# Radiographie chez le patient en réanimation

Alain Nchimi

# Plan

- What are the main indications for CRX in ventilated patients? (interactive)
- What’s about a systematic use of CRX in critically ill patients?
- What’s about CRX radiological reporting
- What’s about the emerging role of chest echography?

# What are the main indications for CRX in ventilated patients?

- Matériel
- Désaturation
- Post-intervention
- Foyer
- PNO
- Épanchement

Annals of Intensive Care
a SpringerOpen Journal

RESEARCH Open Access

# Significant changes in the practice of chest radiography in Dutch intensive care units: a web-based survey

Martijn Tolsma[2*], Tom A Rijpstra[1], Marcus J Schultz[3], Paul GH Mulder[5] and Nardo JM van der Meer[1,4]

| | Routine strategy | 'On-demand only' |
|---|---|---|
| All hospitals (n = 69); n (%) | 27 (39) | 42 (61) |
| All patients | 5 (7) | - |
| Patients on ventilation only | 4 (6) | - |
| Certain fixed days a week | 3 (4) | - |
| First days of admission only | 2 (3) | - |
| Cardiothoracic surgery patients only | 4 (6) | - |
| Other, not specified | 9 (13) | - |
| Academic hospitals (n = 7); n (%) | 6 (86) | 1 (14) |
| Non-academic hospitals (n = 62); n (%) | 21 (34) | 41 (66) |
| ICU < 5 beds (n = 9); n (%) | 3 (33) | 6 (67) |
| ICU 5 to 15 beds (n = 40); n (%) | 9 (22) | 31 (78) |
| ICU > 15 beds (n = 20); n (%) | 15 (75) | 5 (25) |

CXR = chest radiograph; n = number.

| | 2006 (n = 41) | 2013 (n = 69) | *P*-value |
|---|---|---|---|
| Daily routine CXR strategy; n (%) | 26 (63) | 27 (39) | 0.018 |
| All patients | 6 (15) | 5 (7) | 0.324 |
| Mechanically ventilated patients | 15 (37) | 4 (6) | < 0.001 |
| Other daily routine strategy | 5 (12) | 18 (26) | 0.095 |
| 'On-demand only' strategy; n (%) | 15 (37) | 42 (61) | 0.018 |
| Routine CXR after; n (%) | | | |
| Chest tube placement | 40 (98) | 68 (99) | 1.000 |
| Endotracheal intubation | 31 (76) | 53 (77) | 1.000 |
| CVL placement | 34 (83) | 52 (76) | 0.475 |
| CPR setting | 24 (59) | 40 (68) | 1.000 |
| Tracheostomy | 24 (59) | 30 (43) | 0.168 |

CPR = cardiopulmonary resuscitation; CVL = central venous line; CXR = chest radiograph.

| Assumed therapeutic efficacy; n (%) | Routine CXR | 'On-demand'CXR |
|---|---|---|
| < 10% | 17 (25) | 5 (7) |
| 10 to 20% | 11 (16) | 21 (30) |
| 20 to 30% | 6 (9) | 23 (33) |
| 30 to 60% | 3 (4) | 17 (25) |
| > 60% | 0 (0) | 3 (4) |
| Not applicable | 32 (46) | |

CXR = chest radiograph; n = number.

# What's about a systematic use of CRX in critically ill patients?

## Comparison of routine and on-demand prescription of chest radiographs in mechanically ventilated adults: a multicentre, cluster-randomised, two-period crossover study

*Gilles Hejblum, Ludivine Chalumeau-Lemoine, Vincent Ioos, Pierre-Yves Boëlle, Laurence Salomon, Tabassome Simon, Jean-François Vibert, Bertrand Guidet*

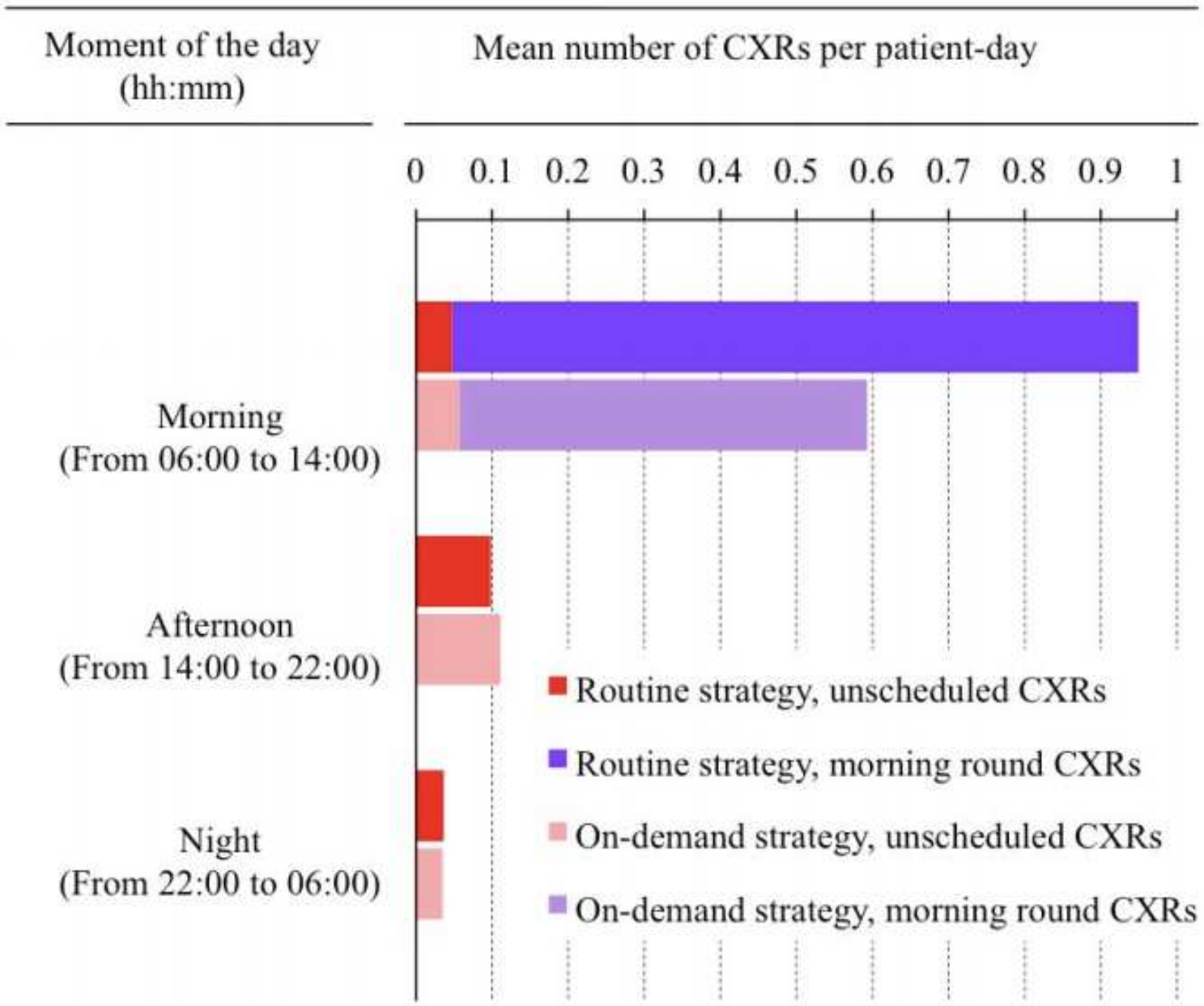
www.thelancet.com Vol 374 November 14, 2009

# Tested hypothesis

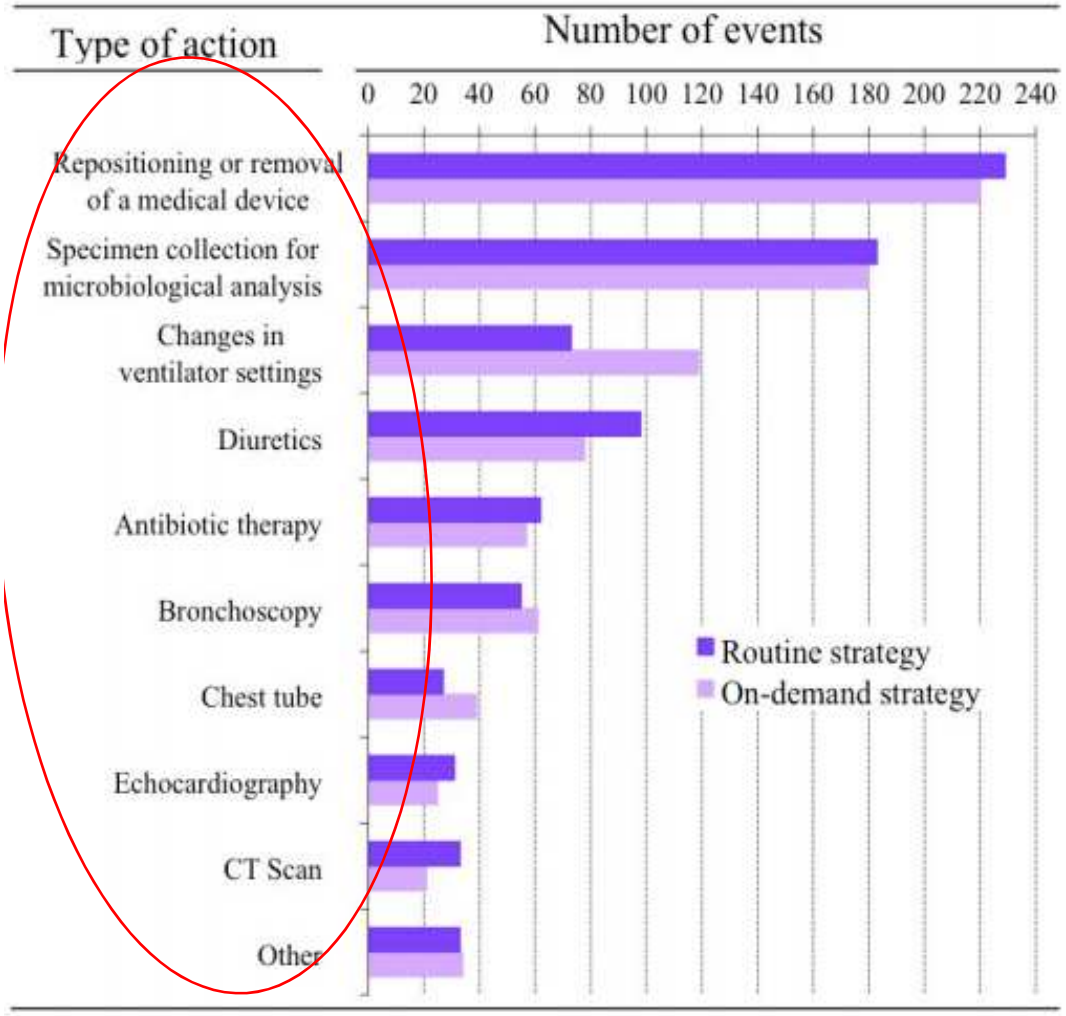
- On demand strategy allows a substantial decrease (at least 20%) in the mean number of CXRs performed per patient on mechanical ventilation and per day as compared to the Routine strategy.
- This decrease should not be associated with a decrease in the quality of care and outcome.

