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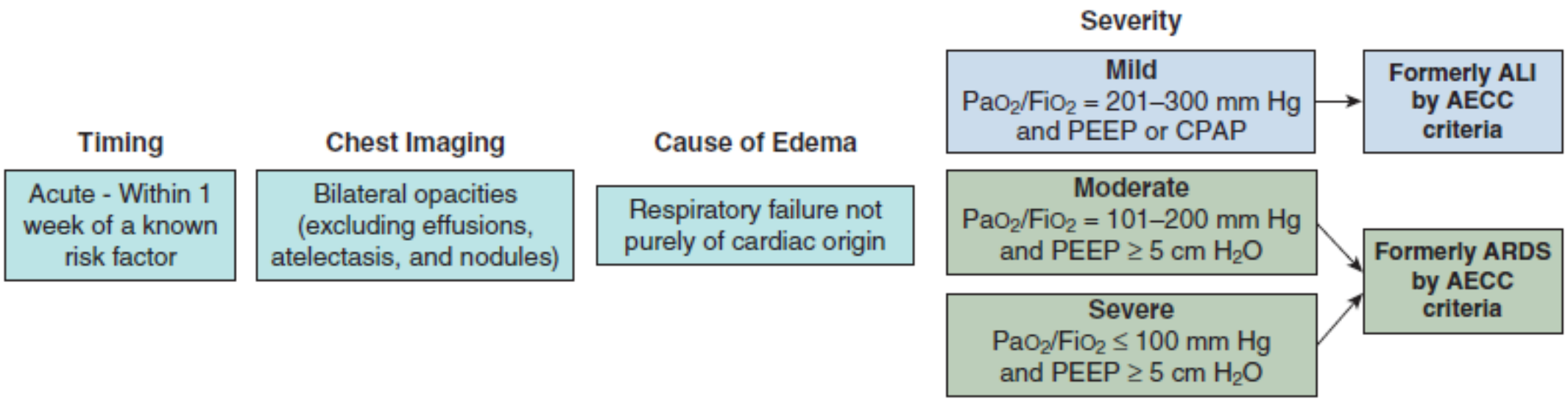
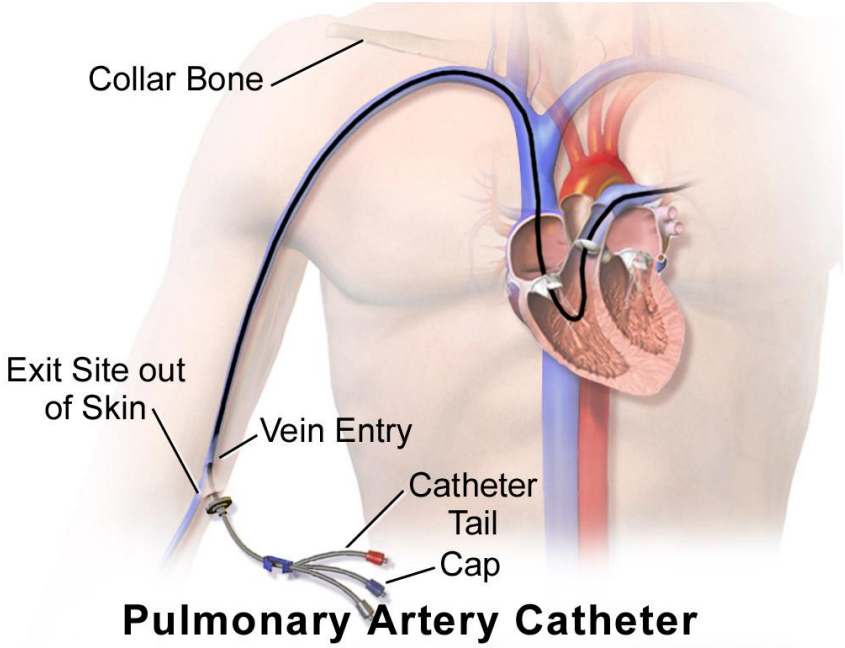
Intensivist

