

Inpatient Chest X-ray Interpretation

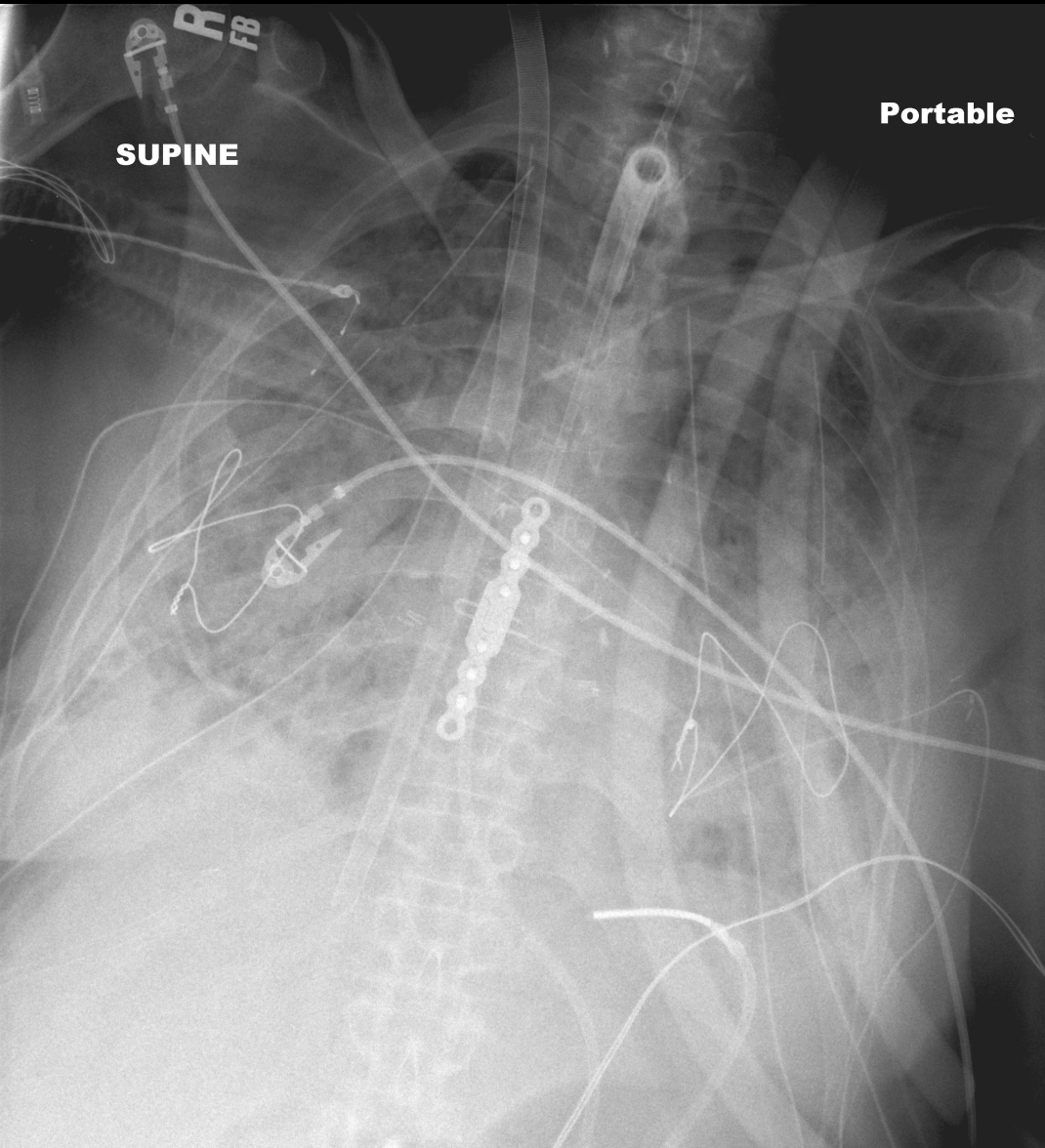
Brett M. Elicker, MD

*University of
California, San
Francisco*

Introduction

- Fundamental topic
- Everyone does things differently
- Limitations of inpatient imaging
- Checklist

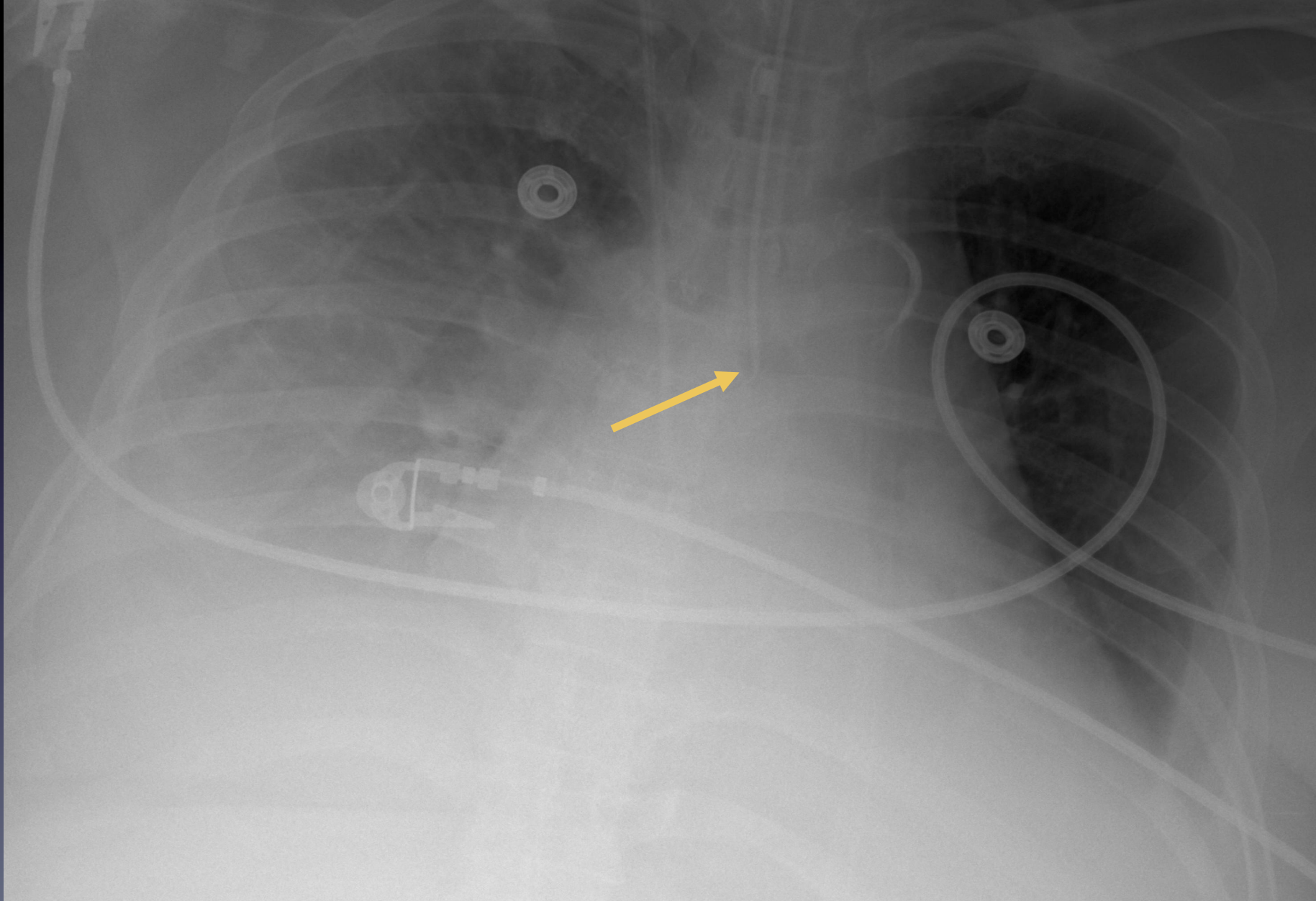
Inpatient radiography



- No imaging study is more limited
- Line and tube management
- Look for big and bad things!
- Significant complications
- Monitor long term trends

Case #1

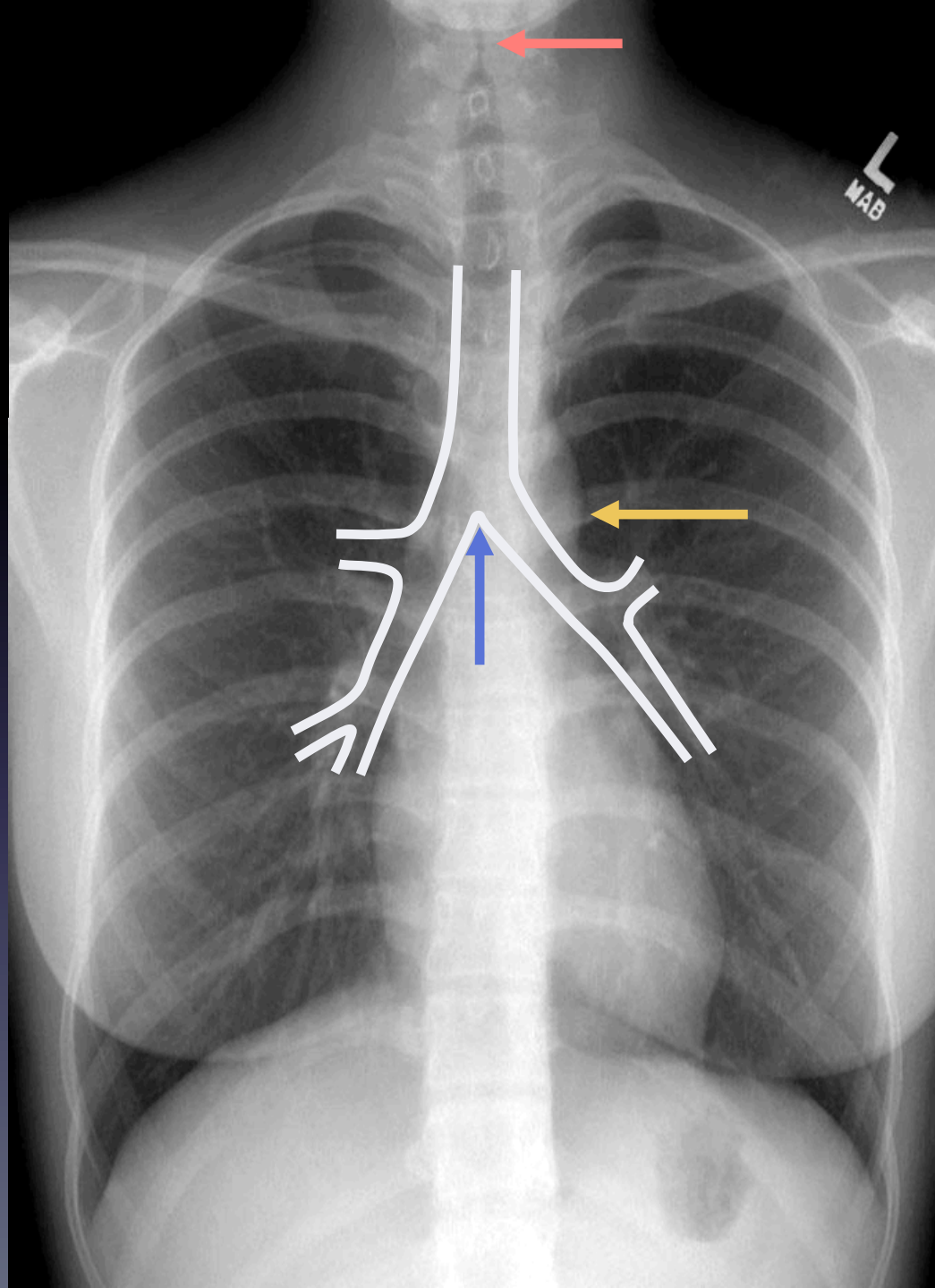
Se



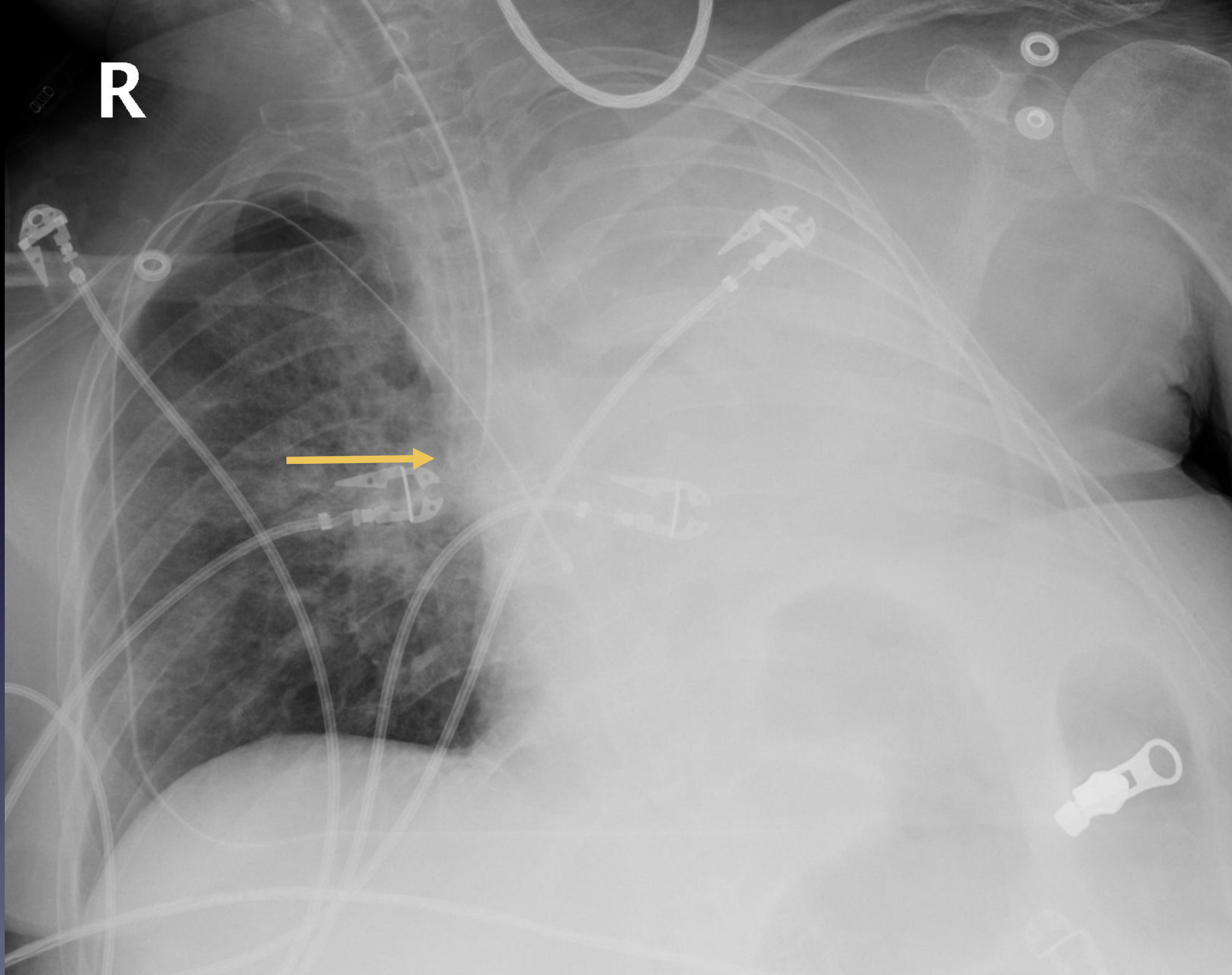
Lines and tubes

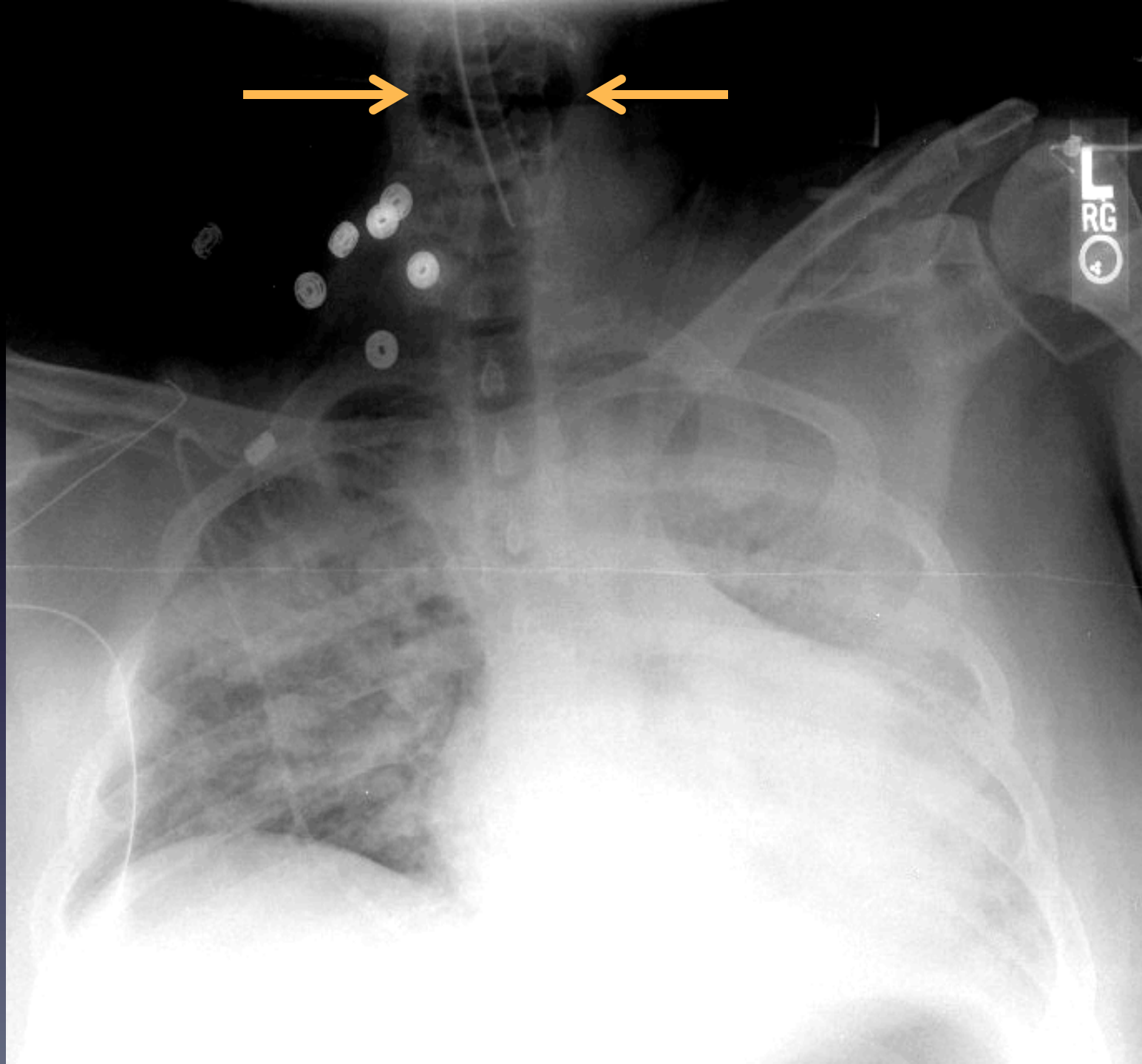
- Endotracheal tubes
- Enteric tubes
- Central lines
- PA line
- Intra-aortic balloon pump

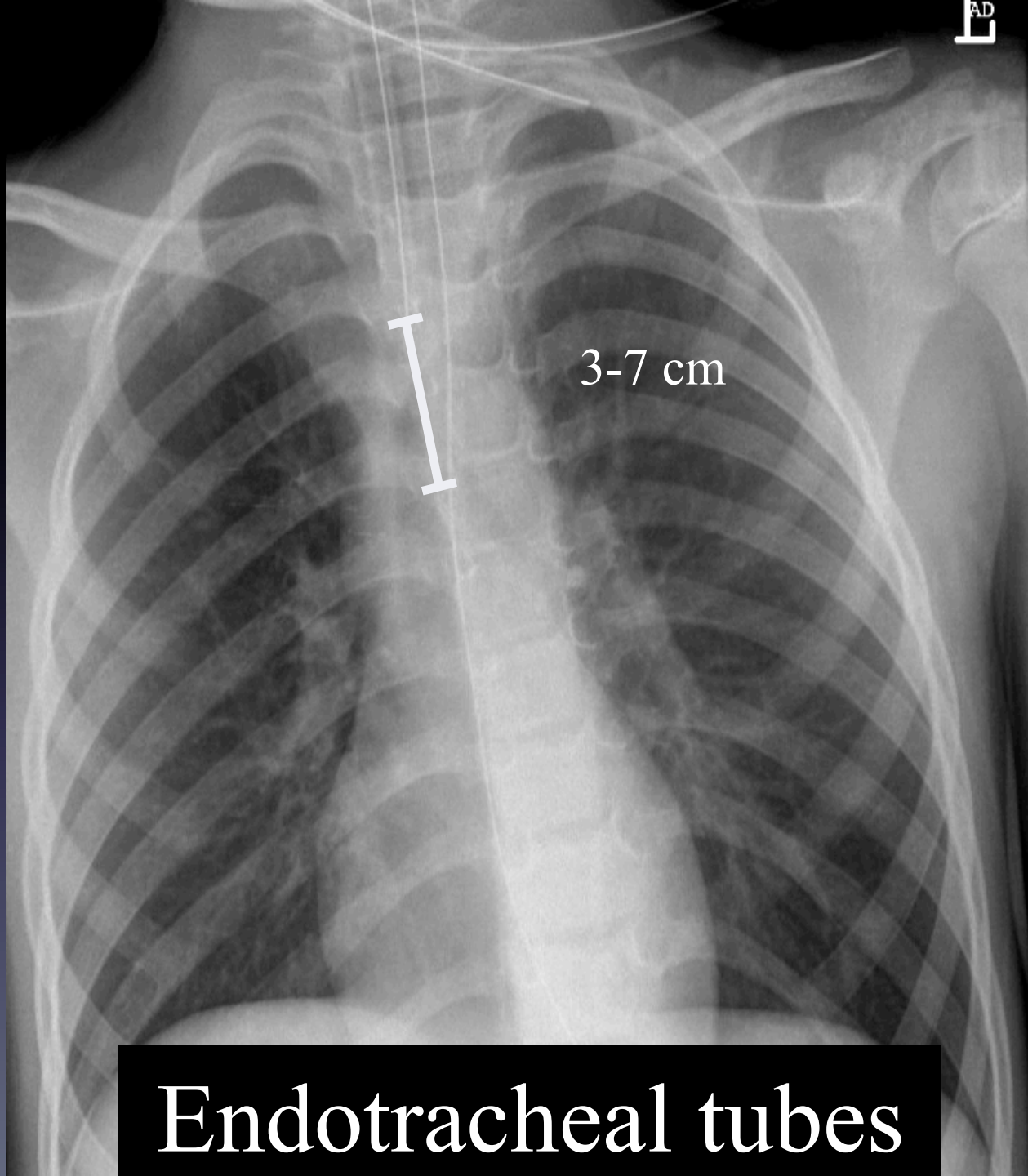
Airway landmarks



R

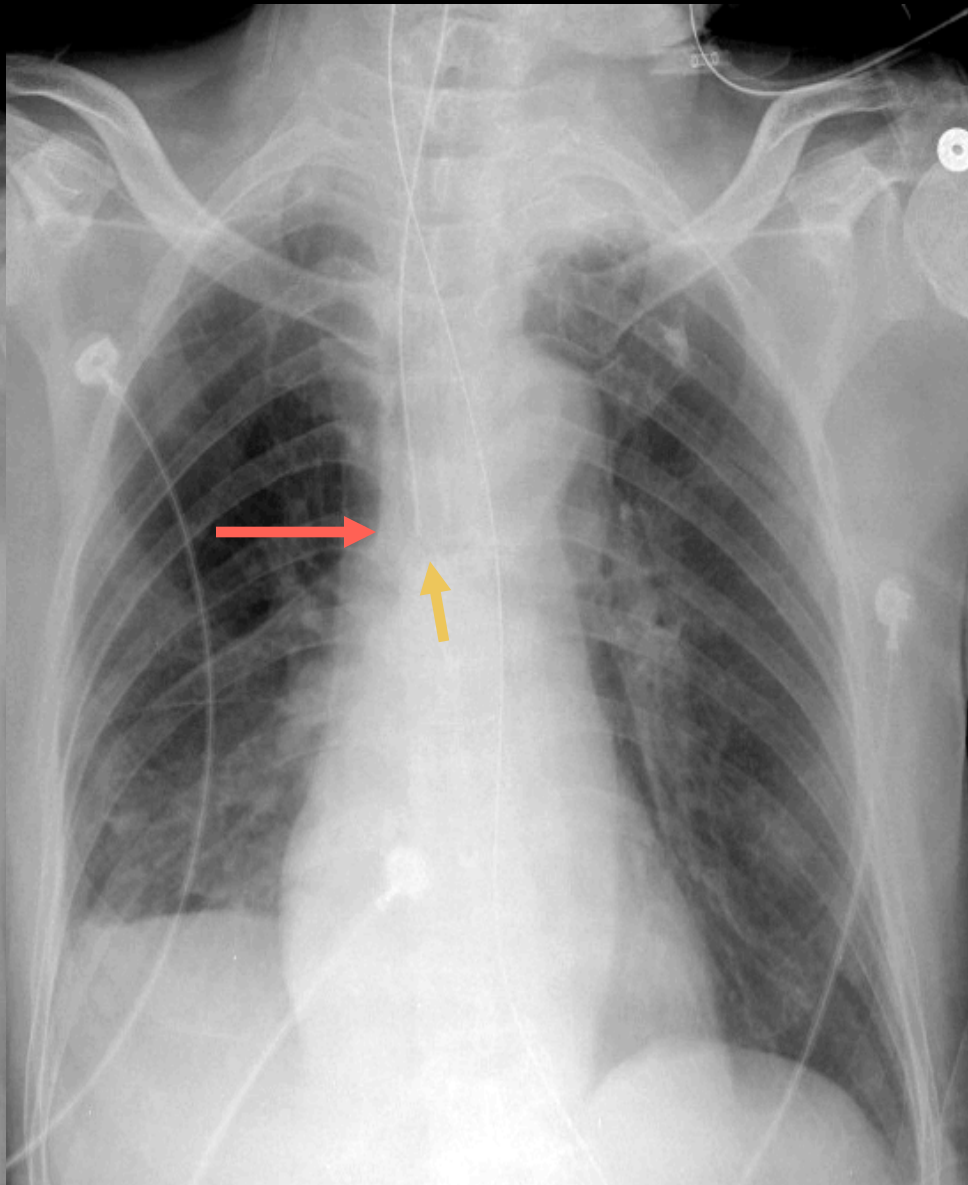
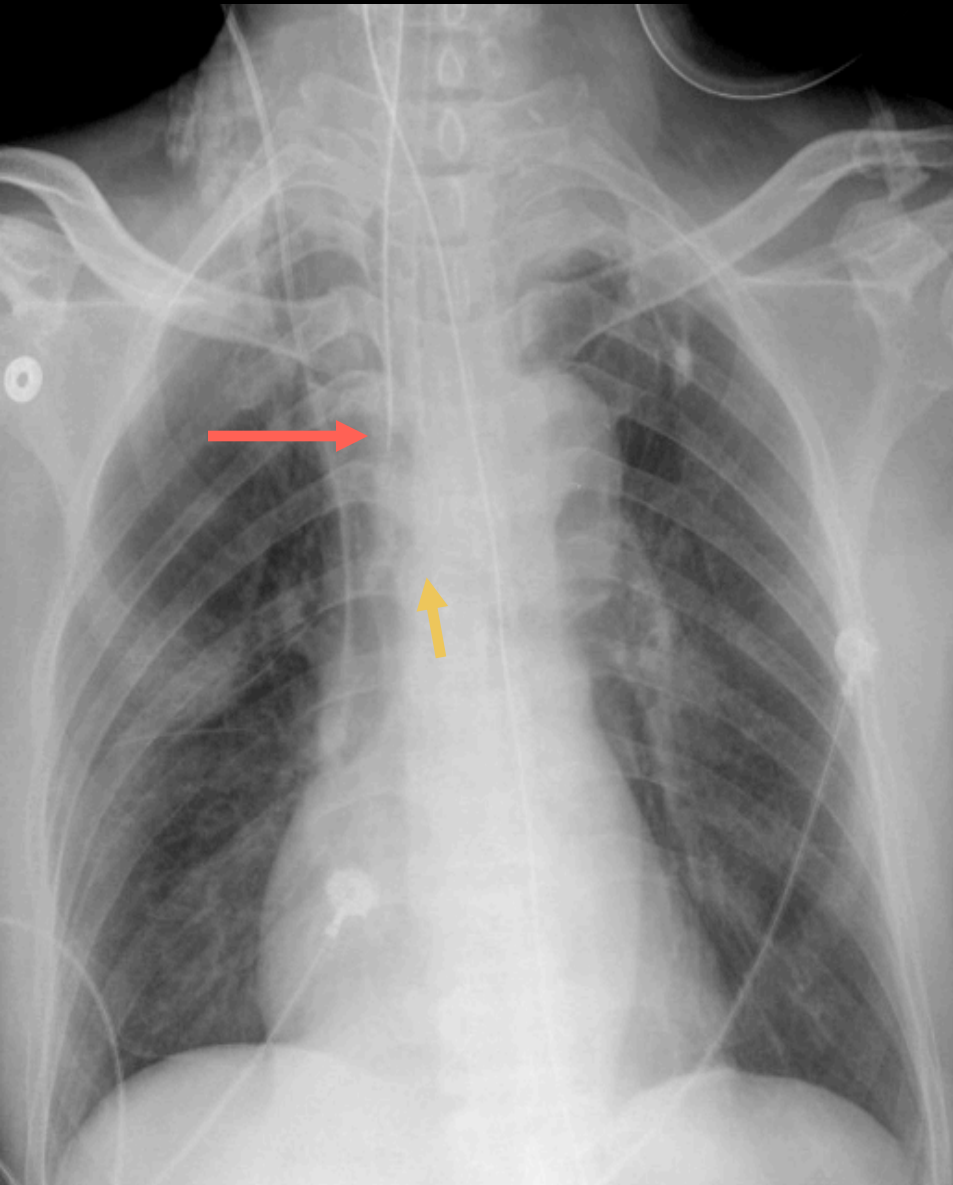