# Methods

- Cluster-randomized two-period two strategies cross-over design
- 11 and 10 participating ICUs applied the Routine and On-demand strategies during the first period
- Enrolling 20 consecutive patients requiring mechanical ventilation for at least two days.
- Each ICU then applied the alternative strategy during the second period, again enrolling 20 consecutive patients.
- 849 patients included (424 routine and 425 on demand)


Moment of the day
(hh:mm)
Mean number of CXRs per patient-day
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Morning
(From 06:00 to 14:00)
Afternoon
(From 14:00 to 22:00)
Night
(From 22:00 to 06:00)
Routine strategy, unscheduled CXRs
Routine strategy, morning round CXRs
On-demand strategy, unscheduled CXRs
On-demand strategy, morning round CXRs

# Conclusion




- An On-demand prescription strategy reduces CXR utilization in mechanically ventilated patients with no measurable changes in key outcome measures that would suggest a reduction in quality of care or patient safety.

# Abandoning Radiography Care Unit: Me

Yuji Oba, MD
Tareq Zaza, MD

**Purpose:** To system
tine chest
such as m
subgroup
be benefic

Eight studies with a total of 7078 patients were identified. A pooled analysis revealed that the elimination of daily routine chest radiography did not affect either hospital or ICU mortality (OR, 1.02; [95% CI: 0.89, 1.17; $P = .78$ and OR, 0.92; 95% CI: 0.76, 1.11; $P = .4$, respectively). There was no significant difference in ICU LOS (WMD = 0.19 days; 95% CI: −0.13, 0.51; $P = .25$), hospital LOS (WMD = −0.29 days; 95% CI: −0.71, 0.13; $P = .18$), and ventilator days (WMD = 0.33 days; 95% CI: −0.12, 0.78; $P = .15$) between the on-demand and daily routine groups. Regression analyses failed to identify any subgroup in which performing daily routine chest radiography was beneficial.

**Table 1**

**Characteristics of Clinical Trials**

| Study | Study Design | No. of Patients | Duration (mo) | Type of patients | Ventilated Patients (%) | Expected Mortality (%)* | Observed Mortality (%) | Quality Score† |
|---|---|---|---|---|---|---|---|---|
| Brivet et al (30) | Observational before-after | 1529 | 36 | 97% medical, 3% surgical | 43 | 23 | 16 | 5 |
| Clec'h et al (3) | Randomized controlled trial | 165 | 6 | 75% medical, 25% surgical | 100 | 60 | 33 | 15 |
| Hendrikse et al (9) | Observational before-after | 736 | 18 | 48% medical, 52% surgical | 62 | 16 | 16 | 10 |
| Krinsley et al (31) | Observational before-after | 2564 | 35 | 69% medical, 31% surgical | 36 | 26 | 20 | 8 |
| Kripoval et al (2) | Randomized controlled trial | 94 | 10 | Medical | 100 | Not available | 24 | 12 |
| Kroner et al (27) | Observational before-after | 1490 | 11 | 26% medical, 74% surgical | 100 | 21 | 18 | 11 |
| Leong et al (32) | Observational before-after | 300 | 7 | Surgical | 100 | Not available | 3 | 9 |
| Rao et al (33) | Observational | 200 | Not available | Surgical | 100 | Not available | Not available | 7 |

* Based on Simplified Actue Physiology Score II or Acute Physiology and Chronic Health Evaluation Score II.

† Range, 0–22; 22 indicates the highest quality (10,11).

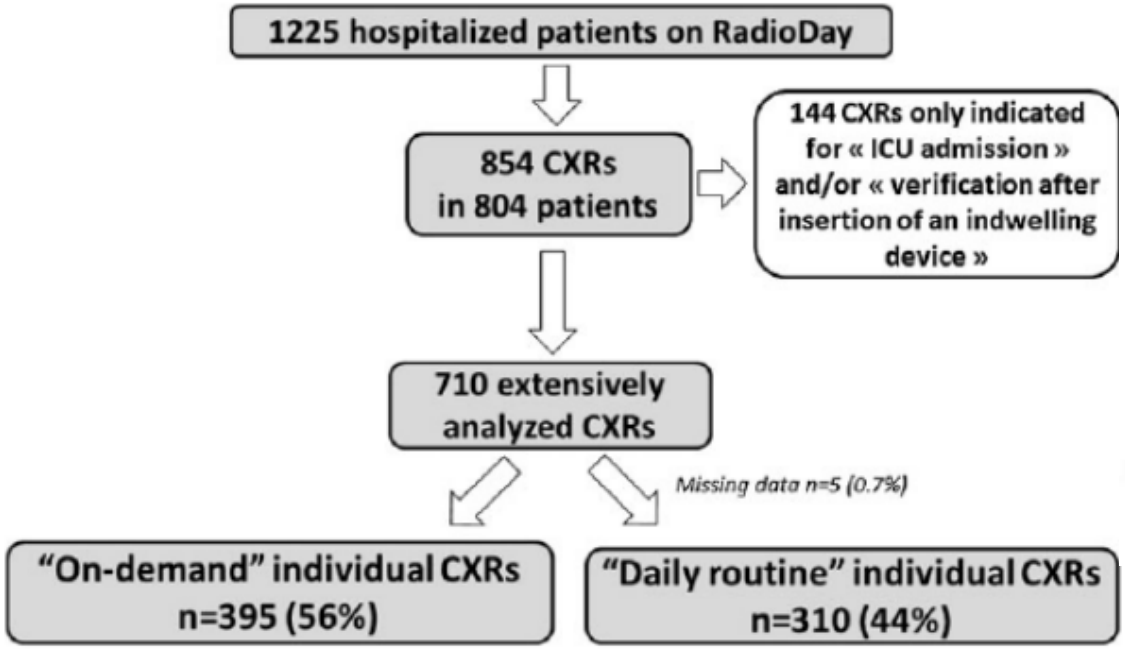
# CRX clinical impact

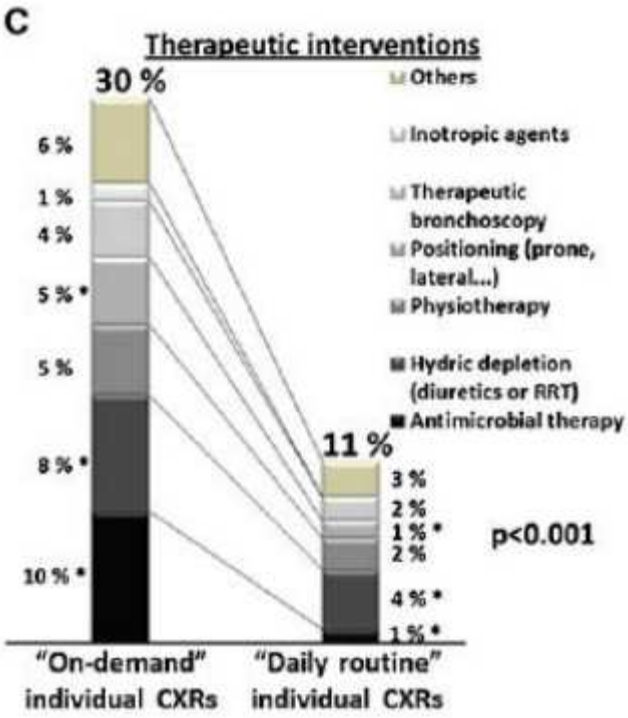
Intensive Care Med (2012) 38:1787–1799
DOI 10.1007/s00134-012-2650-9

ORIGINAL

Karim Lakhal
Marianne Serveaux-Delous
Jean Yves Lefrant
Xavier Capdevila
Samir Jaber
AzuRéa network for the
RadioDay study group

