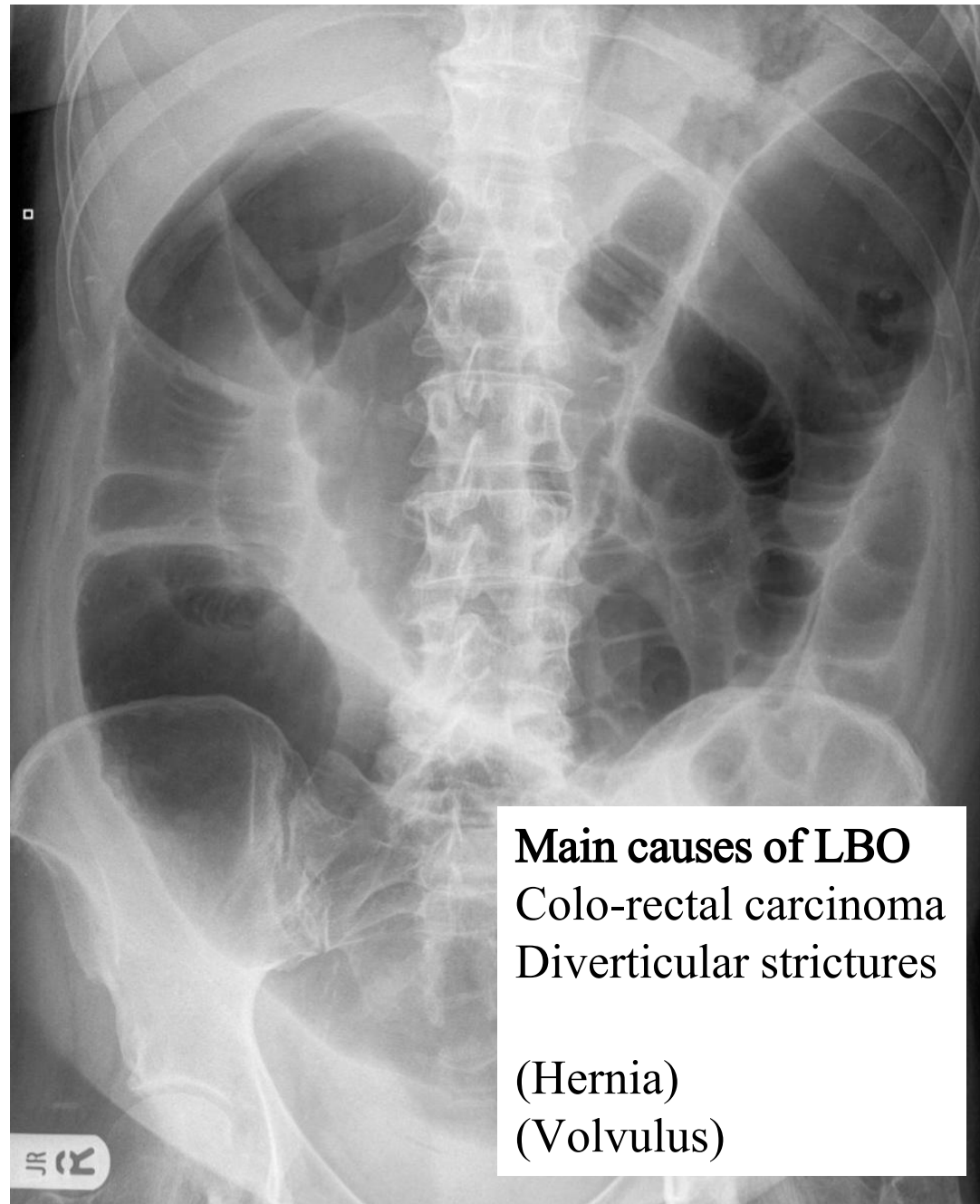
- A) Inguinal hernia
- B) Adhesions
- C) Volvulus
- D) Haemorrhoids
- E) Colonic carcinoma

**OSCE:**

**What abnormality can be seen?**

Large bowel obstruction with haustra

LBO when enlarged above **5cm**  
(or caecum when above 9cm)



**Main causes of LBO**  
Colo-rectal carcinoma  
Diverticular strictures

(Hernia)  
(Volvulus)

# Question 3: SBA for Large Bowel Obstruction

A 4 day old neonate presents with bile stained vomiting.