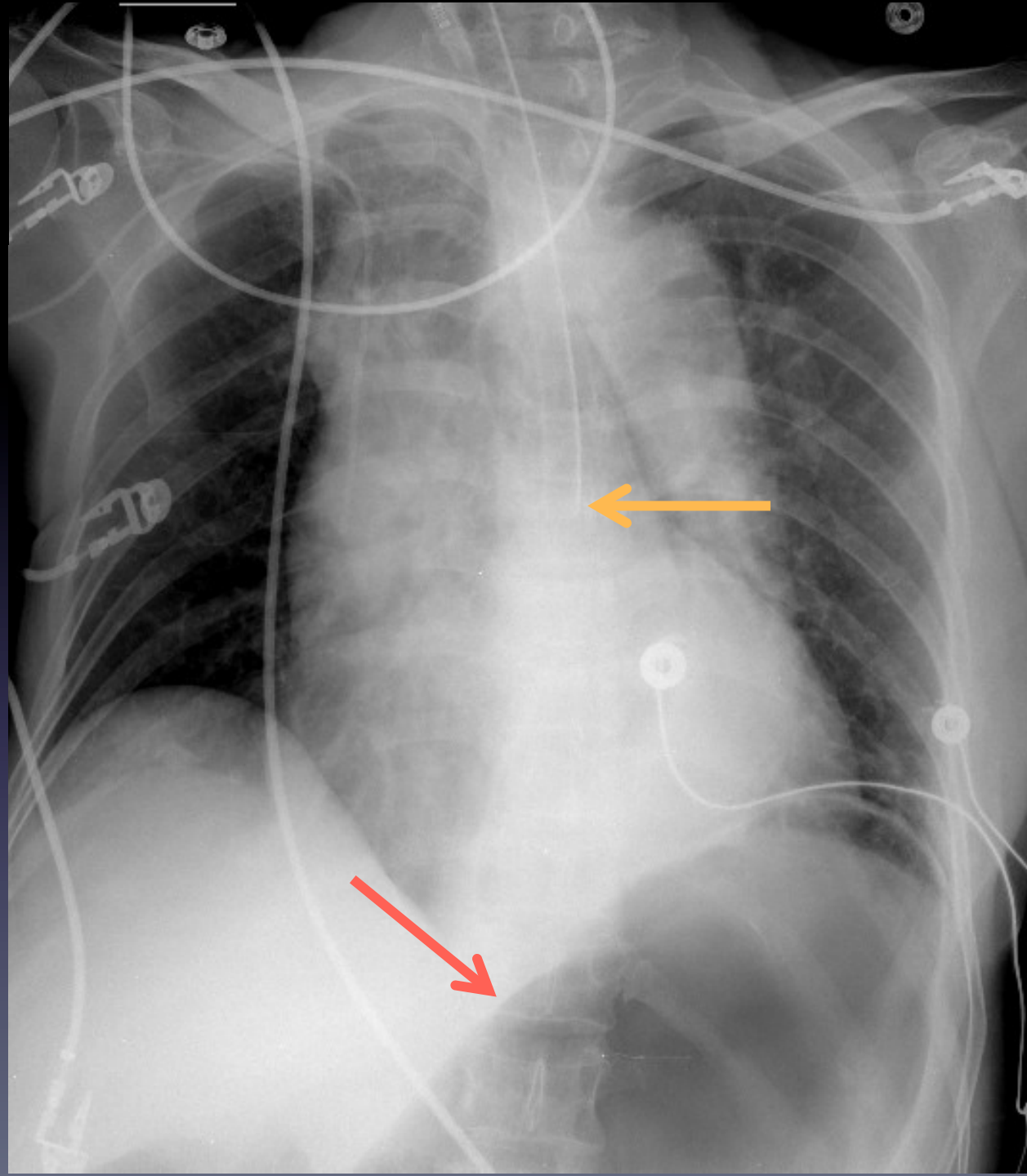


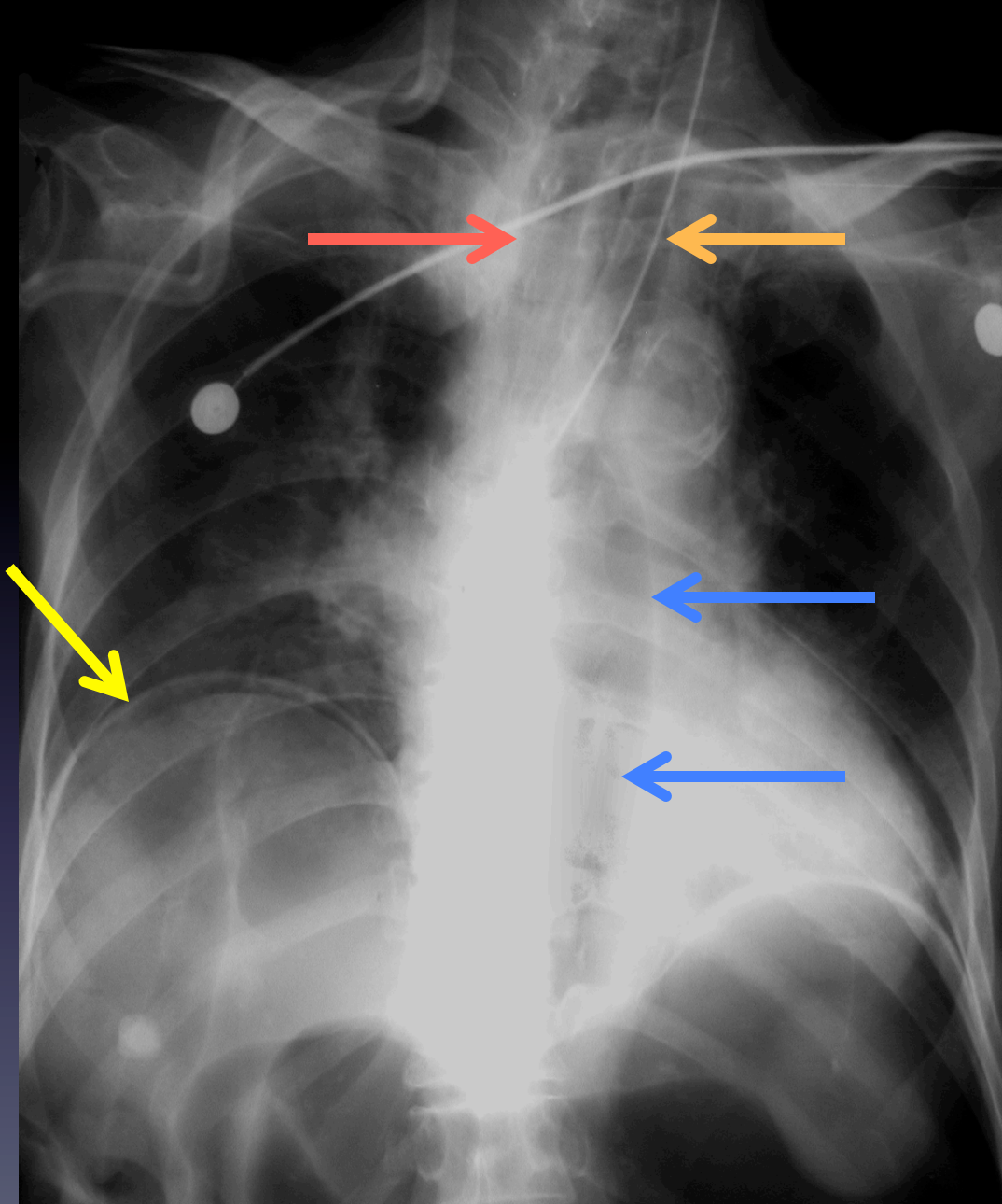
Endotracheal tubes

Tip position with changes in head



Esophageal intubation

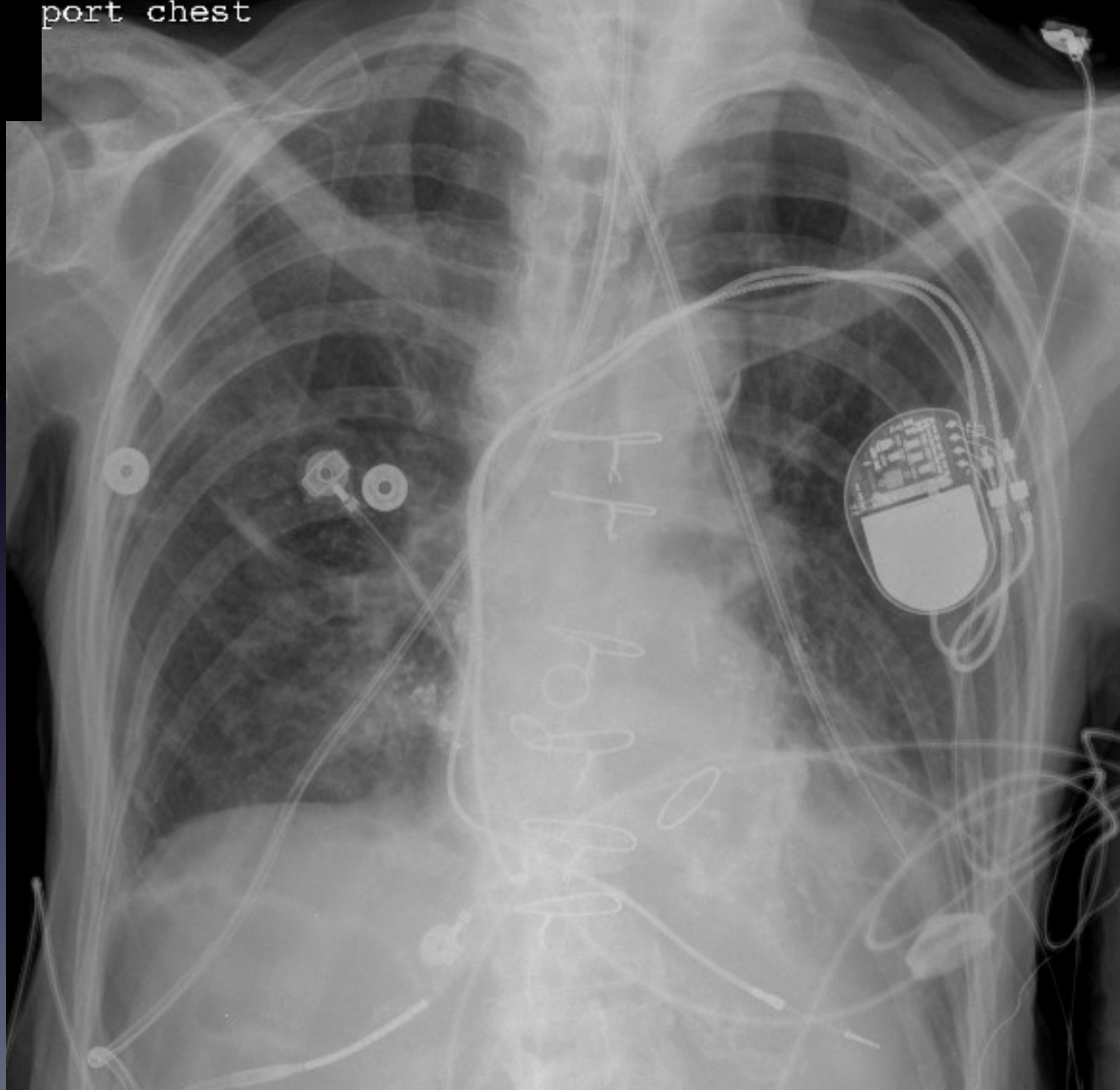




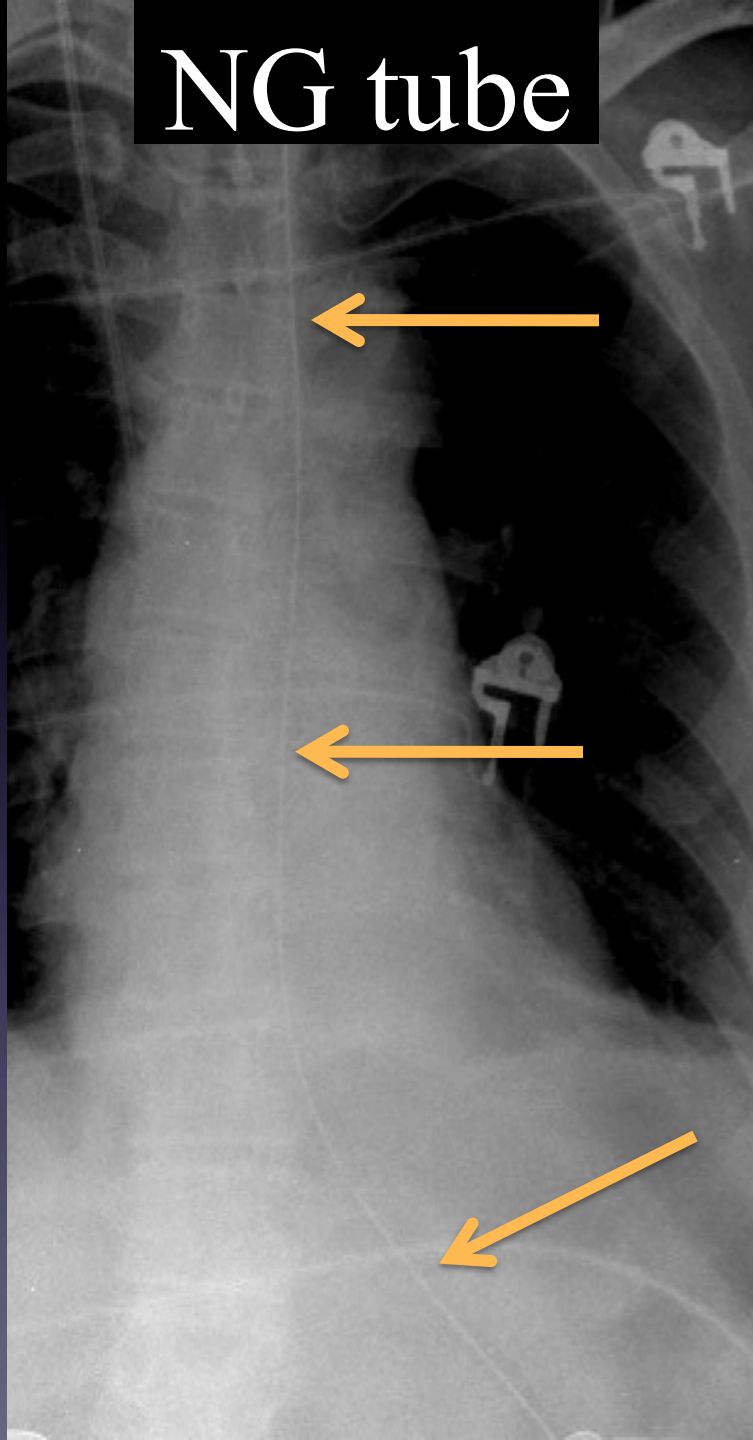
Esophageal

Case #2

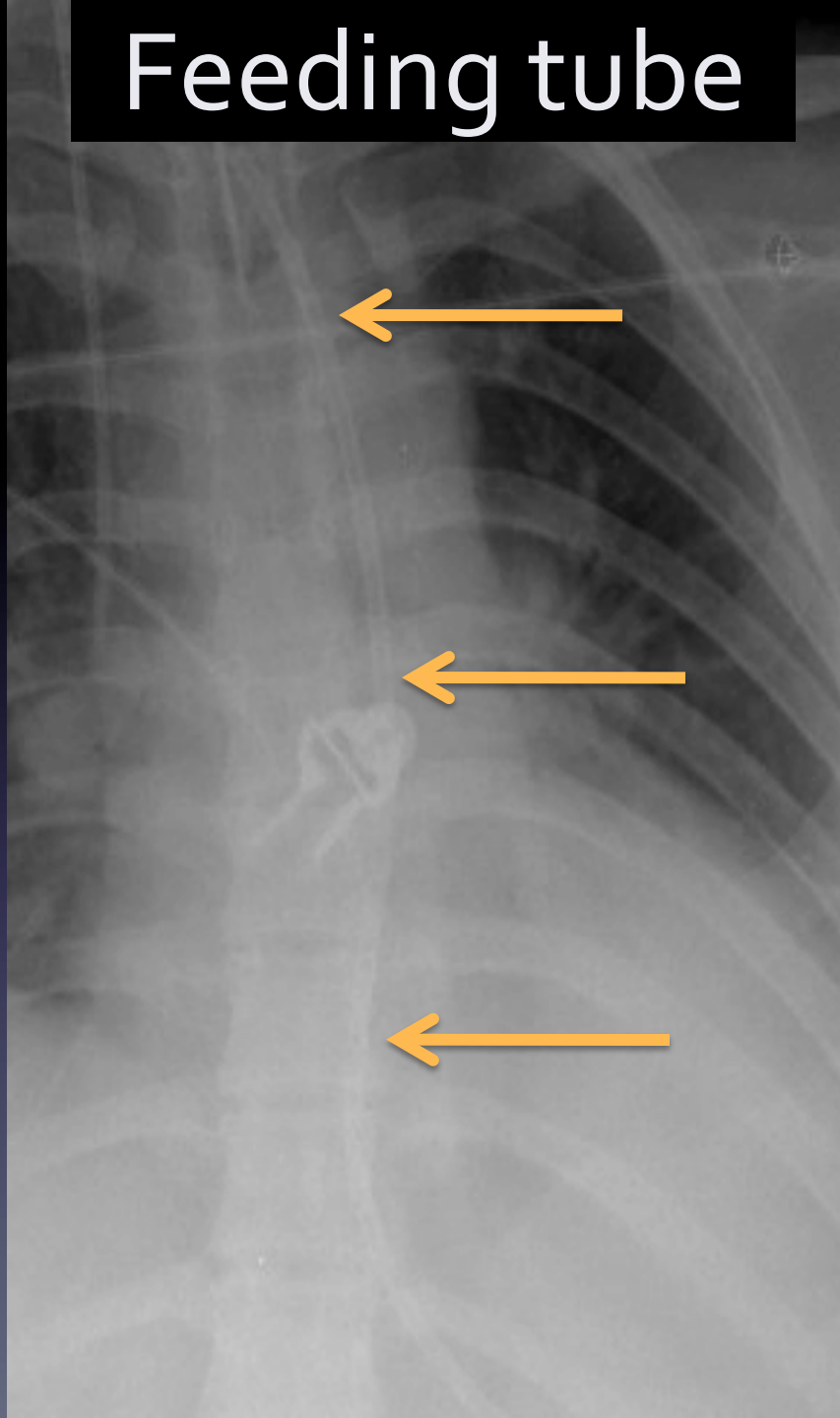
port chest



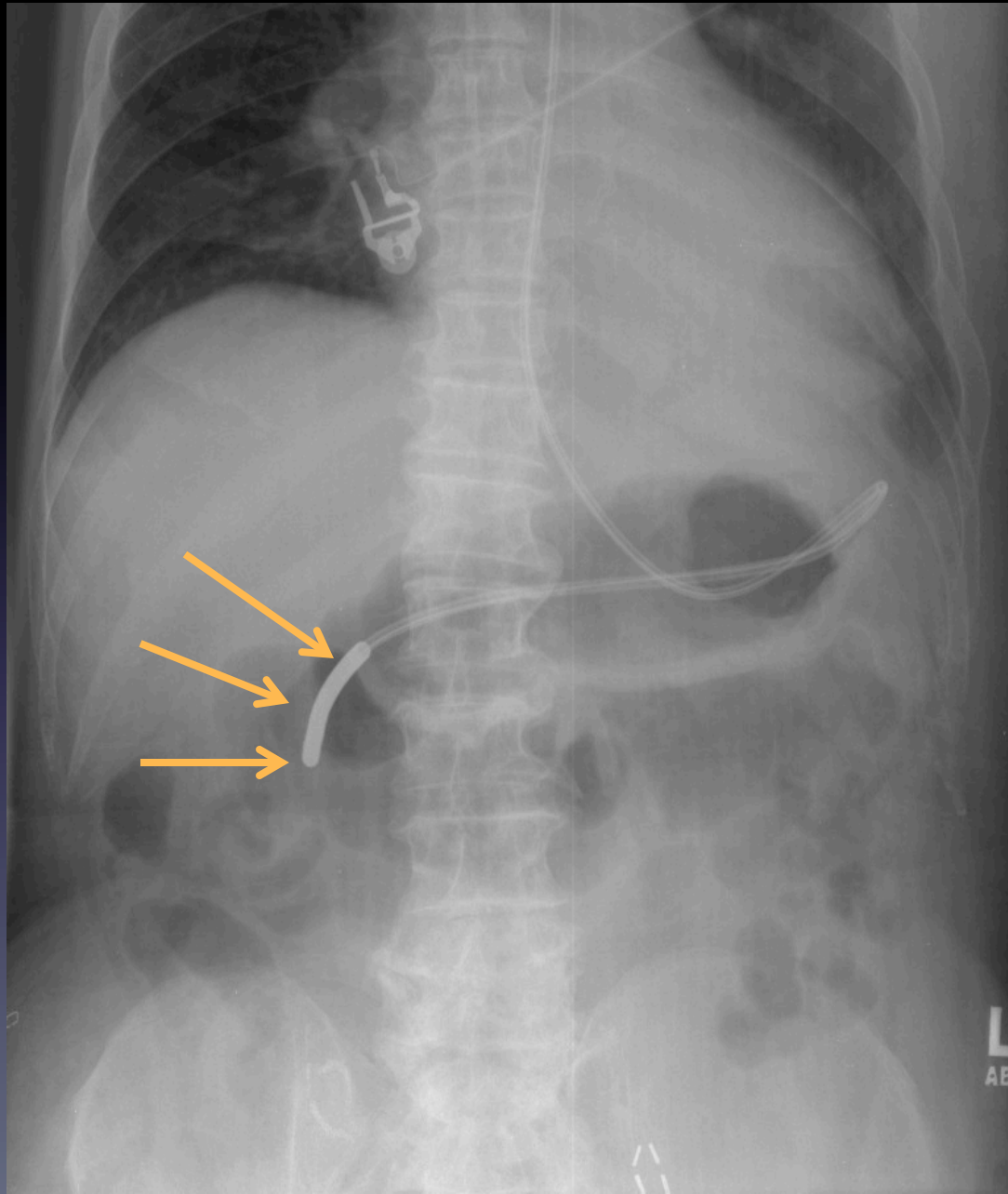
NG tube

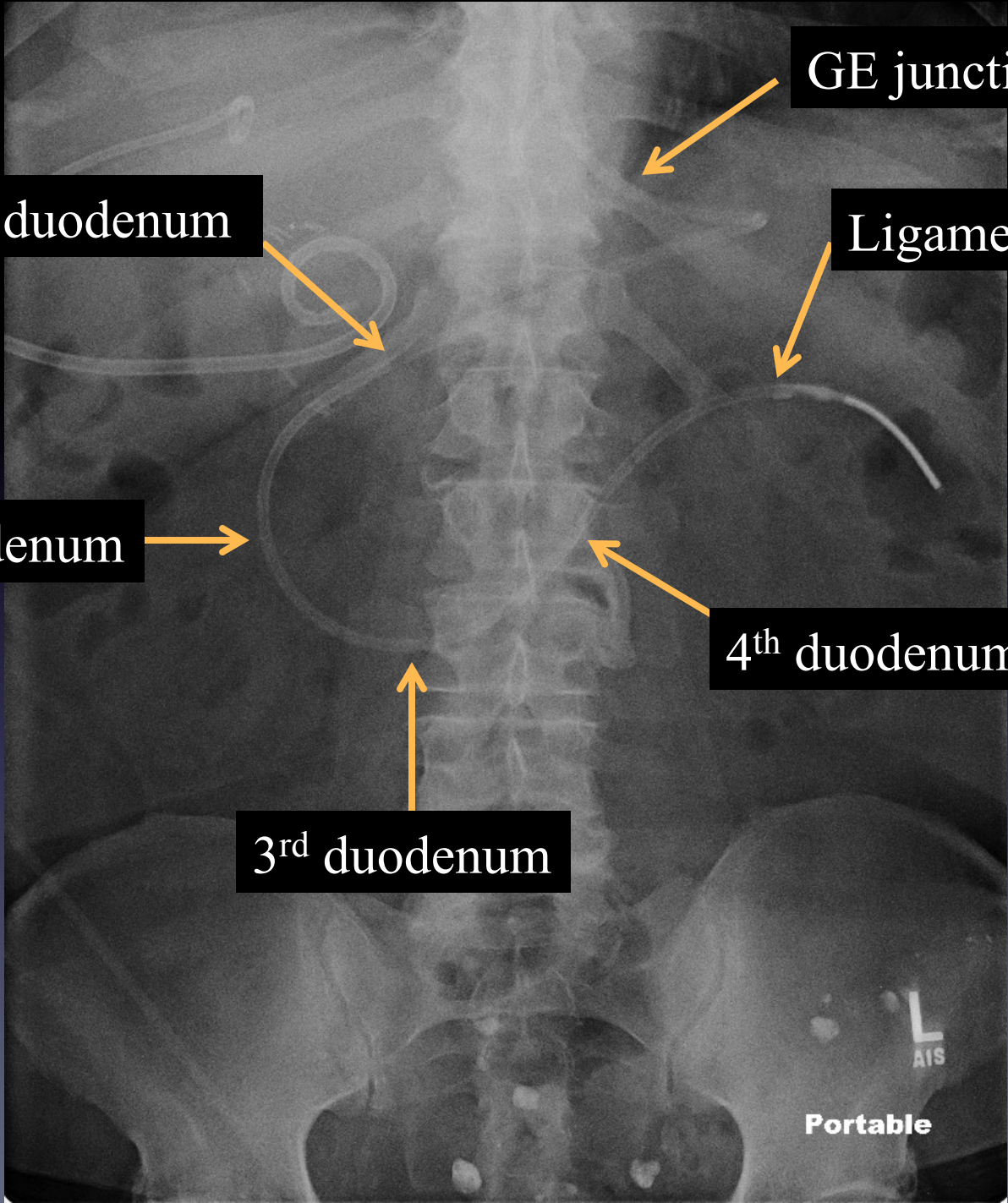


Feeding tube



When is the tube post-pyloric?





GE junction

1st duodenum

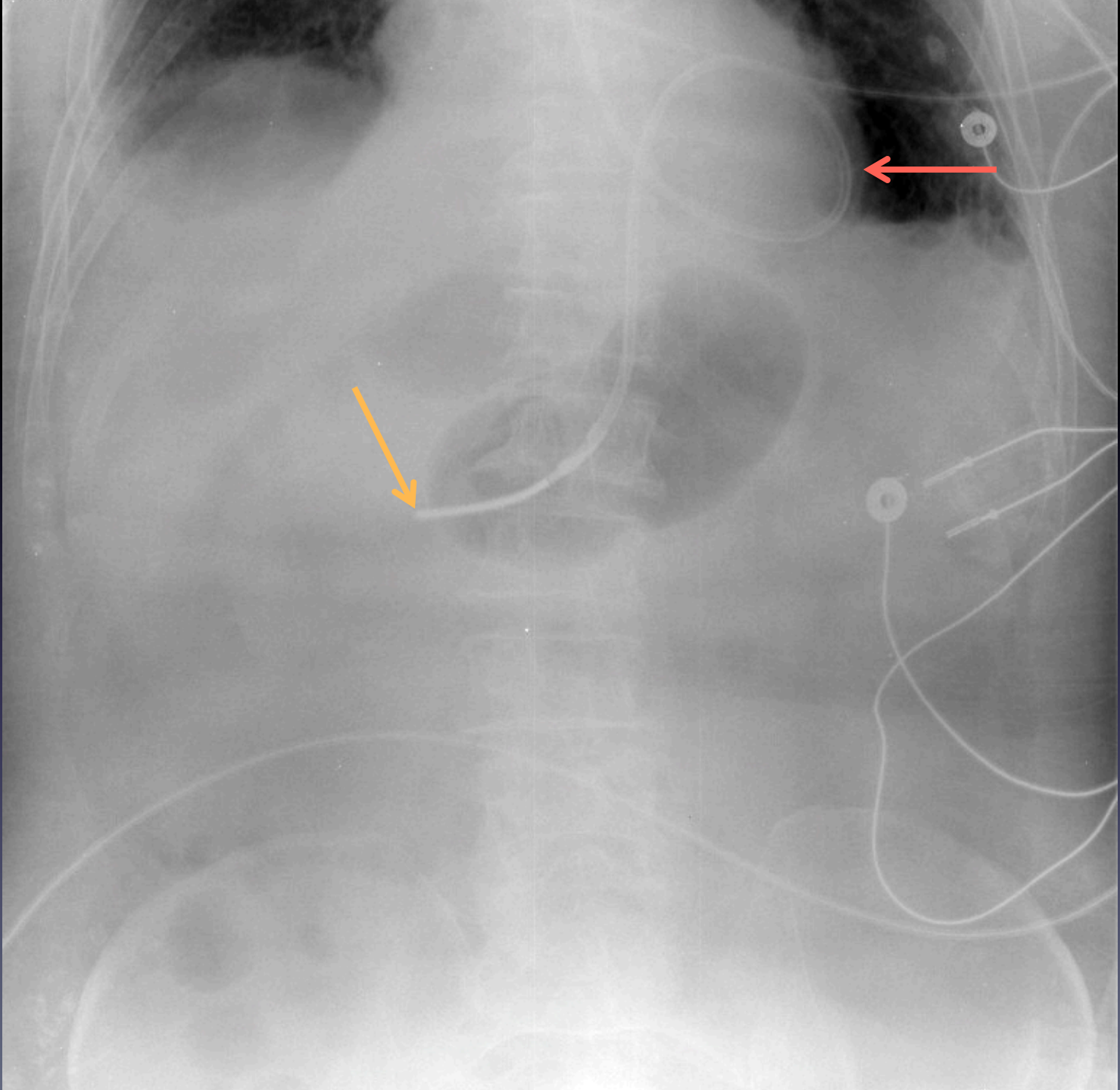
Ligament of Treitz

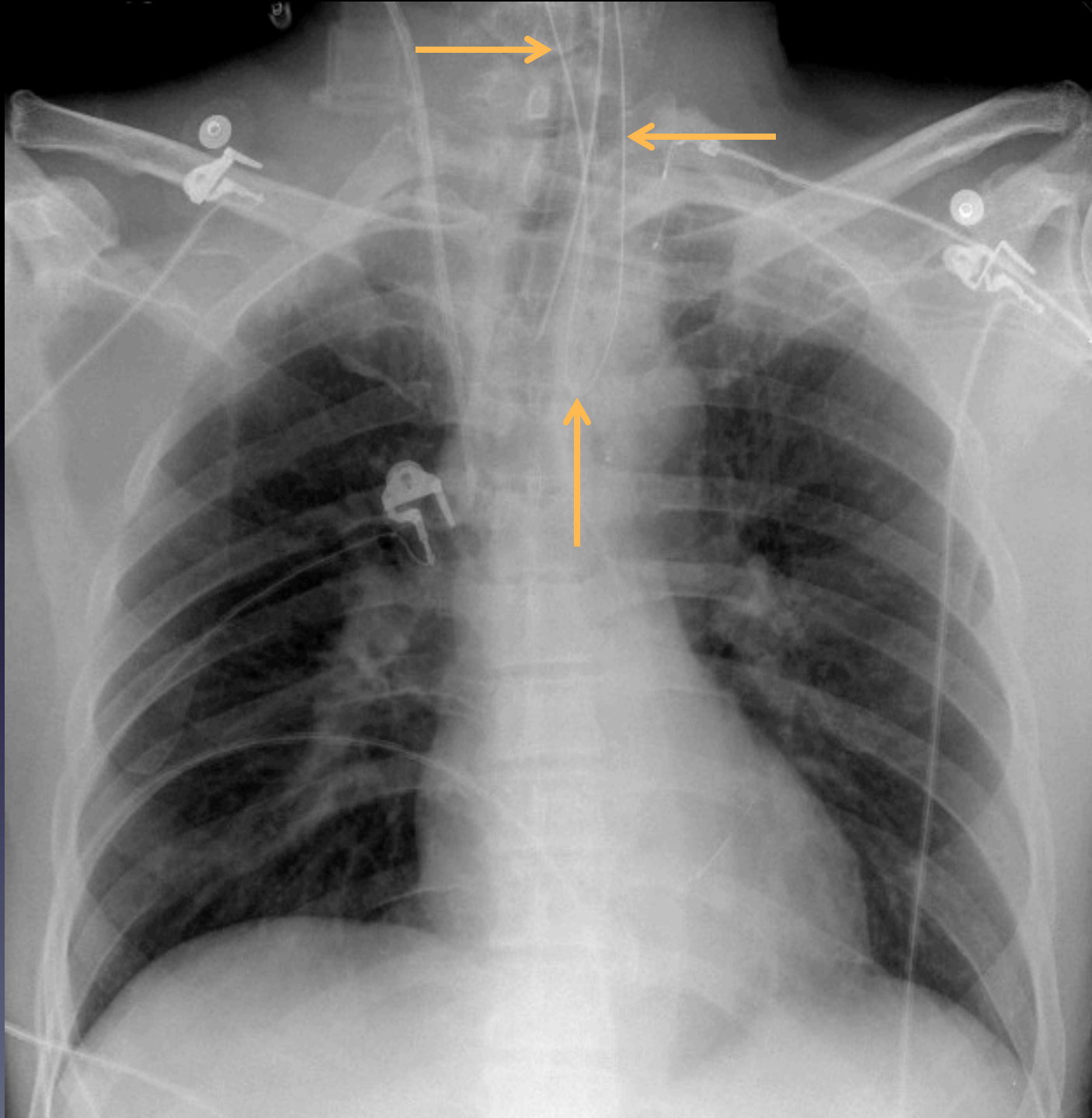
2nd duodenum

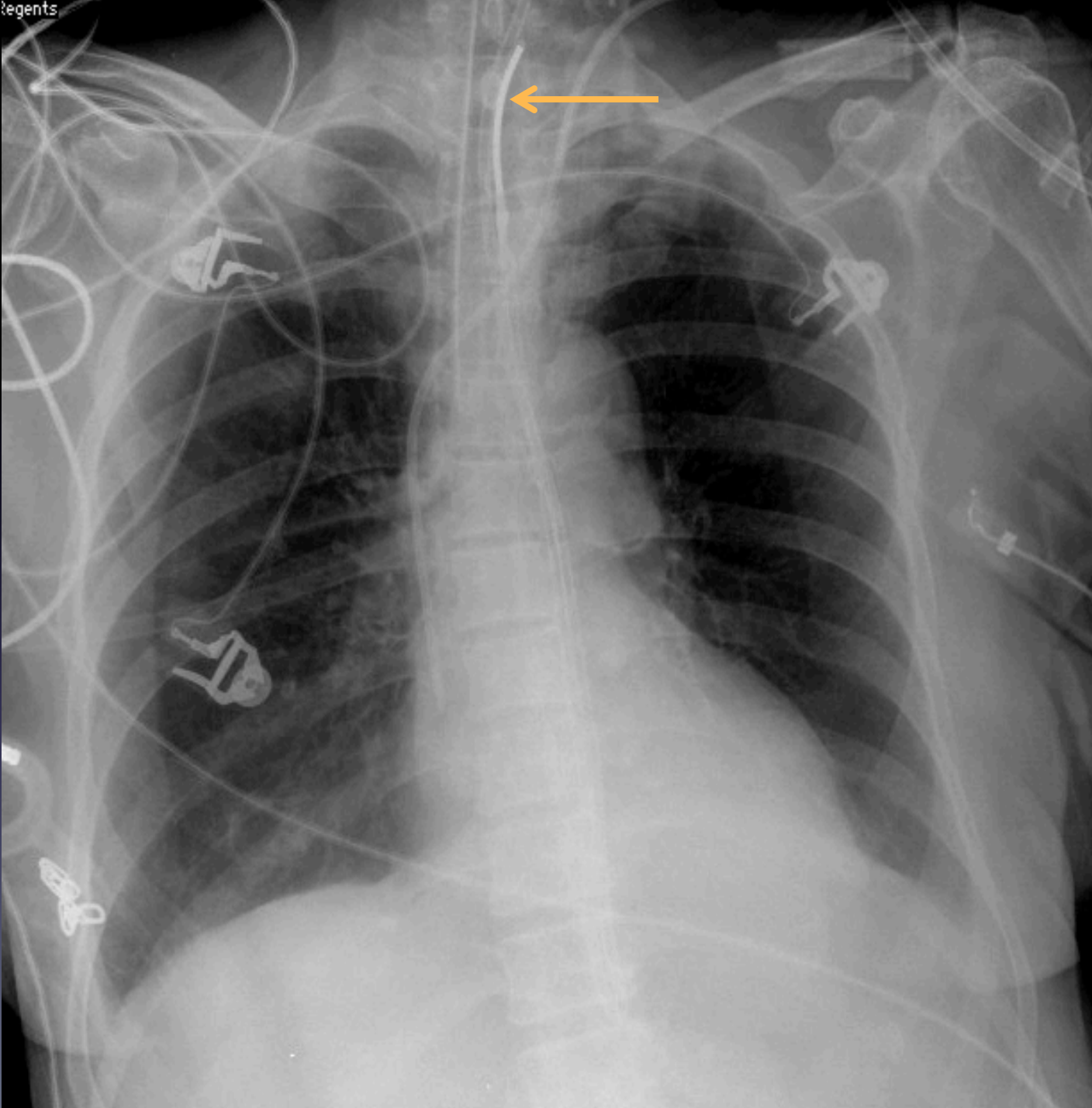
4th duodenum

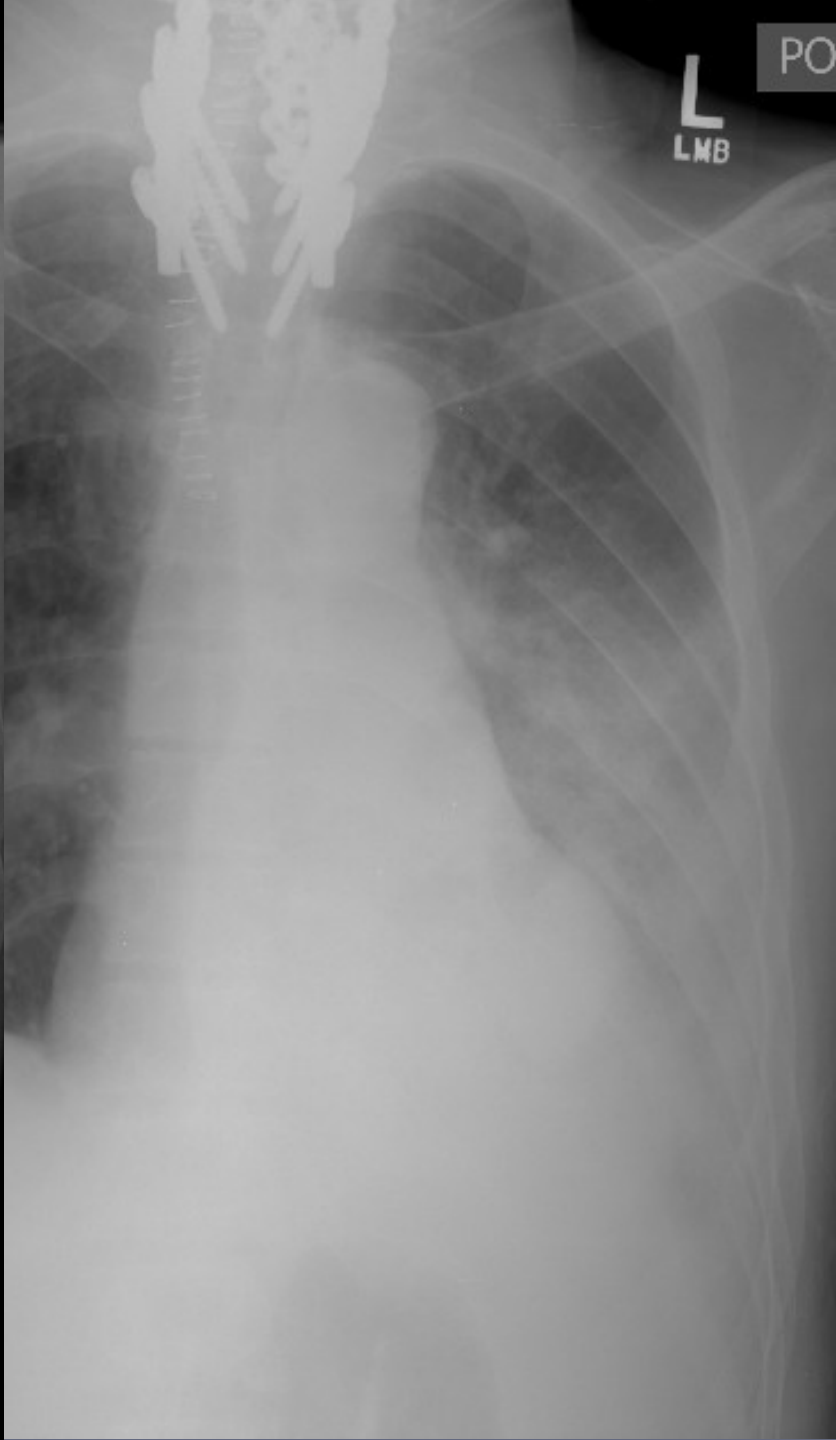
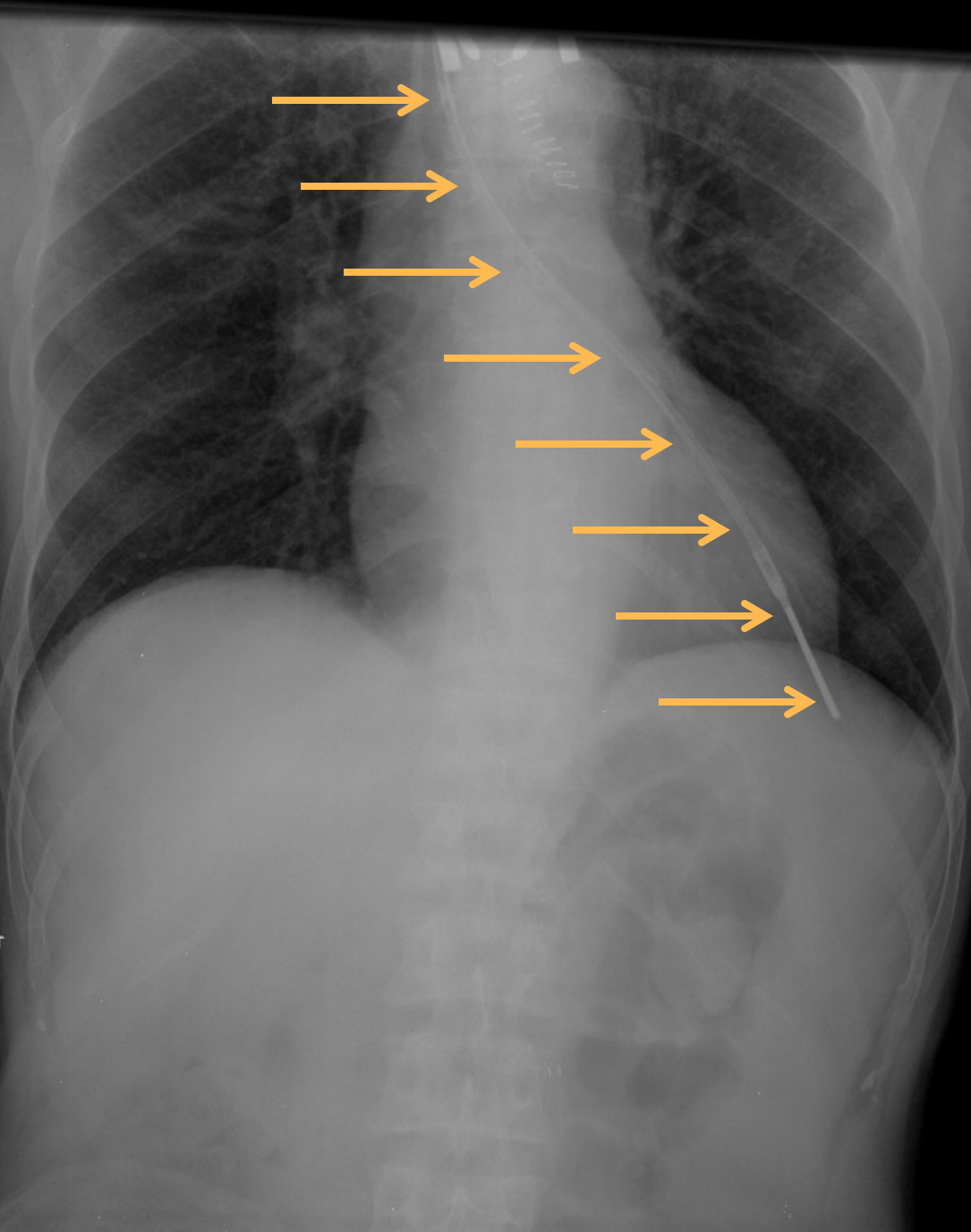
3rd duodenum