## Chest radiographs in 104 French ICUs: current prescription strategies and clinical value (the RadioDay study)



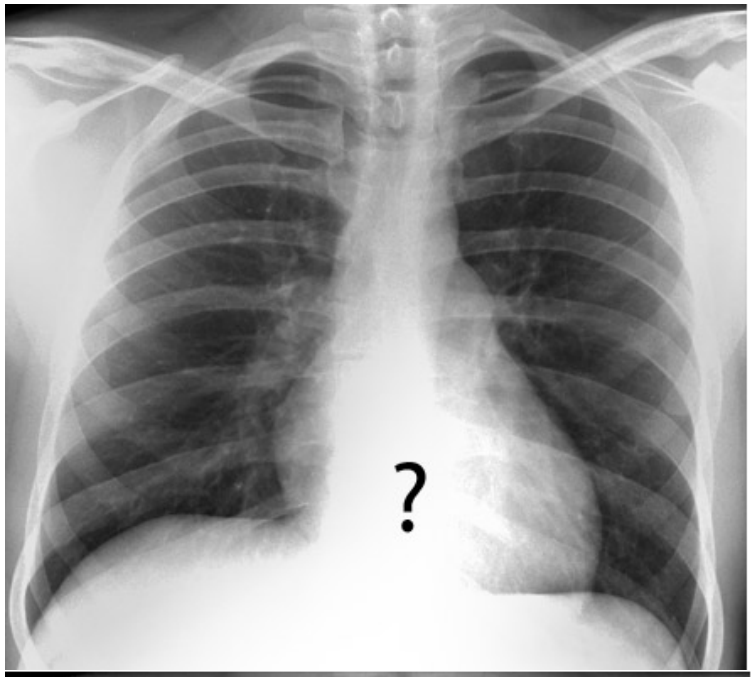
# Other issues (to be discussed)

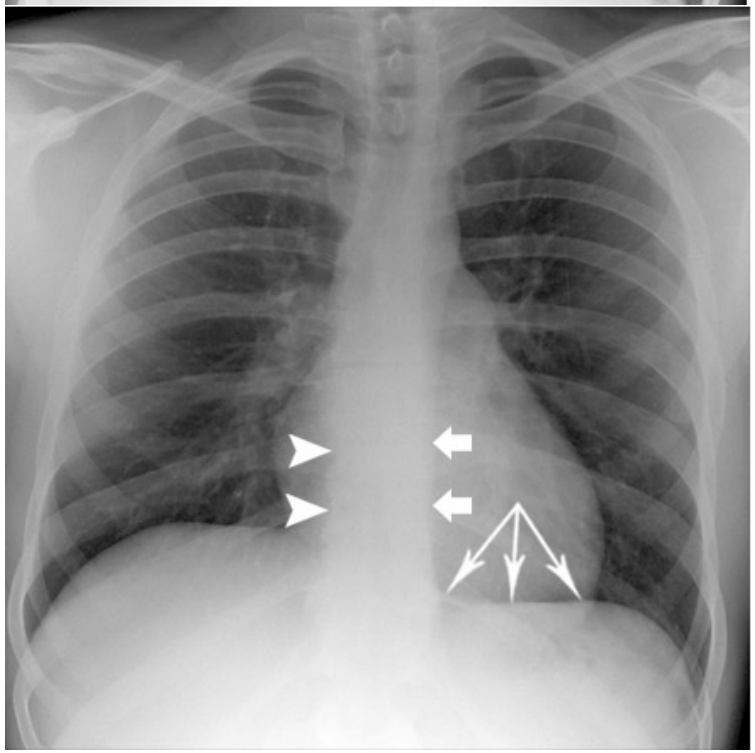
- Financial impact
- Radiation dose
- Teaching

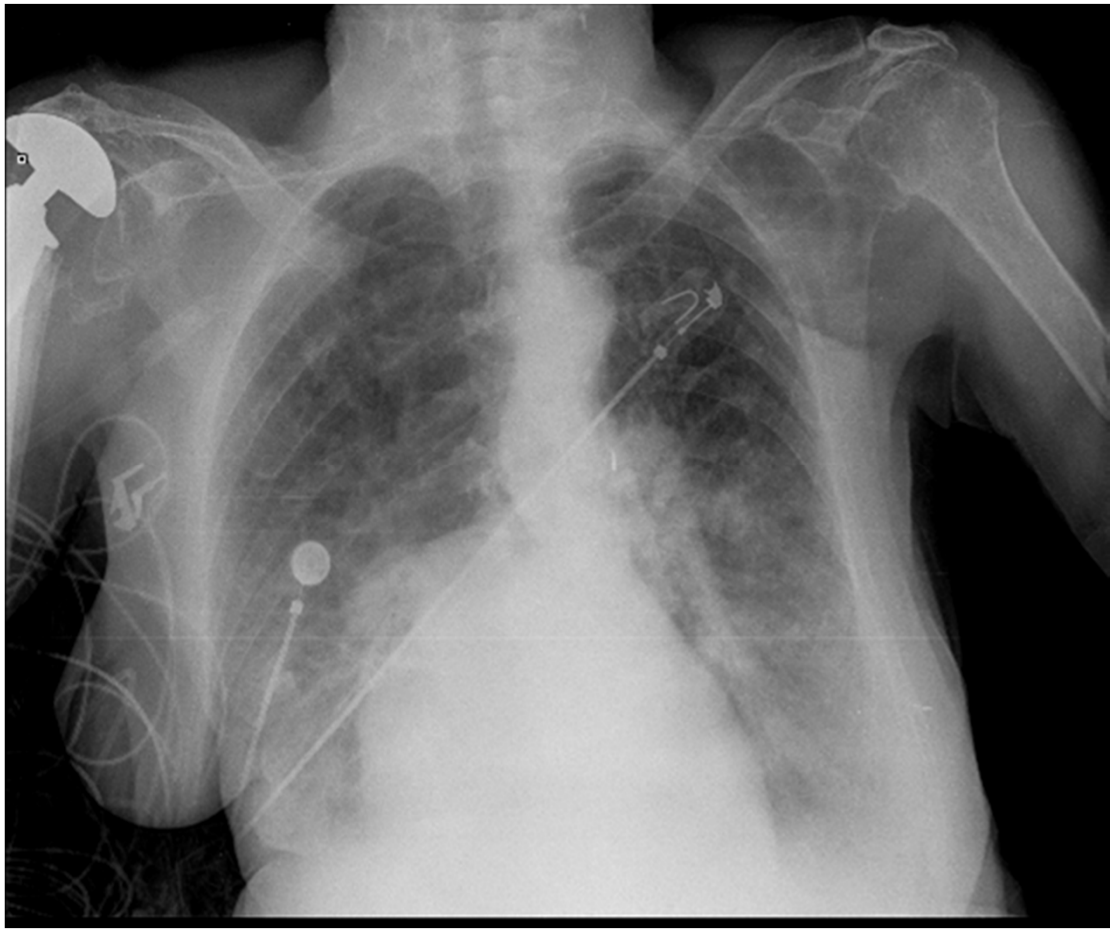
# What’s about CRX radiological reporting