What is the most likely cause of these abnormalities?

- A) Inguinal hernia
- B) Adhesions
- C) Volvulus
- D) Haemorrhoids
- E) Colonic carcinoma



# Presenting AXR

Intro:

This is a (erect/mobile) abdominal radiograph of...

Pt name / Age, taken at...

Date / Time

**READ THE QUESTION**

Image quality:

Adequate or inadequate

?Main abnormality- describe

Or/and: Using a systematic approach

- Bowel – location, ?dilated
- Extra-luminal gas
- Soft tissue/bone/calcification

In summary:

This is a abdominal radiograph which demonstrates evidence of ... which is consistent with the **given clinical picture**

Further investigations:

- Full history
- Bedside e.g. Urine dip
- Blood tests e.g. Inflammatory markers
- More imaging e.g. erect XR, CT abdo/pelvis
- Special tests

Management



# Ulcerative colitis

Thumbprinting



Lead Piping



Toxic Megacolon



AXR YOU SHOULD NEVER SEE



# AXR OSCE marks

- Identifies patient
- Correctly notes time and date
- Comments on image quality
- Comments on medical devices
- Assesses bowel gas pattern
- Assesses soft tissues and bone
- Comments on abnormal calcification
- Offers appropriate management plan
- Requests appropriate next image e.g. eCXR/CT Abdomen

# EMQ

	Scenario
1	A 4 day old child with bile stained vomiting and gastric dilatation
2	A 65 year old man who presents with rectal bleeding and large bowel dilatation
3	A 65 year old woman presents with abdominal pain and small bowel dilatation 20 years after a appendicectomy.
4	A 49 year old woman with rheumatoid arthritis presents with acute abdominal pain and free air is observed under the diaphragm on a CXR
5	A 49 year old woman presents with abdominal pain. An abdominal radiograph shows small bowel dilatation and air in the biliary tree

- A) Volvulus
- B) Adhesions
- C) Colonic carcinoma
- D) Haemorrhoids
- E) Gallstone ileus
- F) Perforated peptic ulcer
- G) Meckels diverticulum
- H) Inguinal hernia

# EMQ - Answers

	Scenario	Answer
1	A 4 day old child with bile stained vomiting and gastric dilatation	A
2	A 65 year old man who presents with rectal bleeding and large bowel dilatation	C
3	A 65 year old woman presents with abdominal pain and small bowel dilatation 20 years after a appendicectomy.	B
4	A 49 year old woman with rheumatoid arthritis presents with acute abdominal pain and free air is observed under the diaphragm on a CXR	F
5	A 49 year old woman presents with abdominal pain. An abdominal radiograph shows small bowel dilatation and air in the biliary tree	E

- A) Volvulus
- B) Adhesions
- C) Colonic carcinoma
- D) Haemorrhoids
- E) Gallstone ileus
- F) Perforated peptic ulcer
- G) Meckels diverticulum
- H) Inguinal hernia

And finally...





Is this patient elderly?!

4 supportive findings?

1. Constipation
2. Vascular calcification
3. Arthritic Changes
4. Ring pessary





# Thank You...

## *Questions?*



*Bibliography*

[www.rcr.ac.uk](http://www.rcr.ac.uk)

[www.lifeinthefastlane.com](http://www.lifeinthefastlane.com)

[www.radiologymasterclass.co.uk](http://www.radiologymasterclass.co.uk)

 **SIMPLY**  
*FINALS*