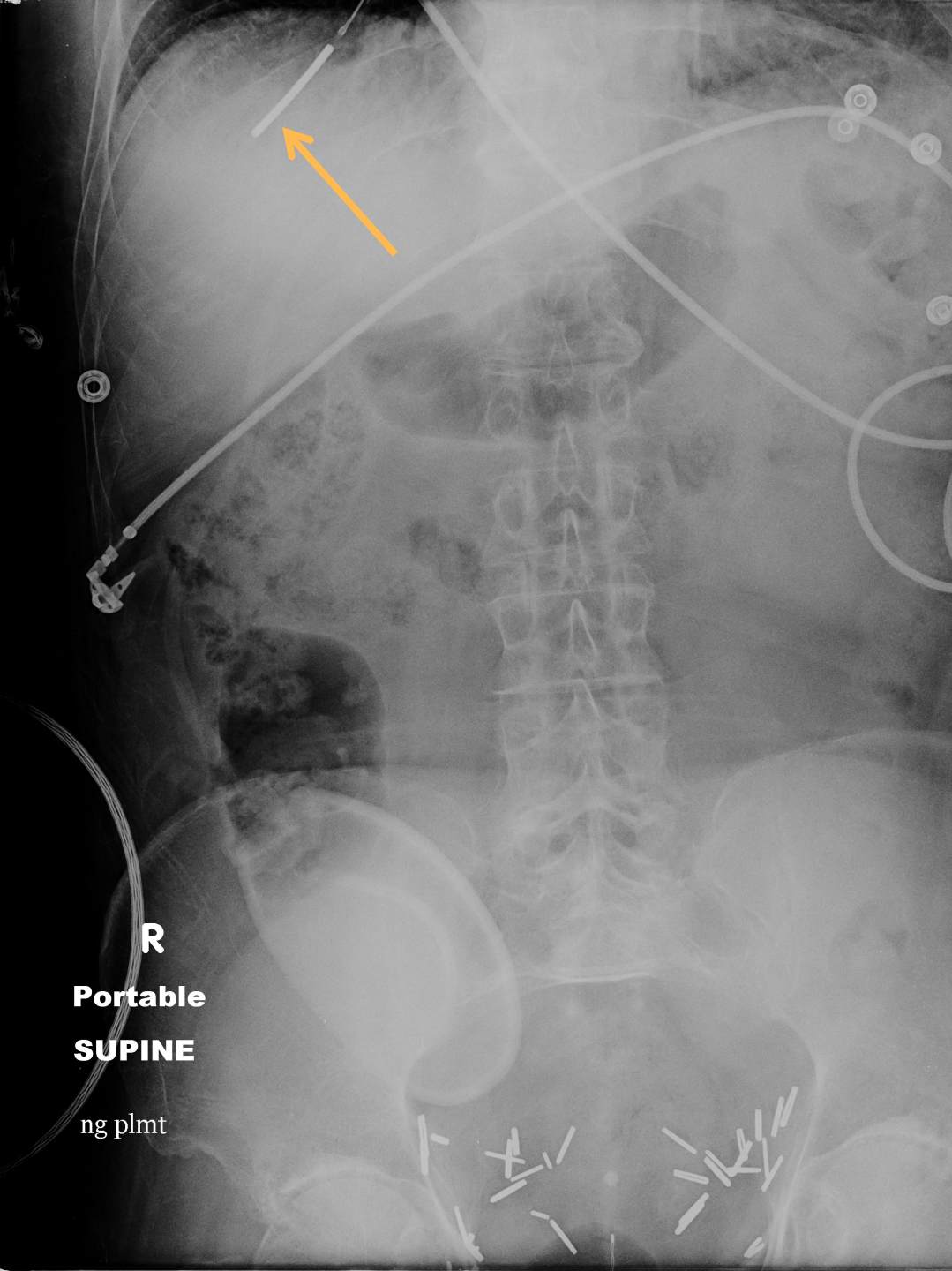
Portable





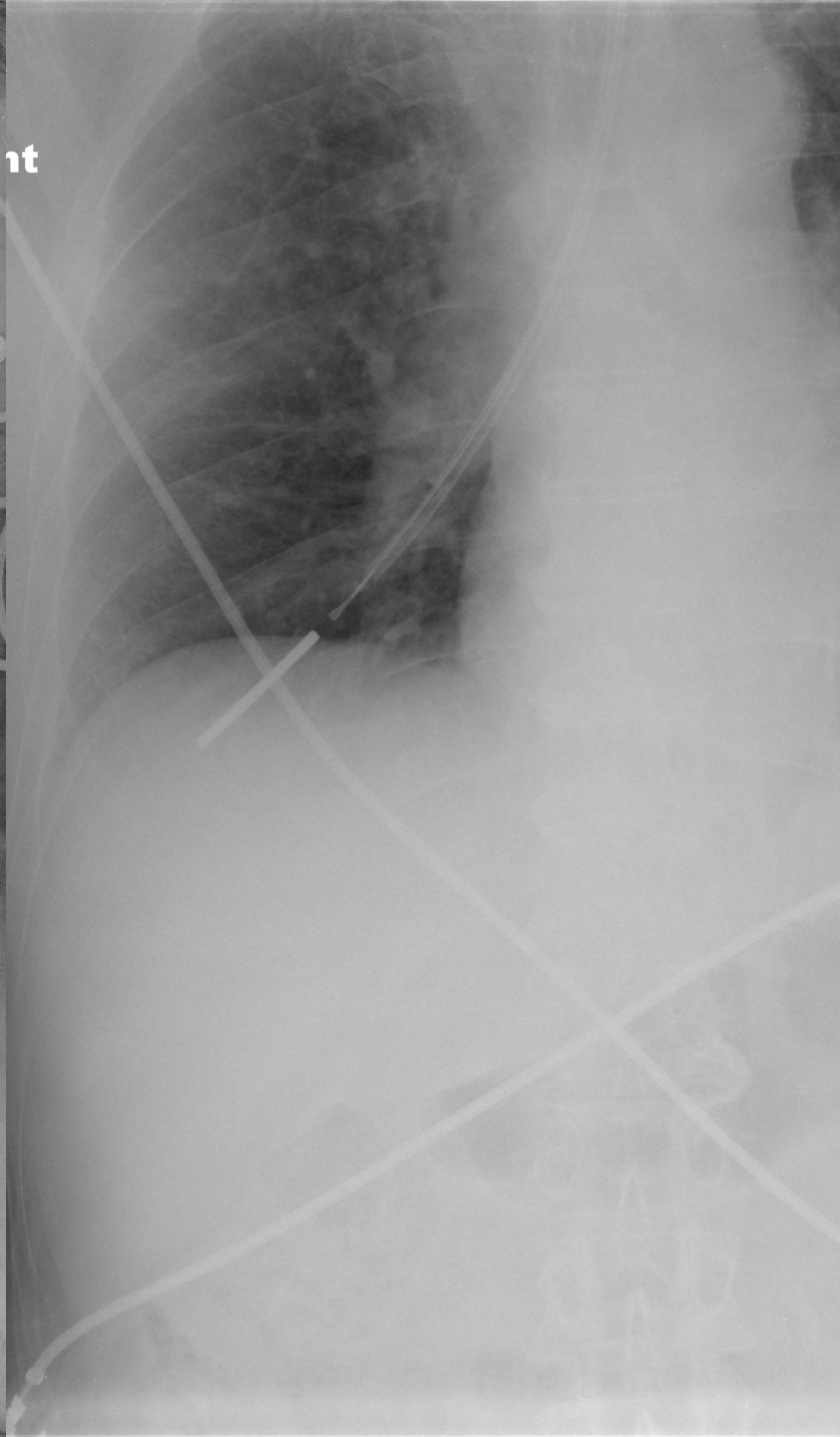




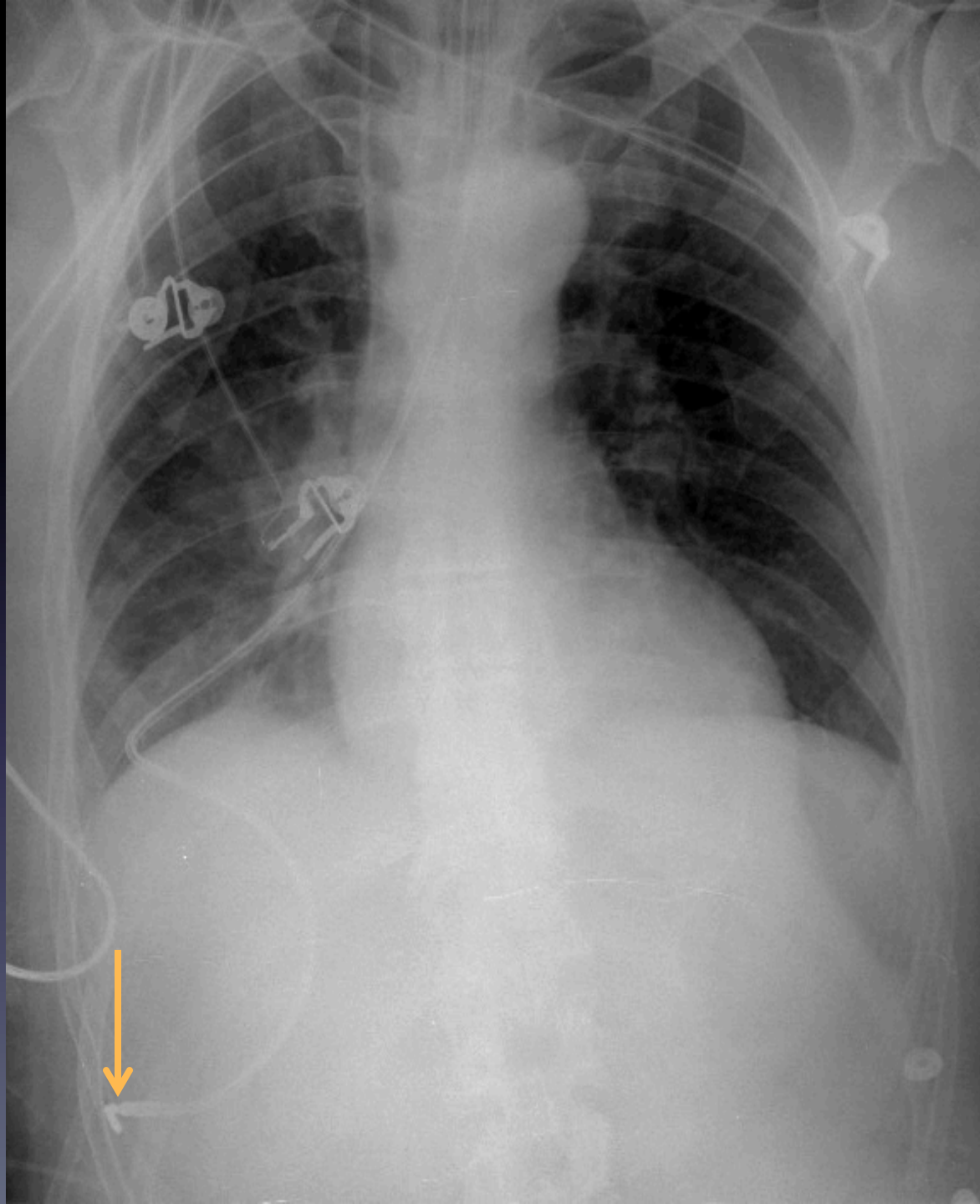


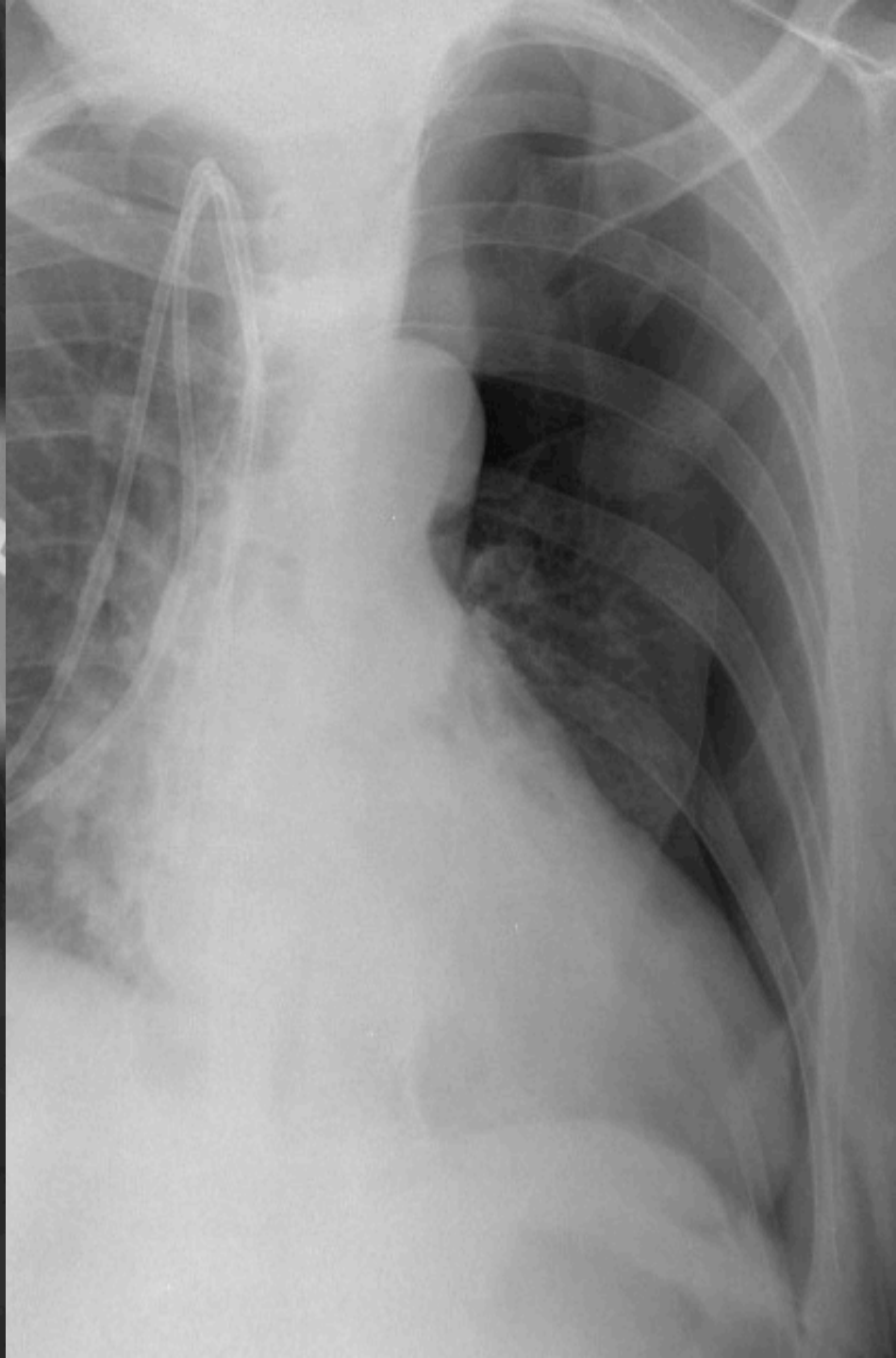
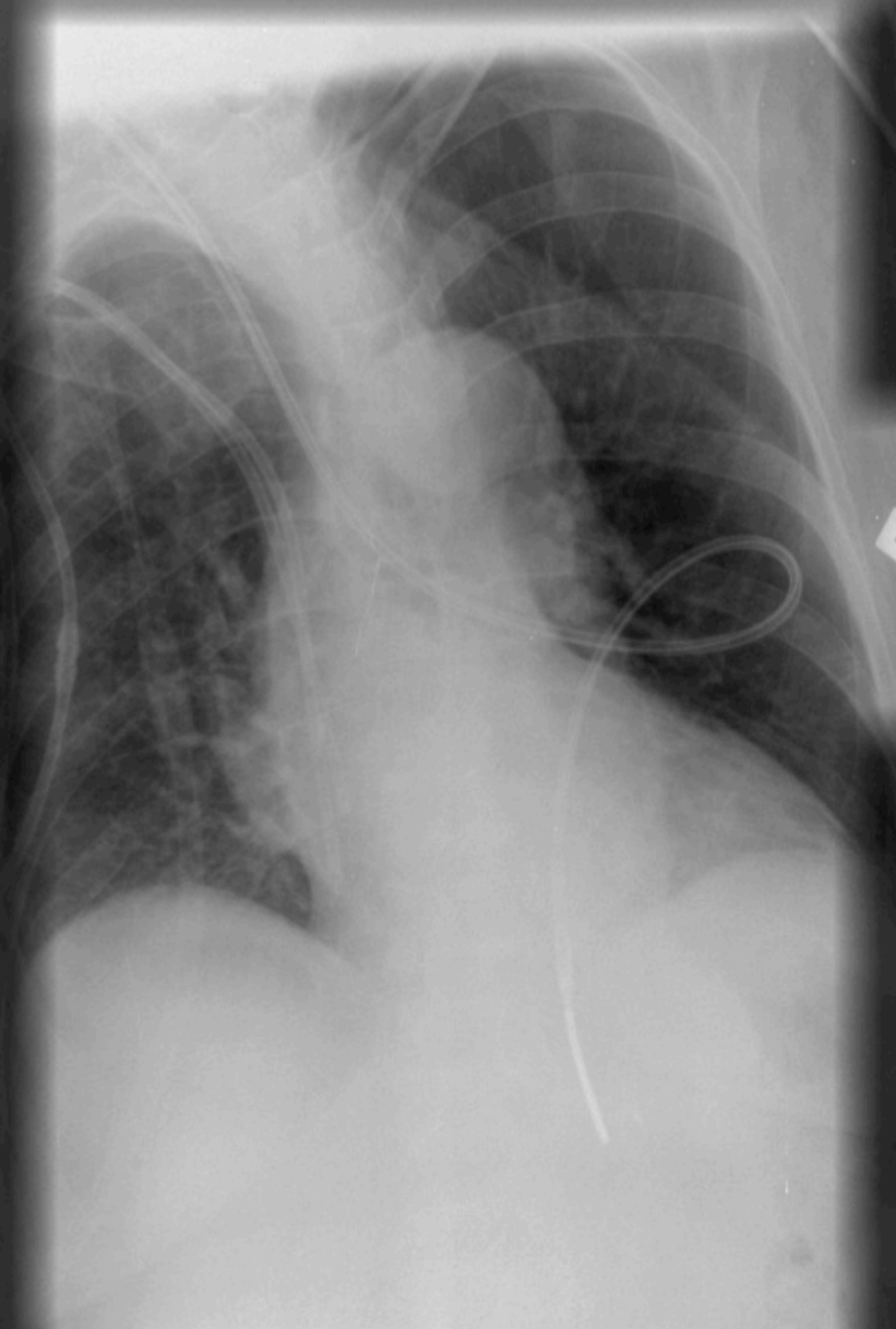
R
Portable
SUPINE

ng plmt

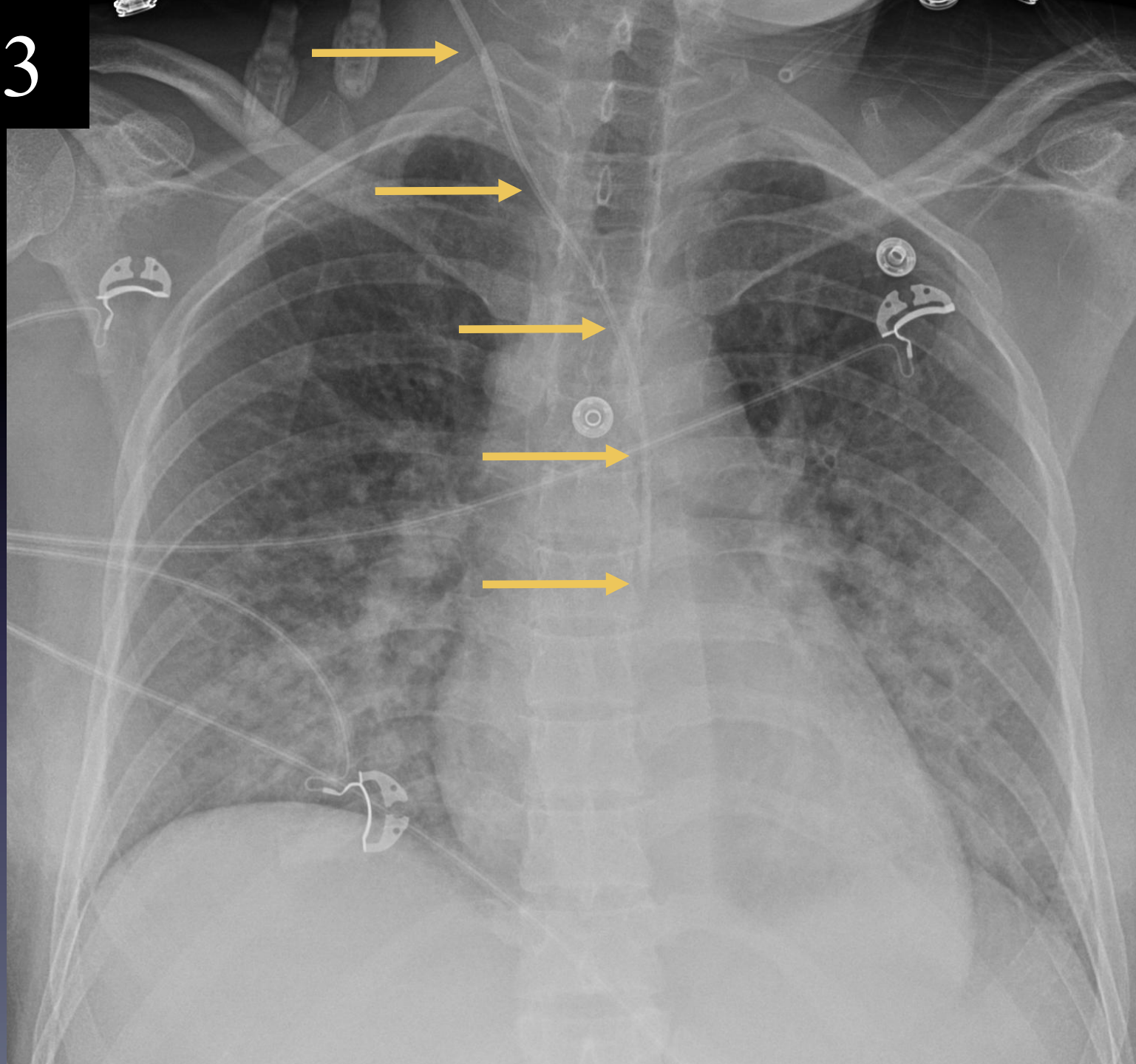


nt

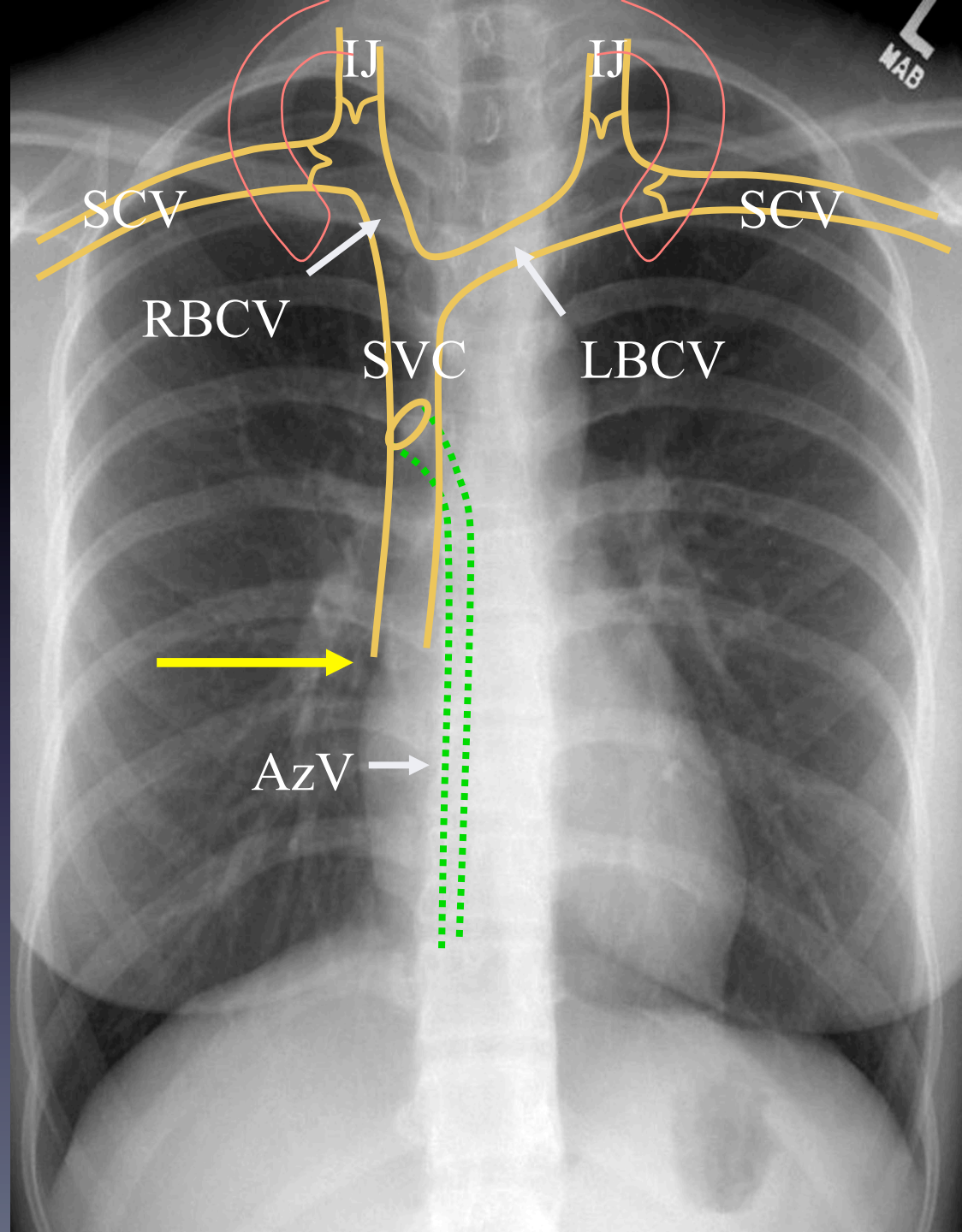




Case #3



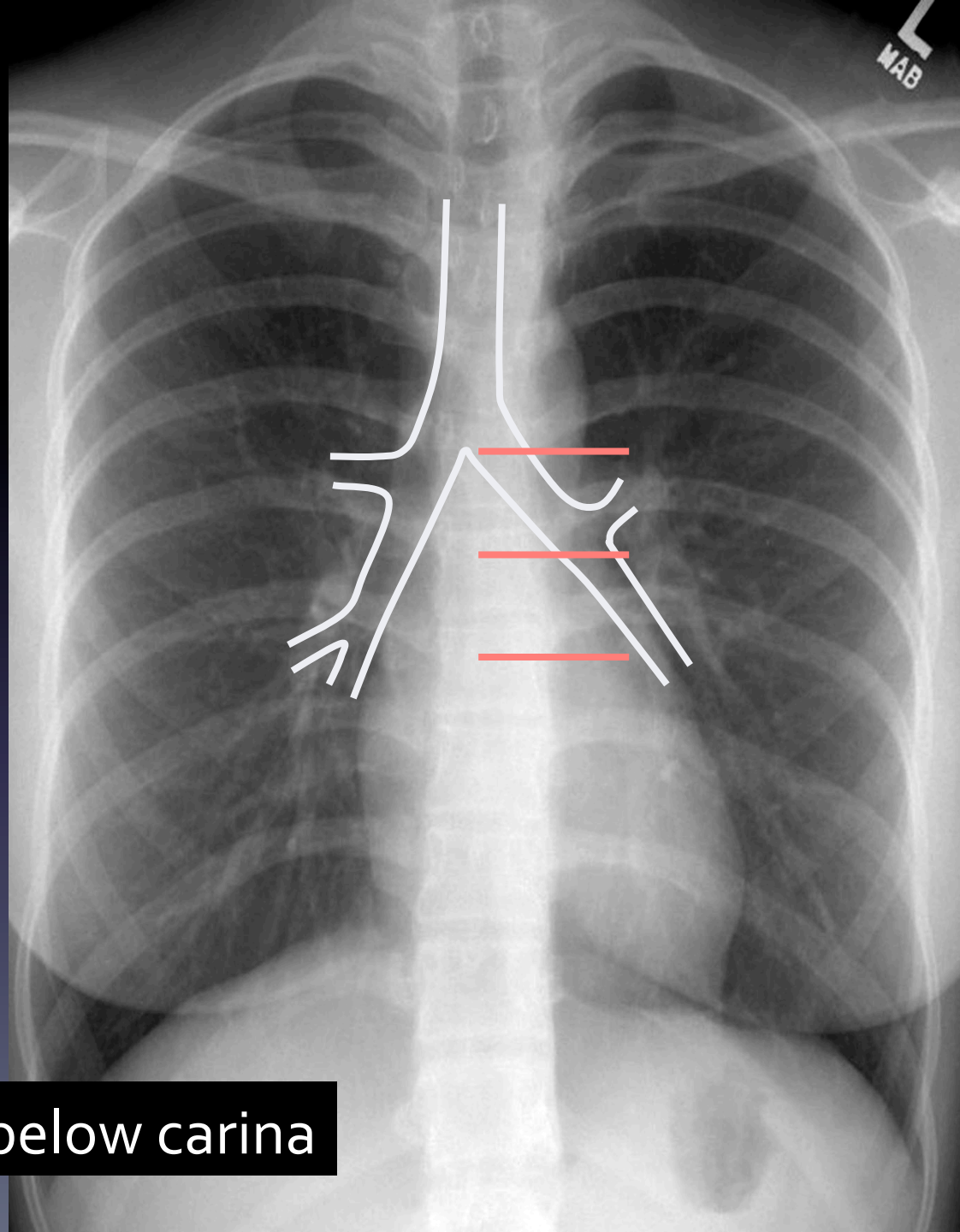
Venous landmarks



The Elusive Cavoatrial Junction

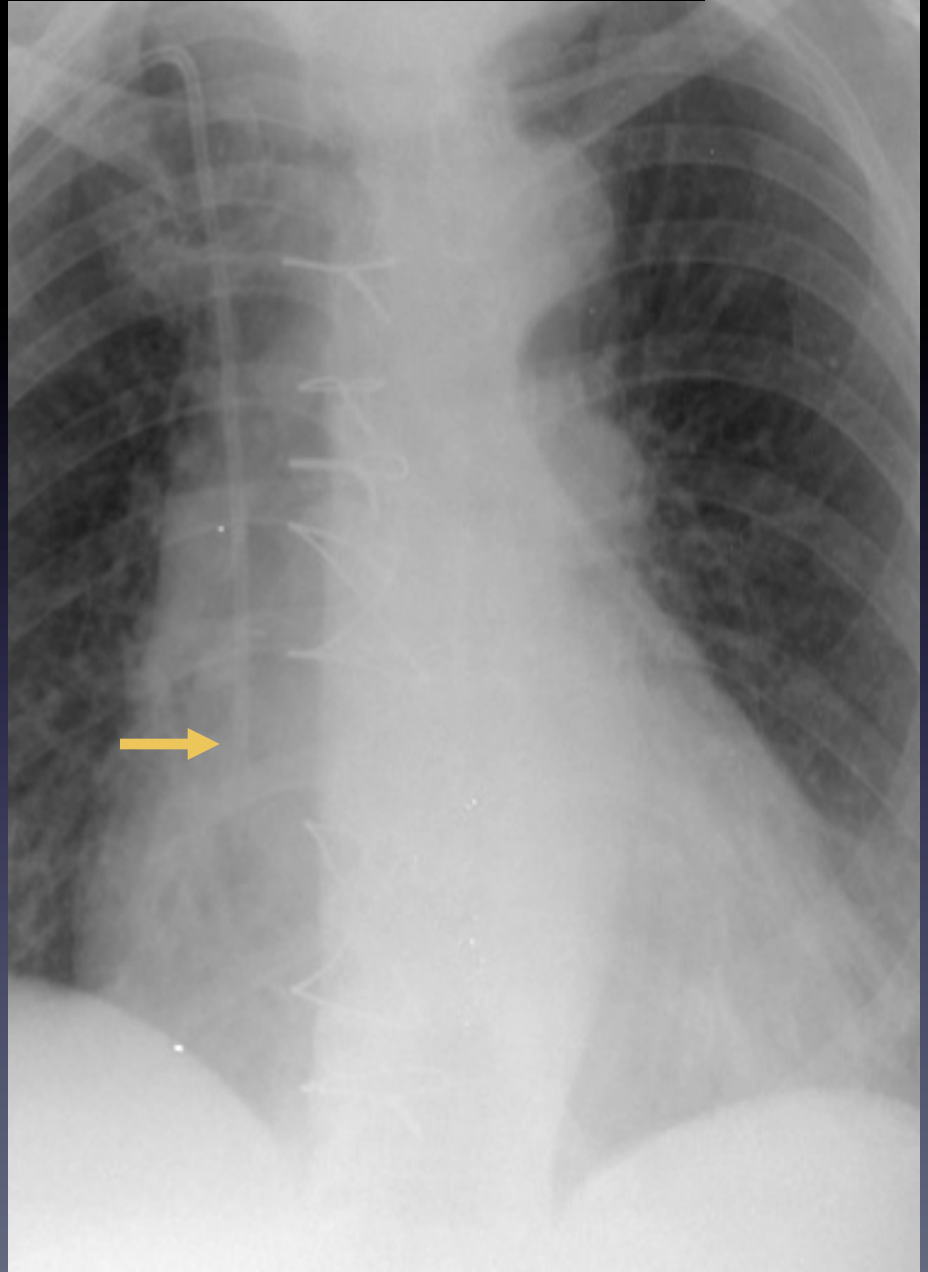
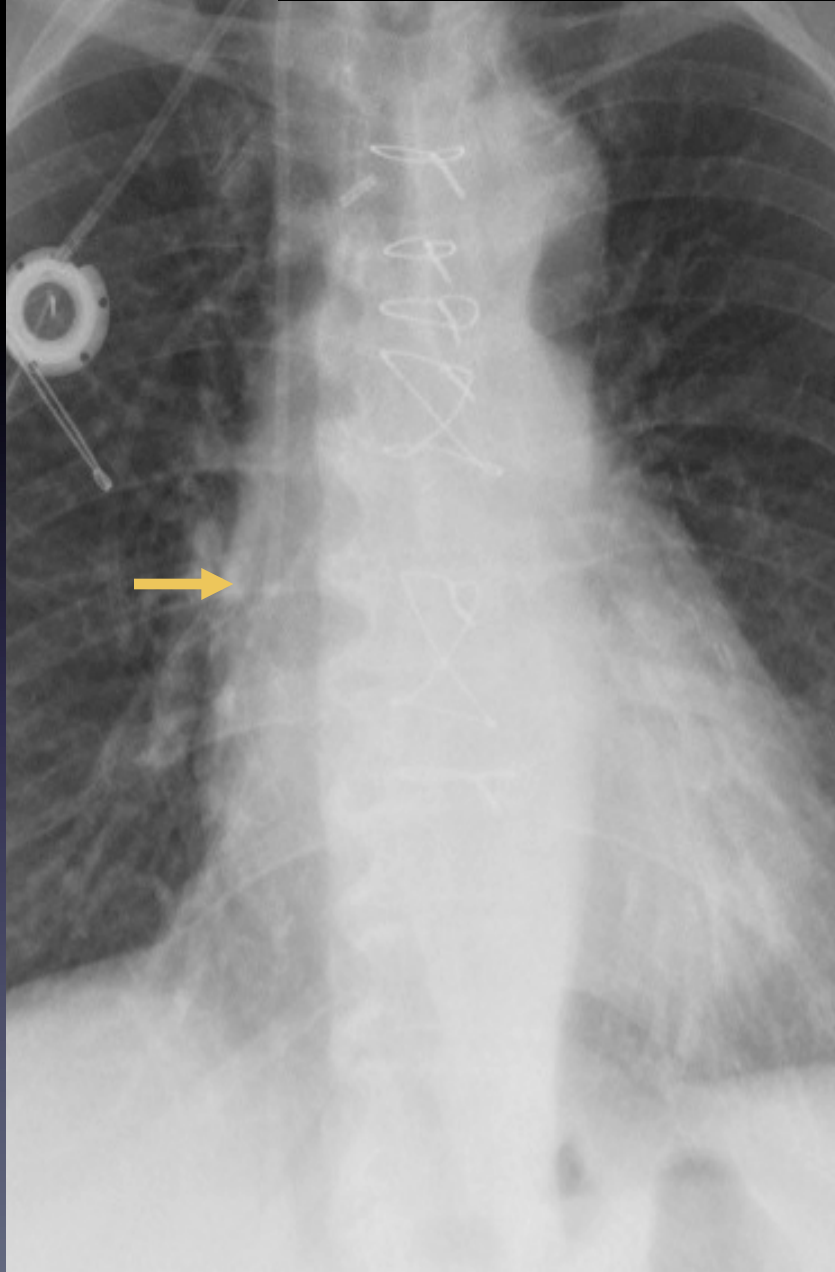


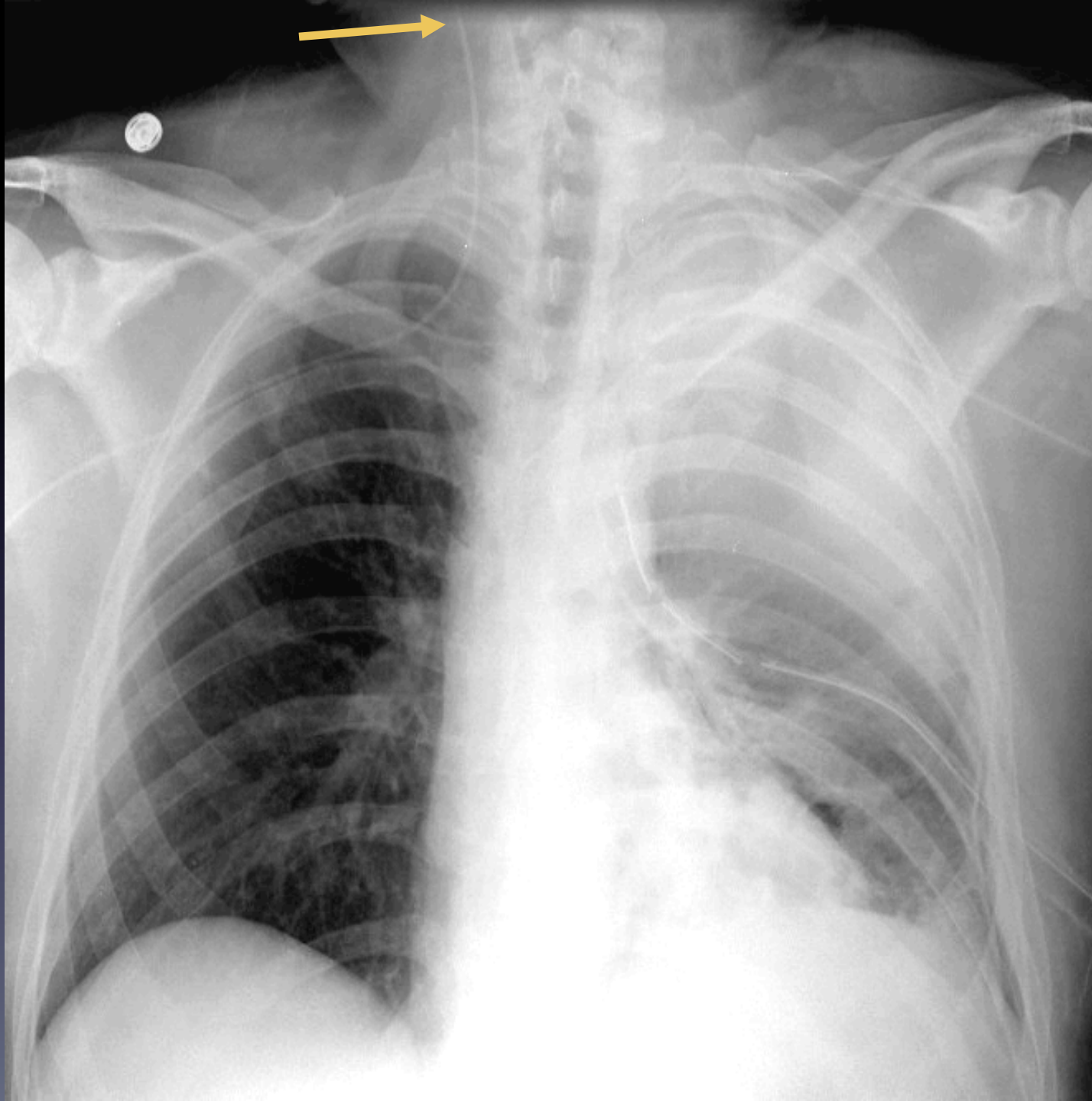
Venous landmarks

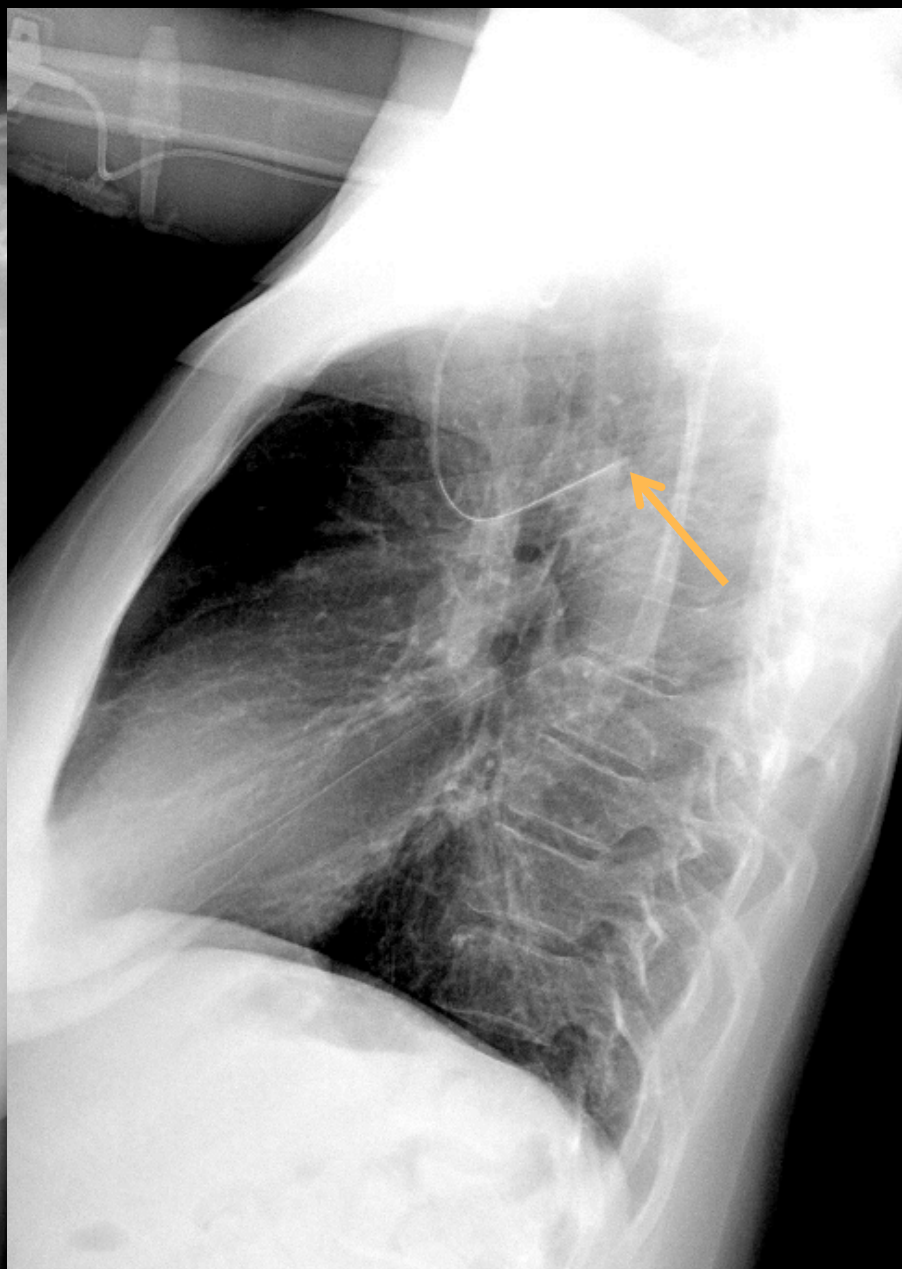
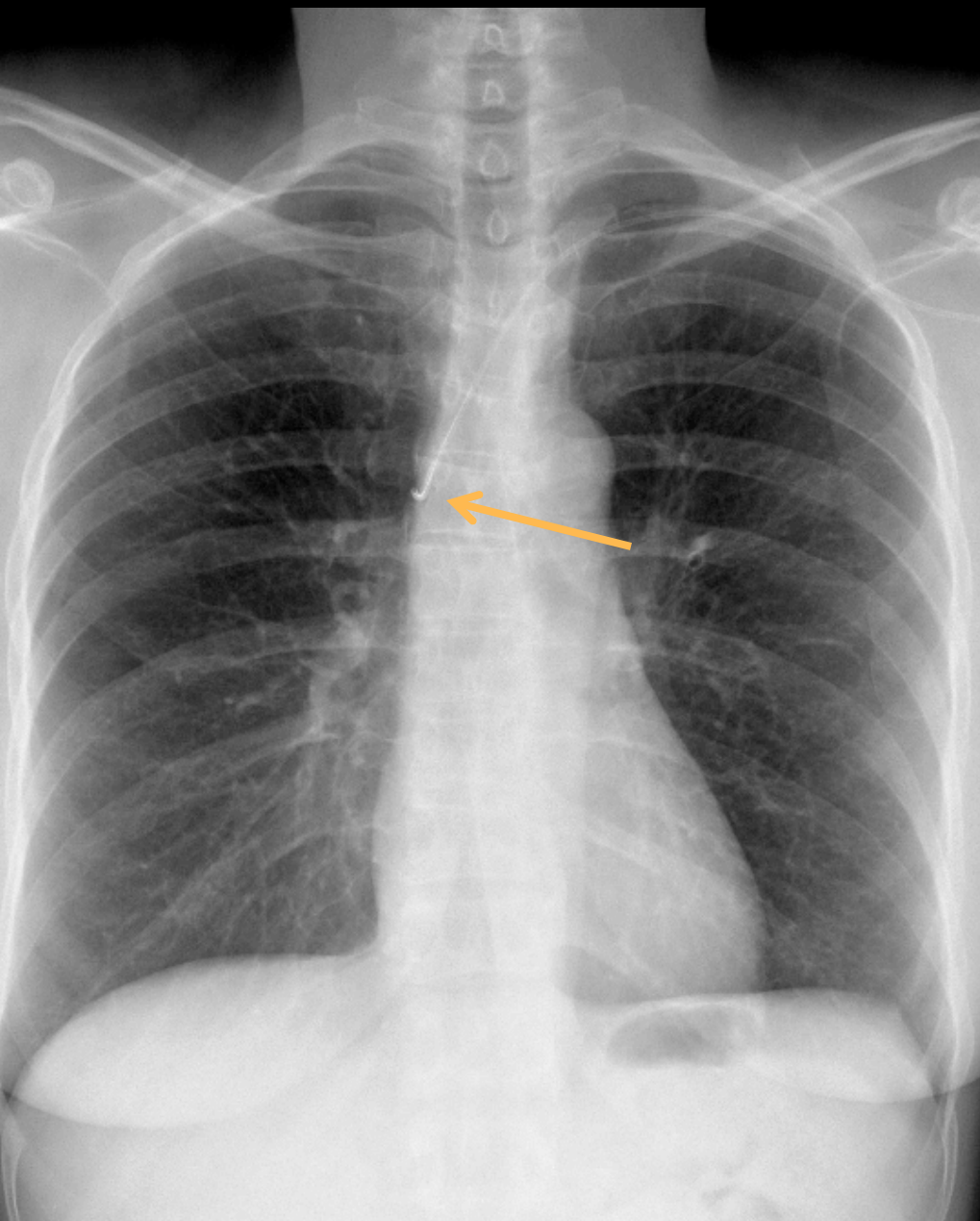