- Variable clinical impact
- High educative value

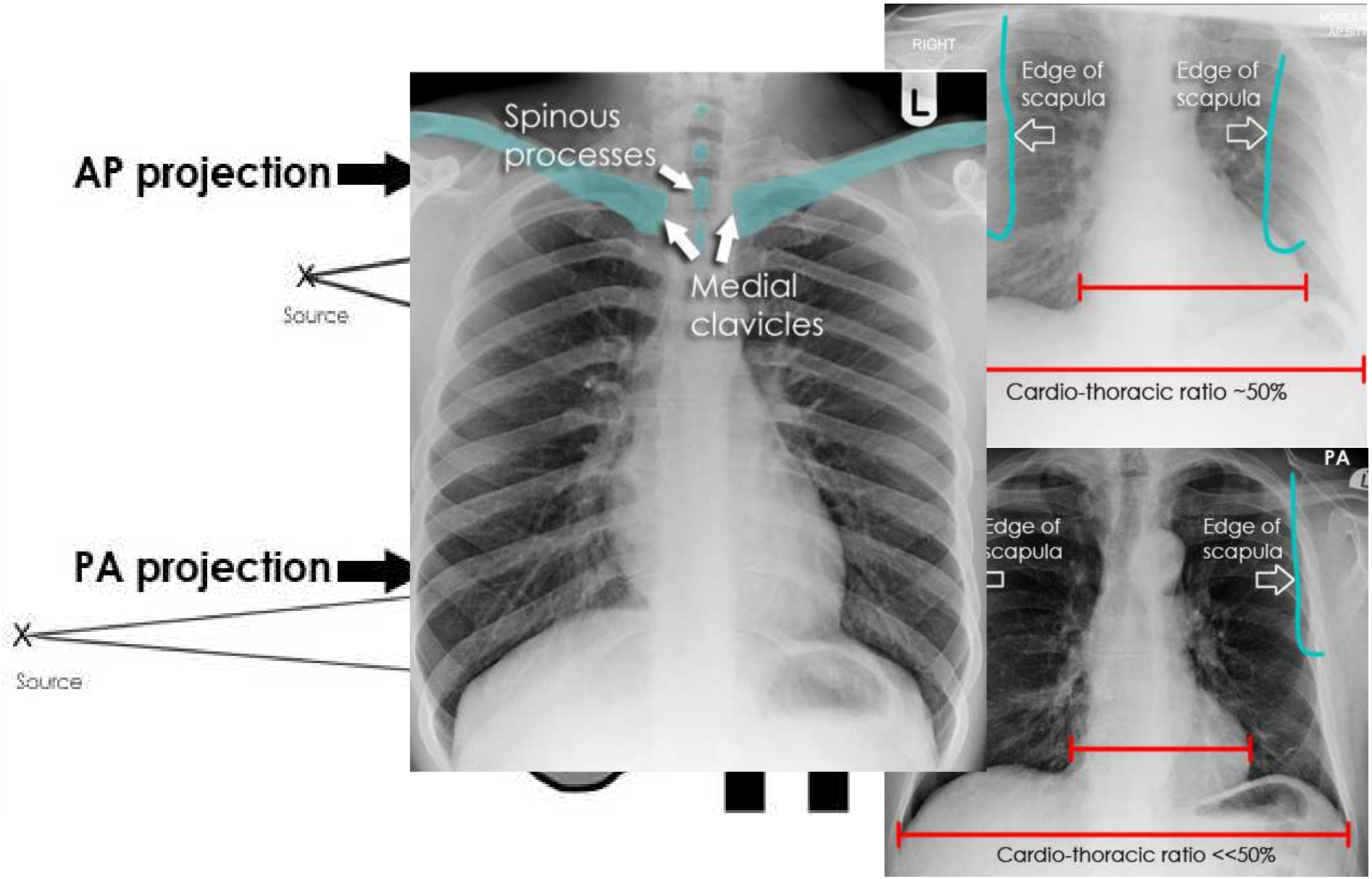
# QC exposure/Others



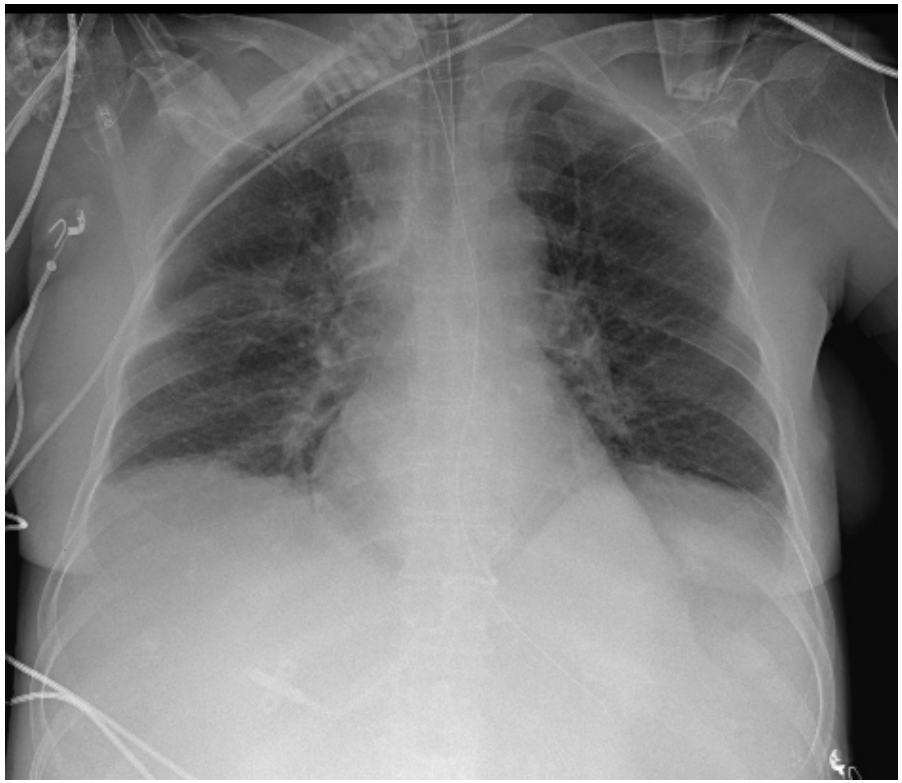



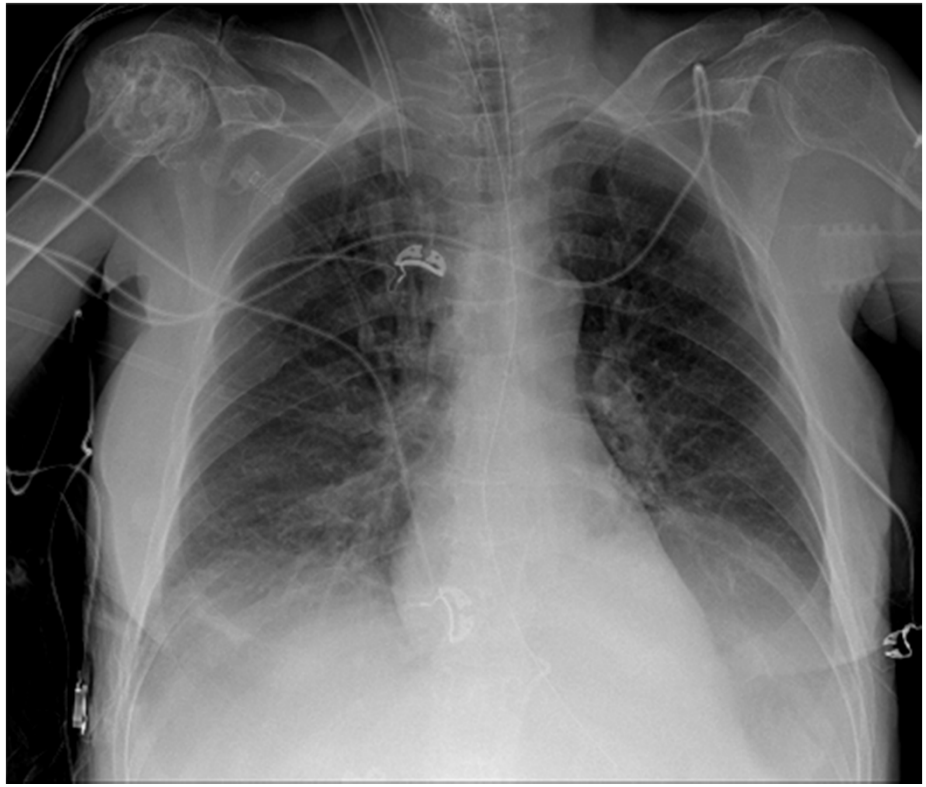


# QC positioning



# QC positioning, Hydro-ionic balance





# Causes of pulmonary hyperemia

**Increased flow or volume**

- Hyperthermia
- Hyperthyroïdism
- Pregnancy
- Perfusion
- Left-to-right shunts
- Renal insufficiency
- Liver failure

**Pulmonary venous hypertension**

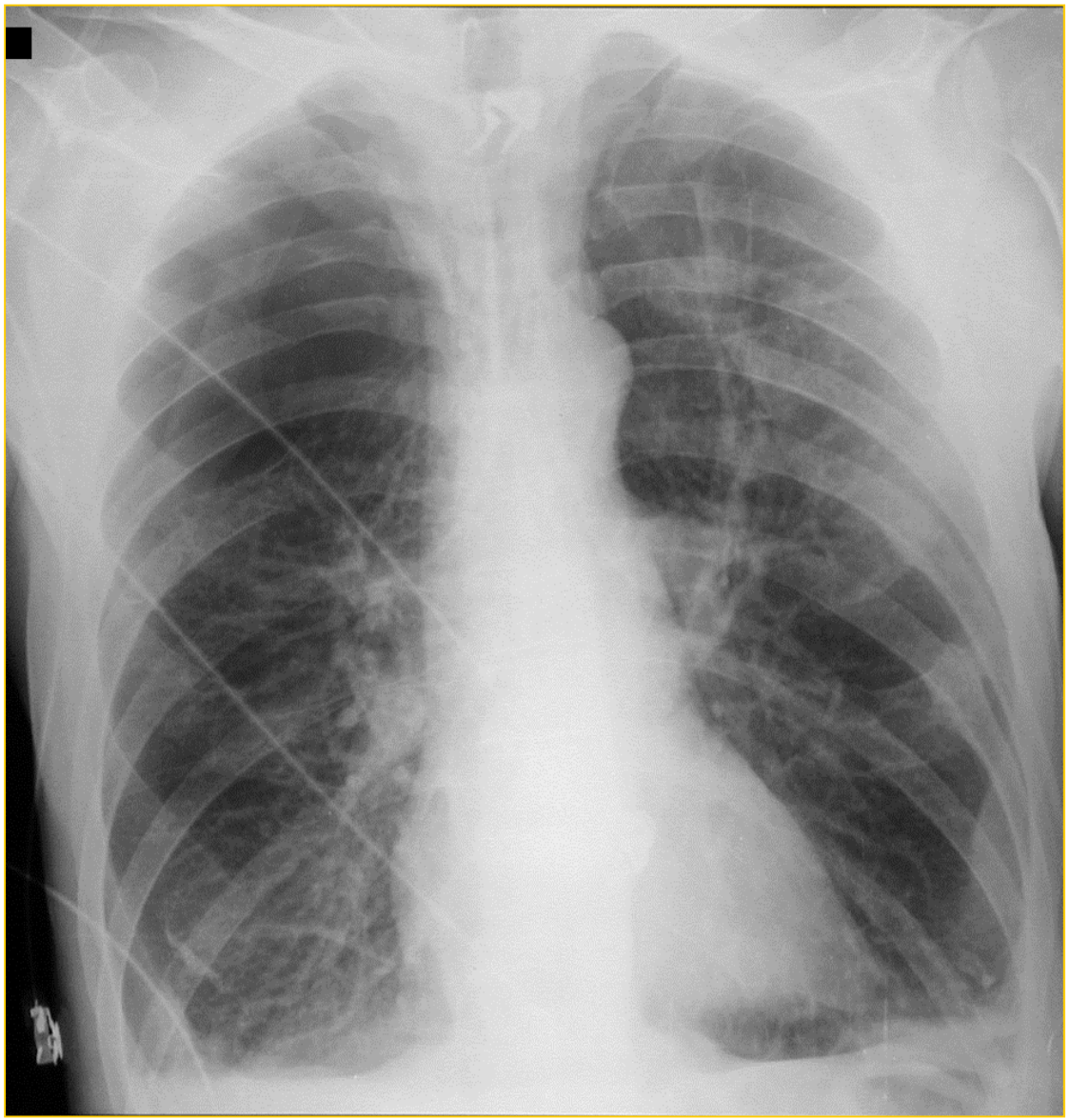
- Left ventricular failure
- Mitral valve disease (Stenosis/ insufficiency)
- Aortic valve stenosis
- Systemic arterial hypertension