Two vertebral bodies below carina

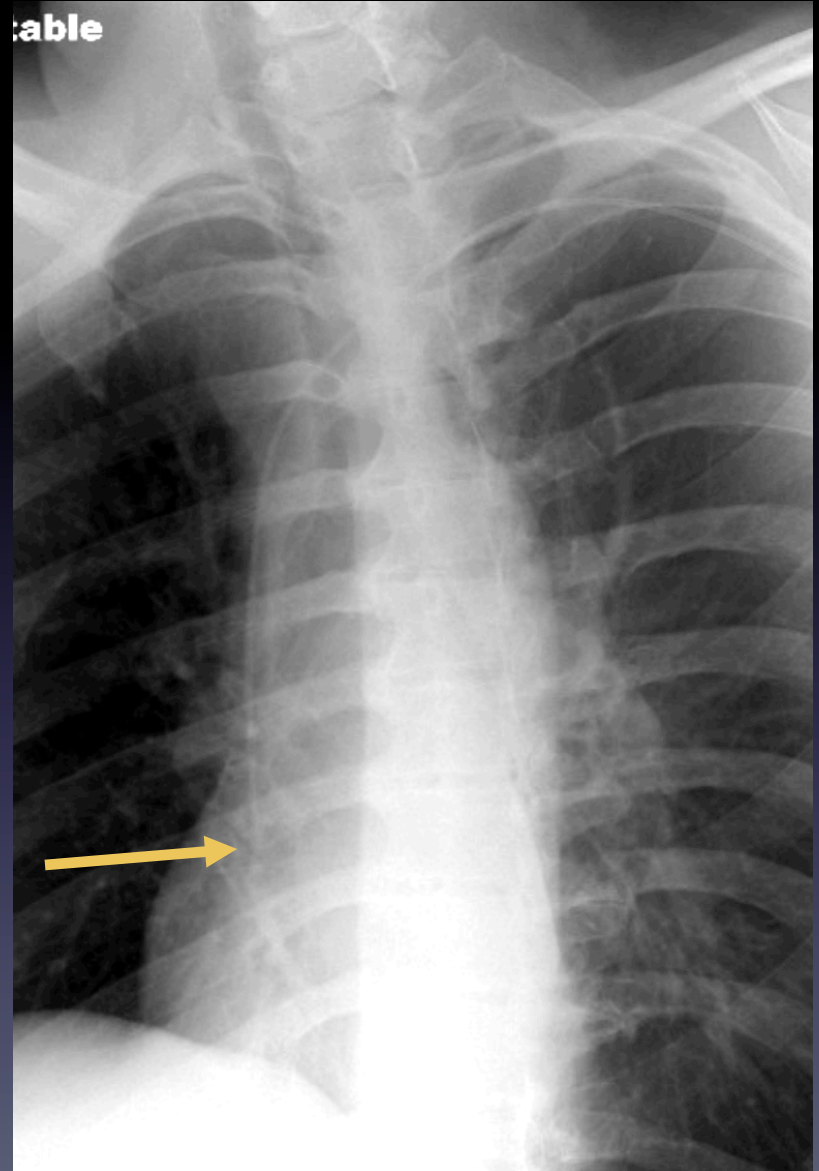
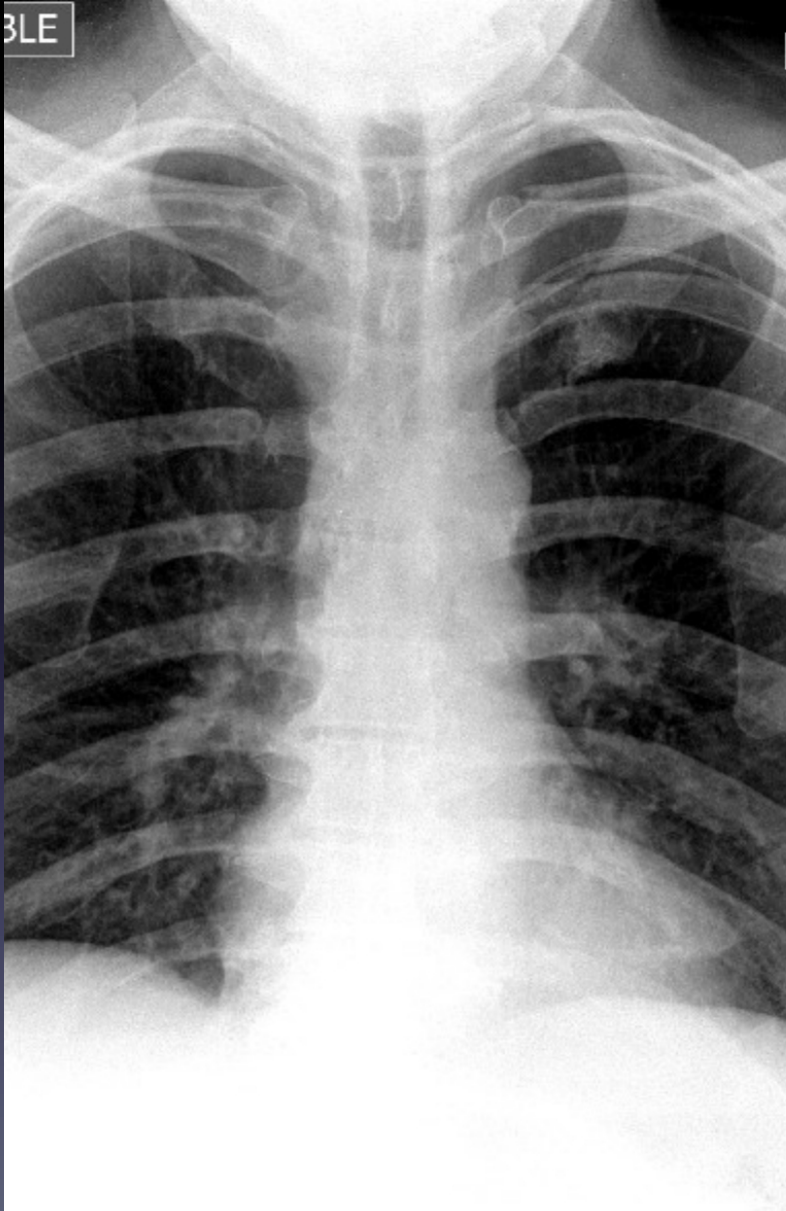
Variation with expiration



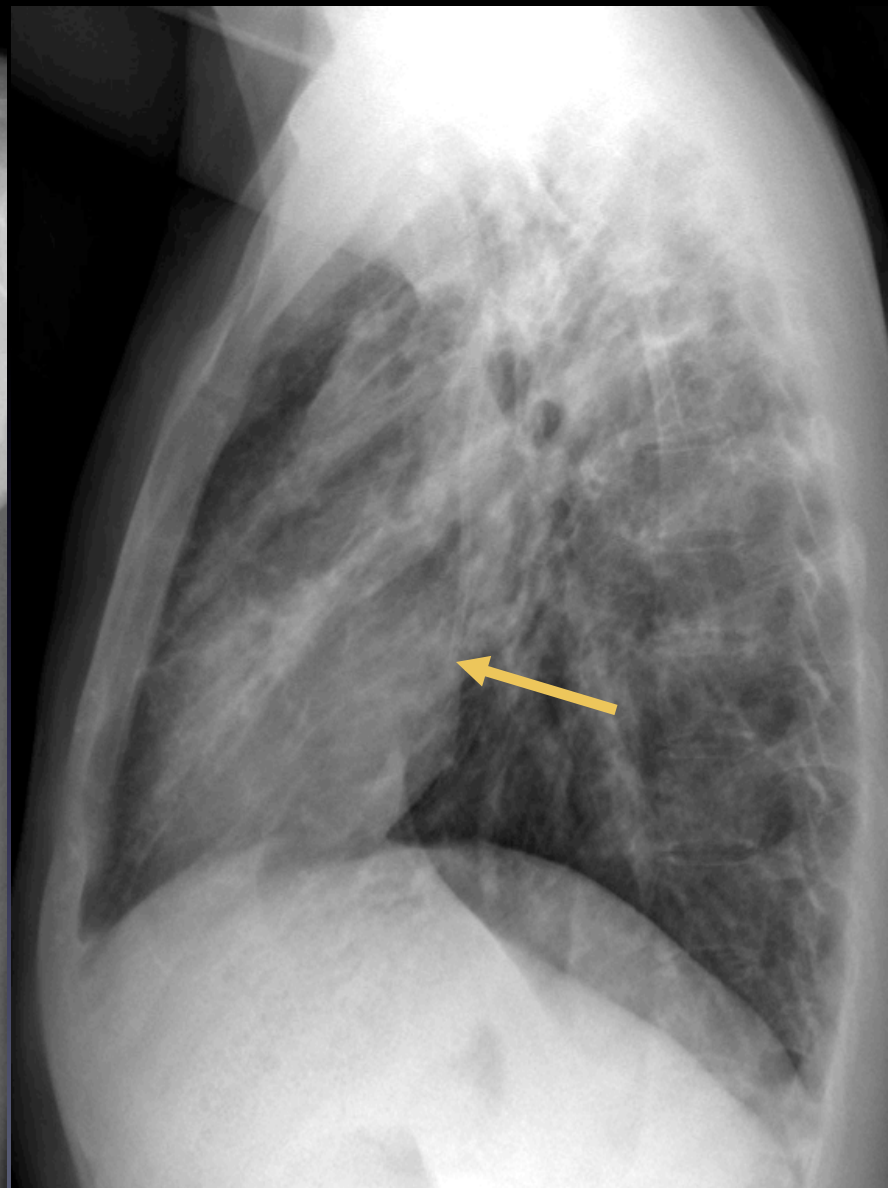
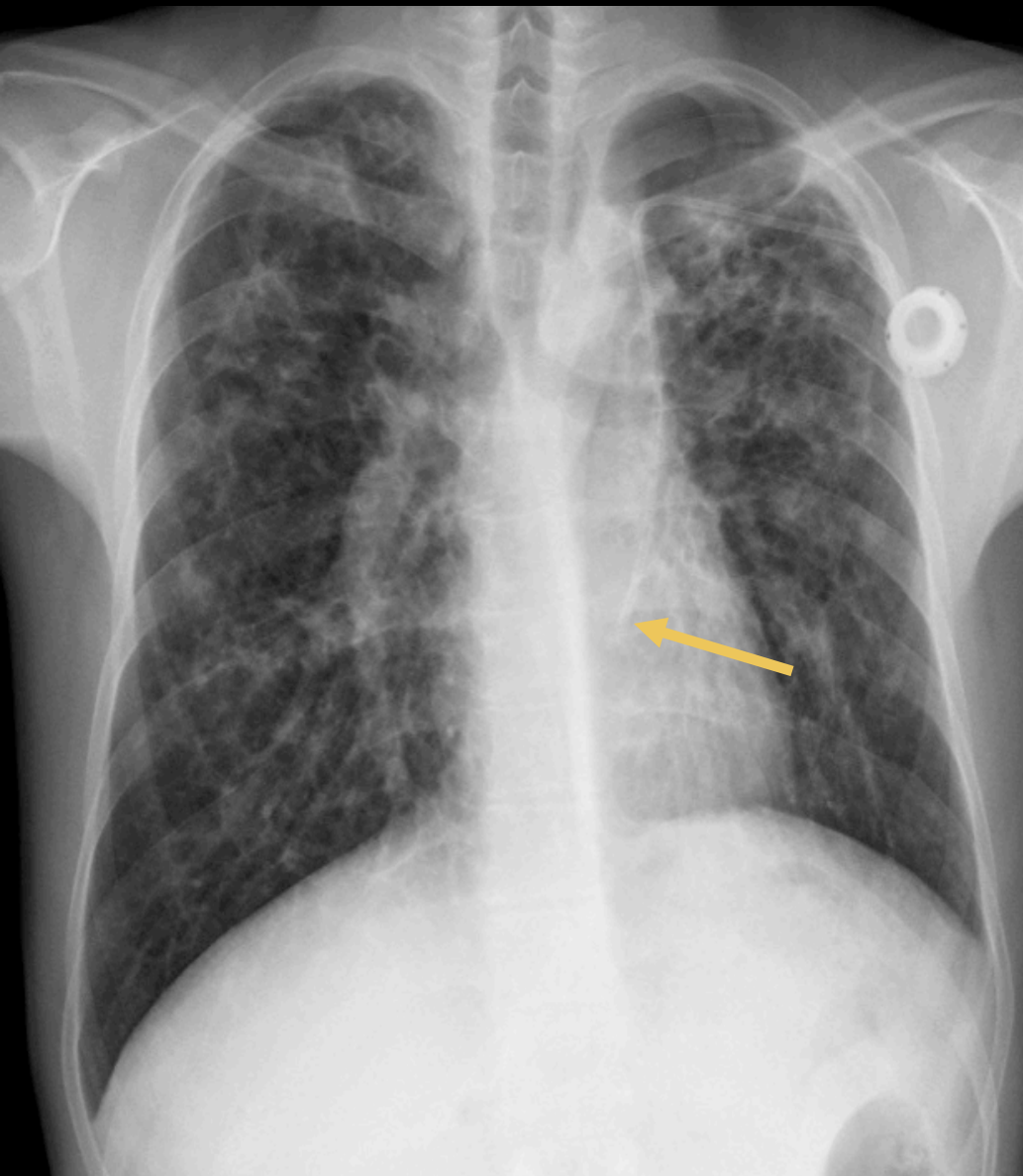


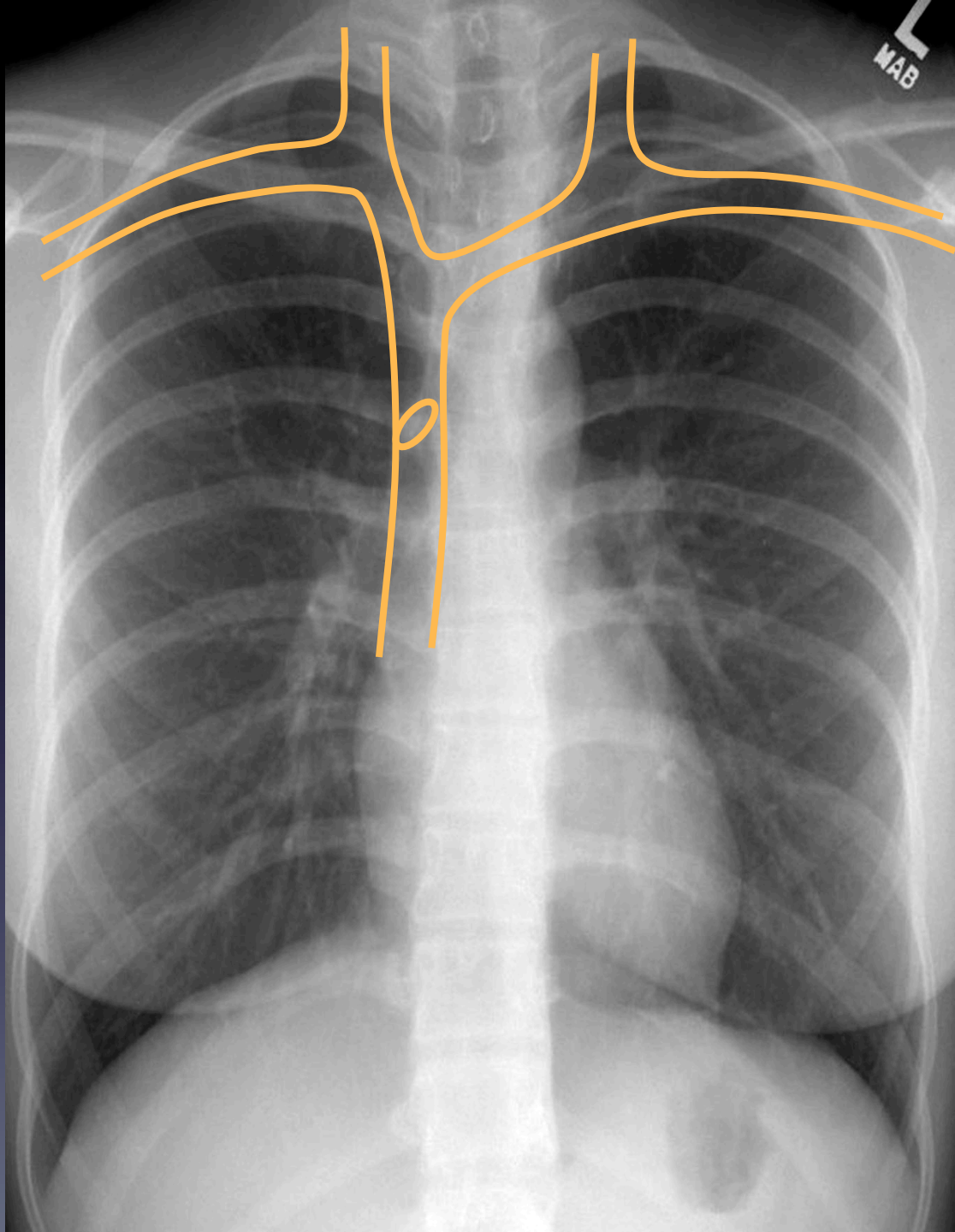


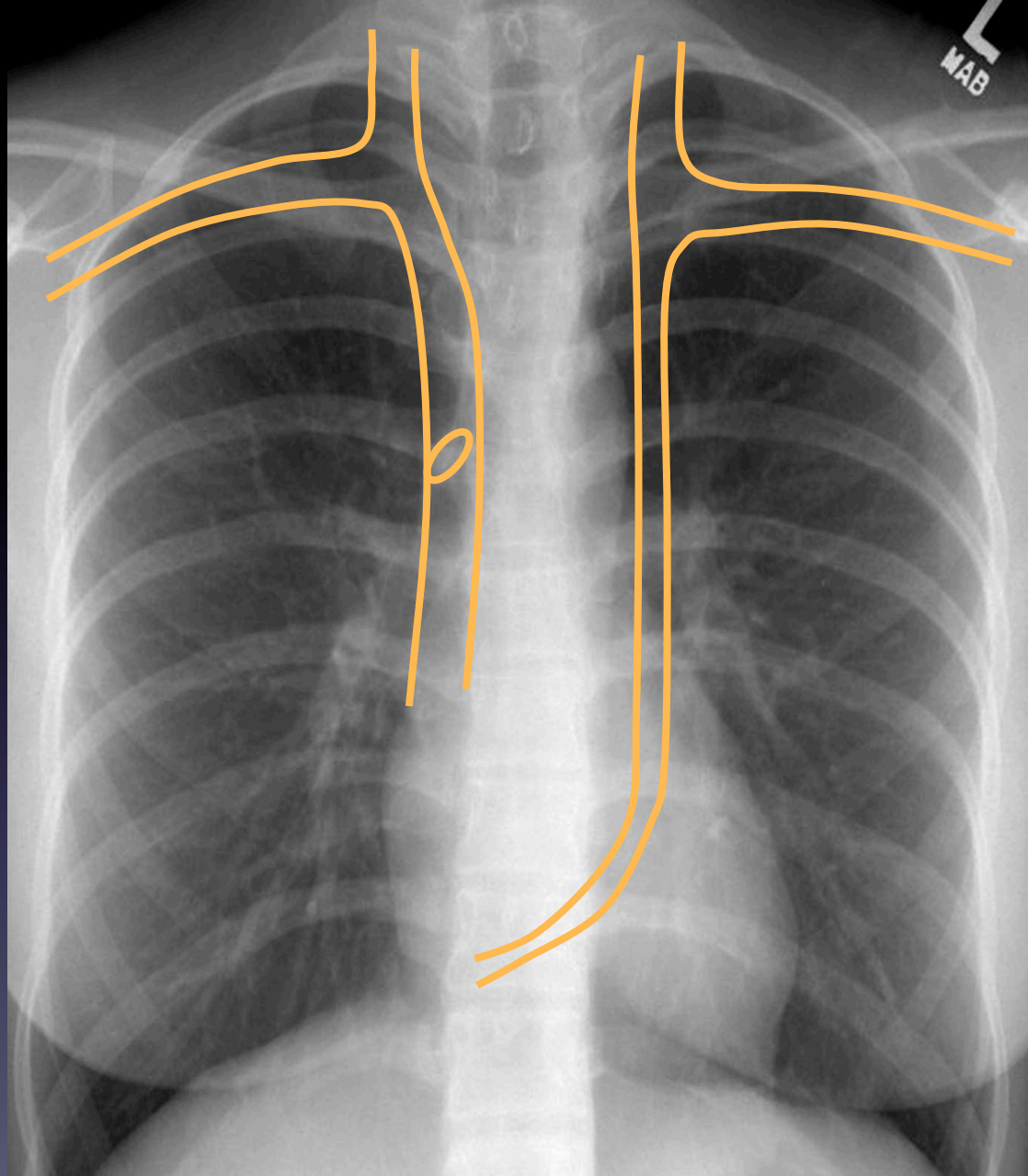
? location



Right posterior oblique

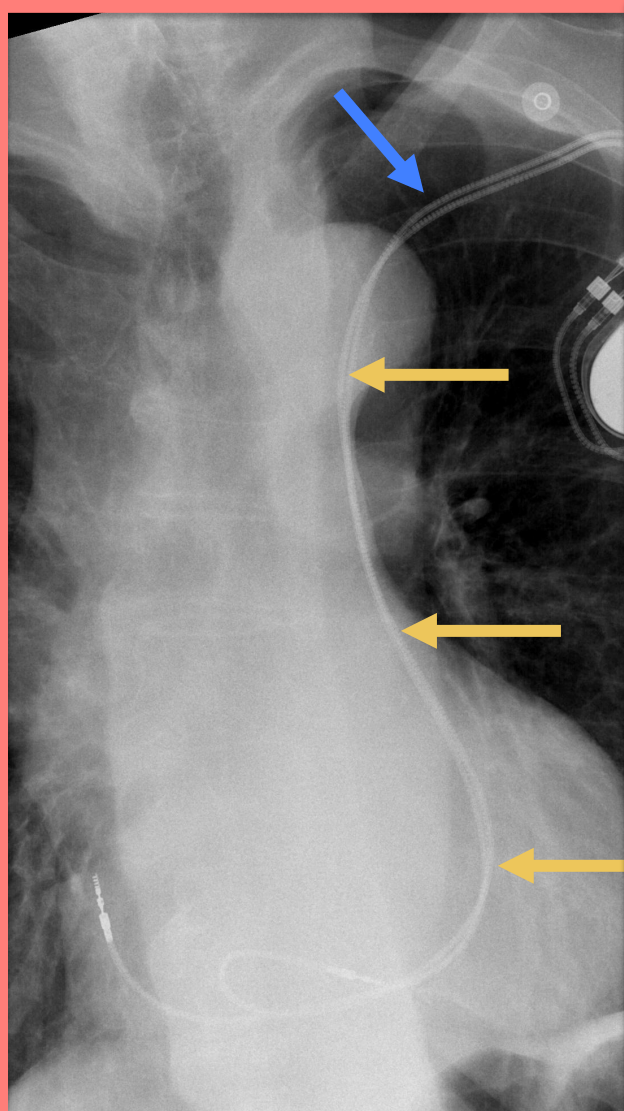




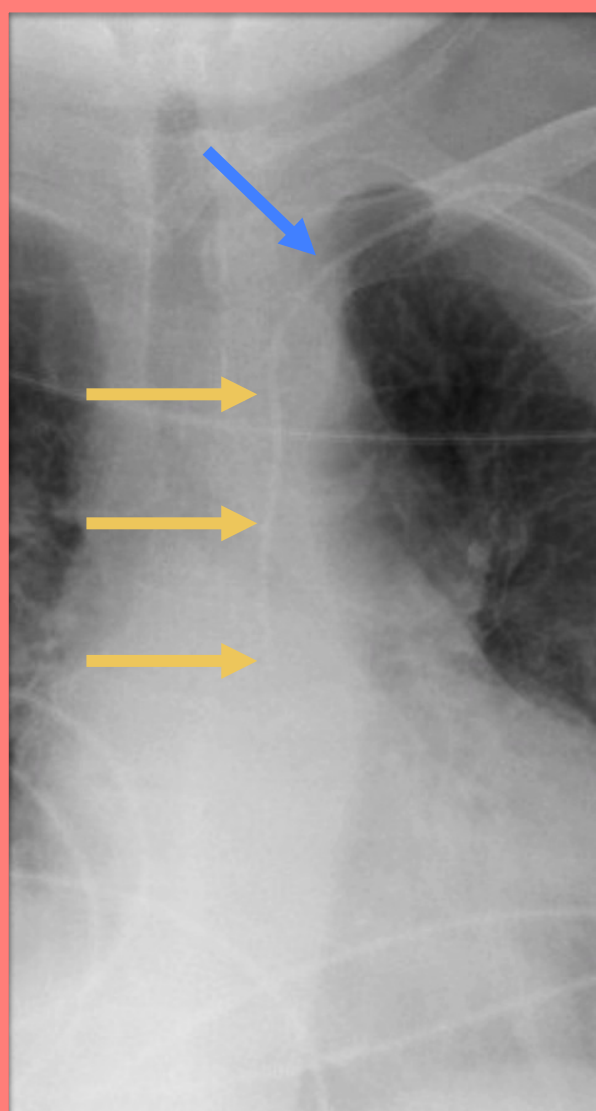


Duplicated SVC

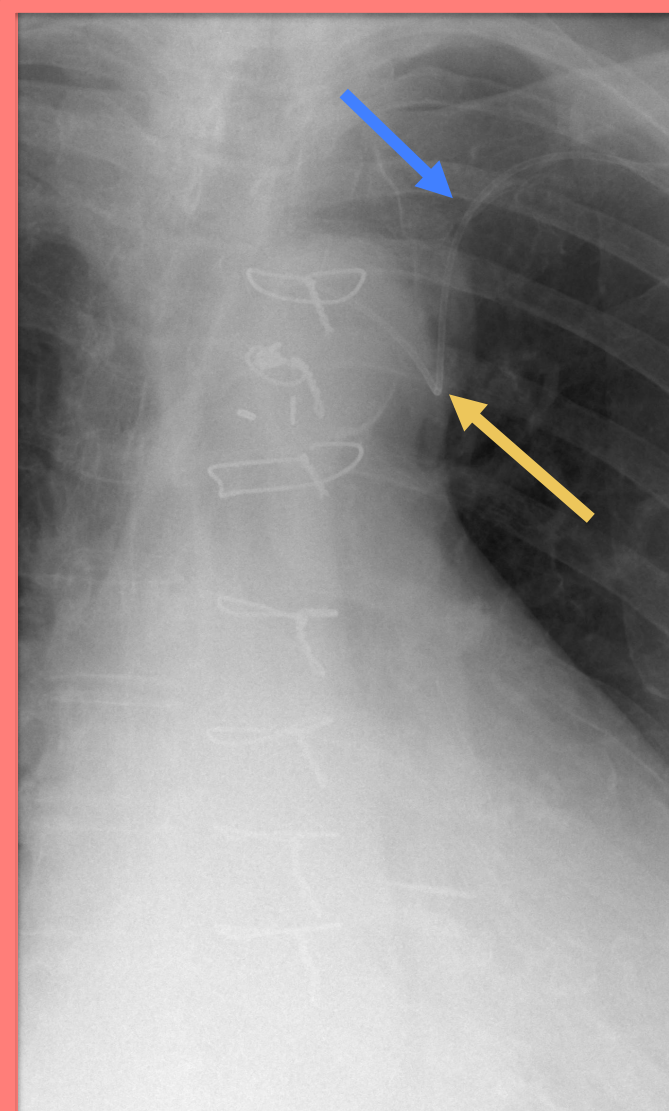
Line on left side of mediastinum



Left superior vena cava

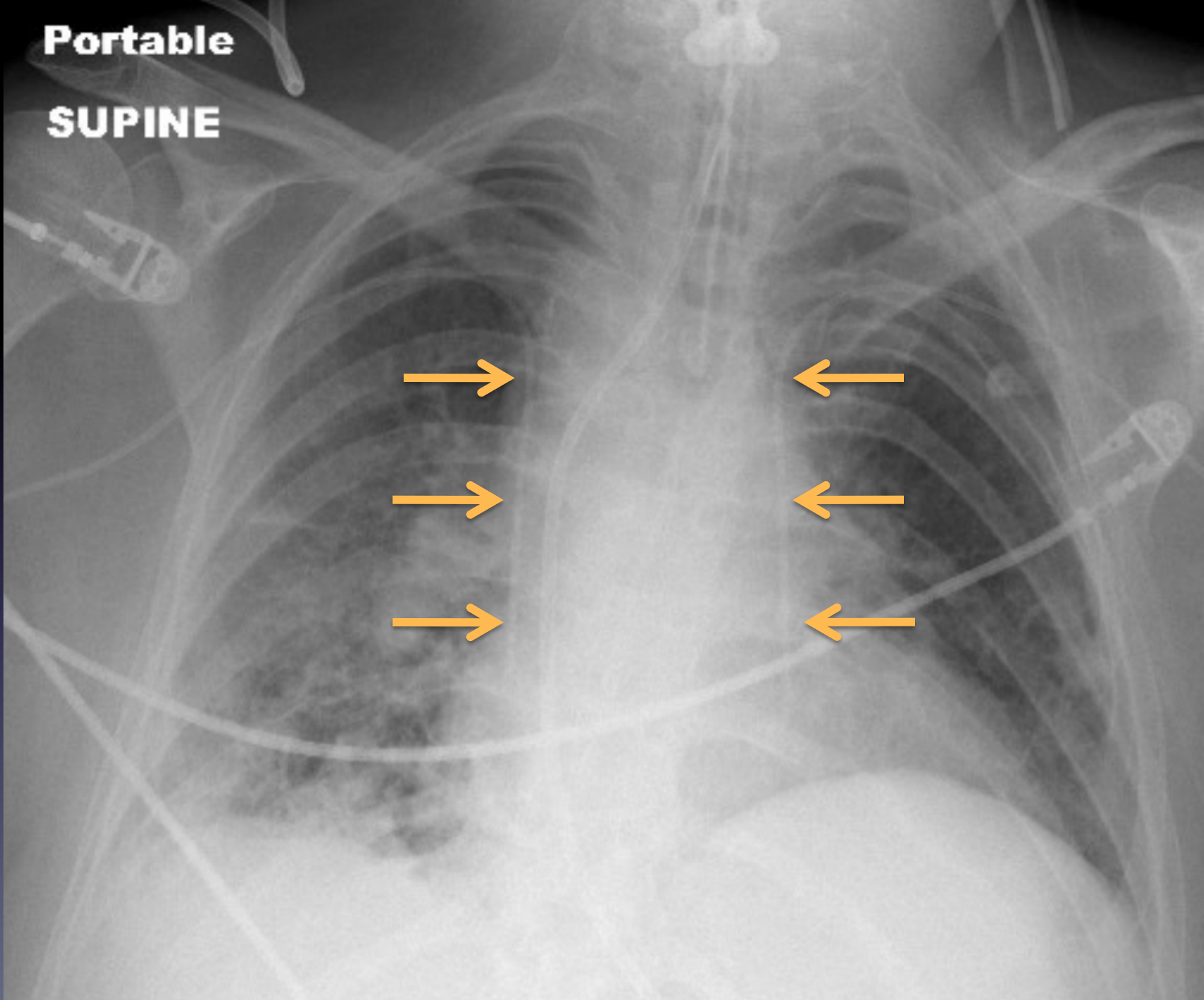


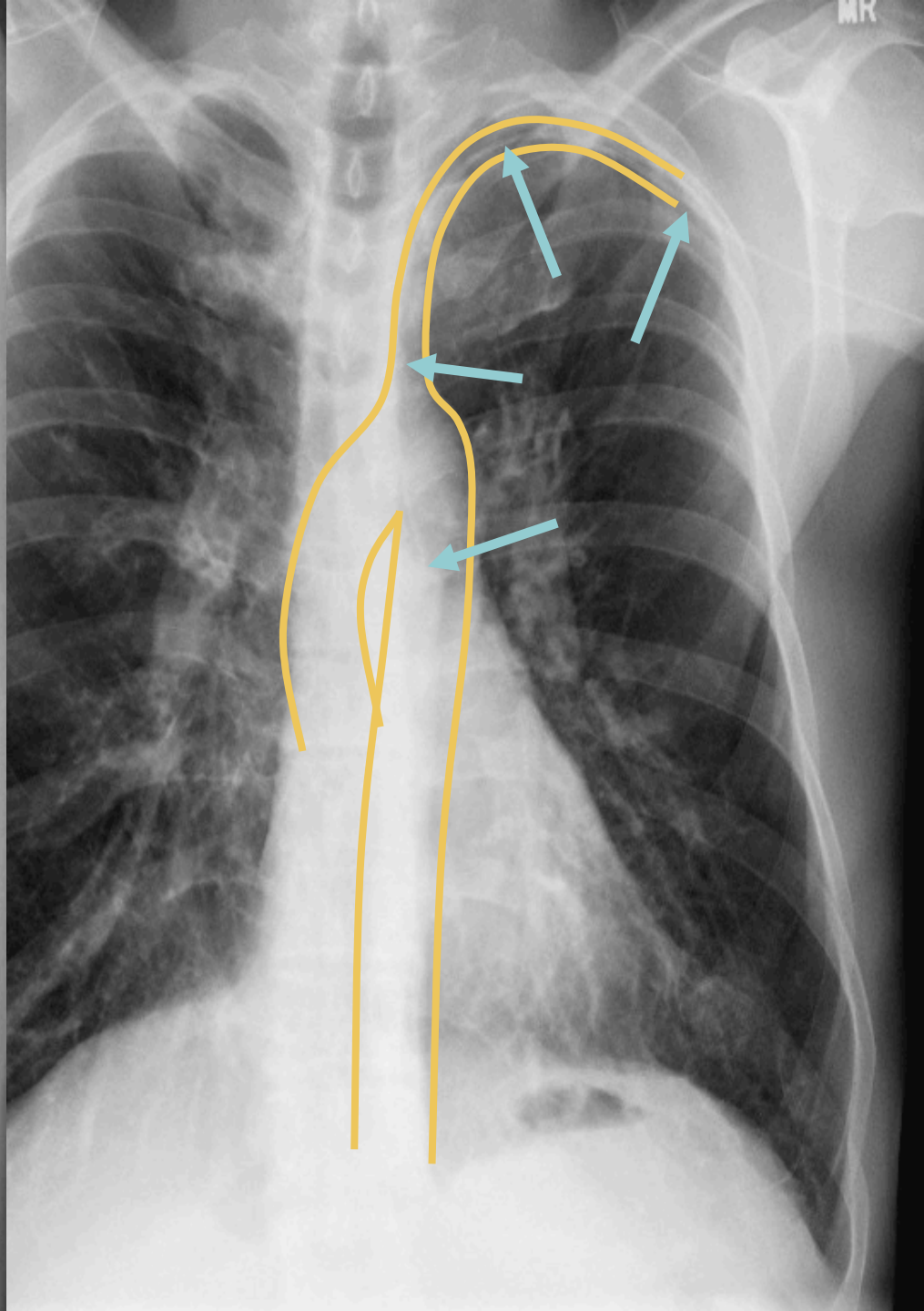
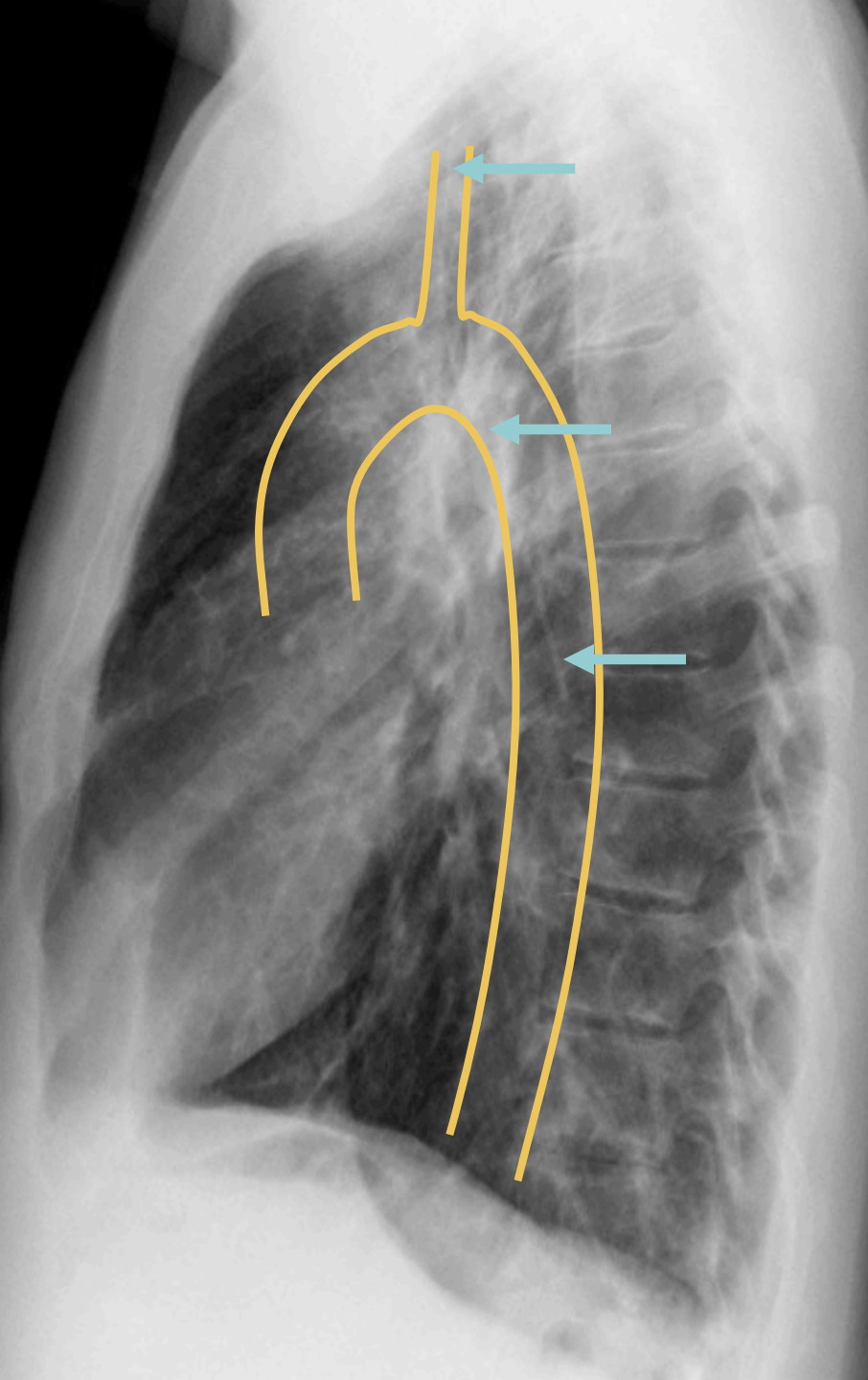
Left internal mammary vein



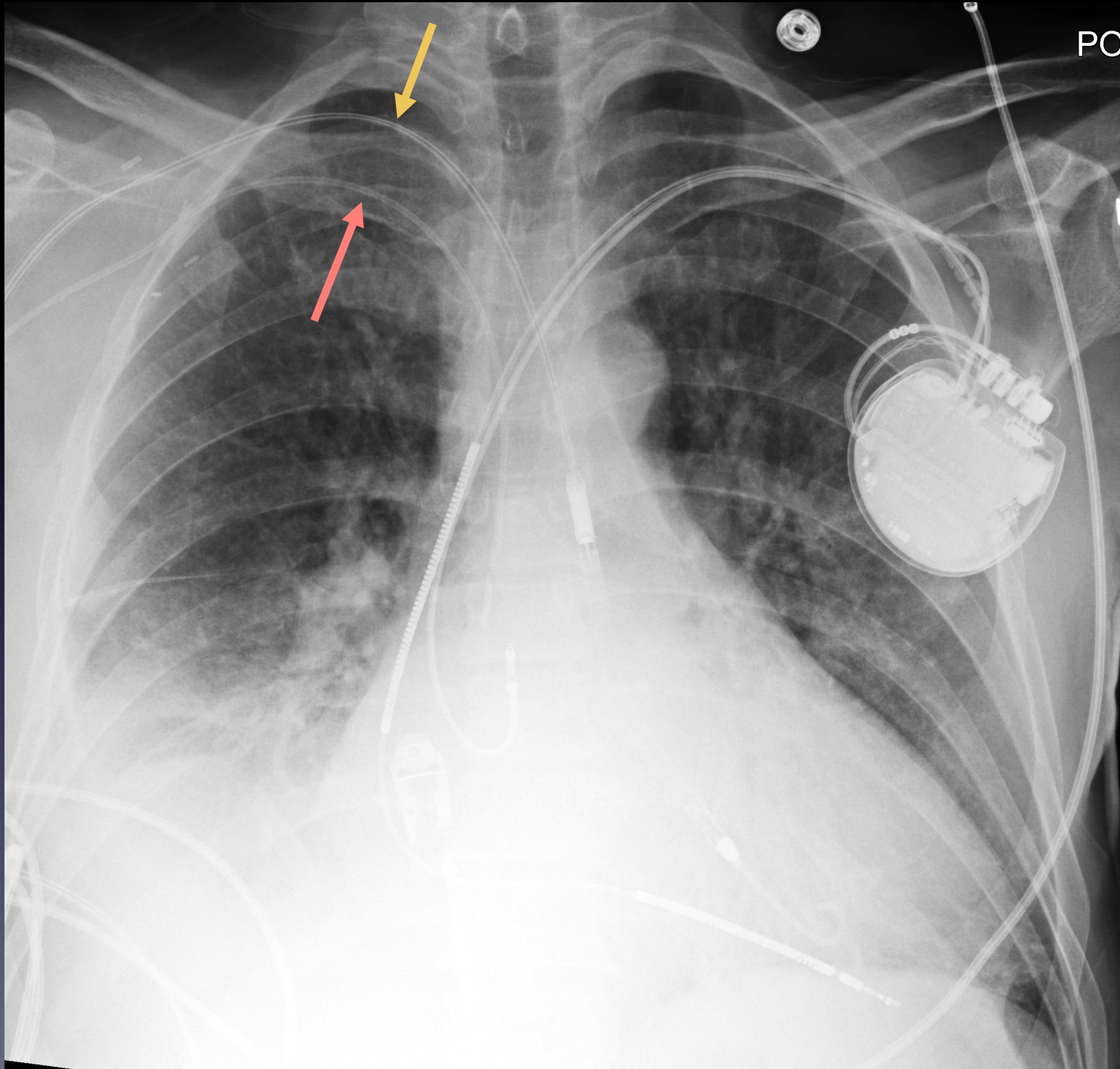
Left superior intercostal vein

**Portable
SUPINE**

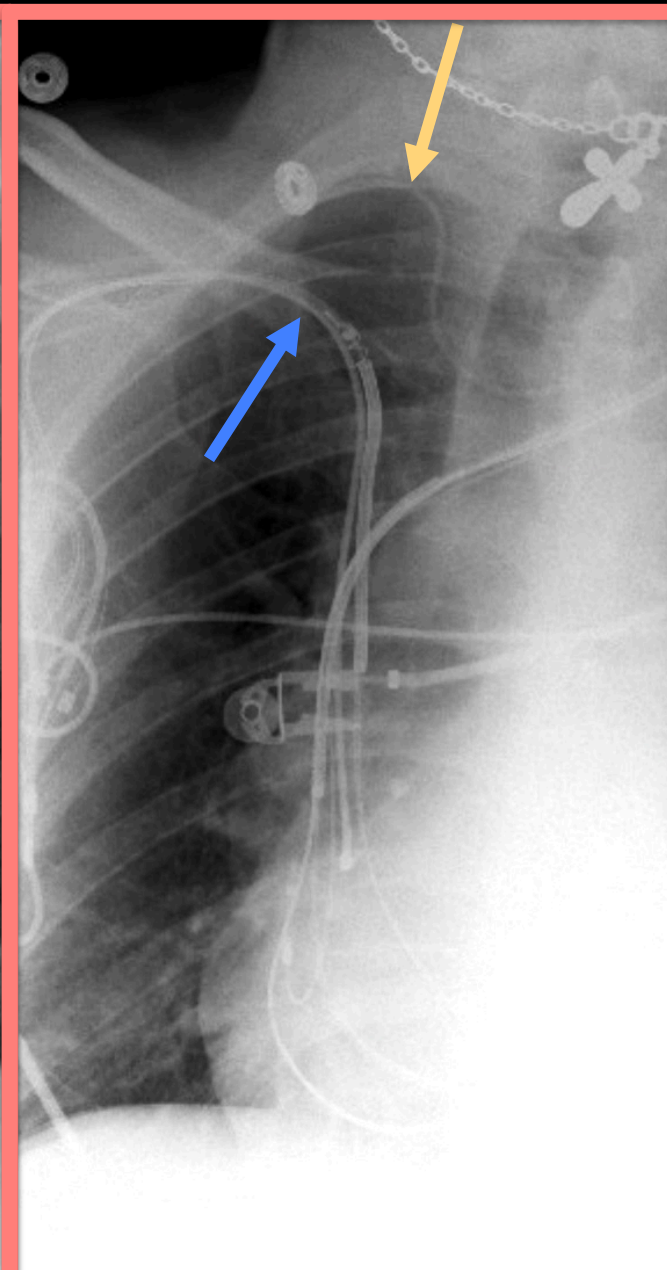
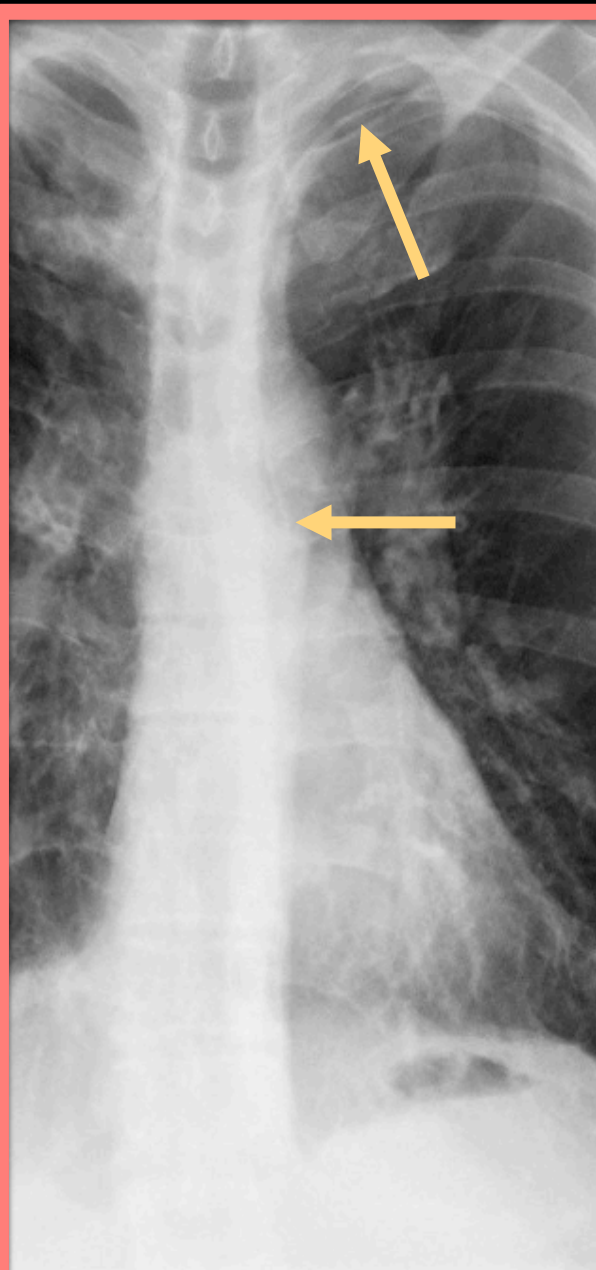
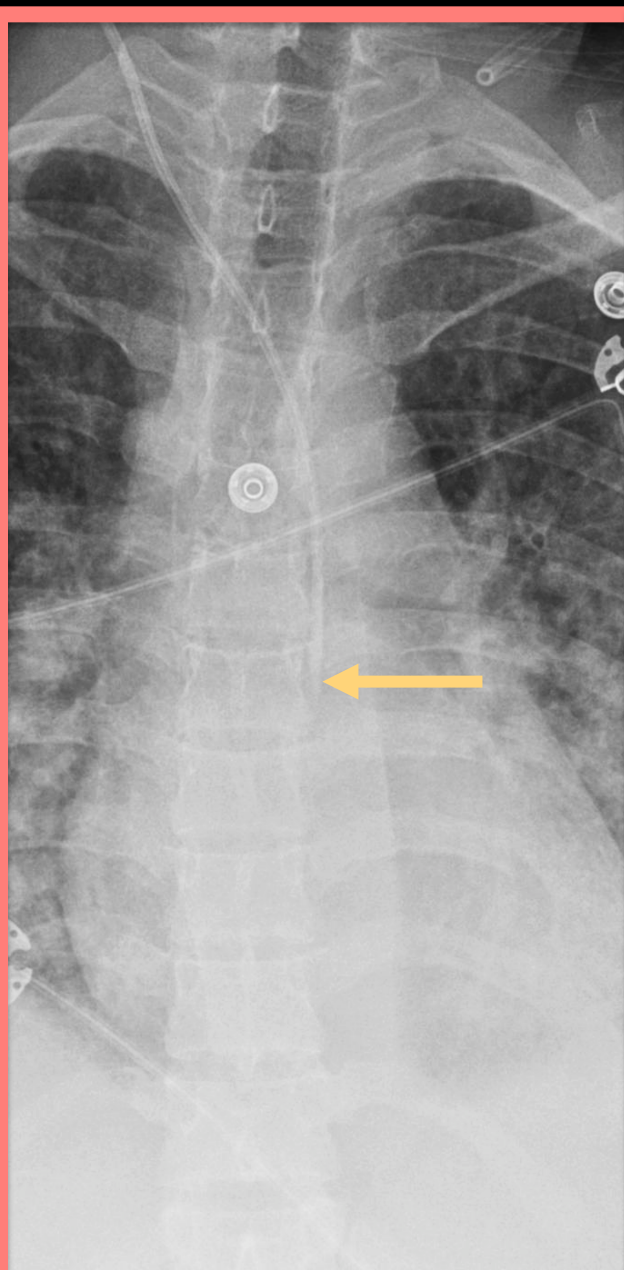


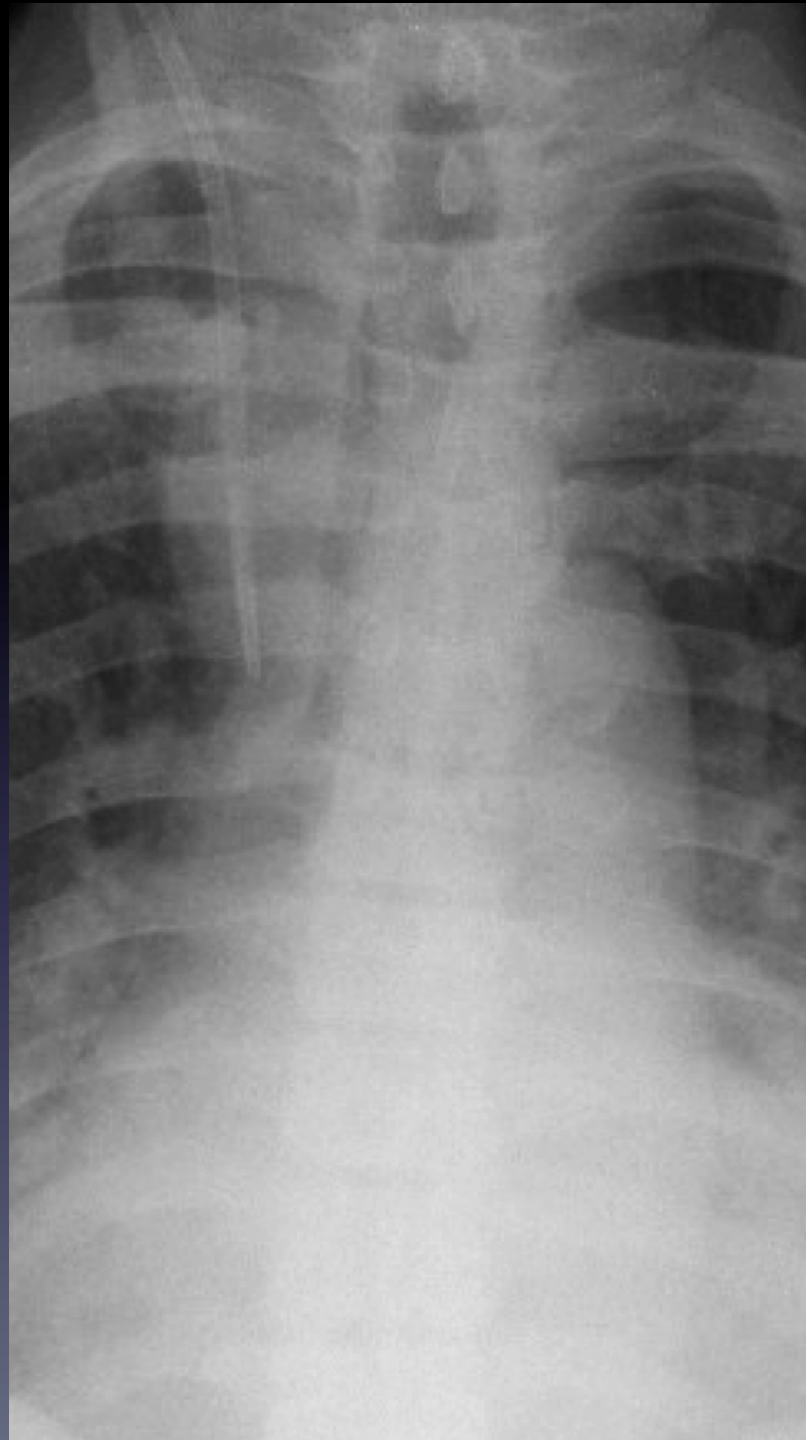
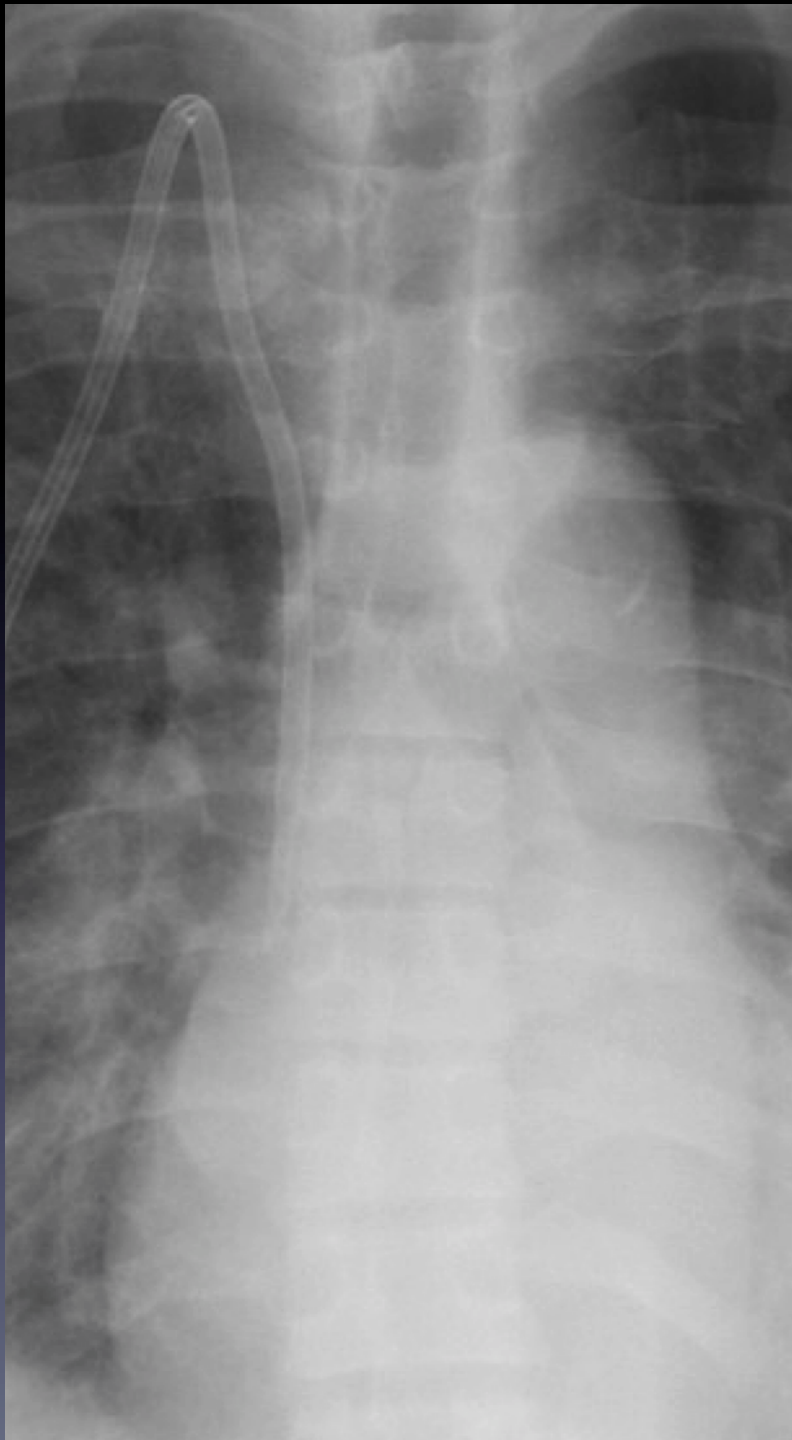


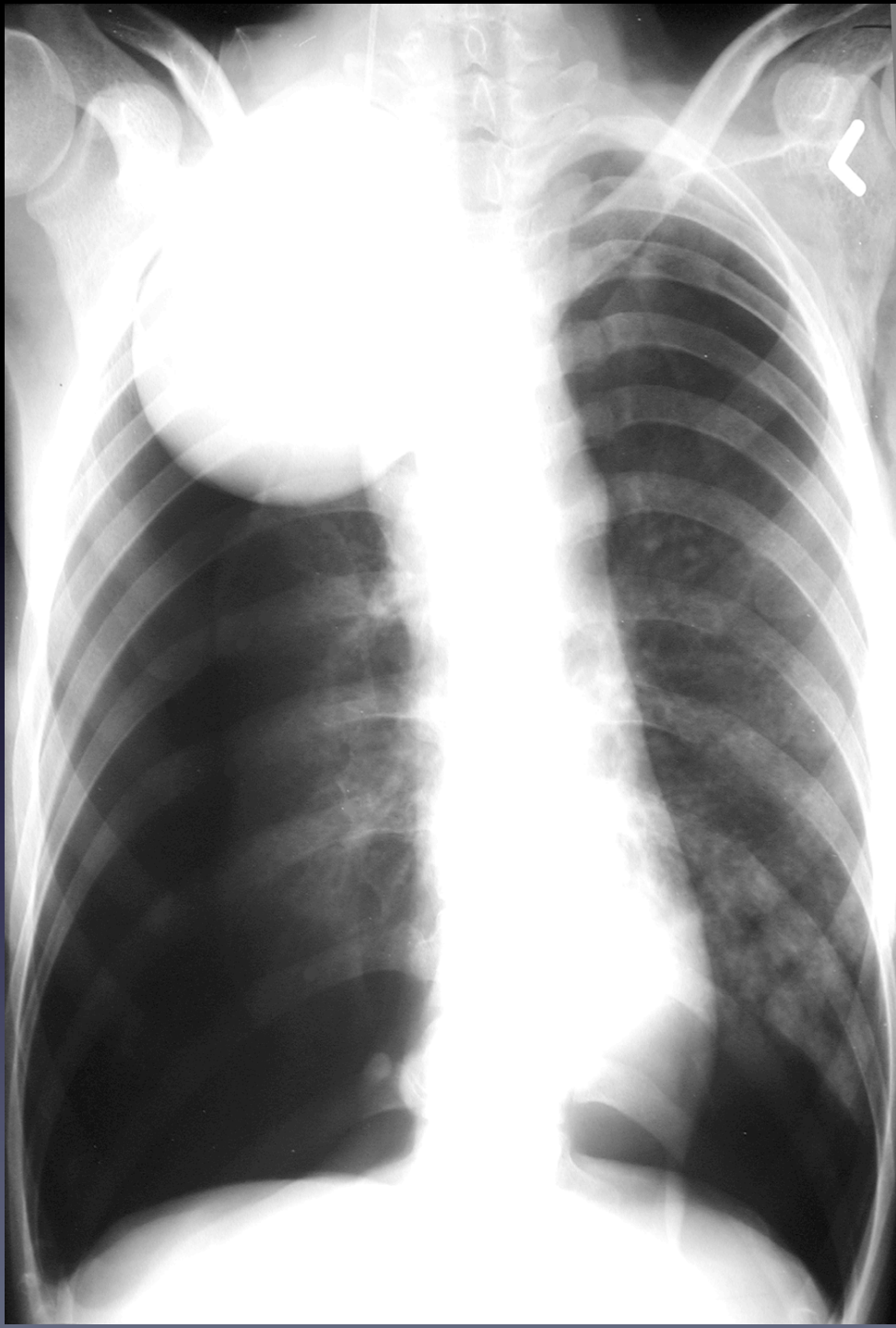
PO

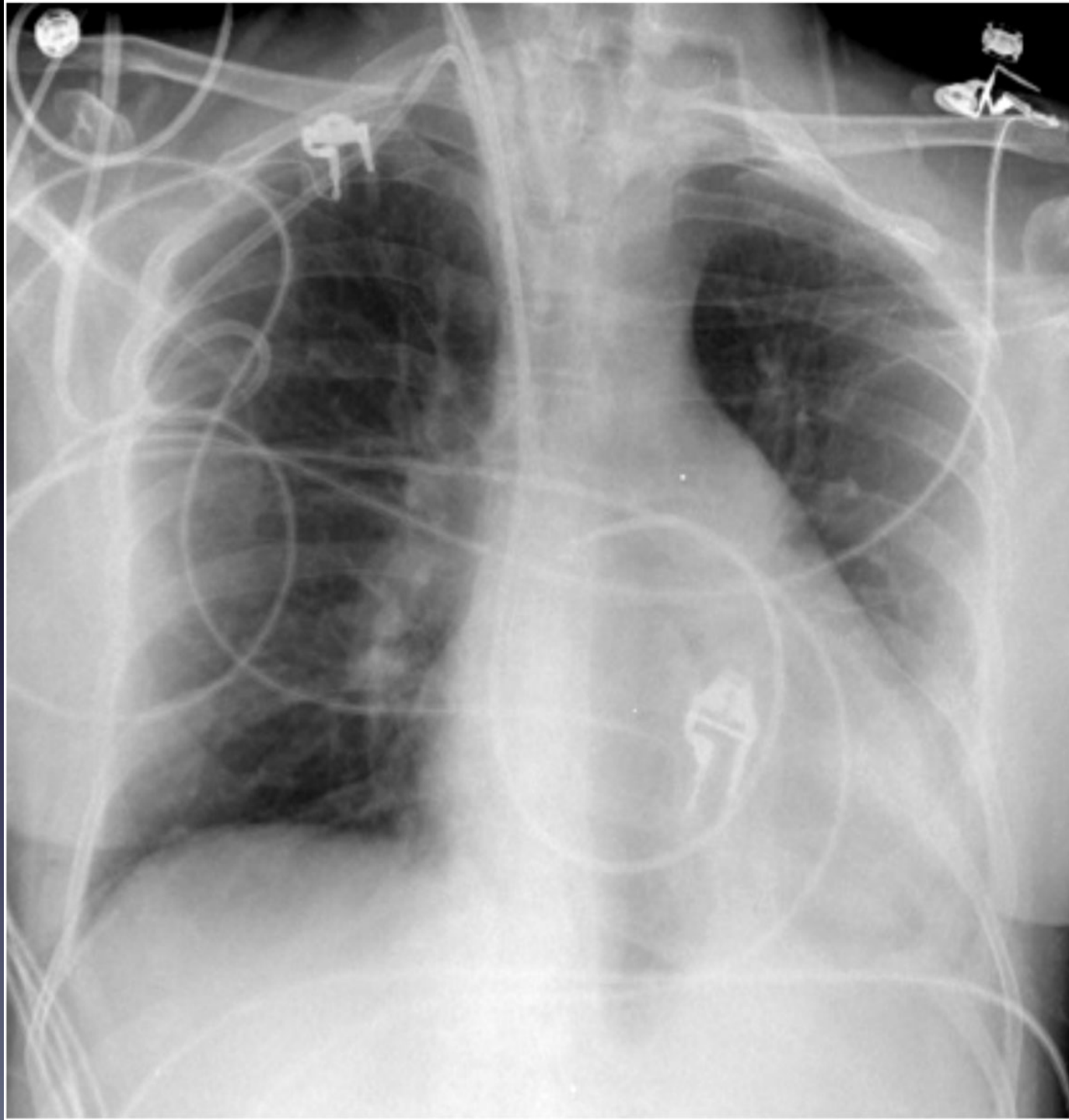


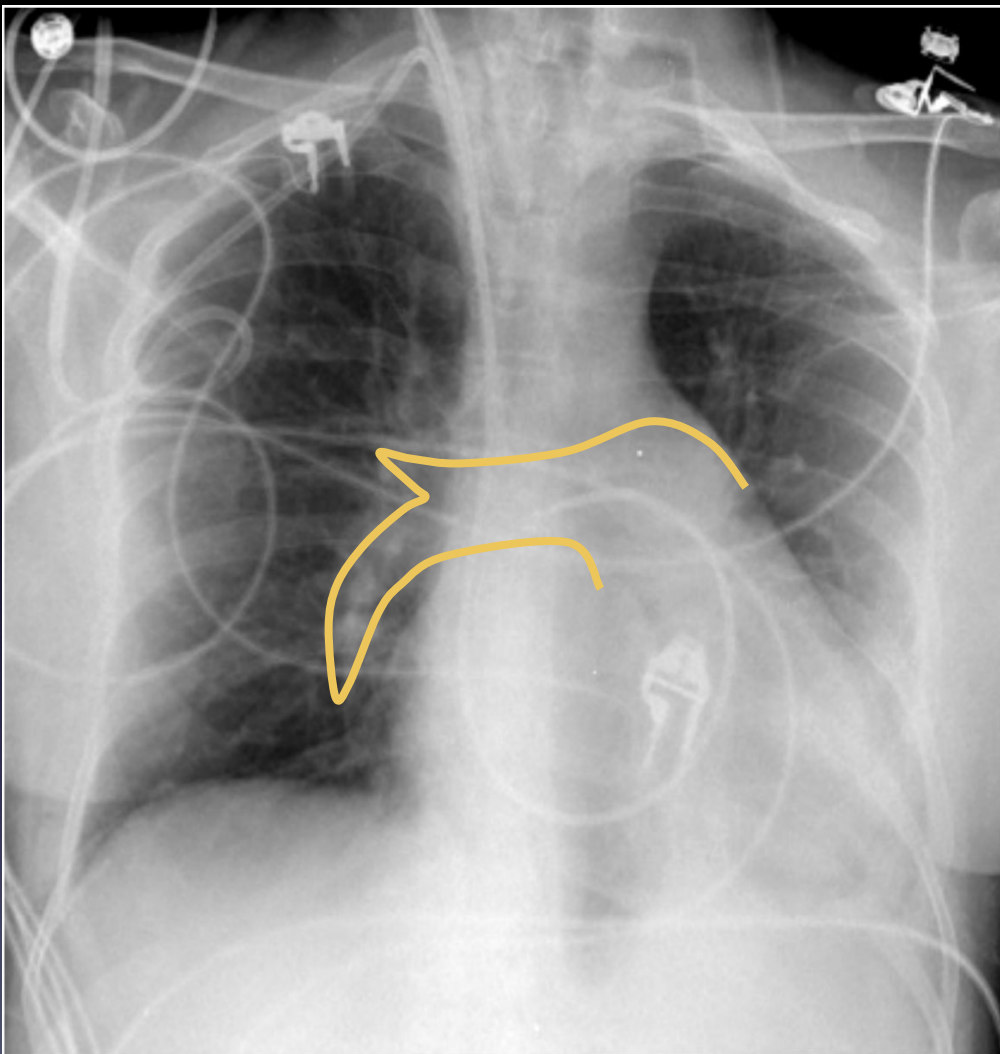
Arterial placements



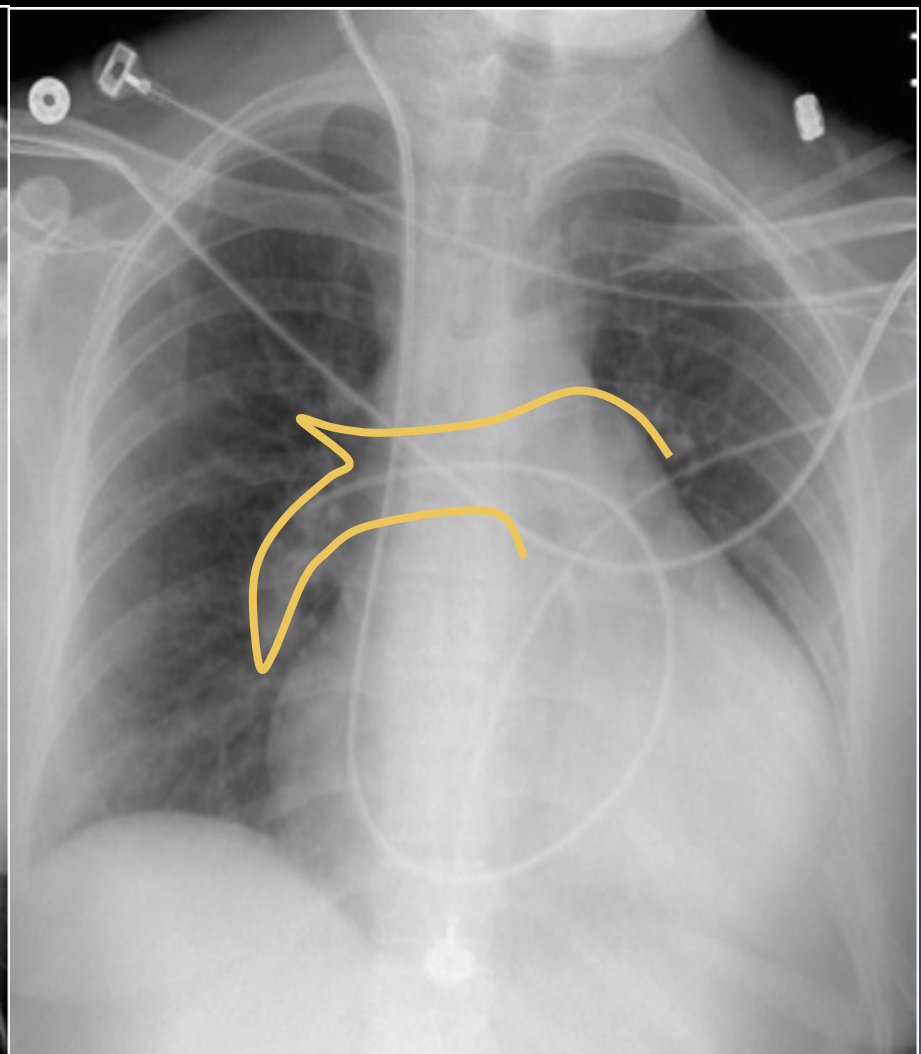




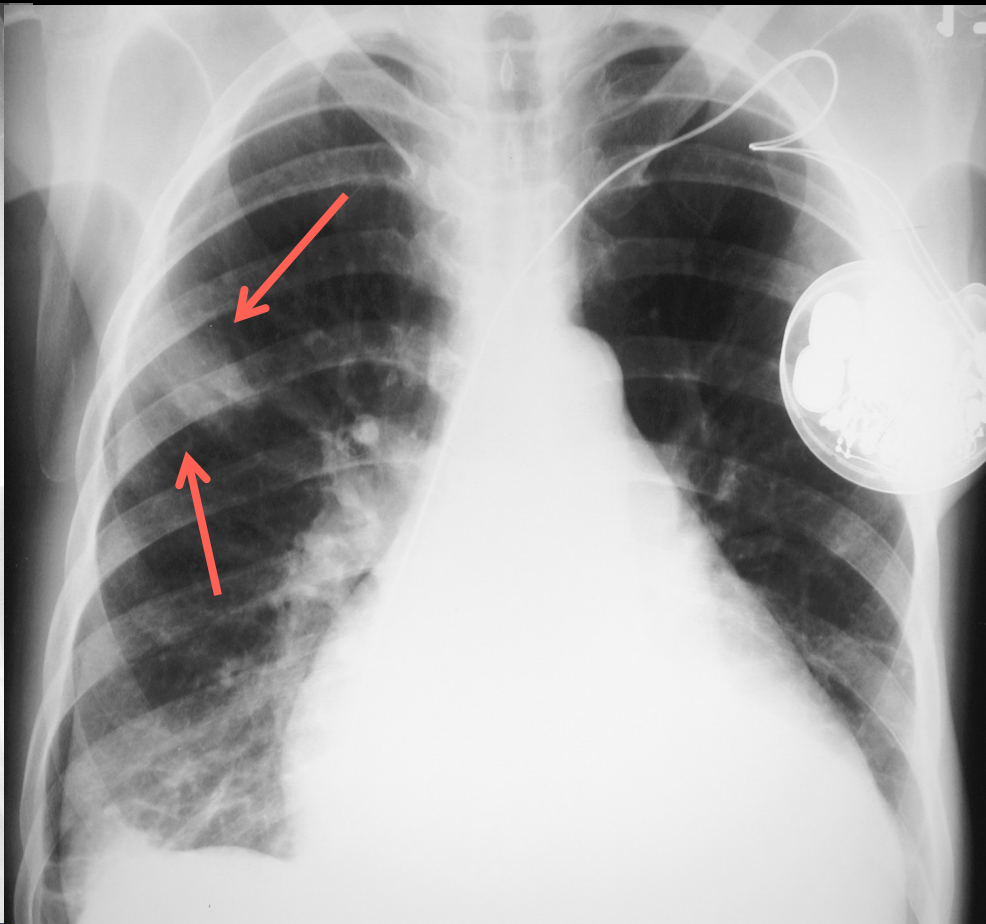
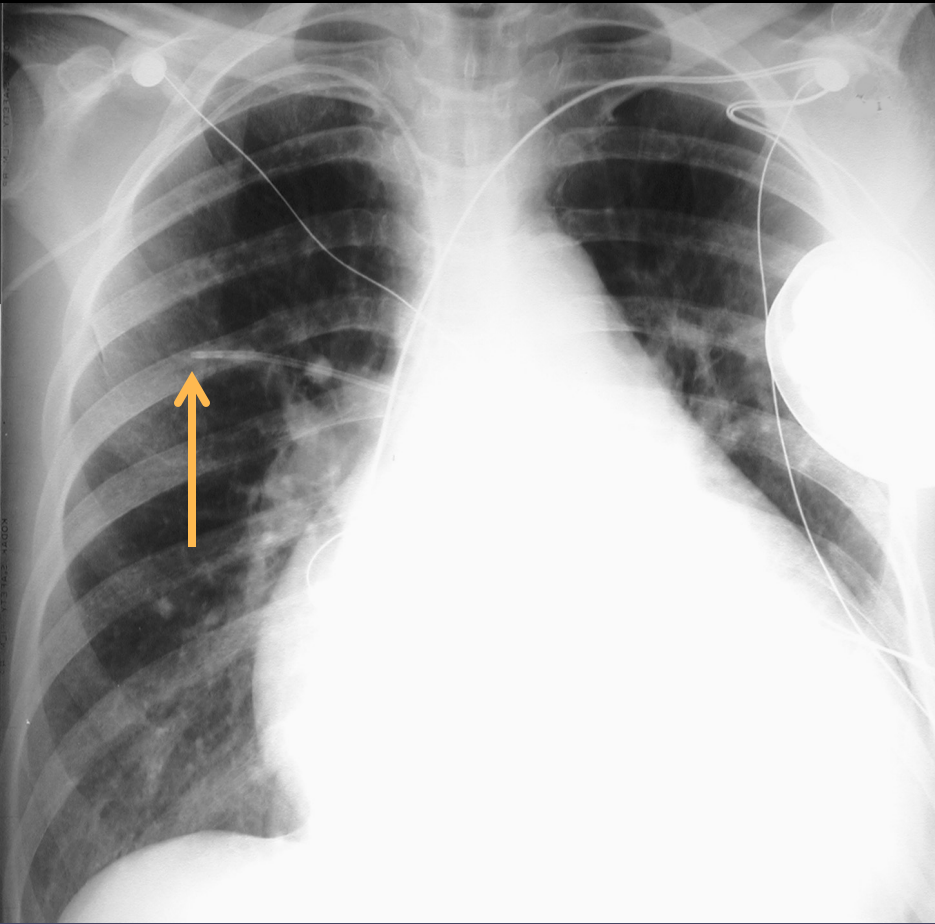


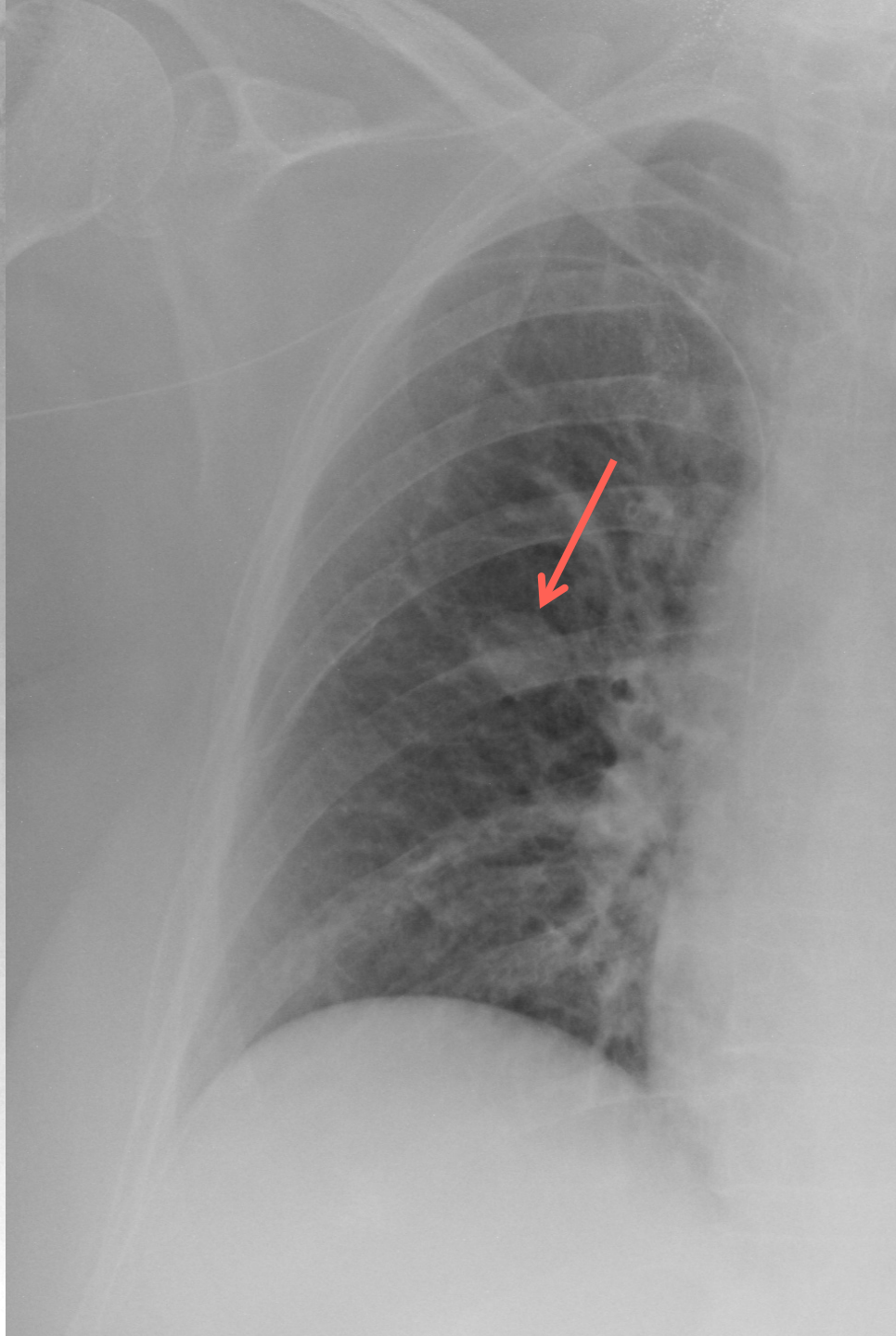
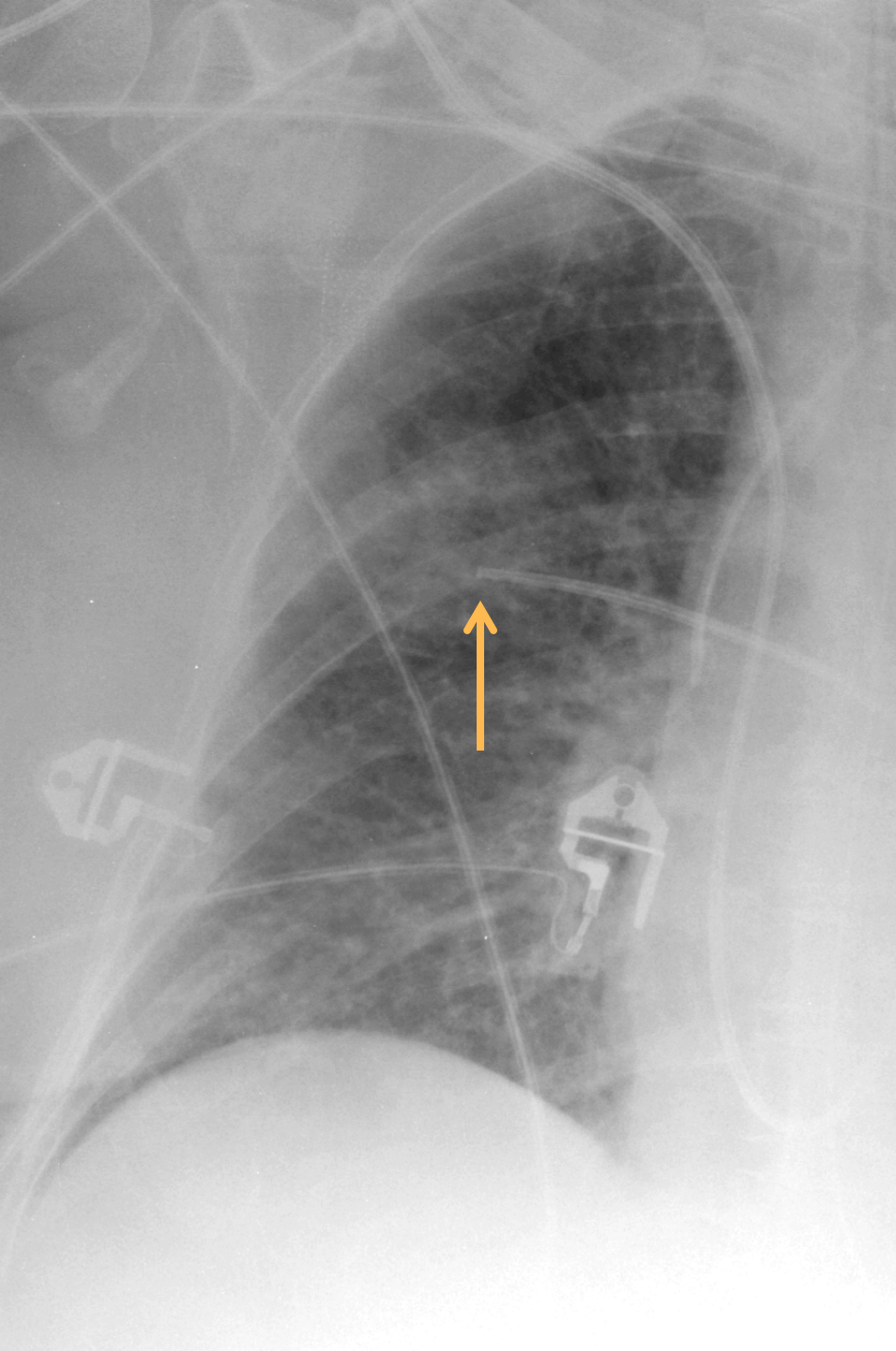