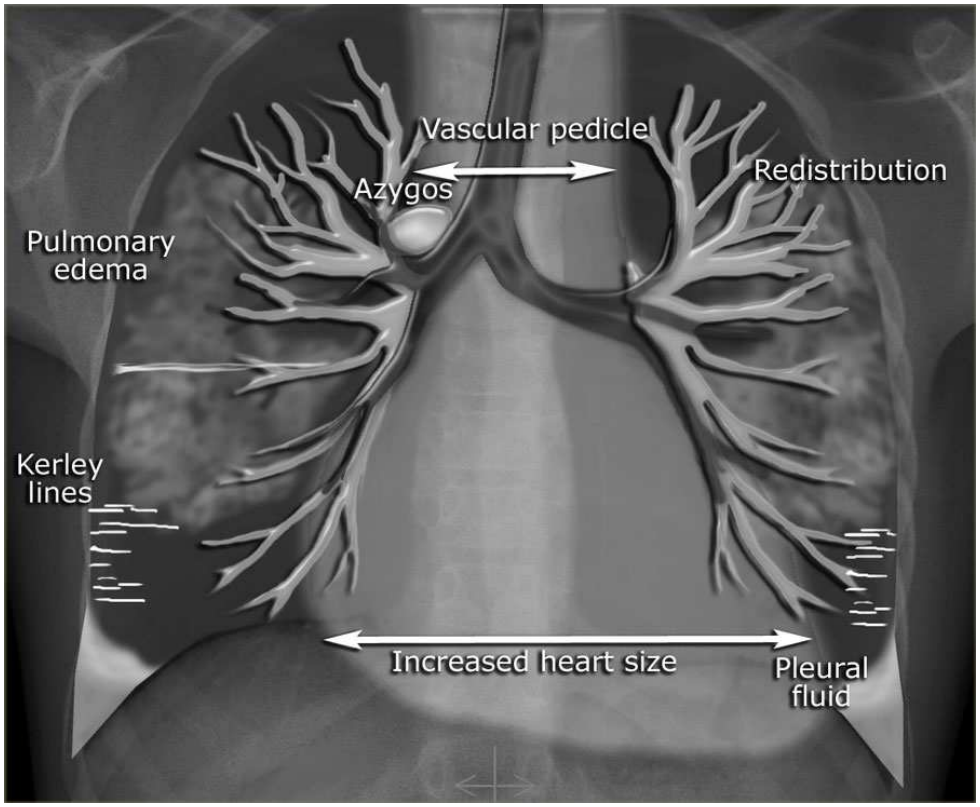
# Pulmonary circulation physiology

- Lung circulation is characterized by
  - High flow
  - Low pressure
  - Circulatory reserve

- Reserves are used to compensate for hypervolemia or increased circulatory resistances

- The bronchial circulation is not visible spontaneously

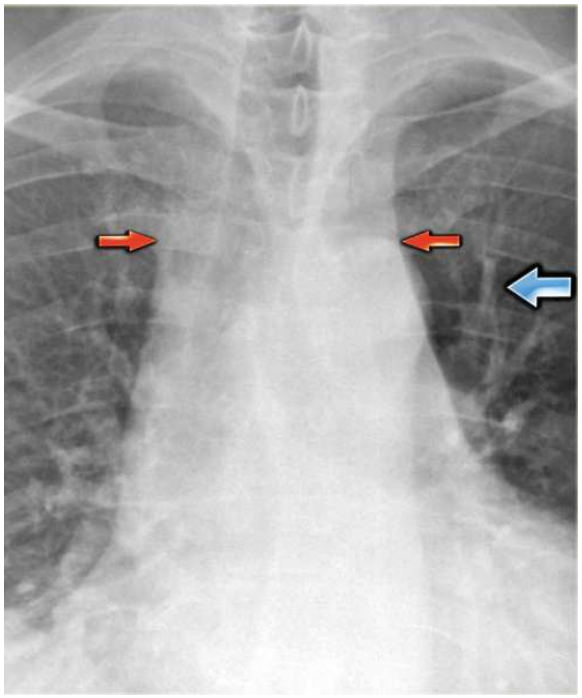


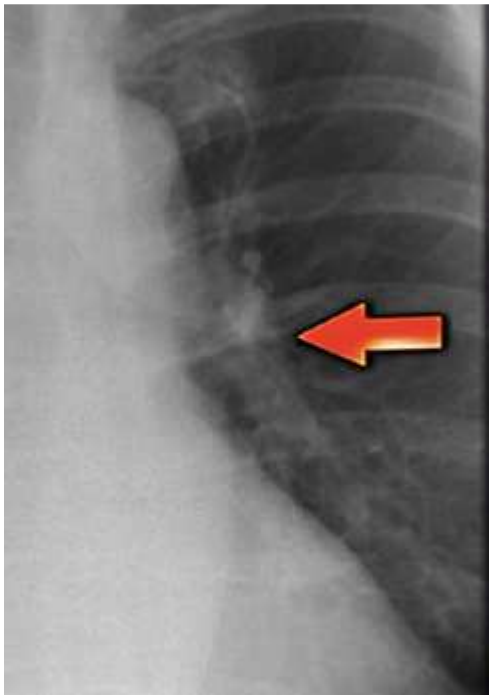


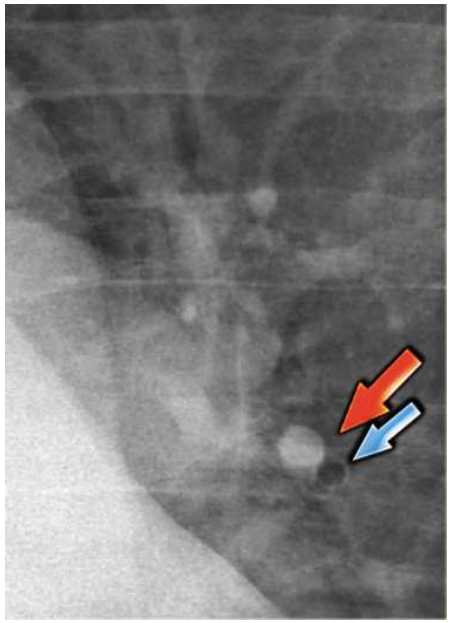

| | | |
|---|---|---|
| Stage 1<br>Redistribution<br>PCWP 13-18 mmHg | → | Redistribution pulmonary vessels<br>Cardiomegaly<br>Broad vascular pedicle (non acute CHF) |
| Stage 2<br>Interstitial edema<br>PCWP 18-25 mmHg | → | Kerley lines<br>Peribronchial cuffing<br>Hazy contour of vessels<br>Thickened interlobar fissure |
| Stage 3<br>Alveolar edema<br>PCWP > 25 mmHg | → | Consolidation<br>Air bronchogram<br>Cottonwool appearance<br>Pleural effusion |

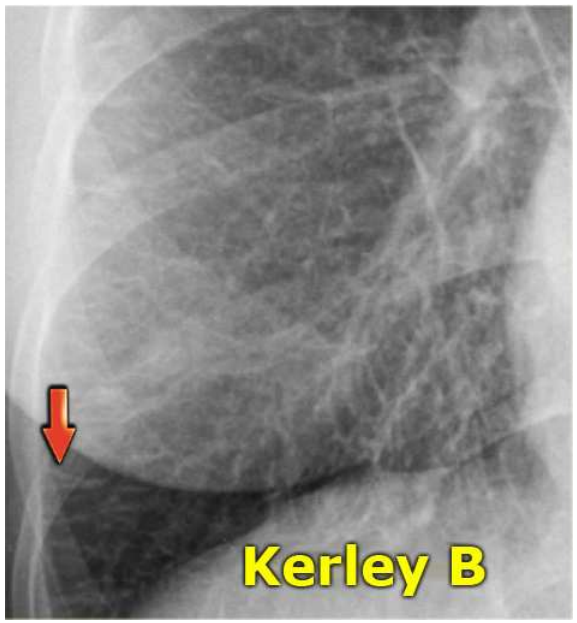
**Pulmonary arteries in hyperemia**

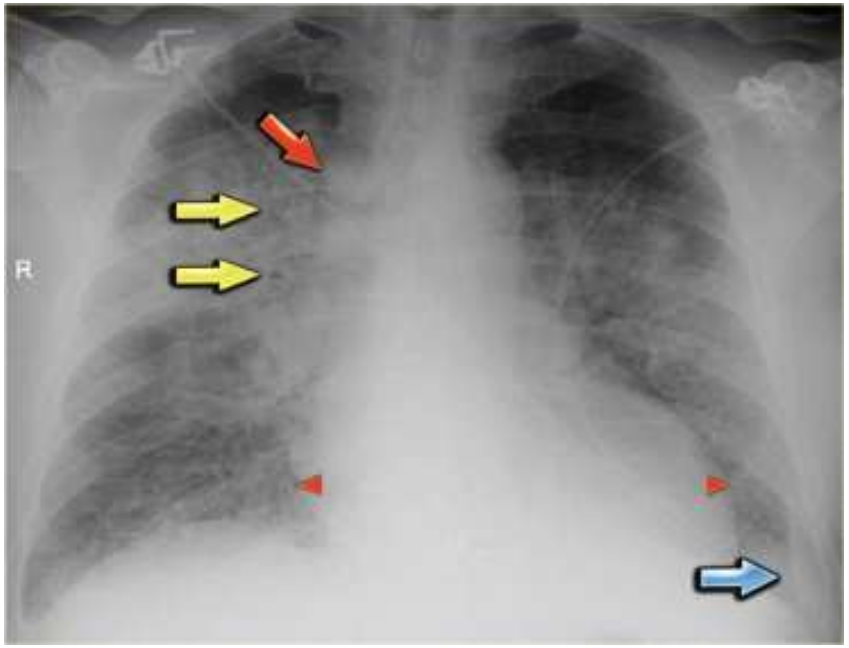
- Number
- Position
- Diameter
- Relative UL/LL diameter
- Hilum size
- ( ***Use the thoracic symmetry!*** )