R PA

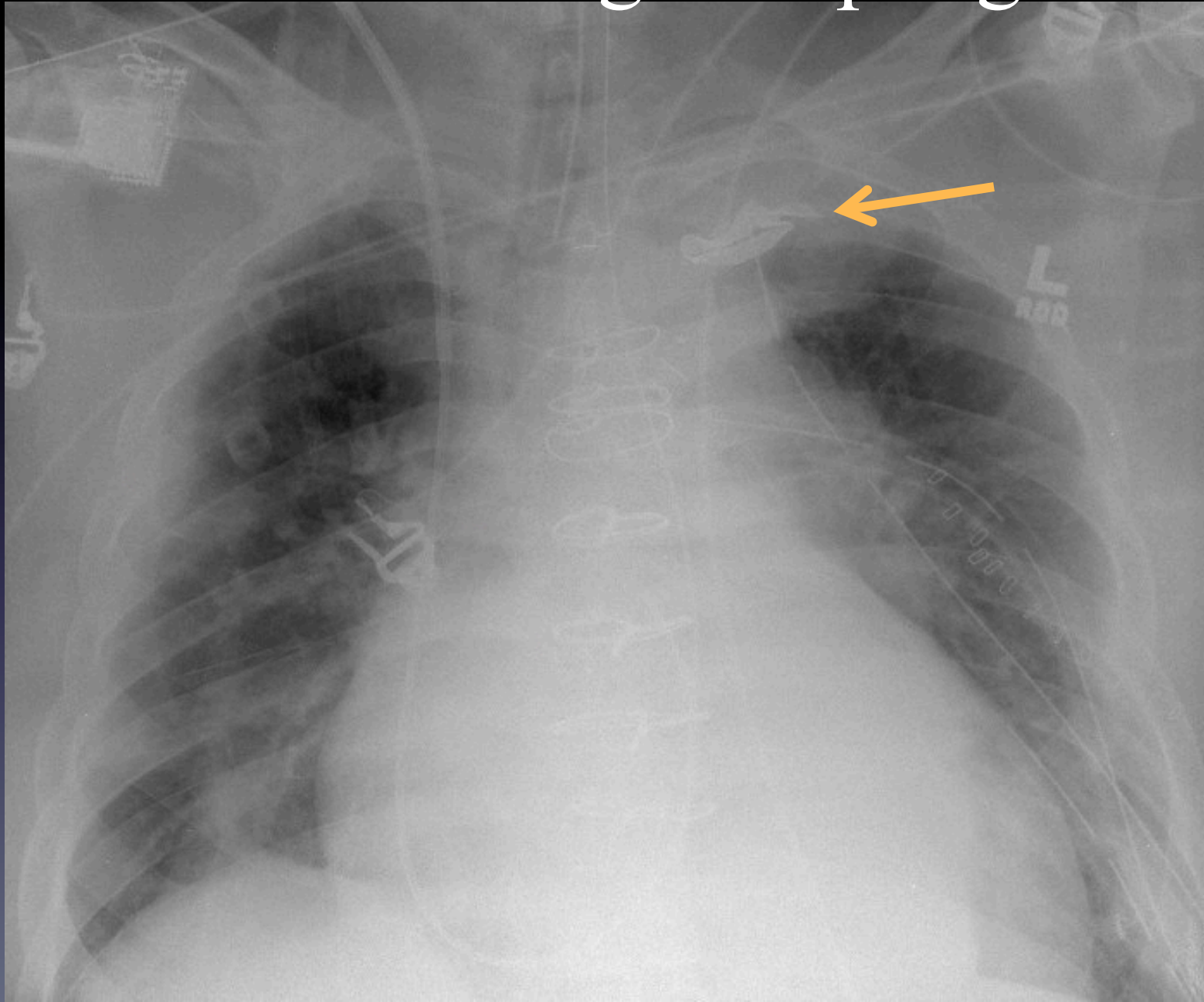


R interlobar PA

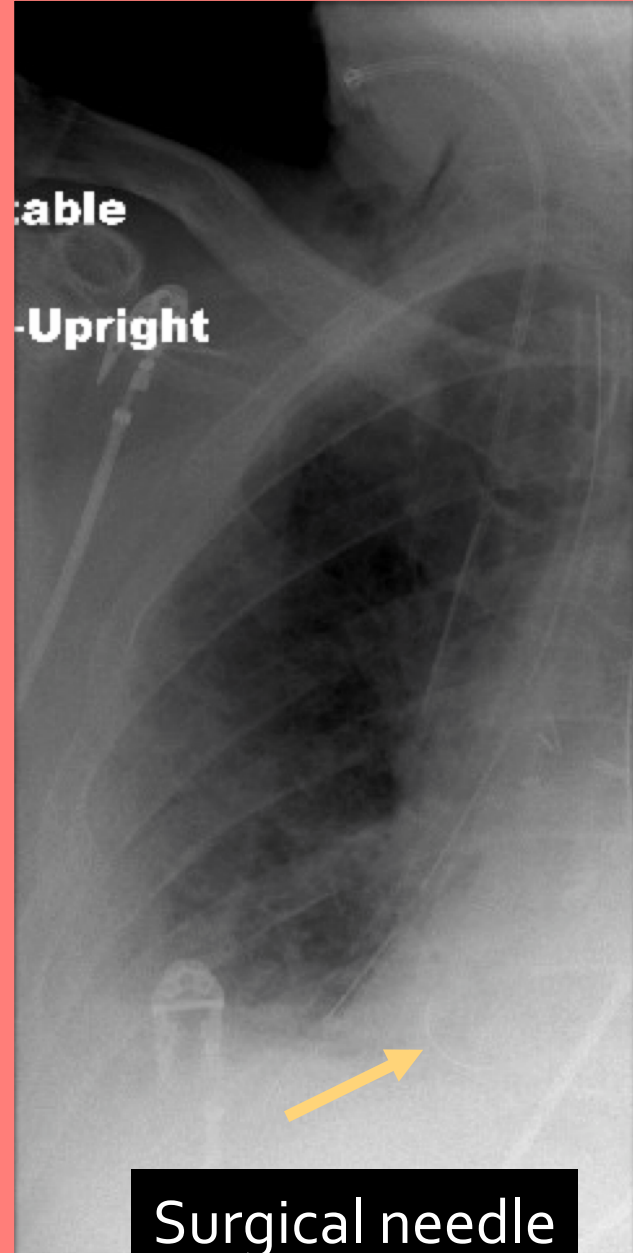
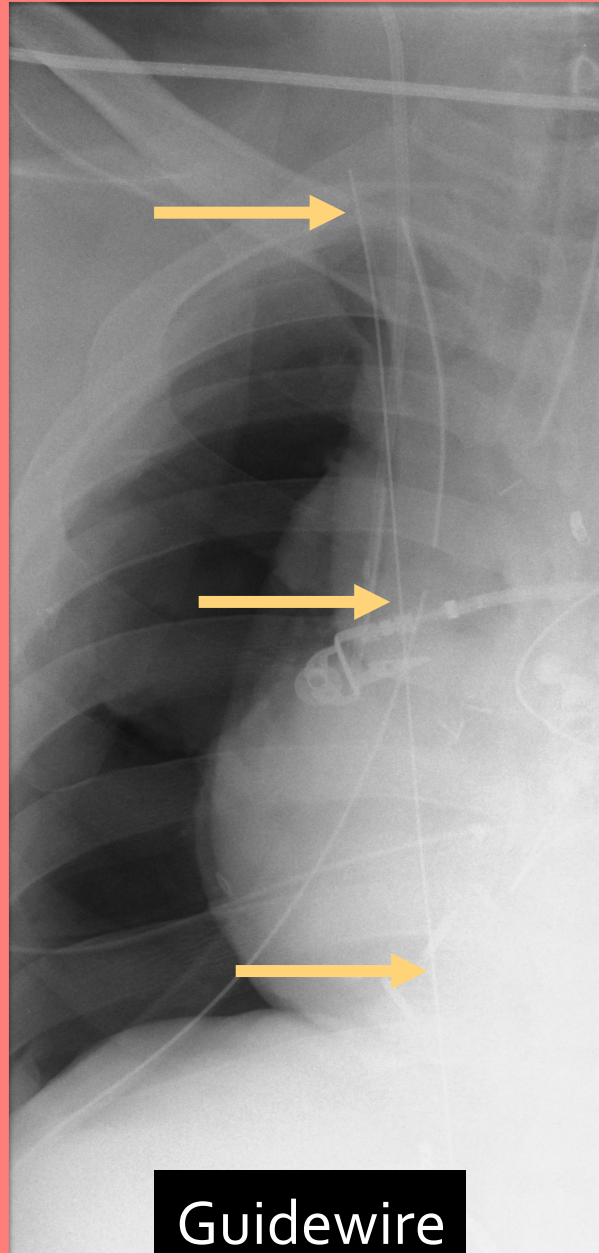
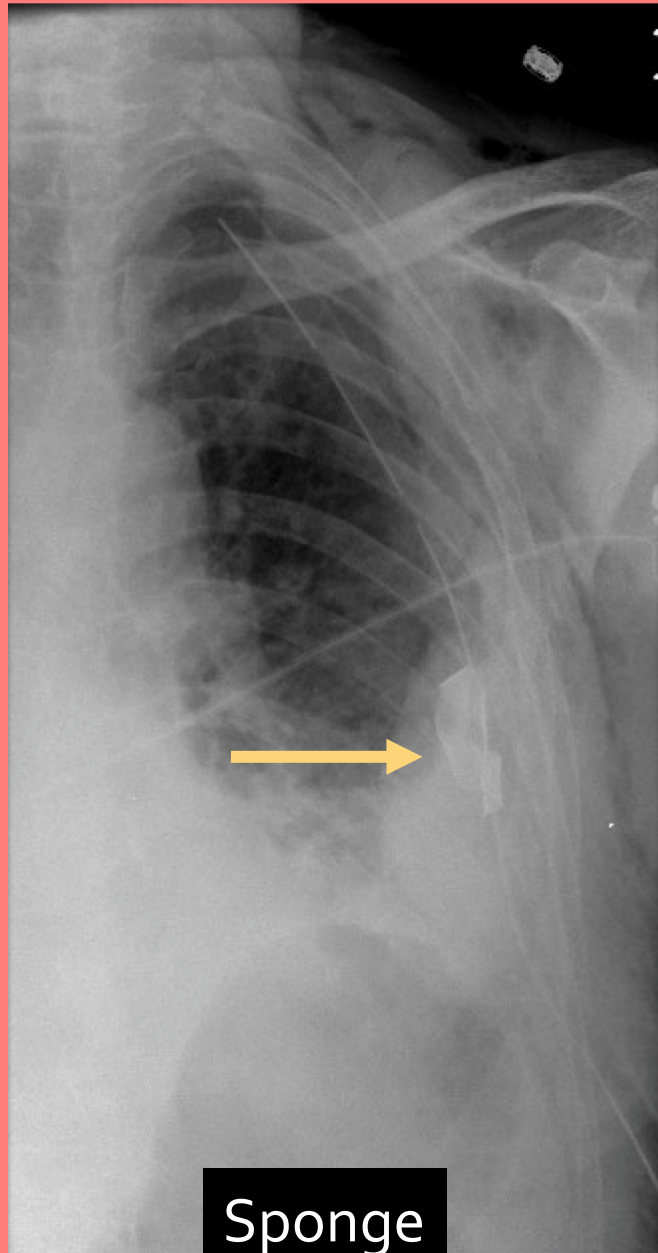




Retained surgical sponge



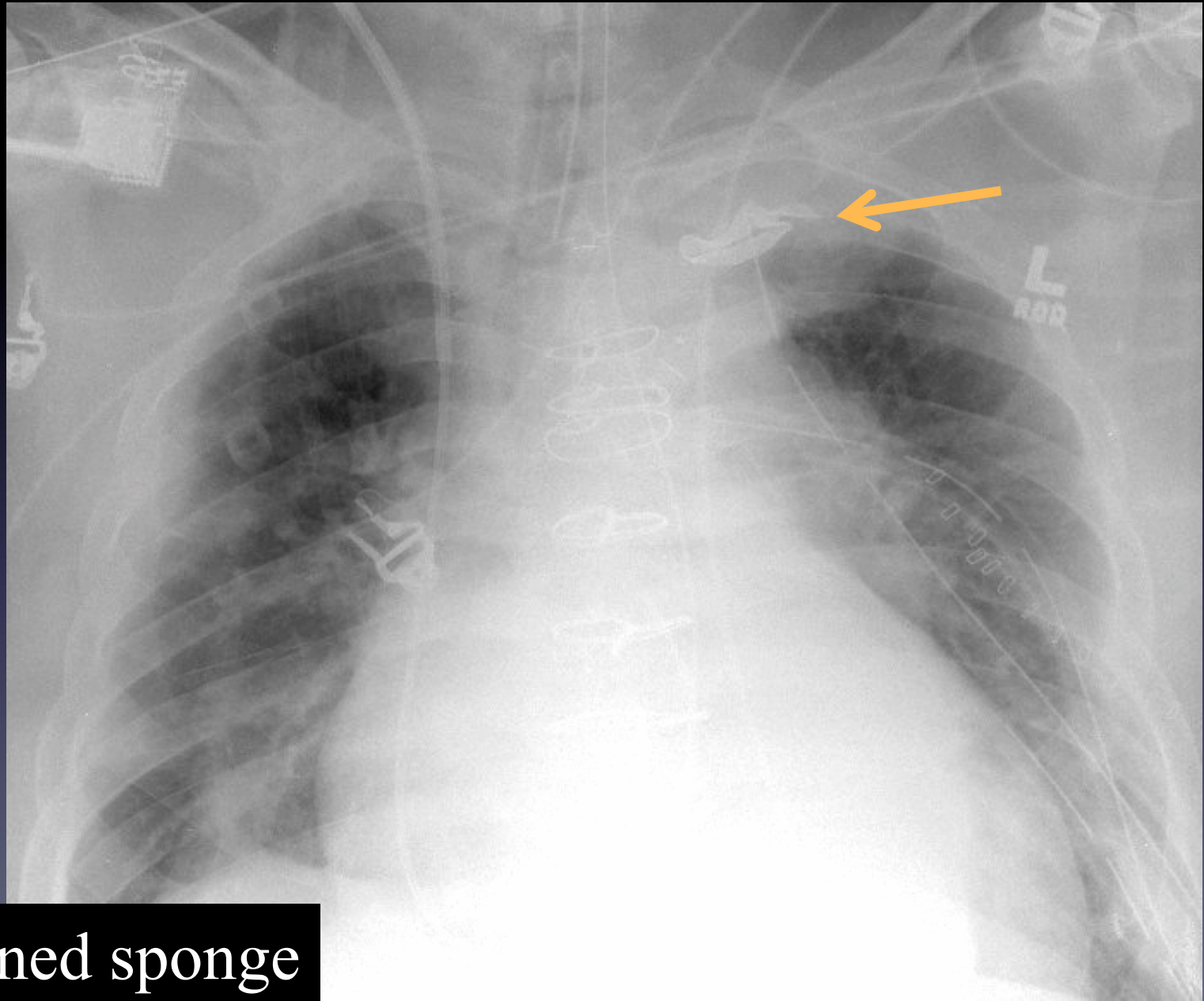
Foreign bodies



Checklist

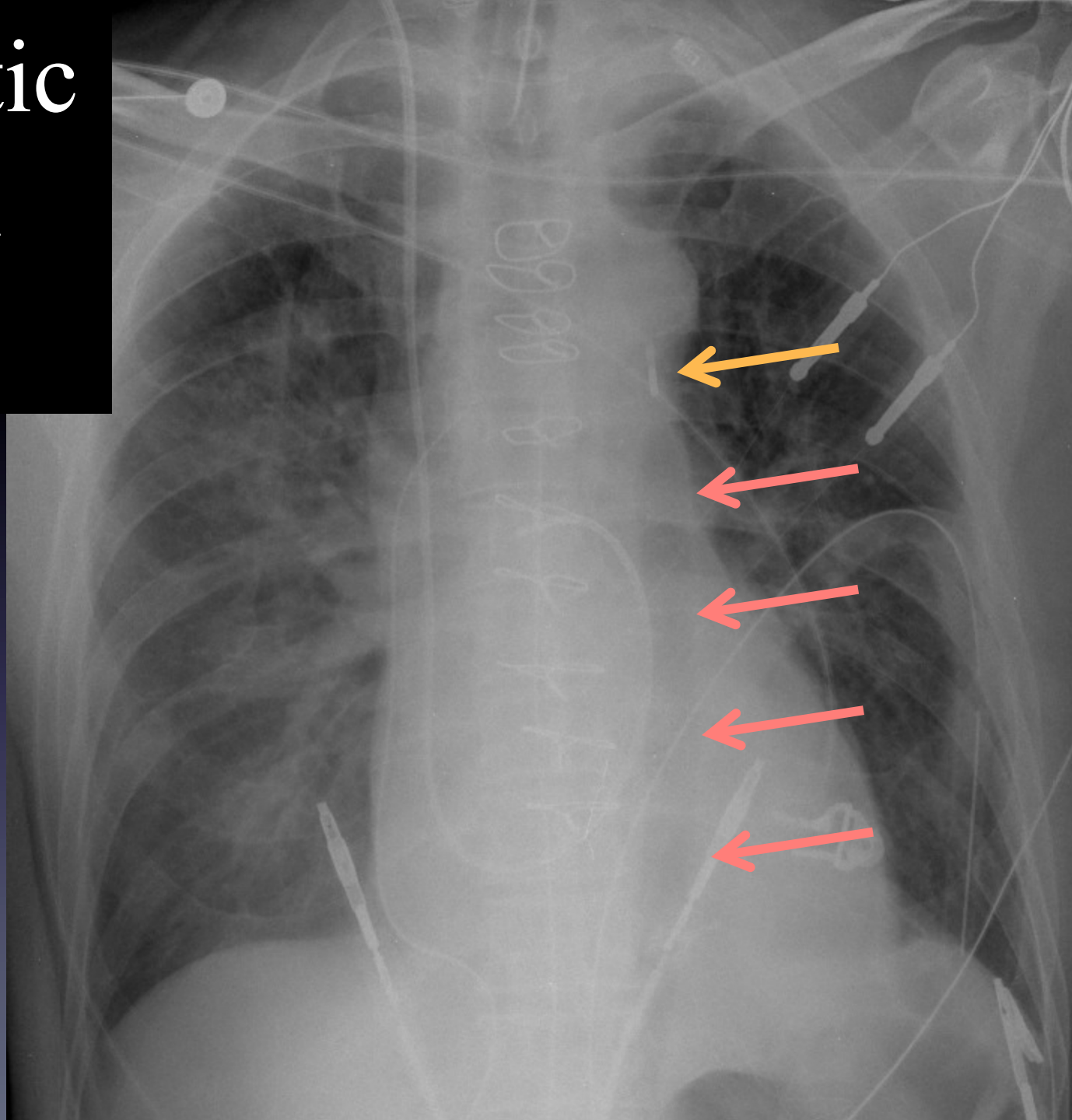
Lines and tubes

Unknown case #2

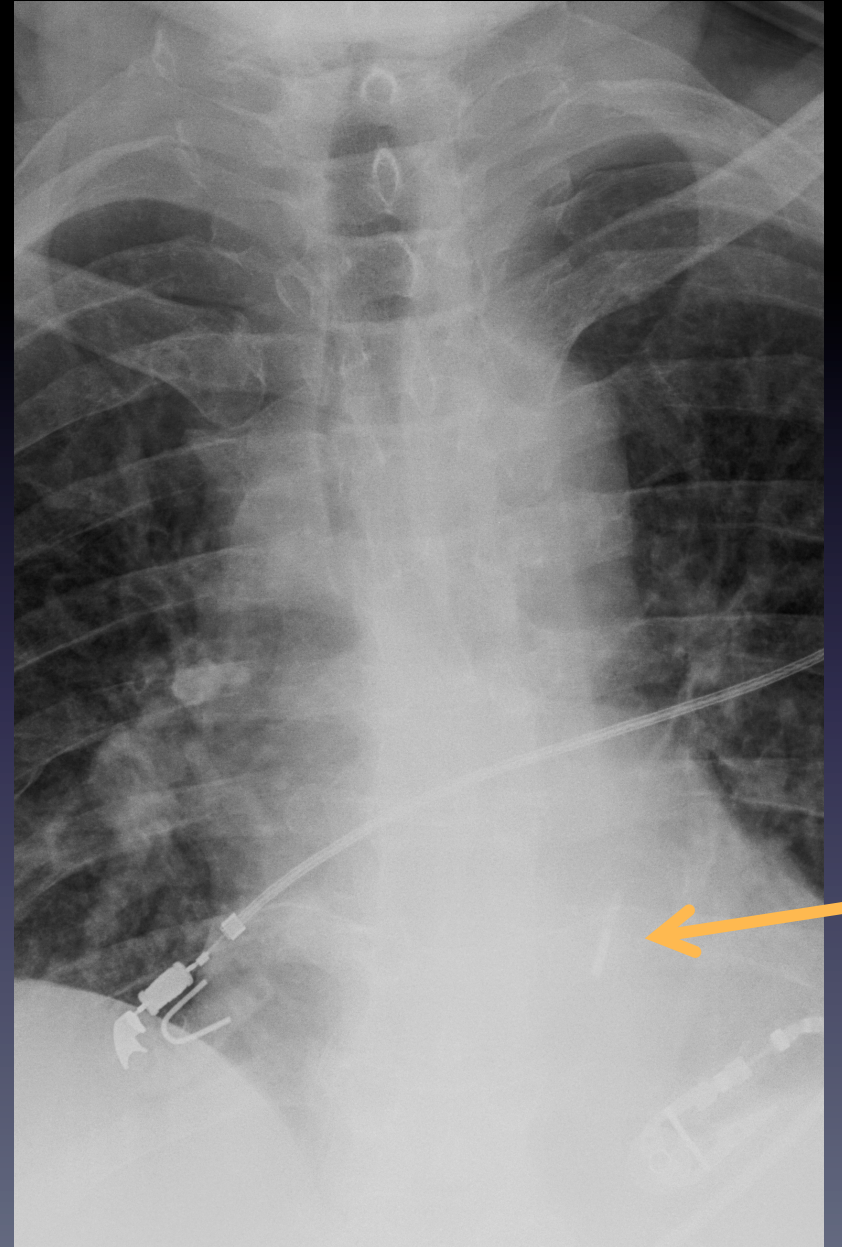
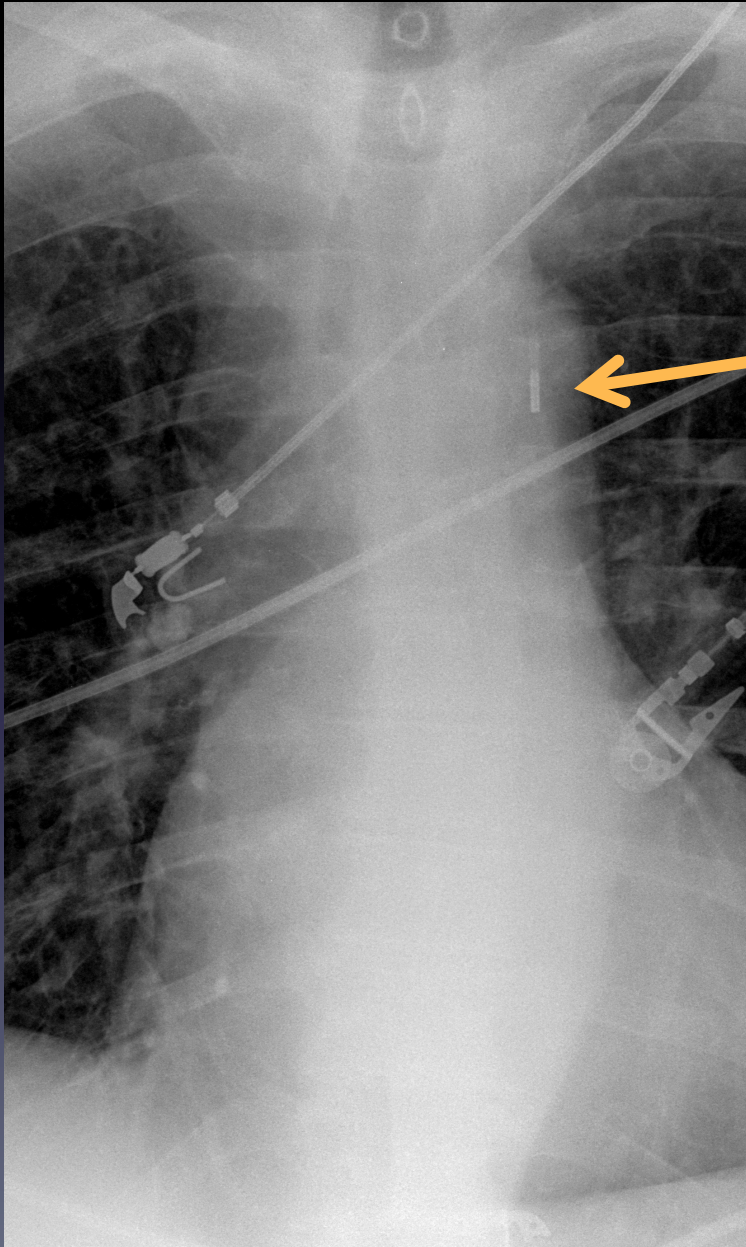


Retained sponge

Intra-aortic balloon pump



Intra-aortic balloon pump

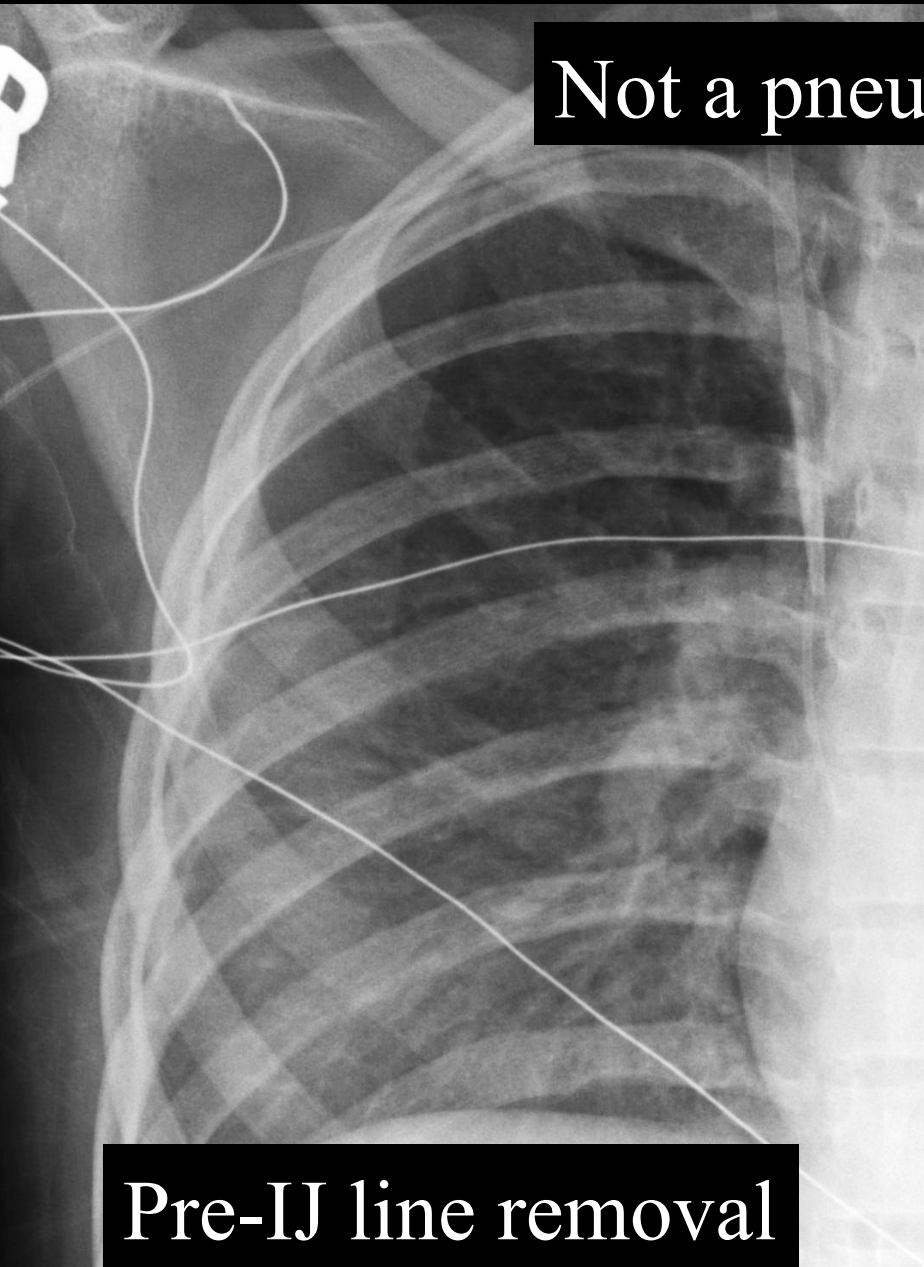


Checklist

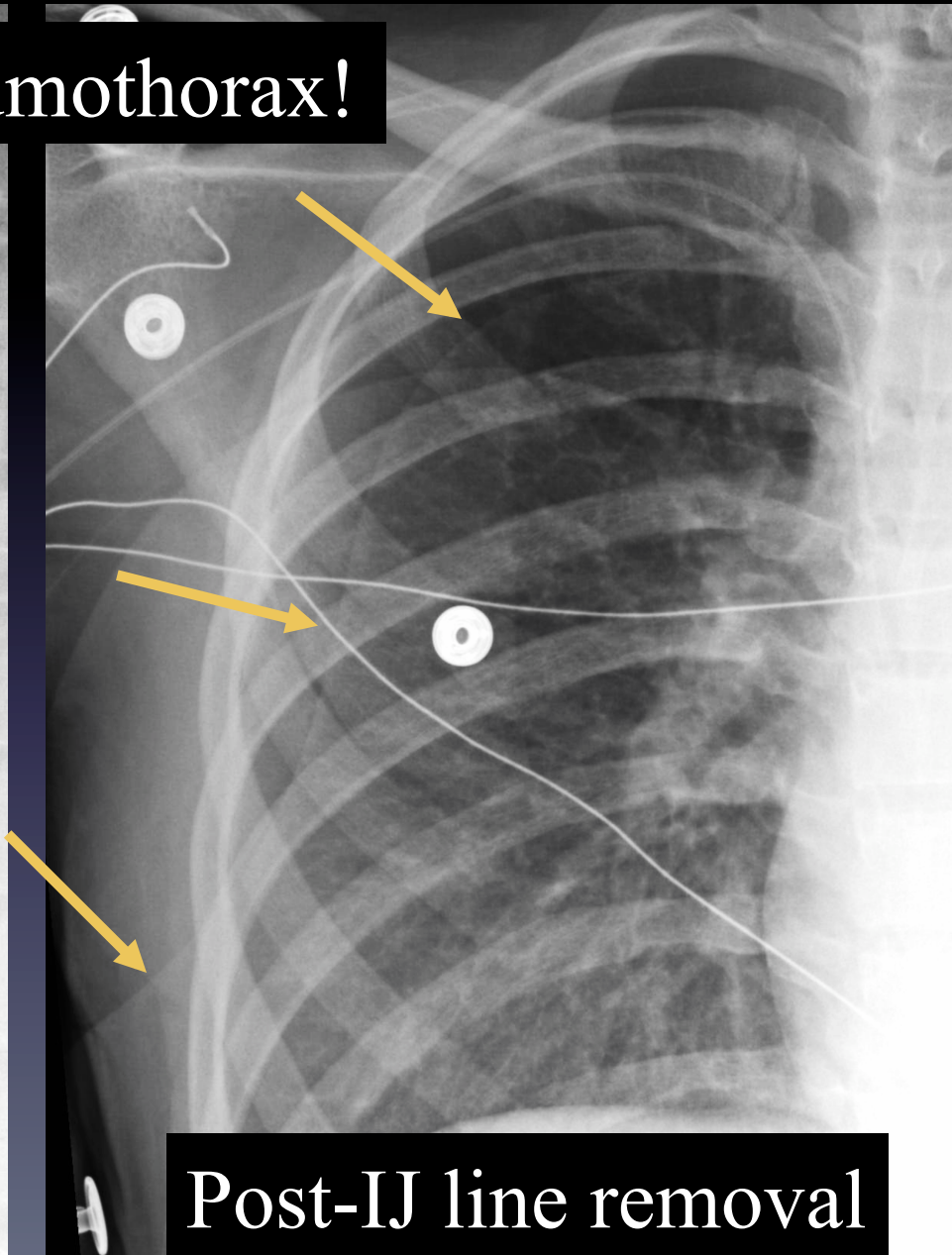
- Lines and tubes
- Foreign bodies

Unknown case #3

Not a pneumothorax!

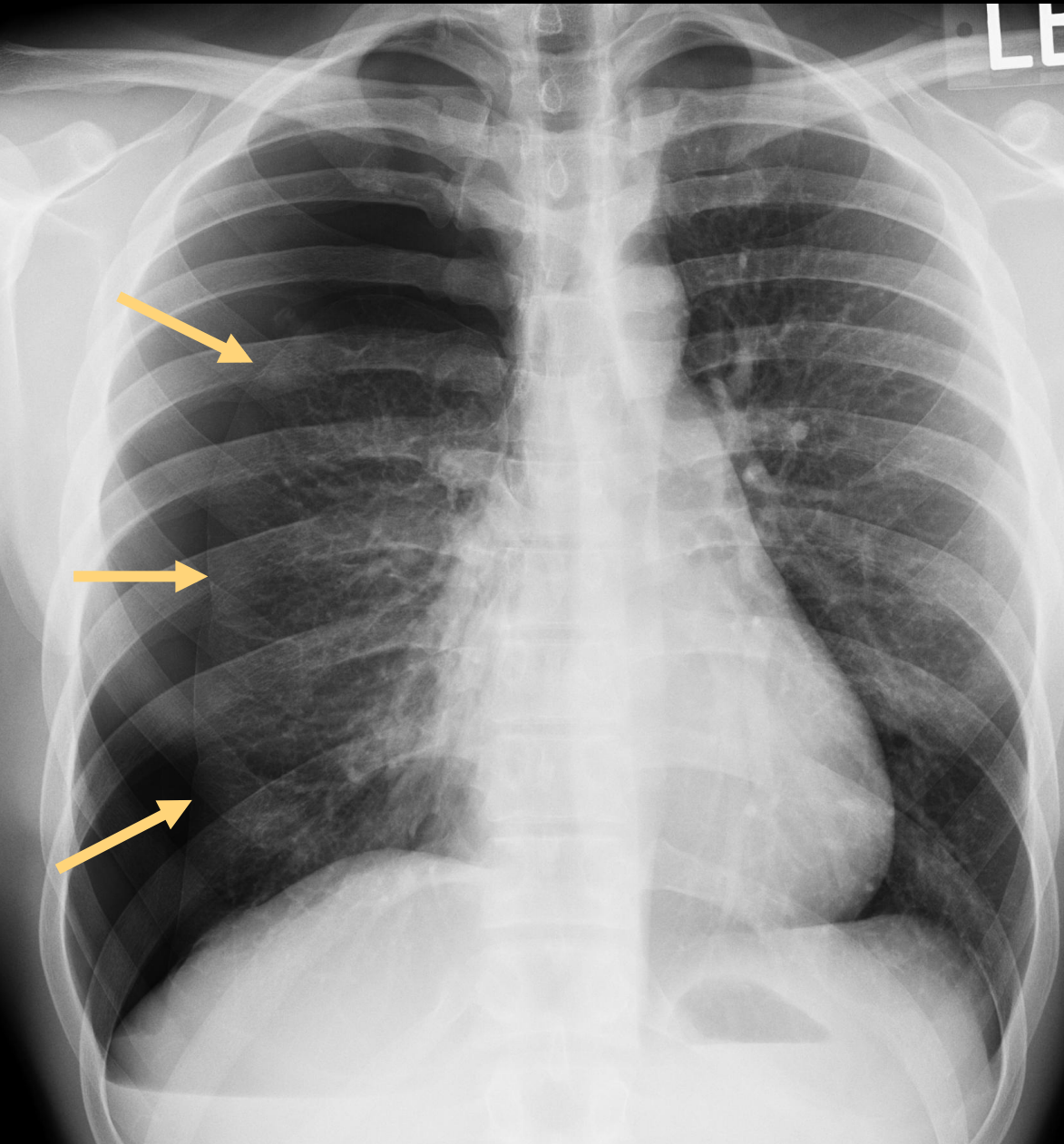


Pre-IJ line removal



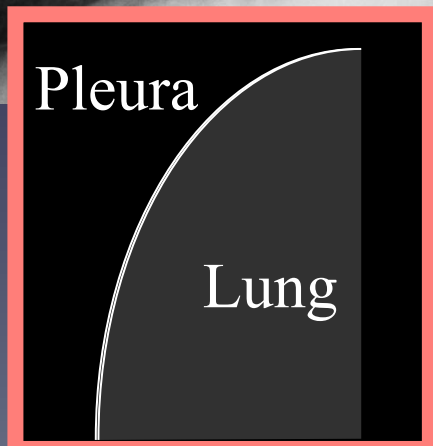
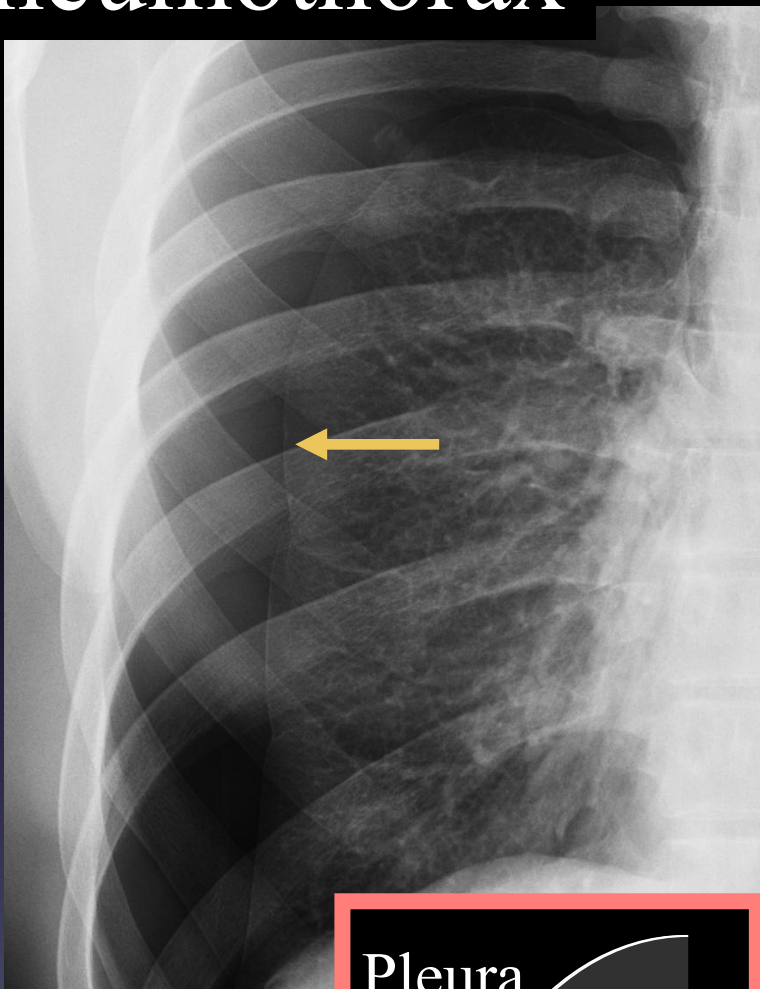
Post-IJ line removal

Pneumothorax

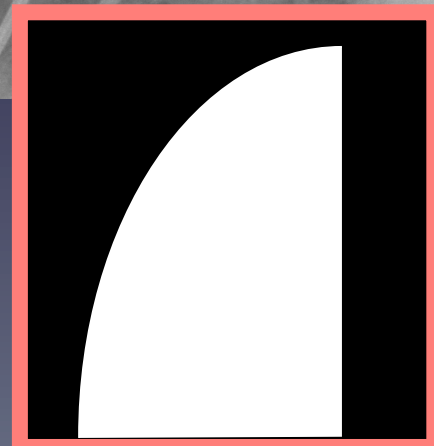
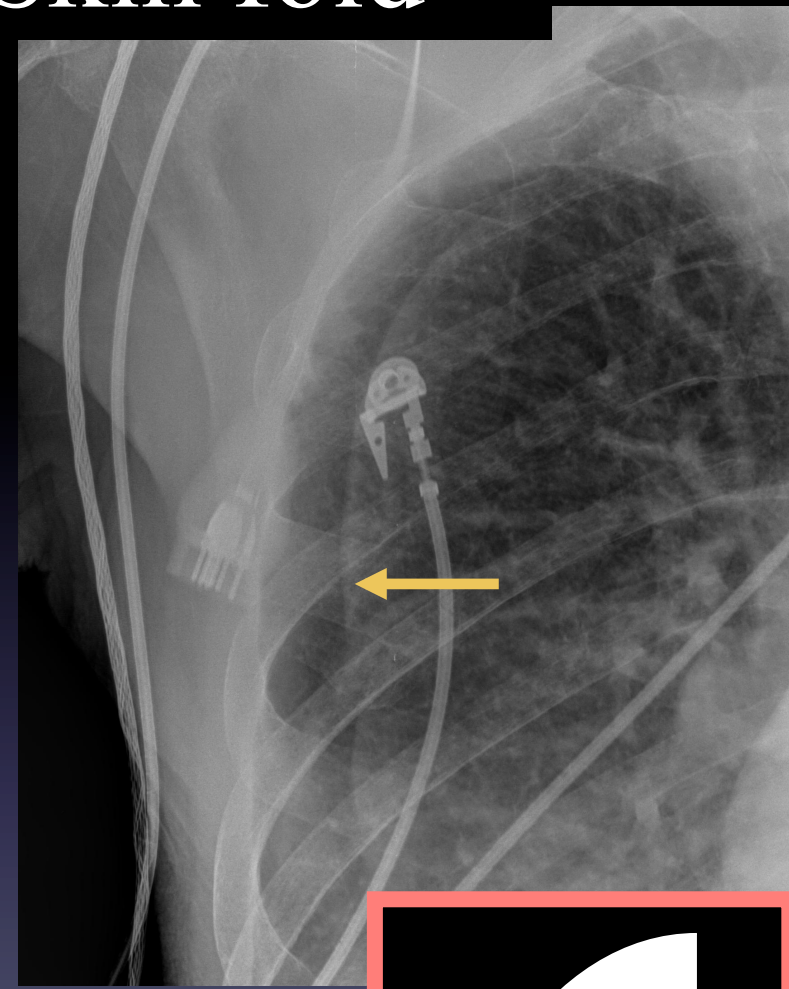