Kerley B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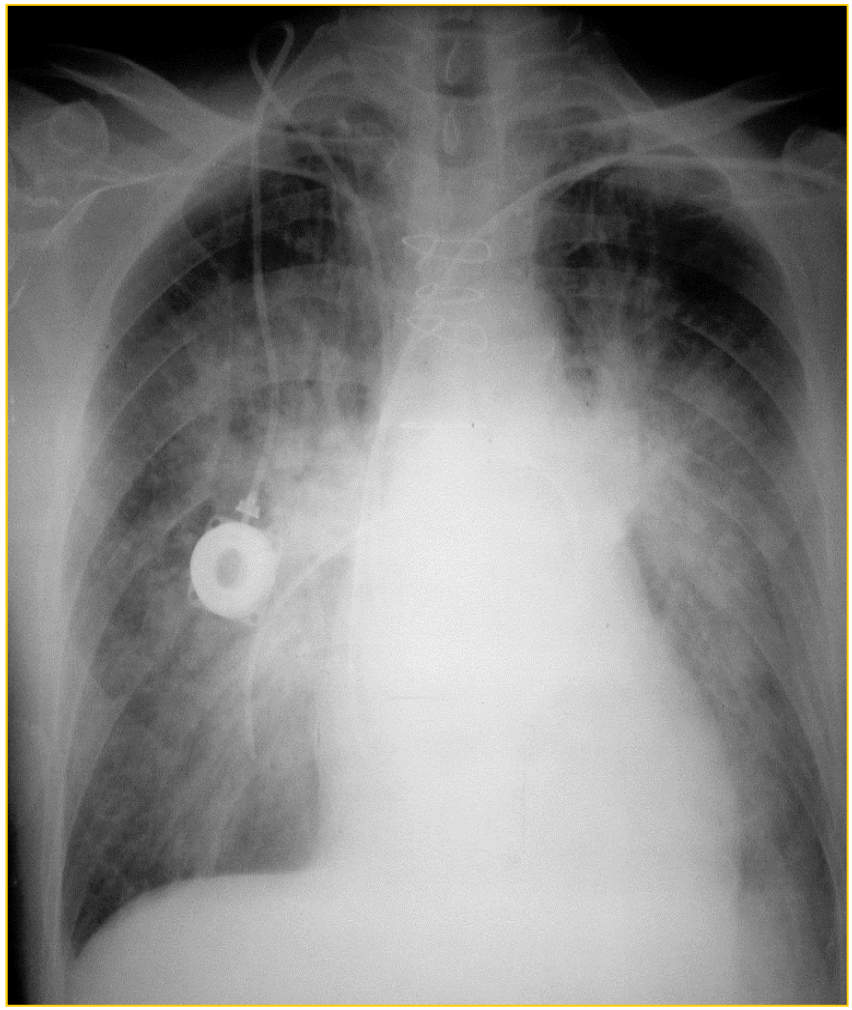
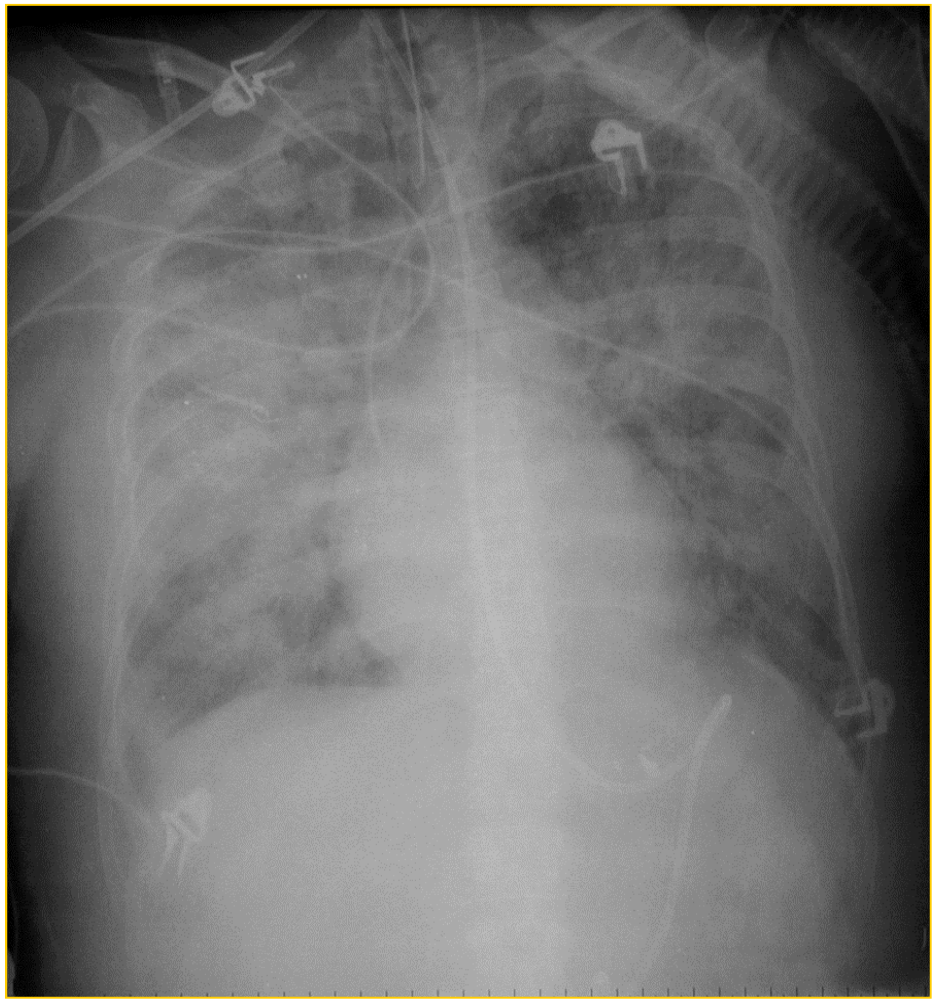
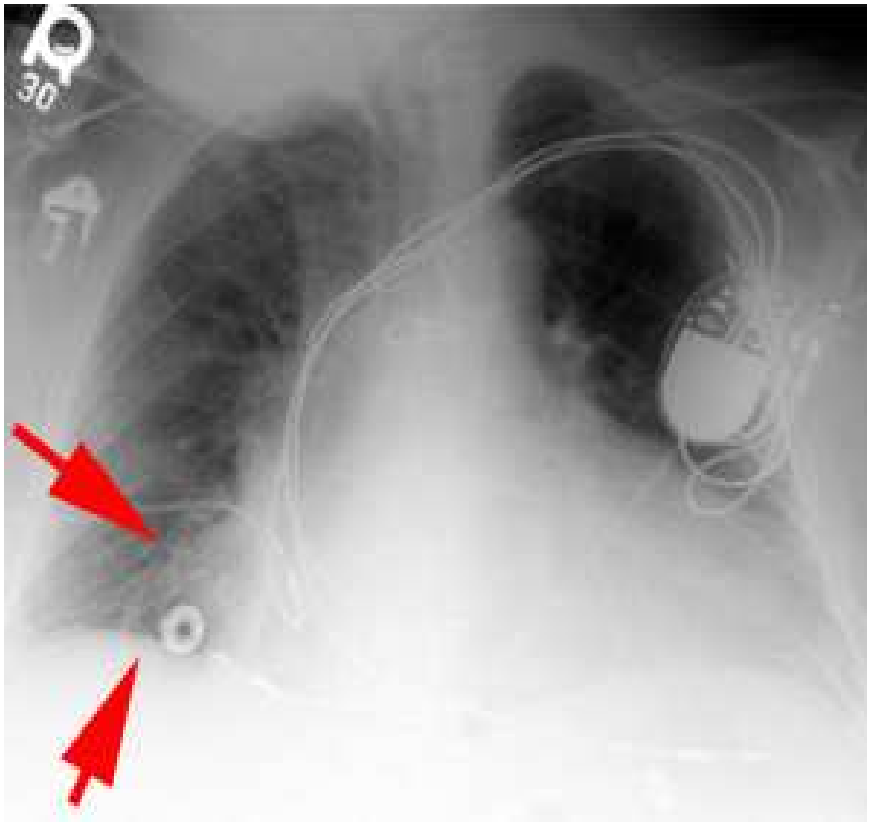
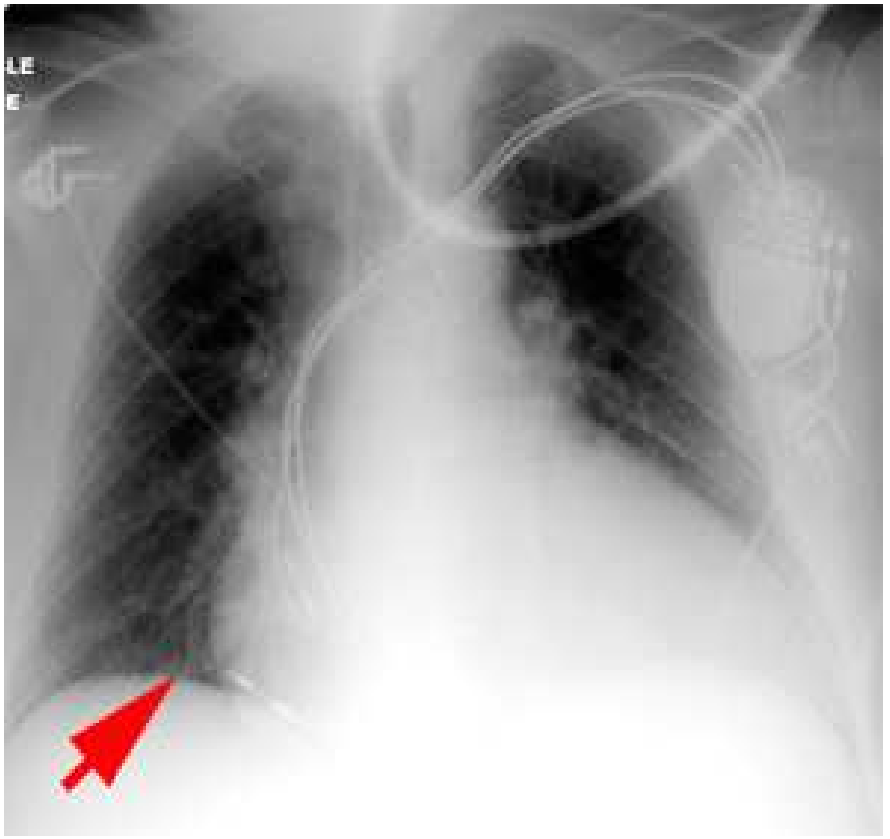


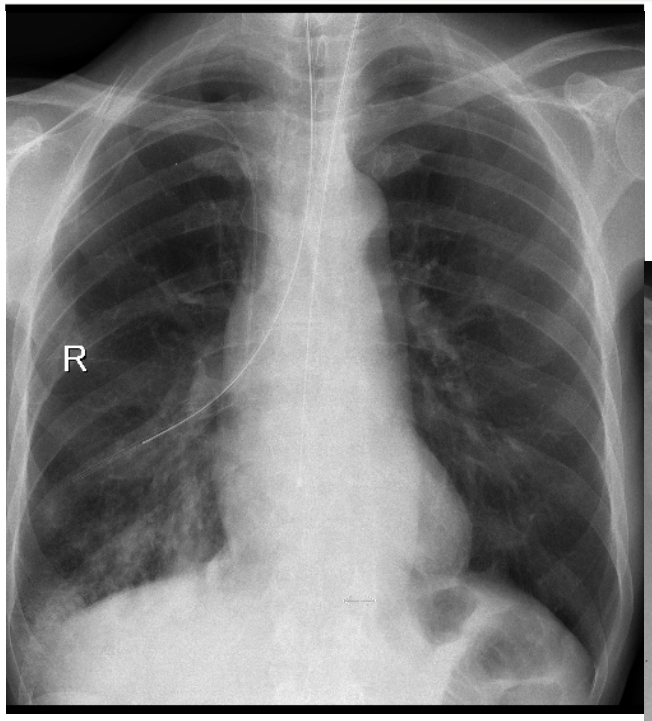


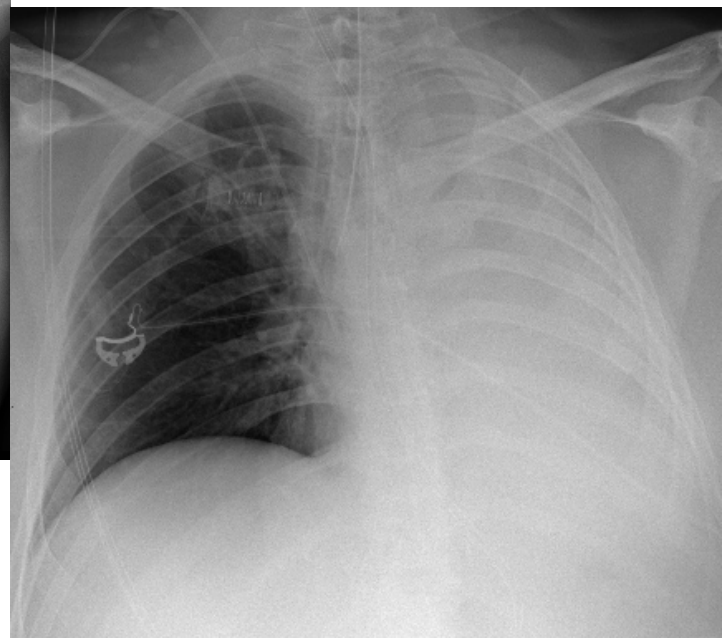
# QC Infection

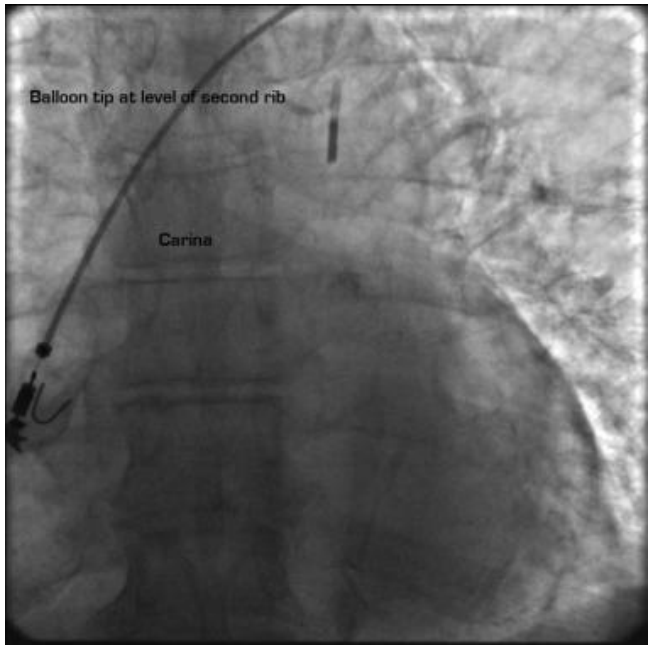


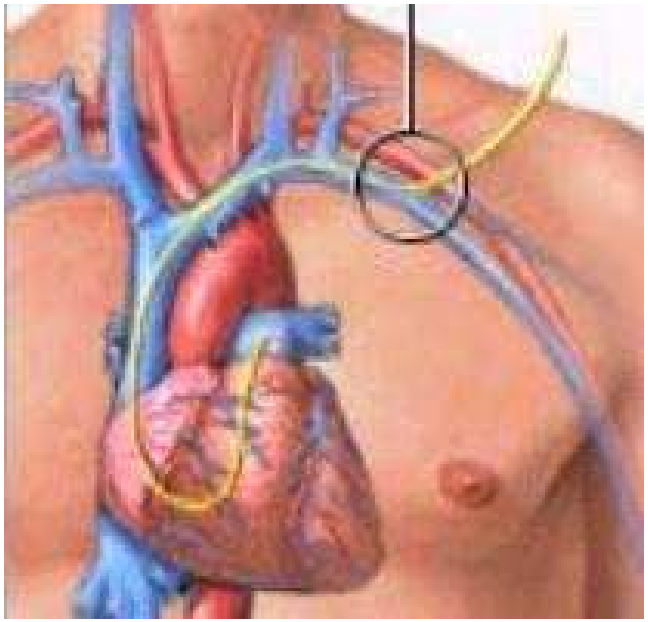


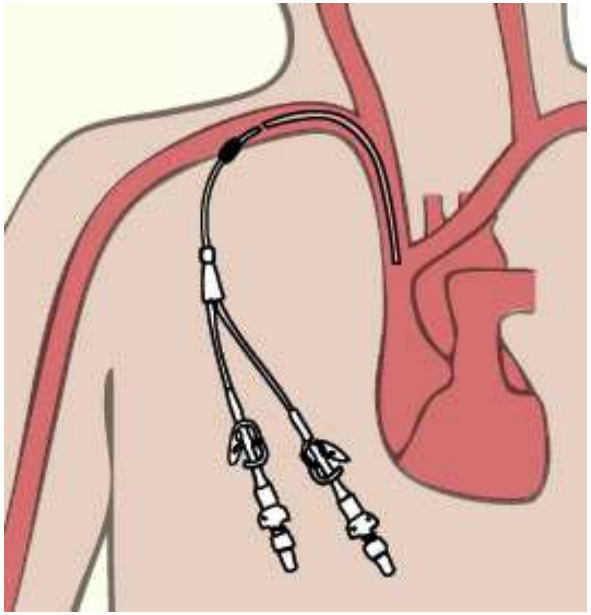
# Lines/tubes/PNO



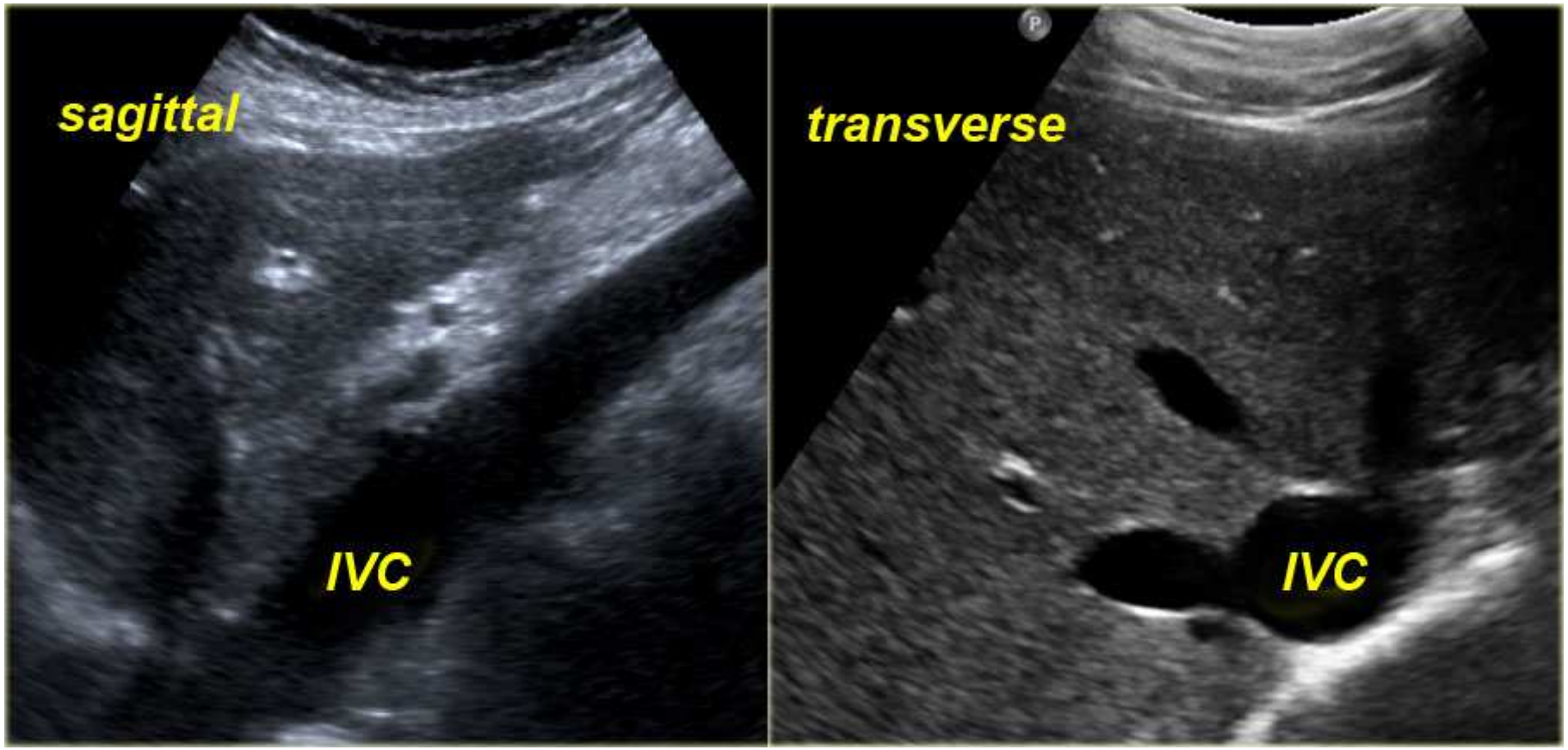




Balloon tip at level of second rib
Carina

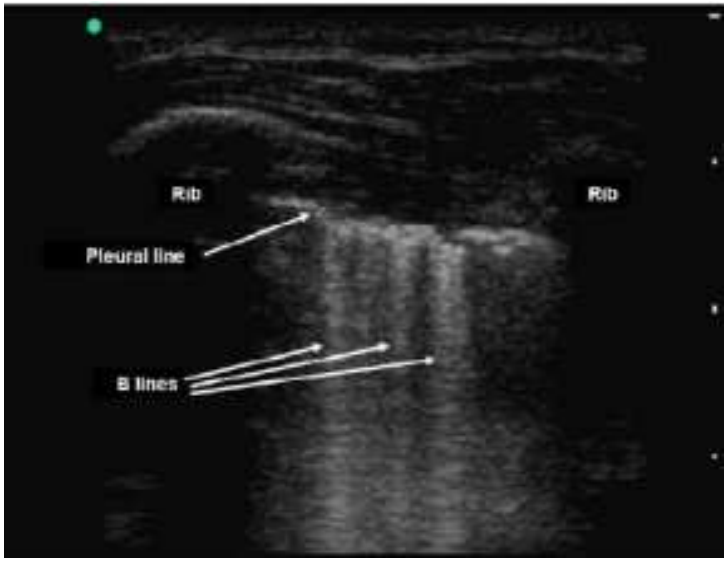


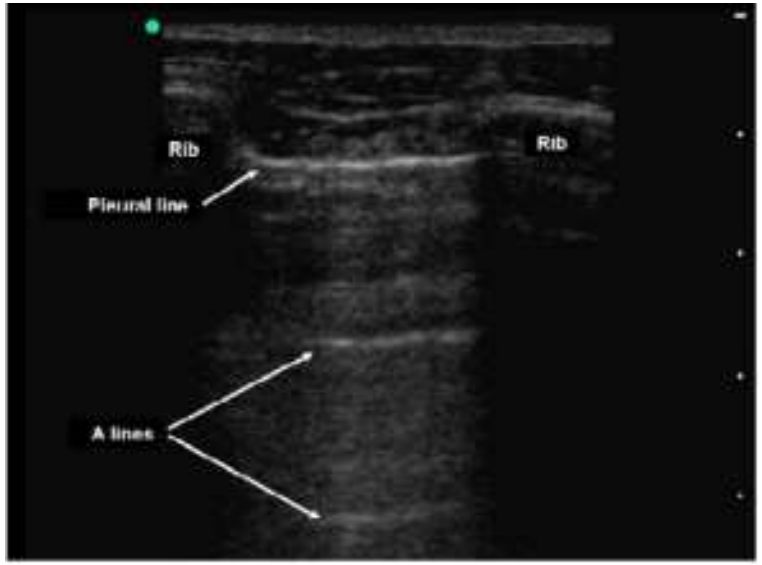


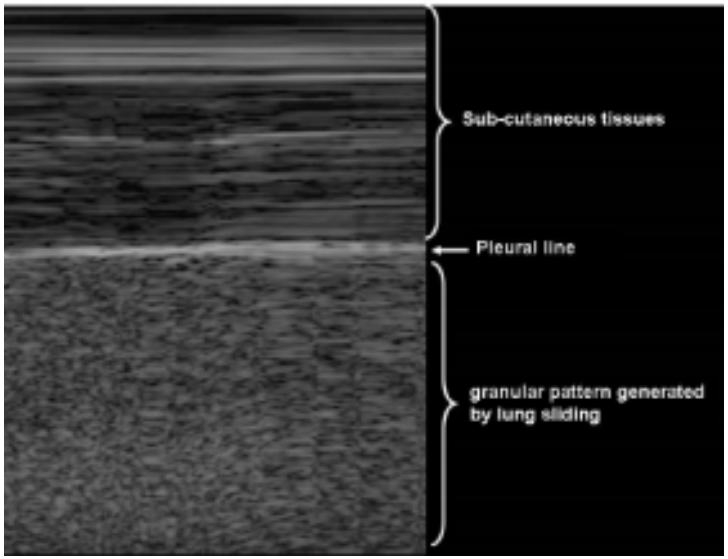
# What's about the emerging role of chest echography?

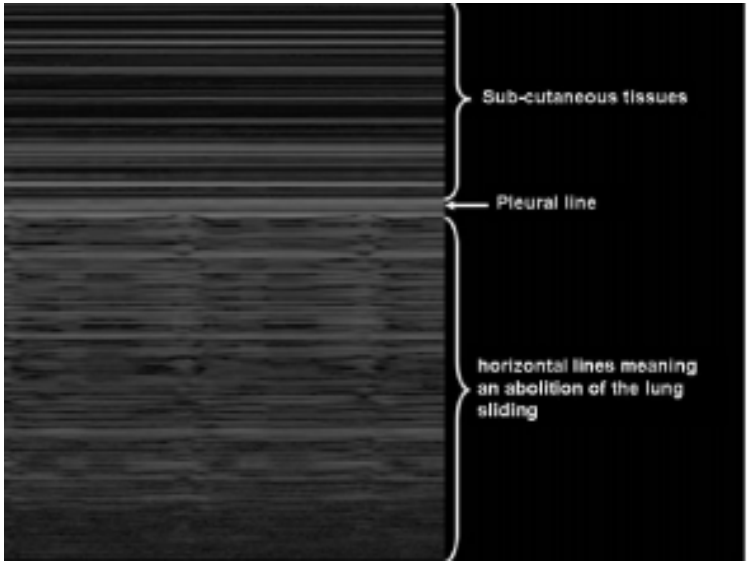


# Other (PNO, NG Tube…)



Anesthesiology 2004; 100:9–15 

# *Comparative Diagnostic Performances of Auscultation, Chest Radiography, and Lung Ultrasonography in Acute Respiratory Distress Syndrome*

*Daniel Lichtenstein, M.D.,* Ivan Goldstein, M.D.,† Eric Mourgeon, M.D.,† Philippe Cluzel, M.D., Ph.D.,‡ Philippe Grenier, M.D.,§ Jean-Jacques Rouby, M.D., Ph.D.,‖*