- Features
 - Pleural line
 - No vessels laterally
 - No extension across midline or outside ribs
- Causes in ICU
 - Alveolar rupture
 - Iatrogenic
 - Ruptured bulla
 - Cavitory infection/
cancer

Pneumothorax



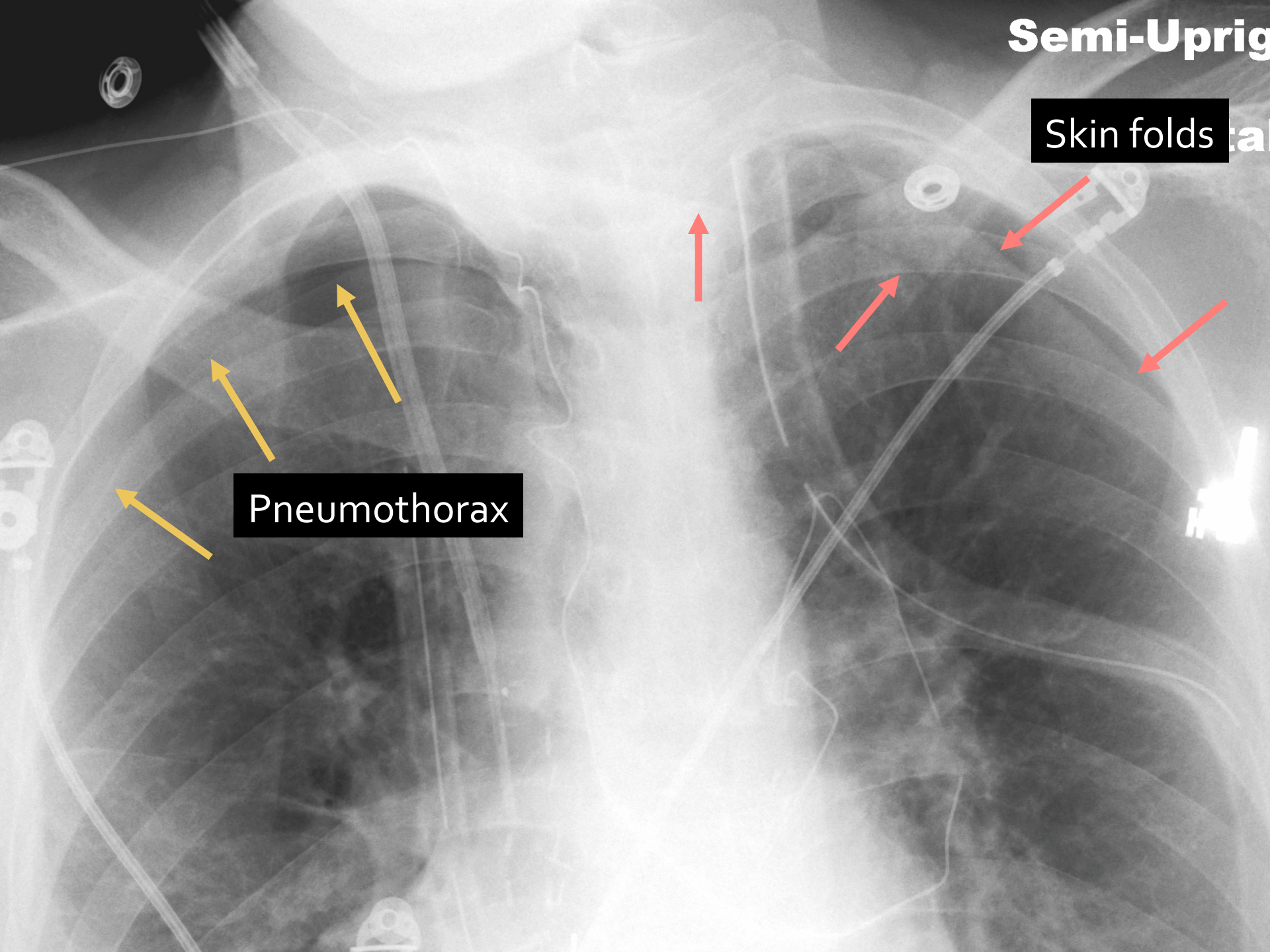
Skin fold



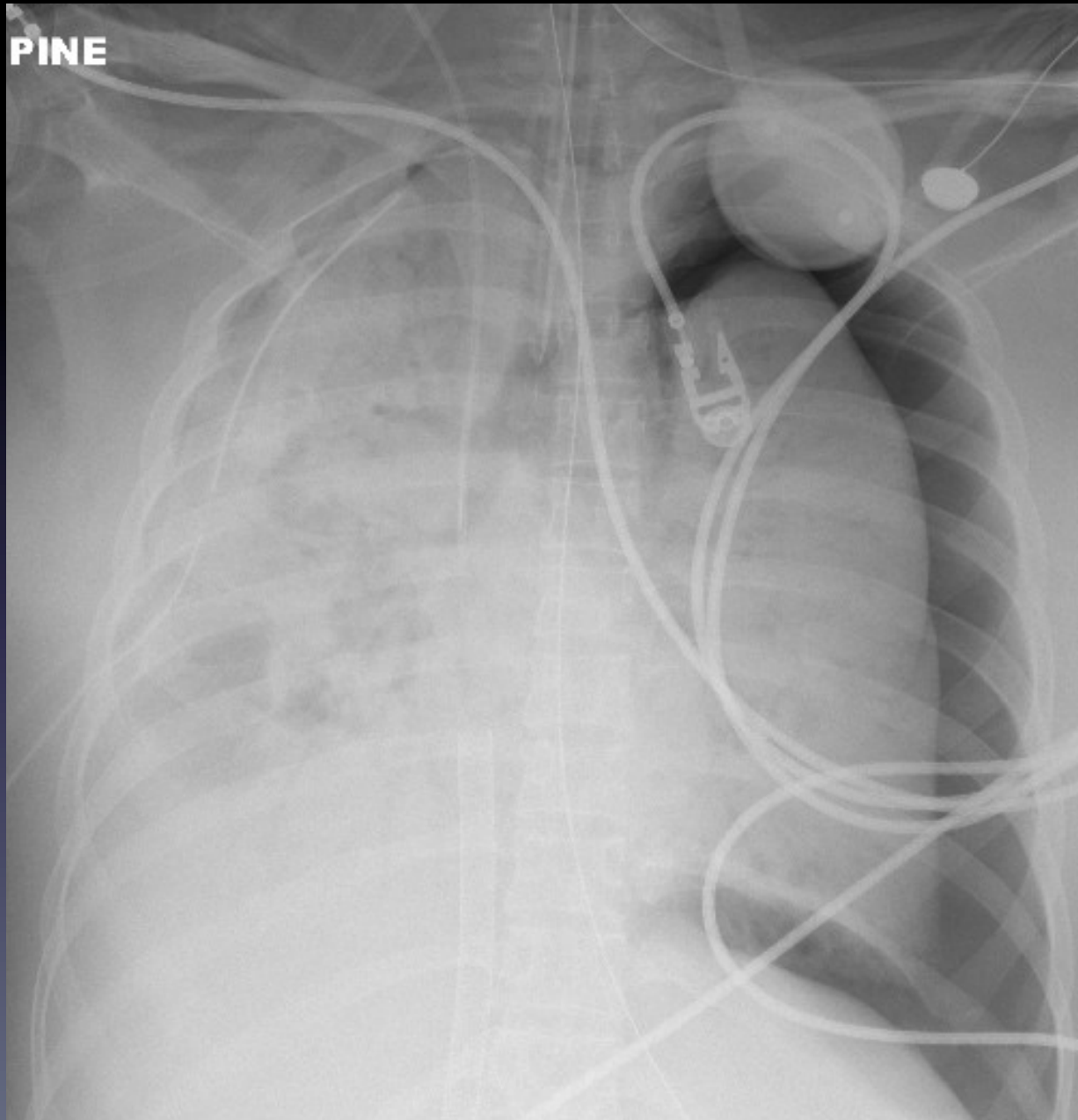
Semi-Upright

Skin folds

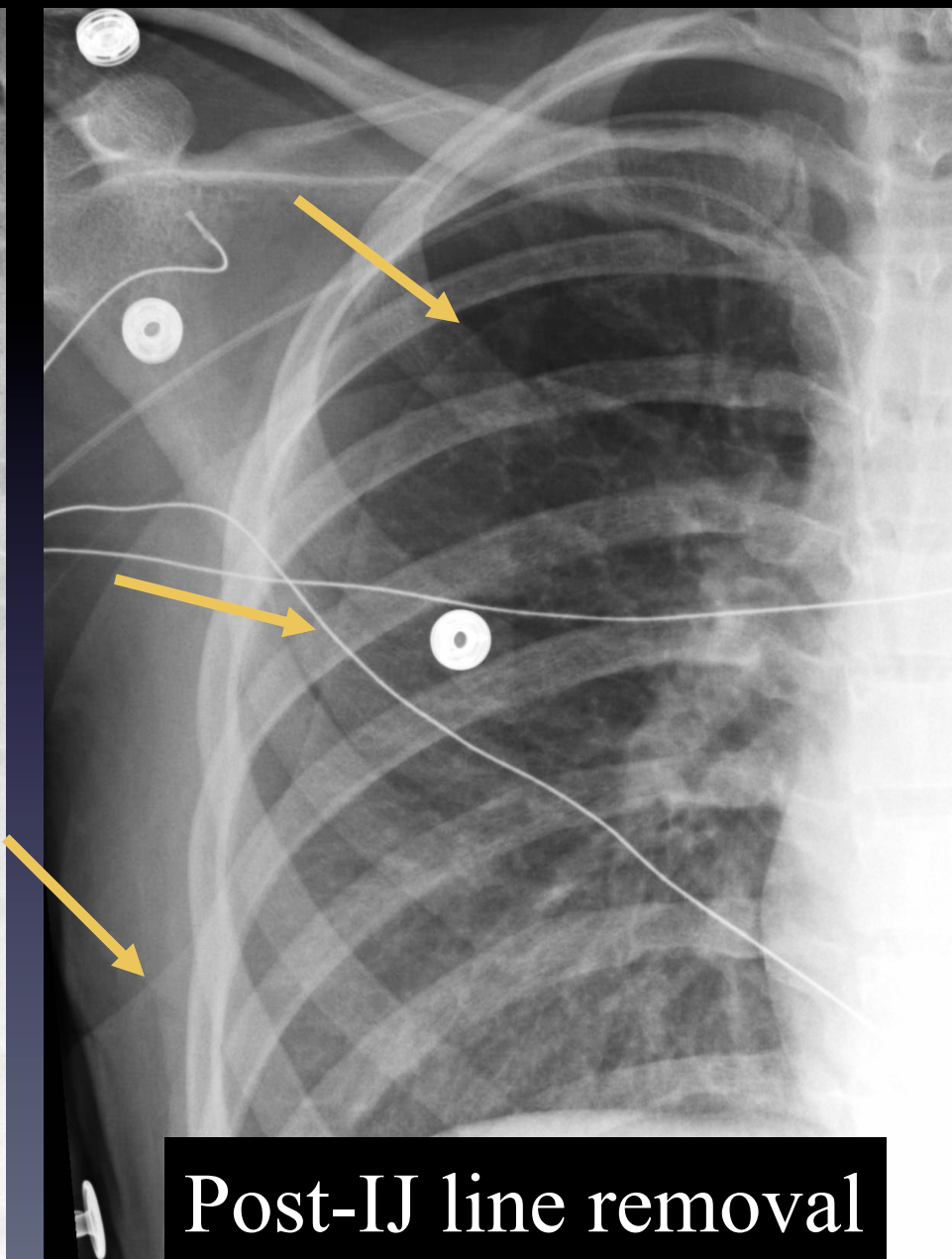
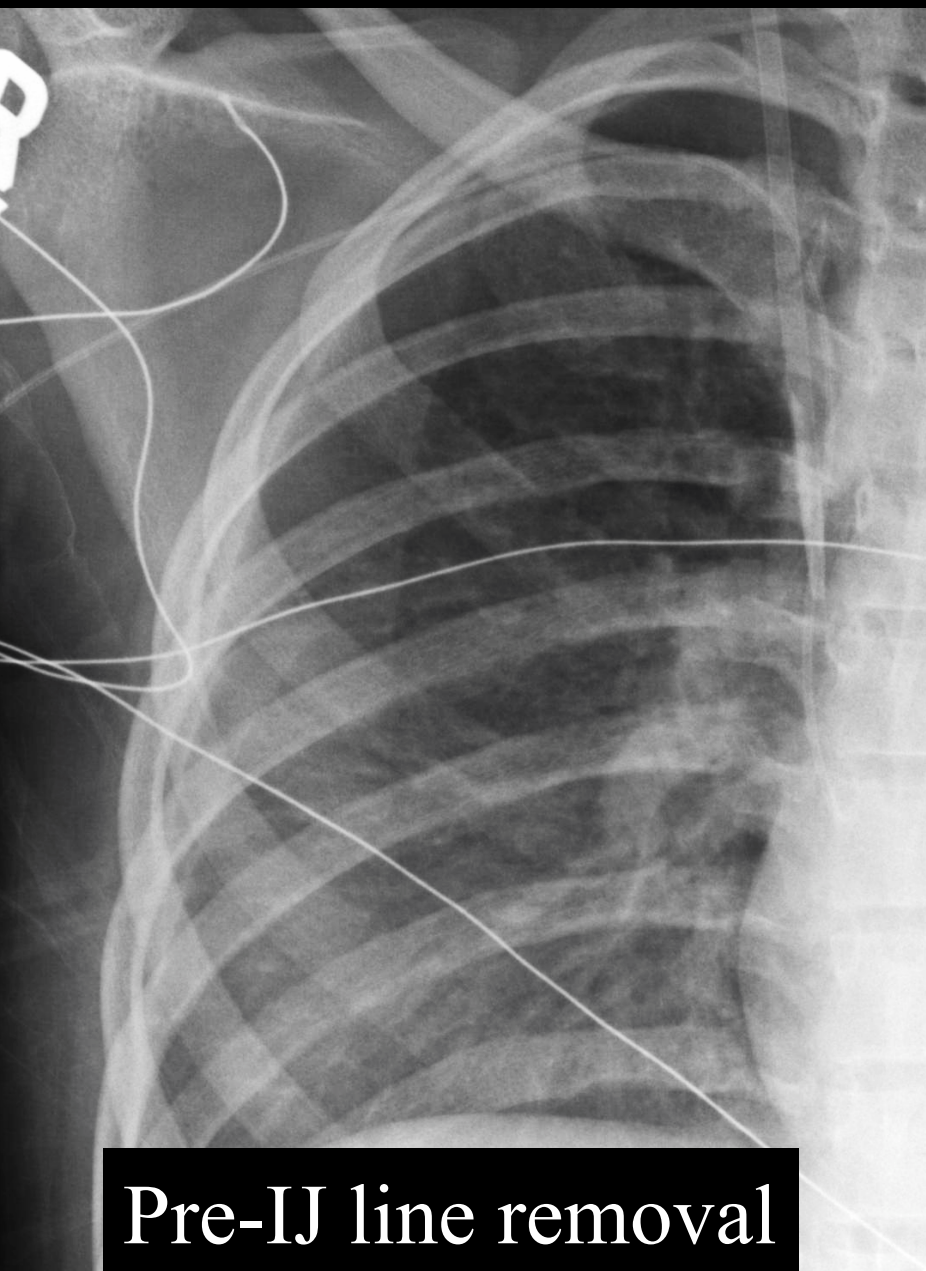
Pneumothorax



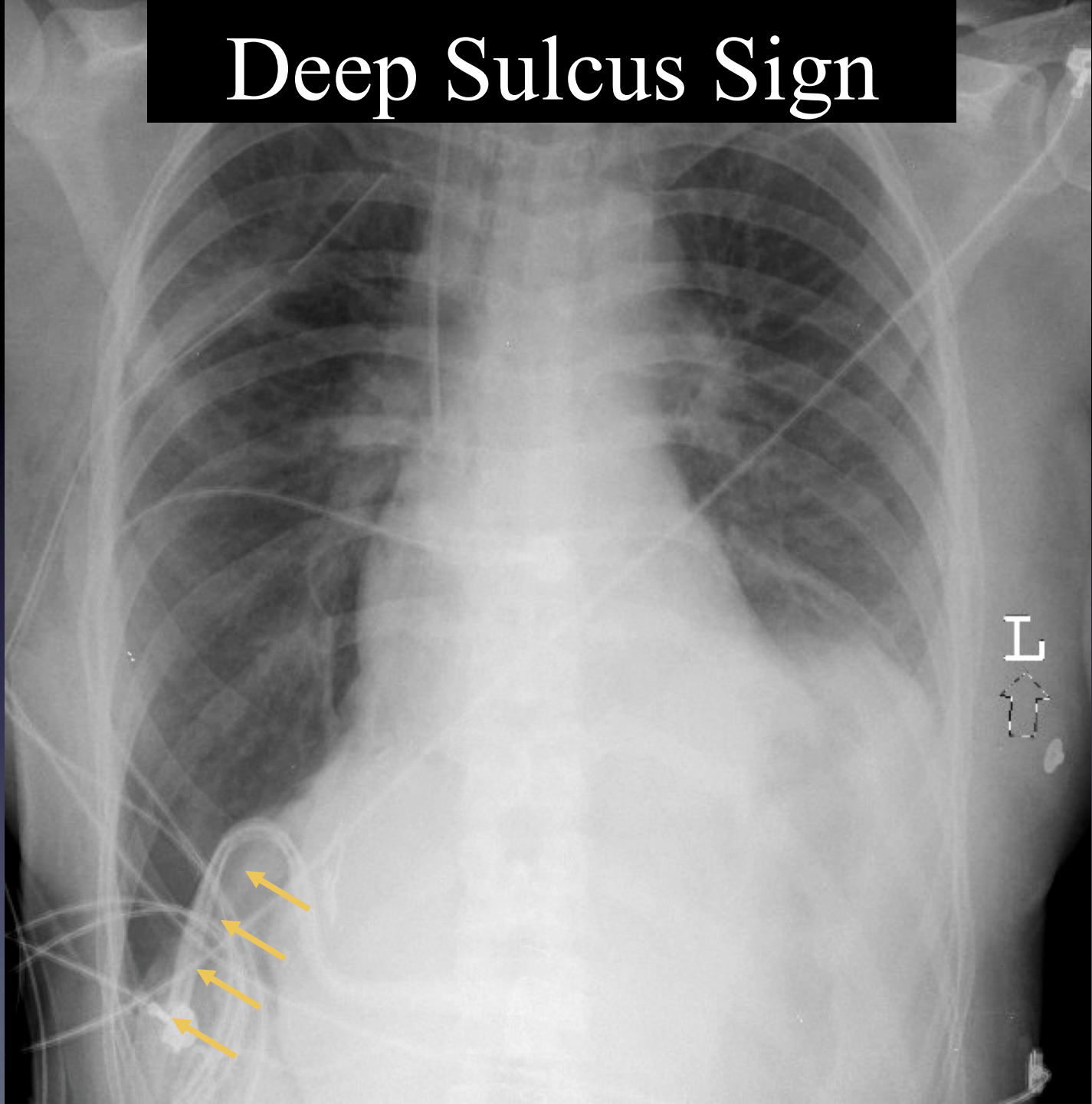
ARDS with pneumothorax

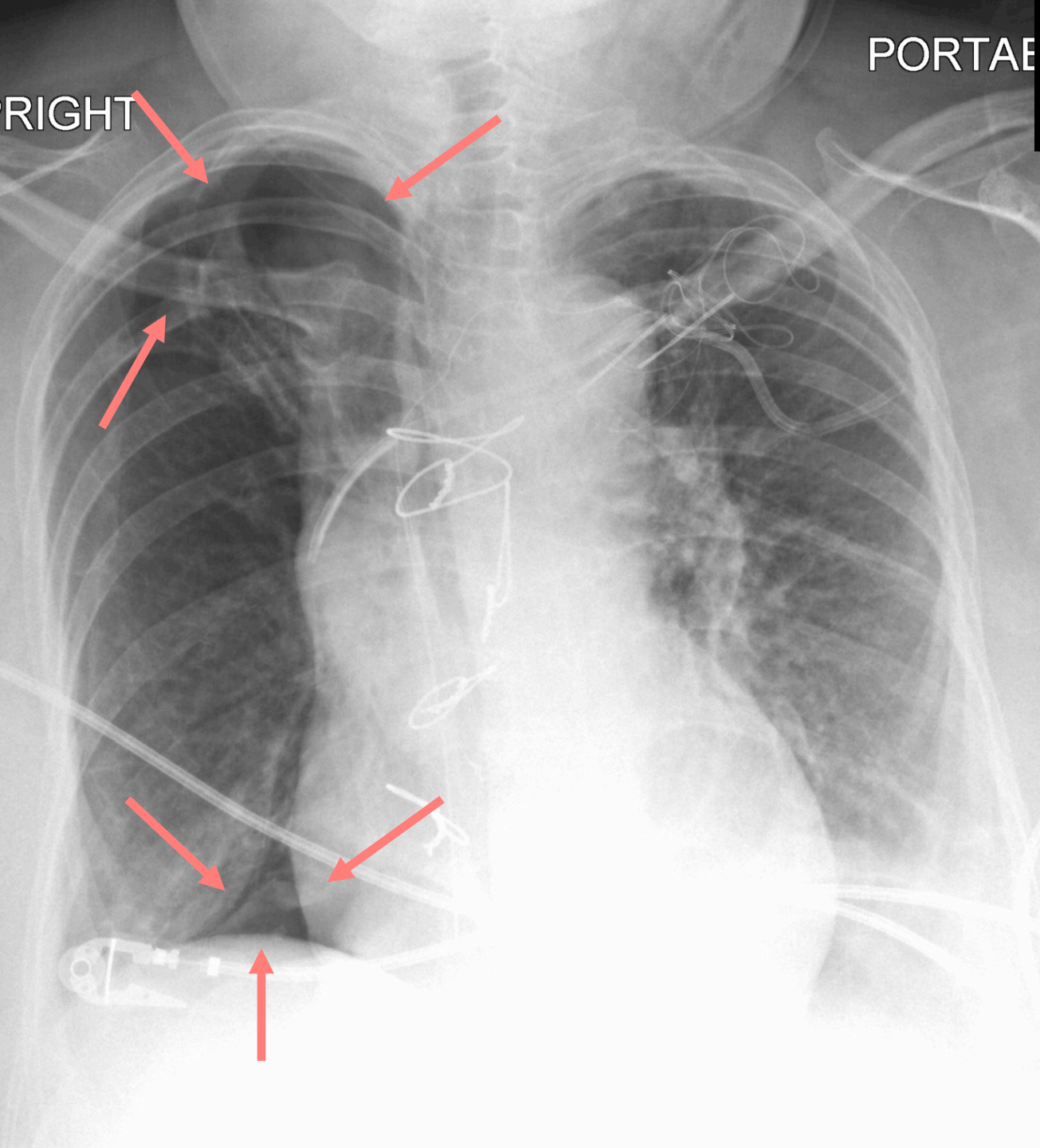


Line extends outside chest wall



Deep Sulcus Sign





PORTAL

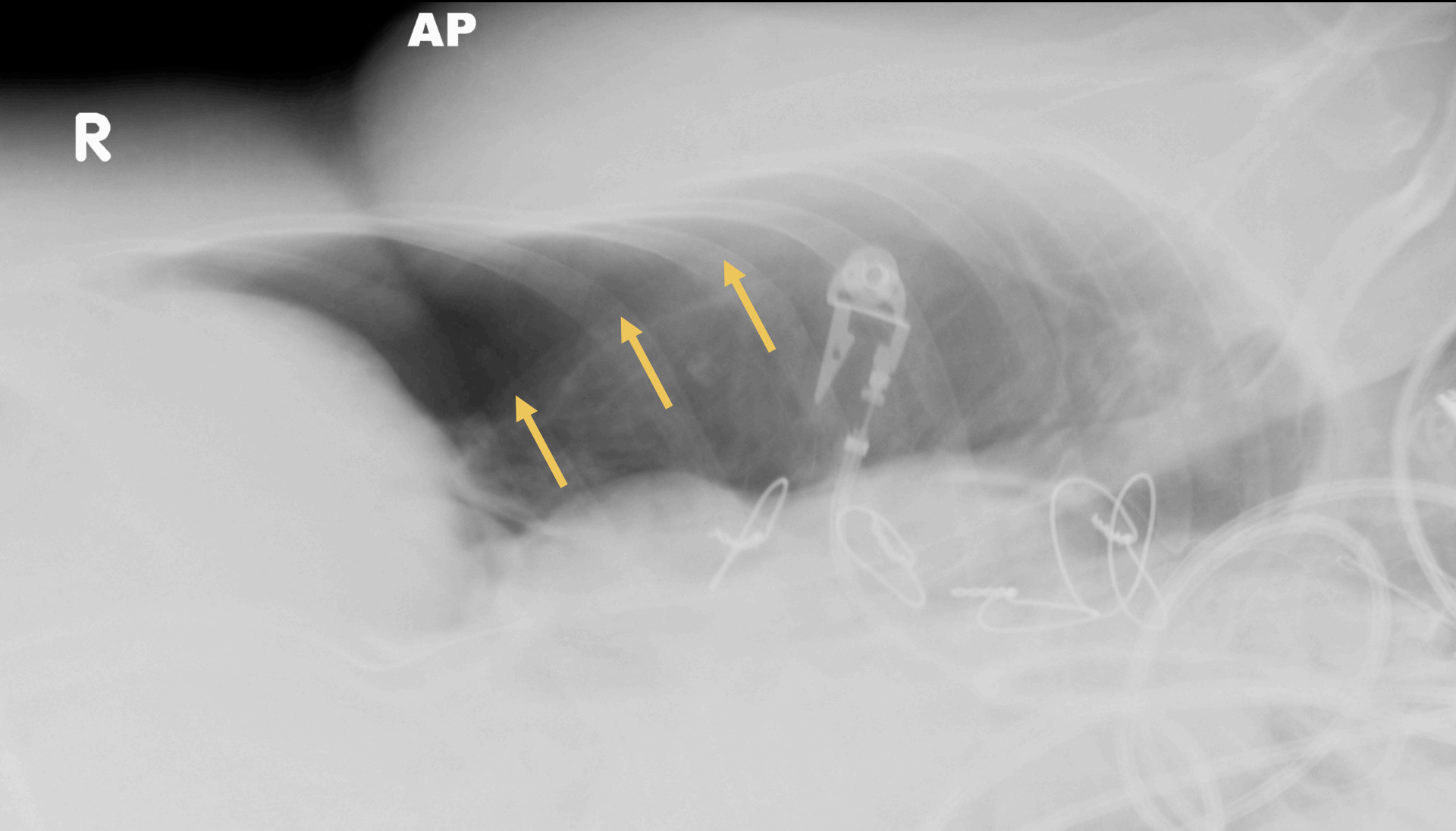
RIGHT

? PTX

Decubitus view

AP

R



R
EB

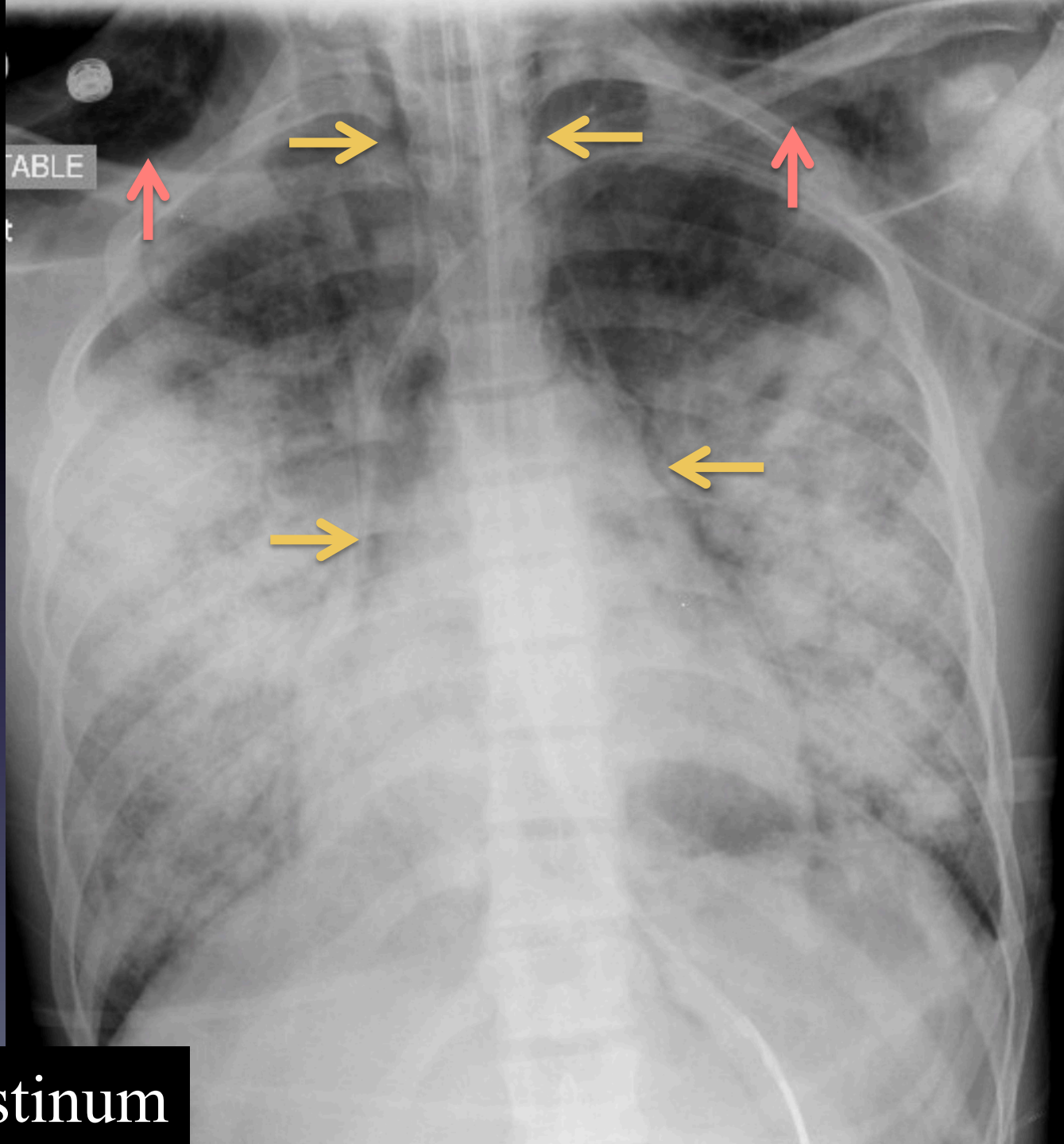
Tension pneumothorax



Checklist

- Lines and tubes
- Foreign bodies
- Pneumothorax

Unknown case #4



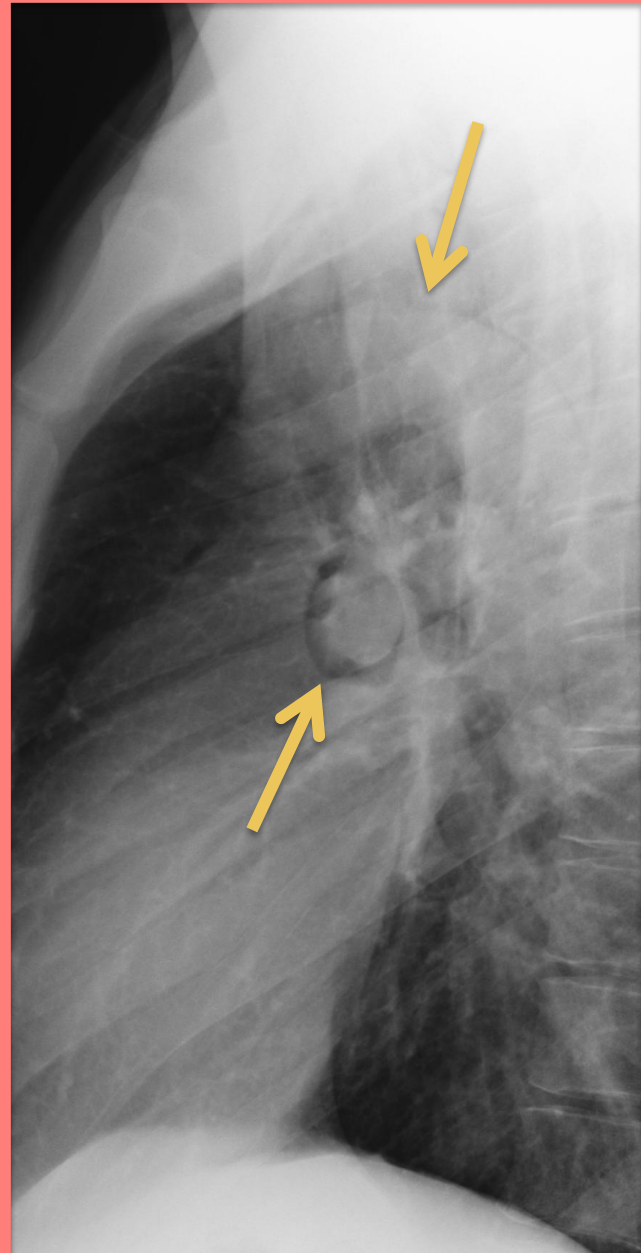
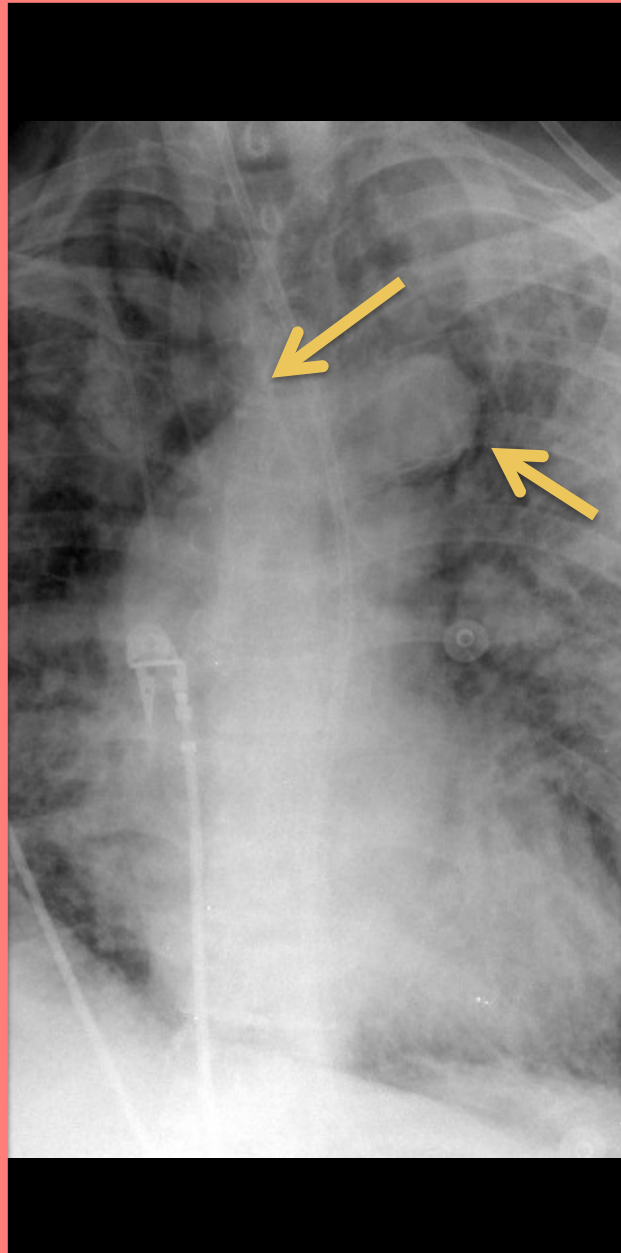
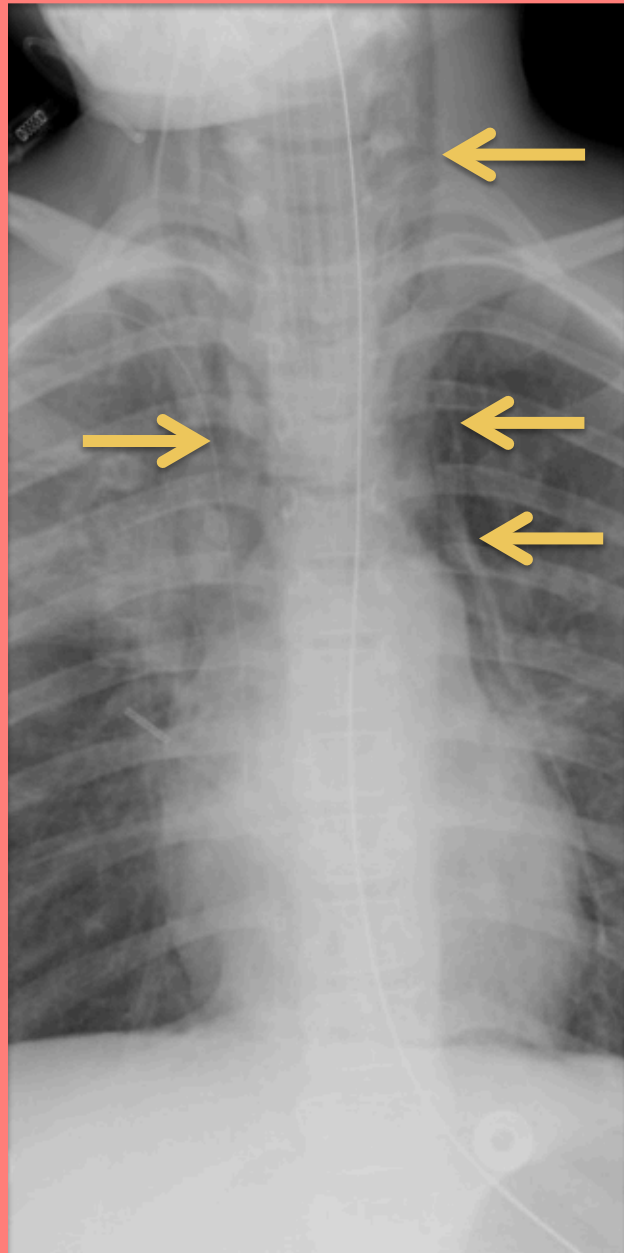
Pneumomediastinum

Pneumomediastinum



- Features
 - Vertically oriented linear lucencies
 - Vessels outlined by air
 - Double bronchial wall
 - Continuous diaphragm
- Sources of air in ICU
 - Lung (alveolar rupture)
 - Airway
 - Esophagus
 - Abdomen
 - Neck