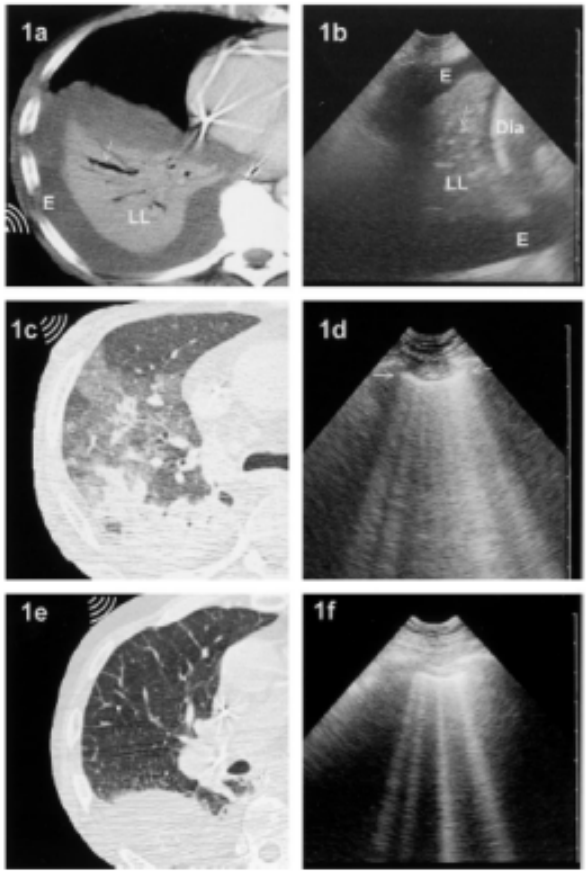



**Table 1. Sensitivity and Specificity of Auscultation, Chest Radiography, and Lung Ultrasonography for Diagnosing Pleural Effusion, Alveolar Consolidation, and Alveolar–Interstitial Syndrome in 384 Lung Regions in 32 Critically Ill Patients with ARDS**

| | Auscultation, % | Chest Radiography, % | Lung Ultrasonography, % |
|---|---|---|---|
| Pleural effusion | | | |
| Sensitivity | 42 | 39 | 92 |
| Specificity | 90 | 85 | 93 |
| Diagnostic accuracy | 61 | 47 | 93 |
| Alveolar consolidation | | | |
| Sensitivity | 8 | 68 | 93 |
| Specificity | 100 | 95 | 100 |
| Diagnostic accuracy | 36 | 75 | 97 |
| Alveolar–interstitial syndrome | | | |
| Sensitivity | 34 | 60 | 98 |
| Specificity | 90 | 100 | 88 |
| Diagnostic accuracy | 55 | 72 | 95 |

ARDS = acute respiratory distress syndrome.