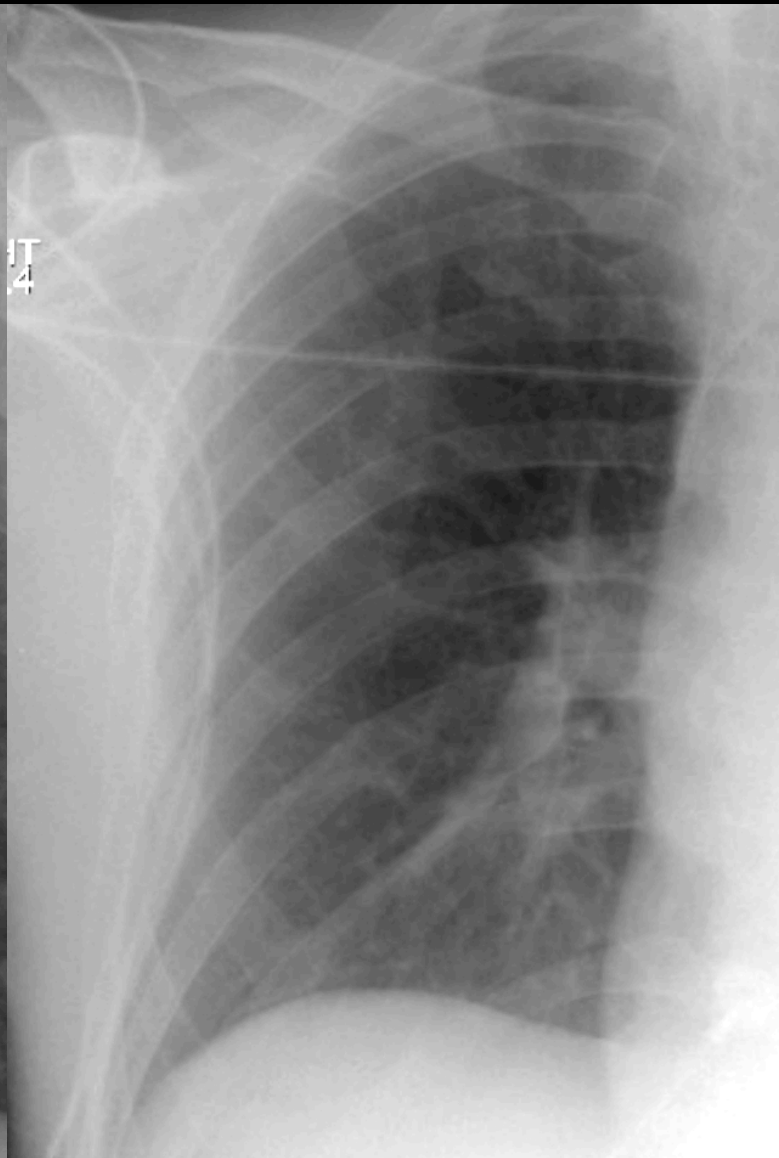
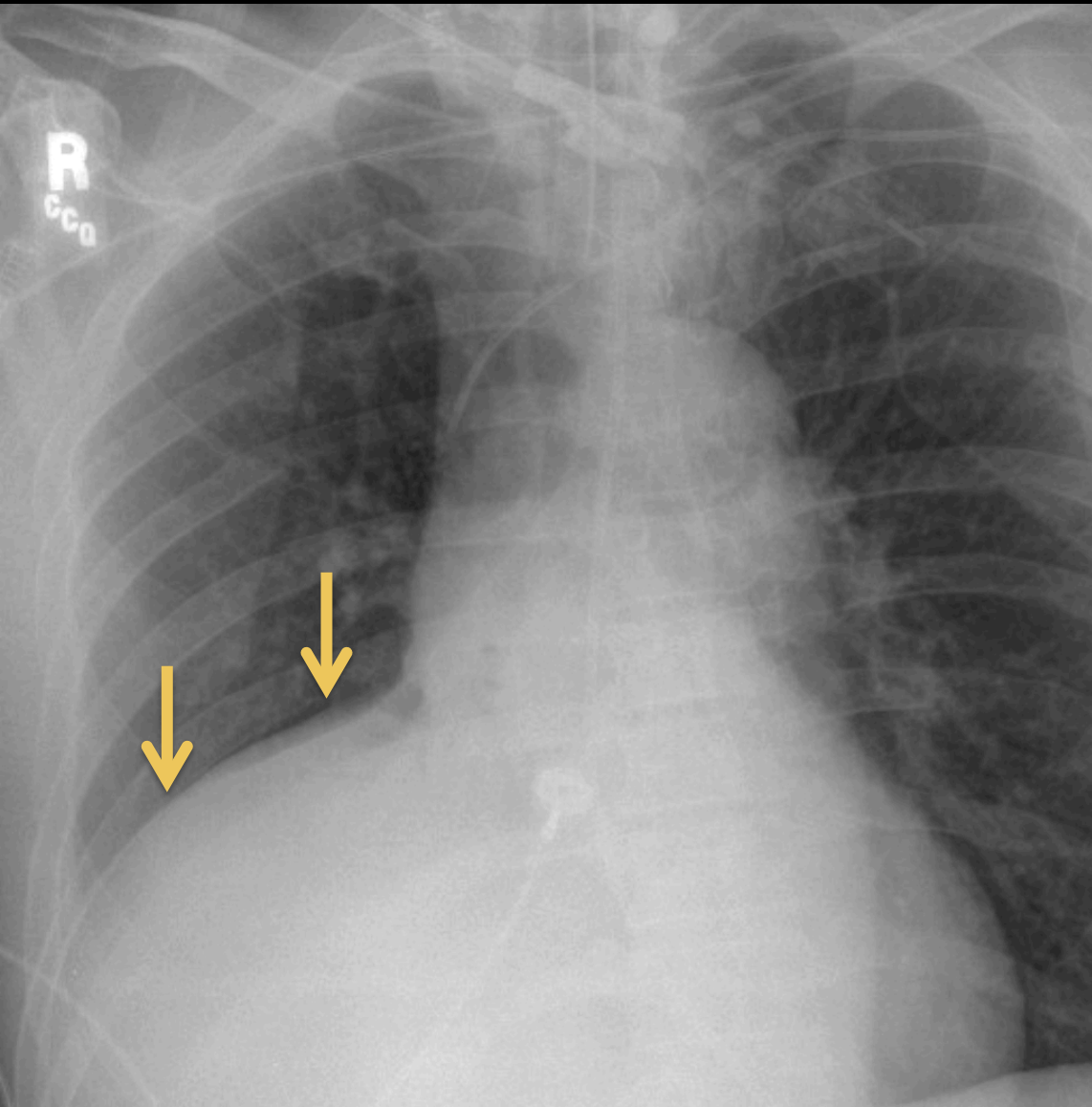
Pneumomediastinum



Checklist

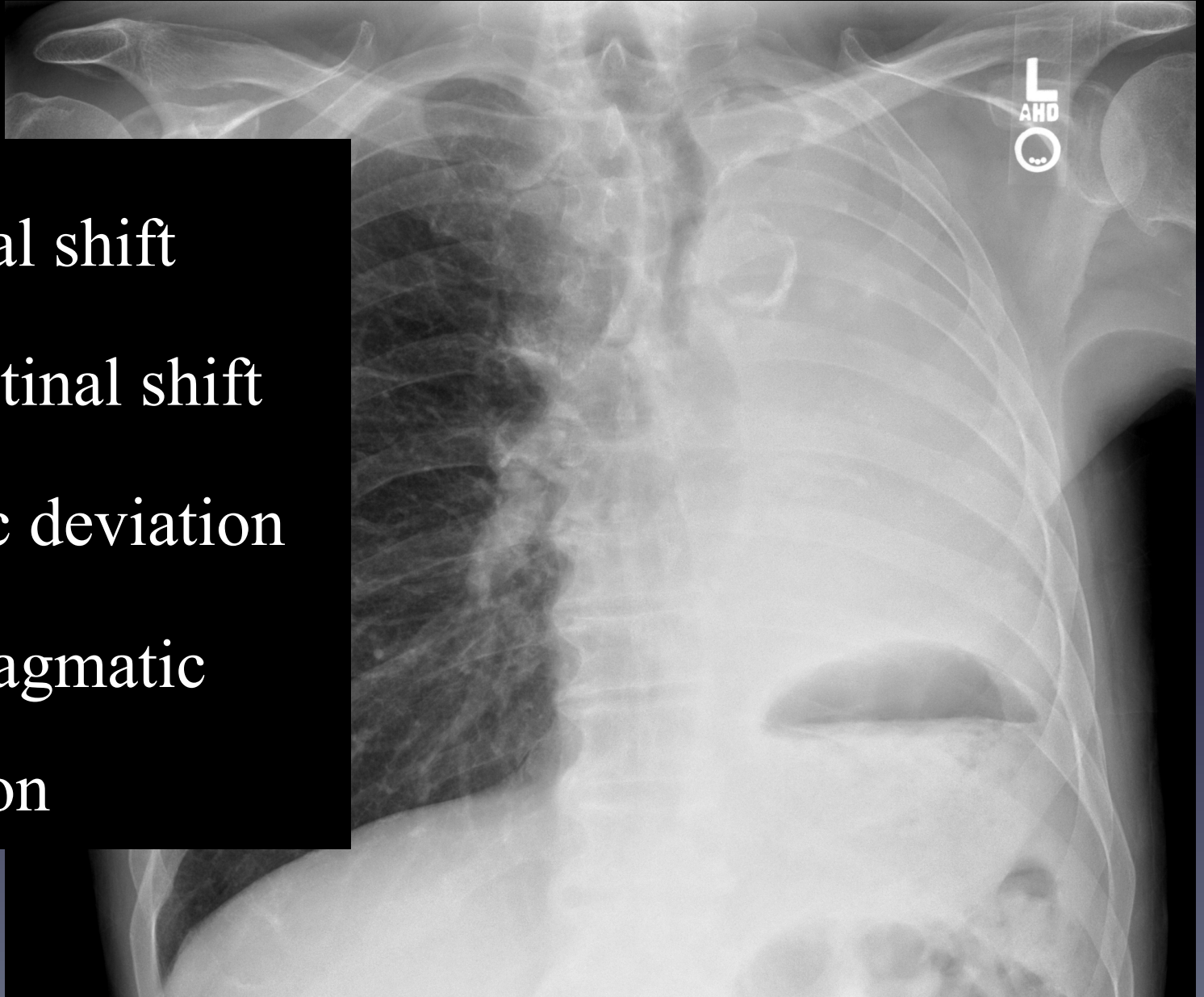
- Lines and tubes
- Foreign bodies
- Pneumothorax
- Pneumomediastinum

Unknown case #5



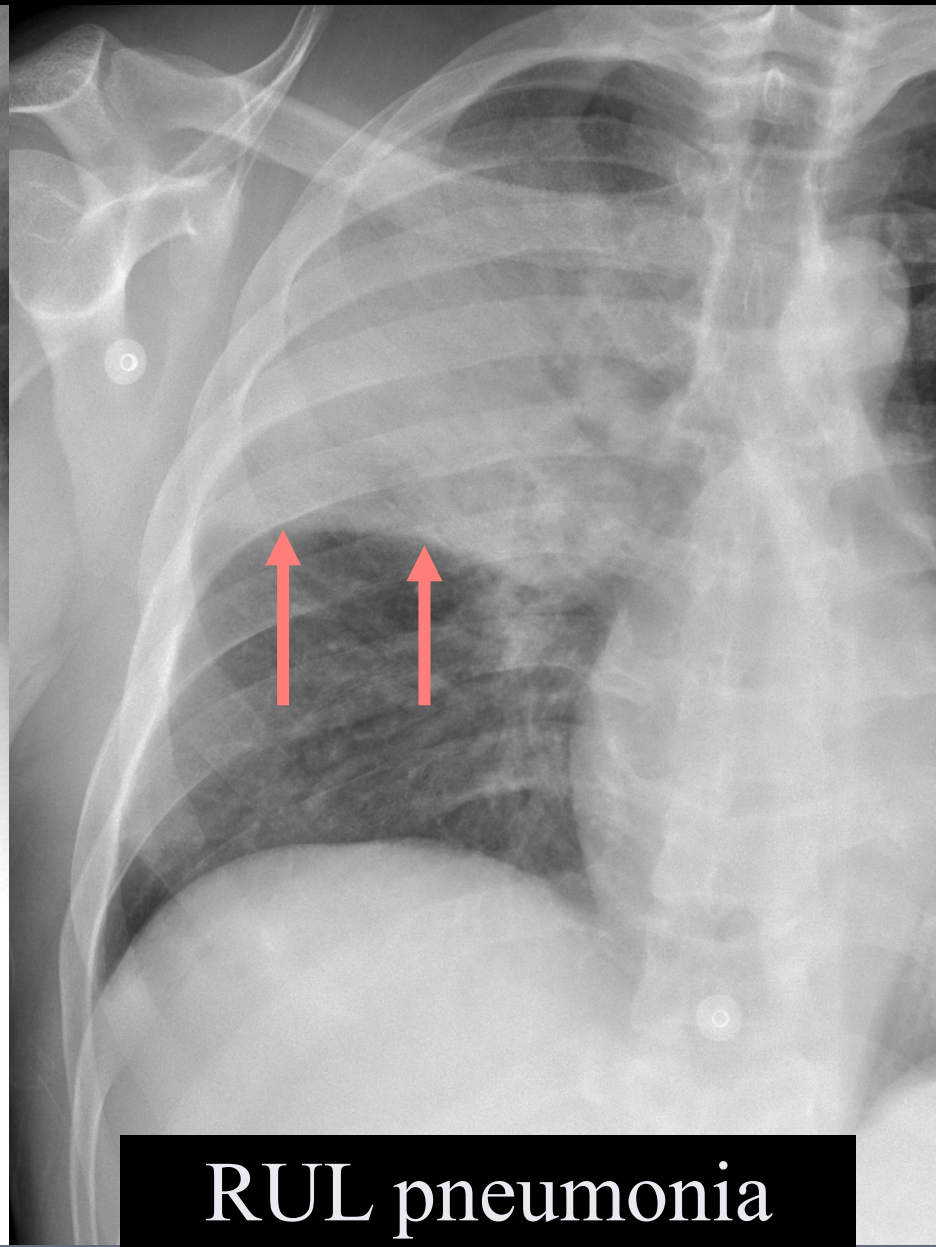
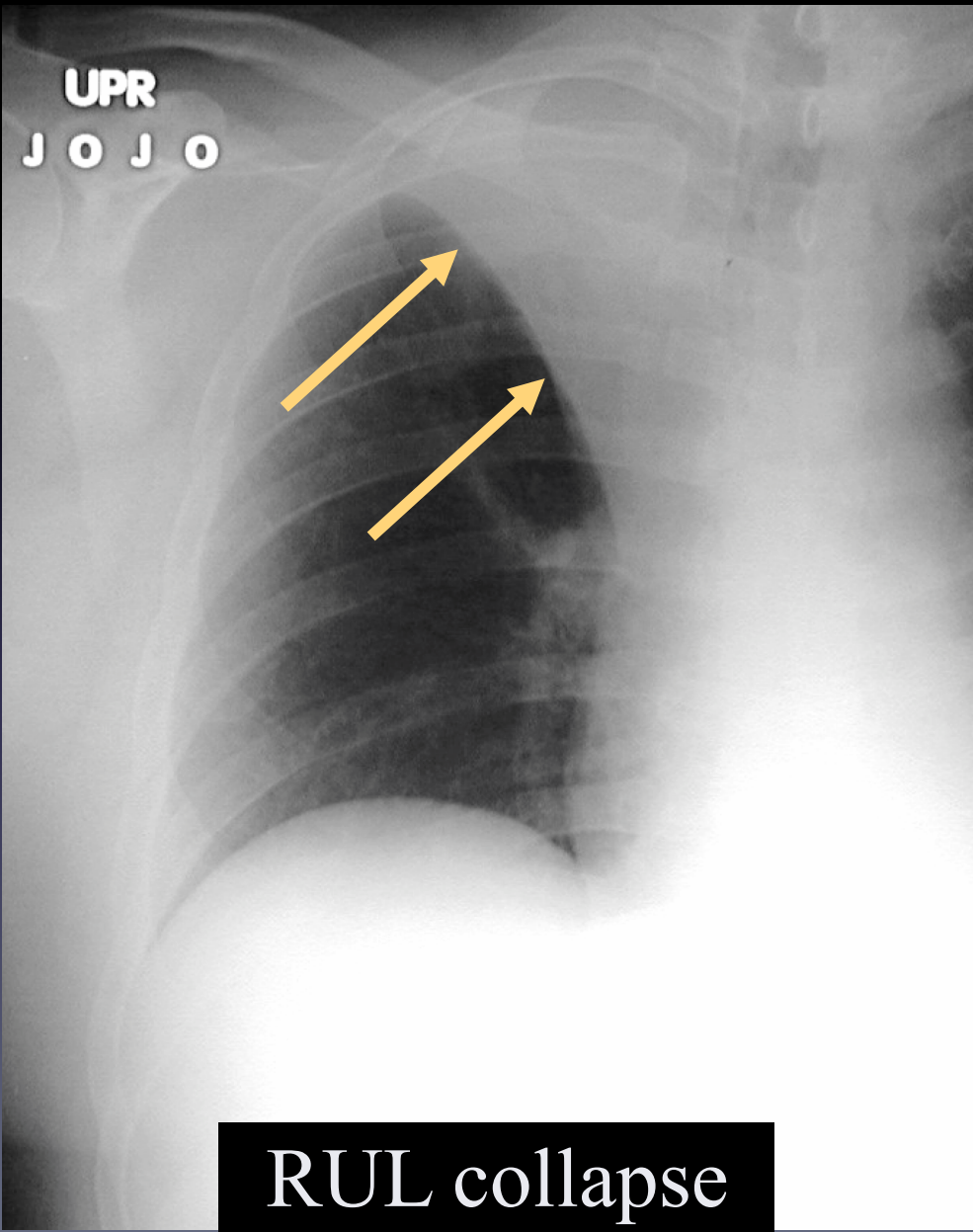
Combined RML/RLL atelectasis

Atelectasis vs. alveolar disease

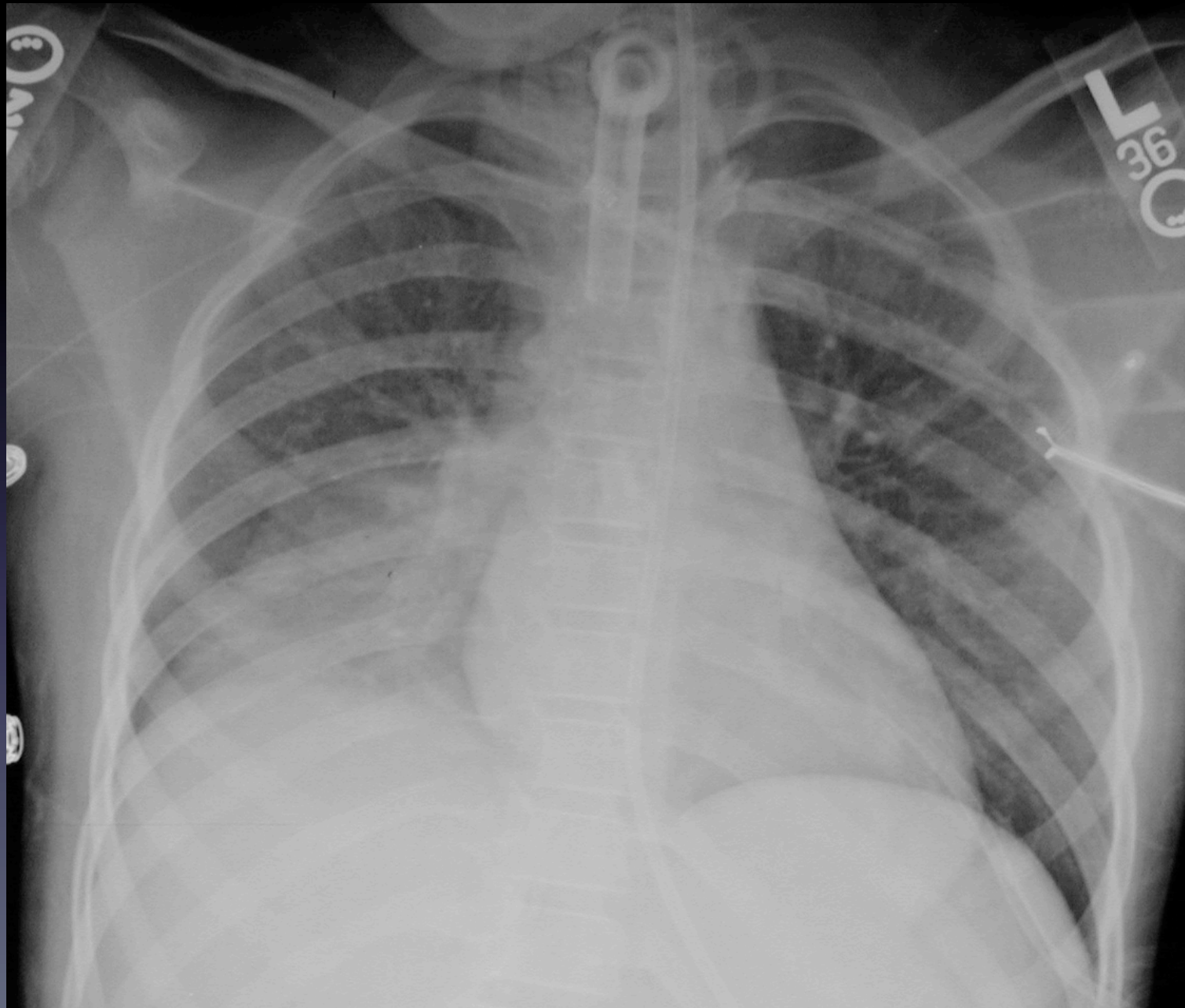


- Tracheal shift
- Mediastinal shift
- Cardiac deviation
- Diaphragmatic elevation

Atelectasis vs. alveolar disease



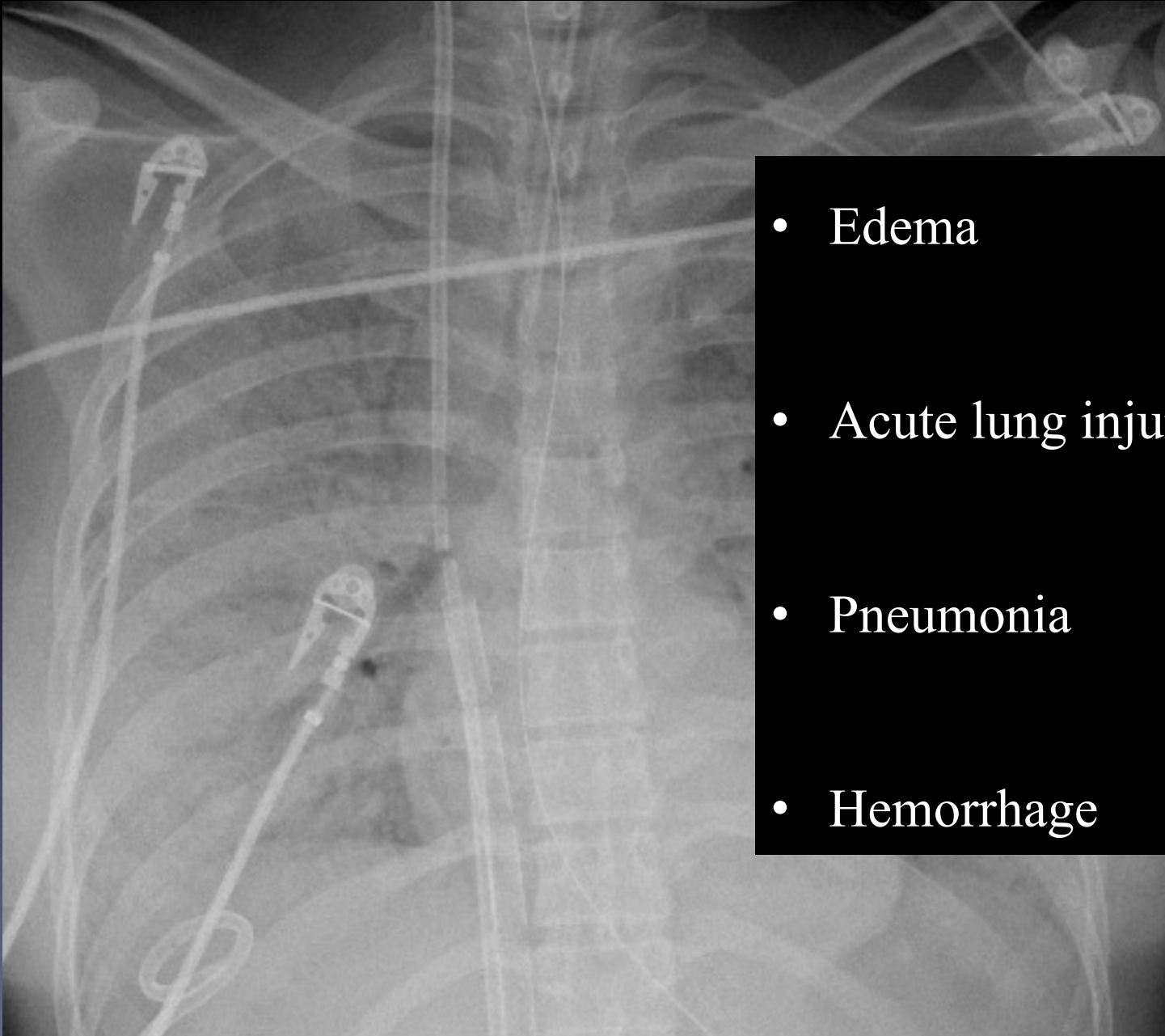
Atelectasis vs. alveolar disease



Checklist

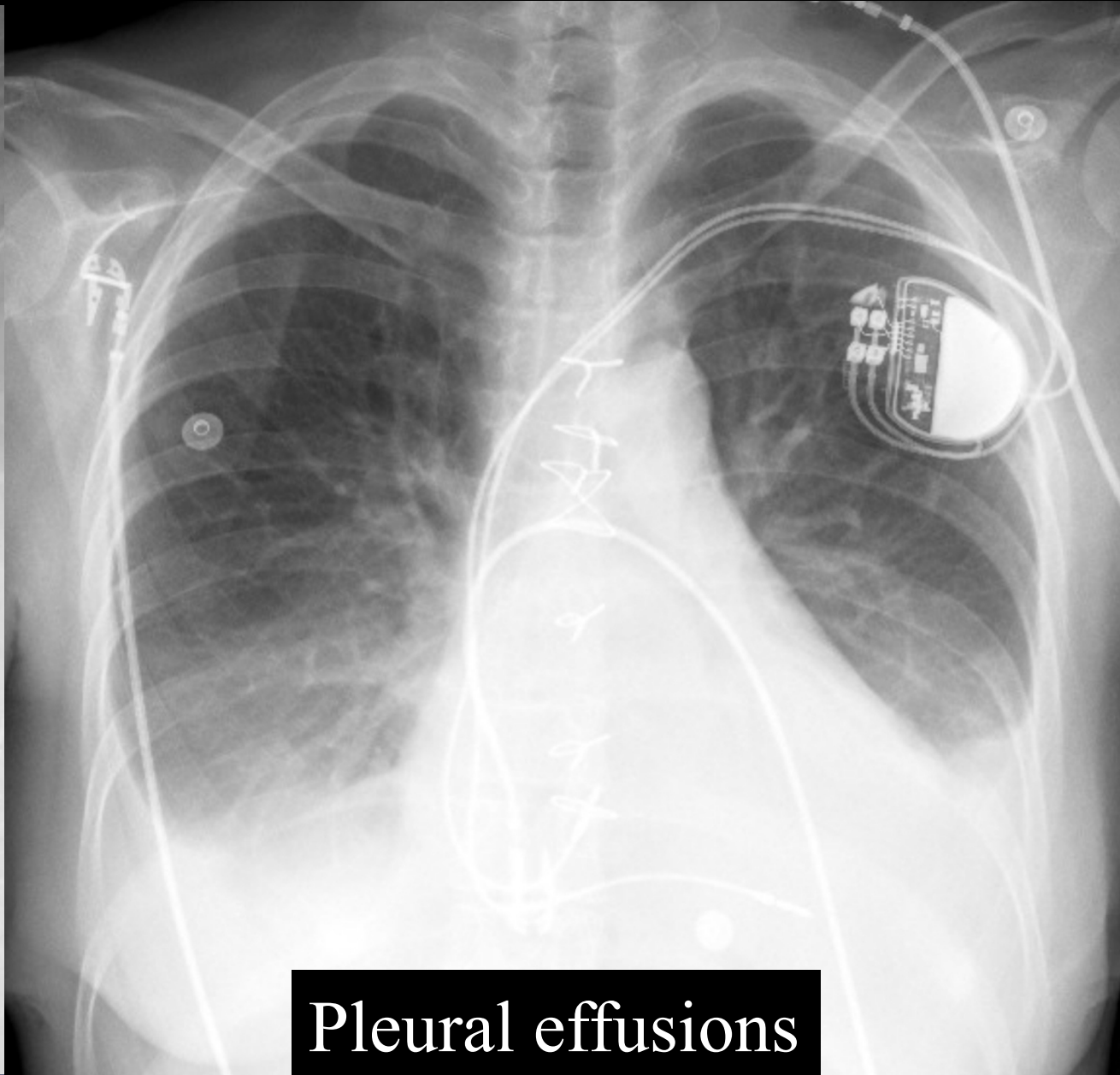
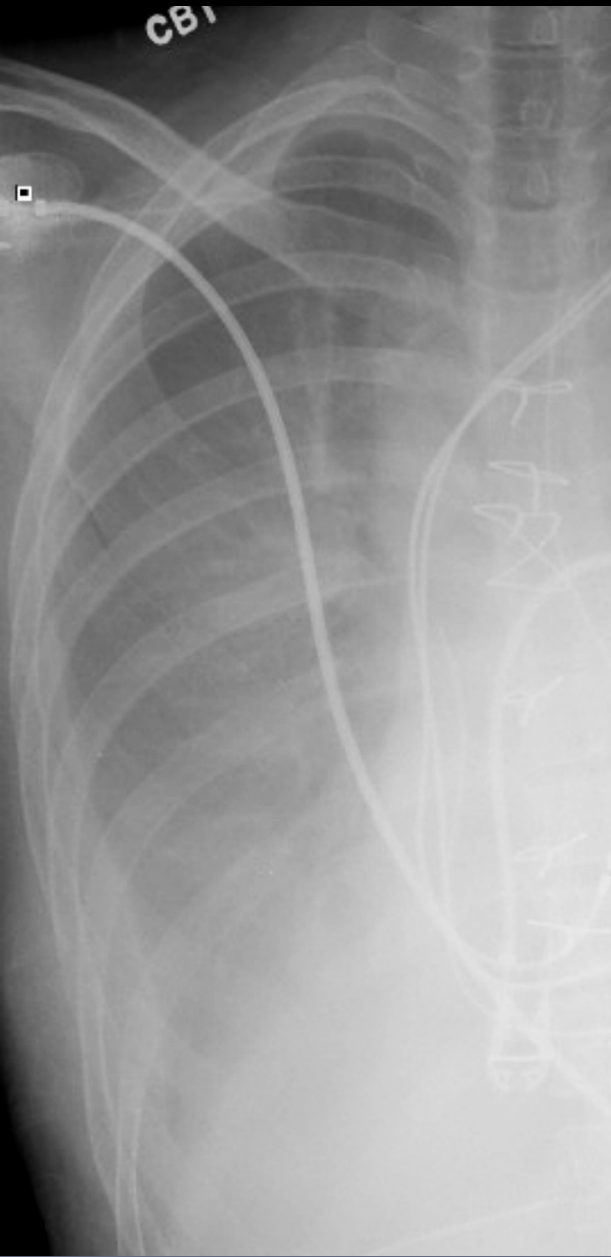
- Lines and tubes
- Foreign bodies
- Pneumothorax
- Pneumomediastinum
- Atelectasis

Diffuse consolidation



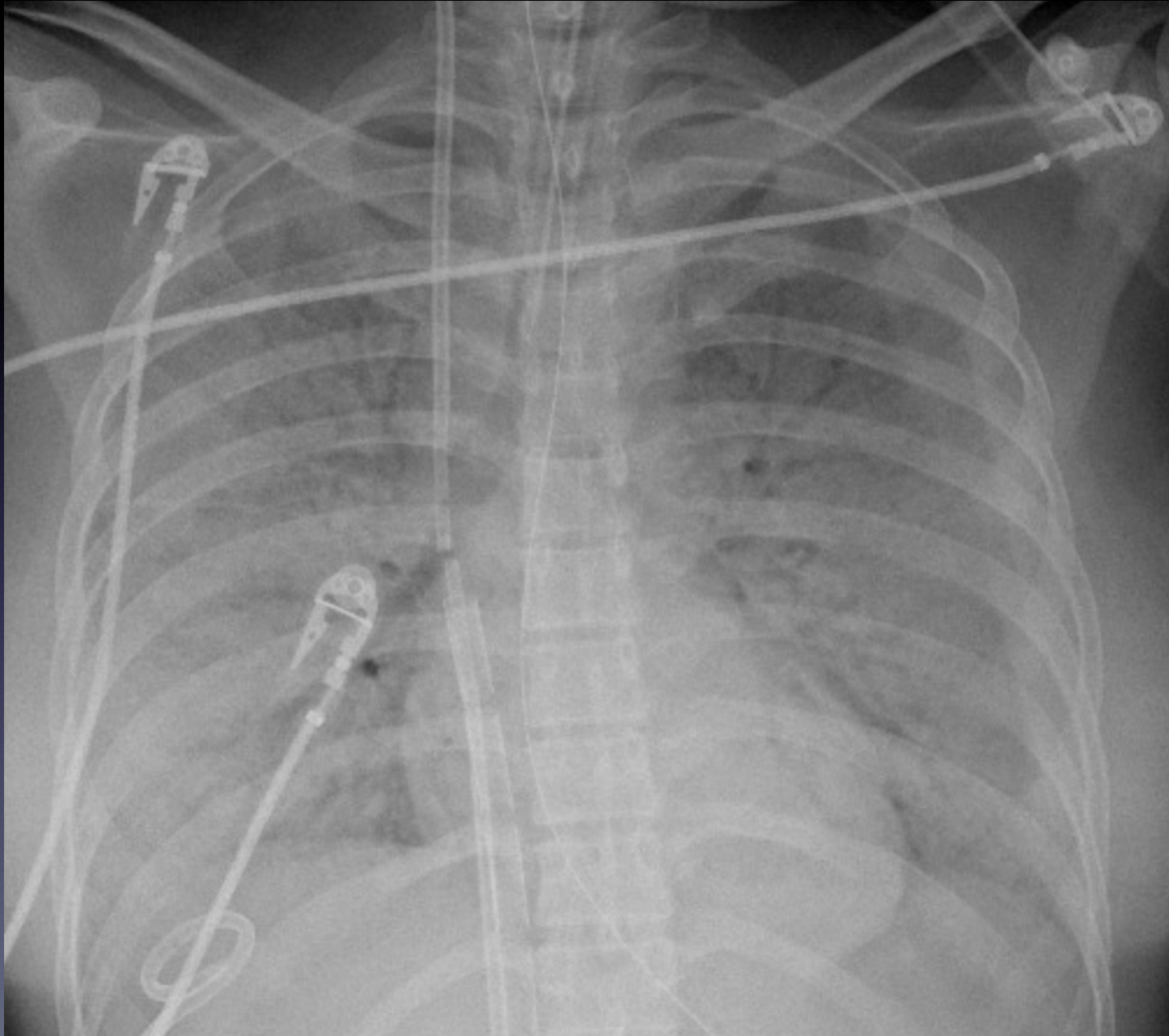
- Edema
- Acute lung injury
- Pneumonia
- Hemorrhage

What is this?



Pleural effusions

Acute lung injury

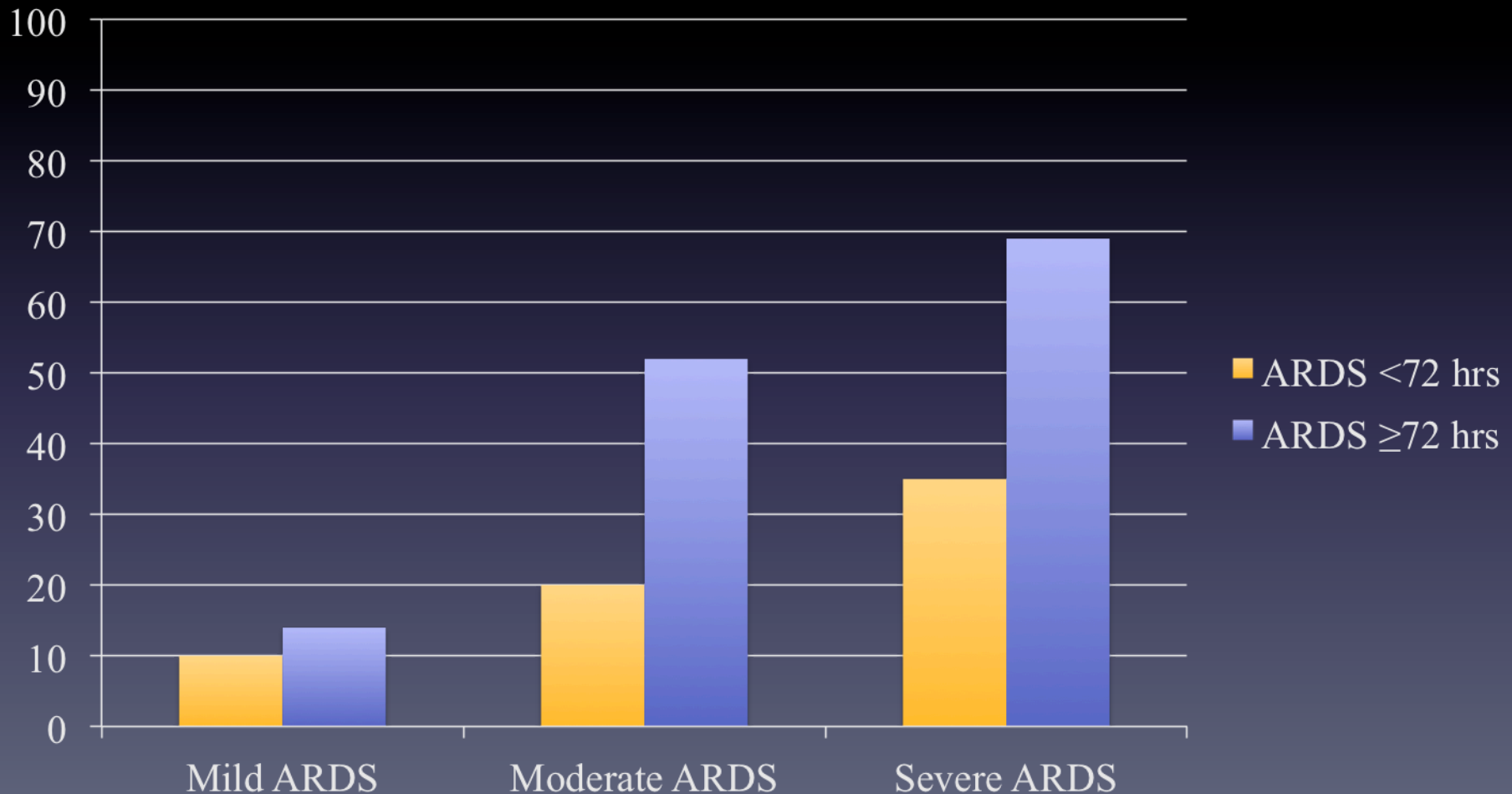


Terminology

Term	Description
Diffuse alveolar damage (DAD)	Histologic pattern of injury
Acute respiratory distress syndrome (ARDS)	Clinical syndrome defined by: <ol style="list-style-type: none">1. Acute symptoms2. Diffuse opacities on imaging3. Exclusion of cardiogenic edema4. Reduced PaO₂:FIO₂ ratio
Acute lung injury (ALI)	Clinical syndrome associated with DAD on pathology
Acute interstitial pneumonia (AIP)	Clinical syndrome of idiopathic DAD

Autopsy in ARDS: % of patients with DAD

Thille et al. Am J Respir Crit Care Med. 2013;187: 761



Alternative diagnoses in ARDS patients without DAD

Thille et al. Am J Respir Crit Care Med. 2013;187: 761

- Pneumonia without DAD: 49%
- Emphysema: 7%
- Malignancy: 6%
- Pulmonary hemorrhage: 6%
- Pulmonary embolism: 5%
- Pulmonary edema: 5%

Checklist

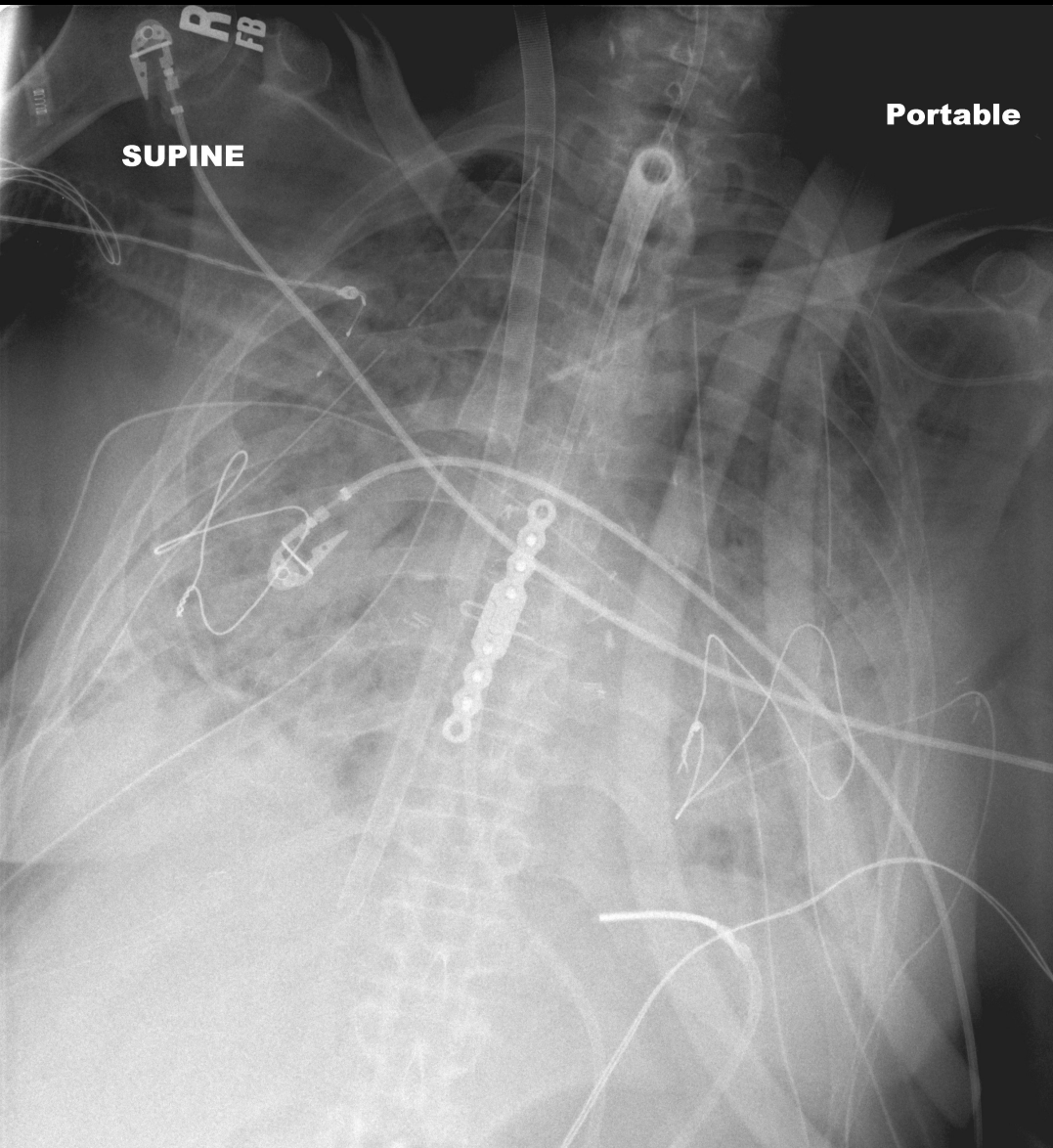
- Lines and tubes
- Foreign bodies
- Pneumothorax
- Pneumomediastinum
- Atelectasis
- Acute alveolar processes

Checklist

- Lines and tubes
- Foreign bodies
- Pneumothorax
- Pneumomediastinum
- Atelectasis
- Acute alveolar processes

Conclusions

- Checklist
 - Lines/tubes
 - Foreign bodies
 - Pneumothorax/pneumomediastinum
 - Atelectasis/alveolar processes
- Challenges in interpretation
- Big picture



Inpatient Chest X-ray Interpretation

Brett M. Elicker, MD

*University of
California, San
Francisco*