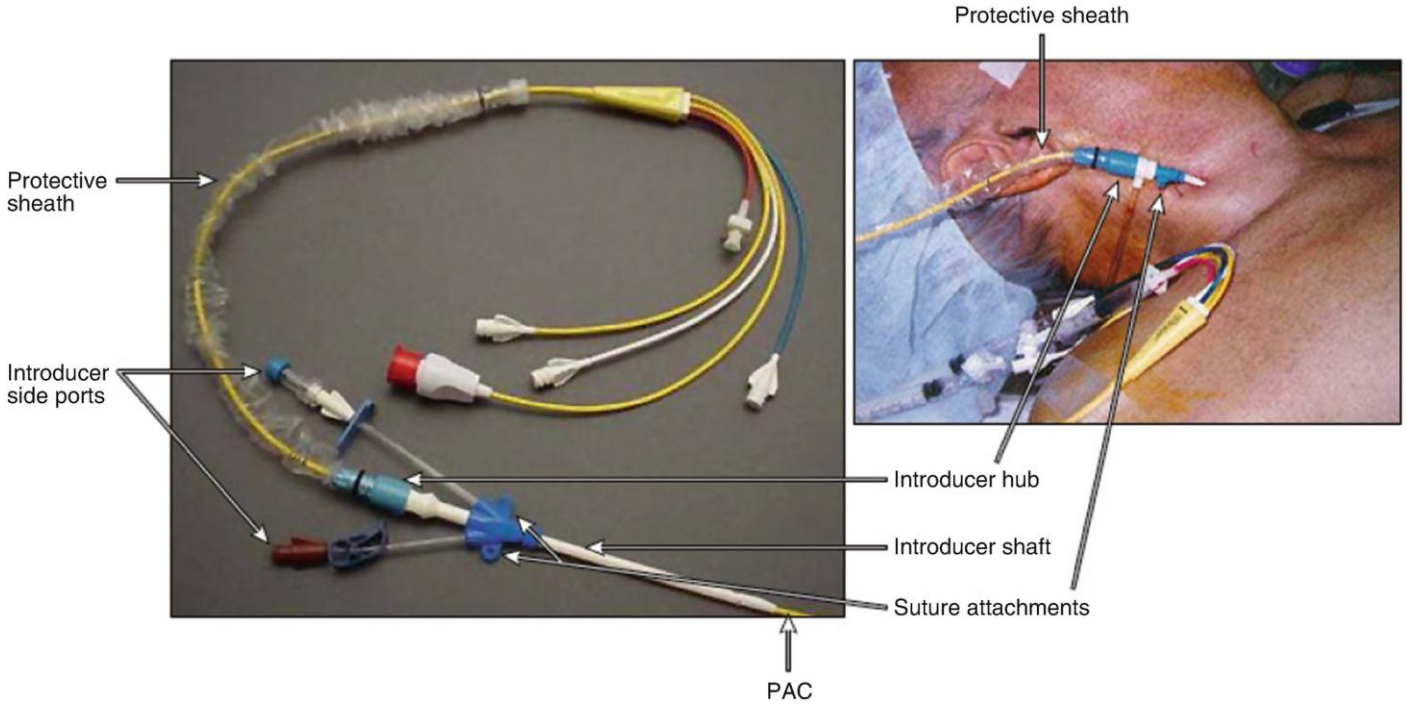
GUMS

	AECC Definition from 1994 [20]	Berlin Definition from 2012 [21]
Timing	Acute onset	Within 1 week of a known clinical insult or new/worsening respiratory symptoms
Chest imaging	Bilateral infiltrates seen on frontal chest radiograph	Chest X-ray or CT scan: Bilateral opacities not fully explained by effusions, lobar/lung collapse, or nodules
Origin of edema	Pulmonary artery wedge pressure $\leq$18 mmHg when measured, or no clinical evidence of left atrial hypertension	Respiratory failure not fully explained by cardiac failure or fluid overload; objective assessment (e.g., echocardiography) required to exclude hydrostatic edema if no risk factor presents
Oxygenation	Acute lung injury criteria: $PaO_2/FiO_2 \leq 300$ mmHg (regardless of PEEP level)	Mild ARDS: $200 < PaO_2/FiO_2 \leq 300$ with PEEP or CPAP ≥ 5 cmH_2O
	ARDS criteria: $PaO_2/FiO_2 \leq 200$ mmHg (regardless of PEEP level)	Moderate ARDS: $100 < PaO_2/FiO_2 \leq 200$ with PEEP ≥ 5 cmH_2O
		Severe ARDS: PaO_2/FiO_2: ≤ 100 with PEEP ≥ 5 cmH_2O



- pulmonary artery catheter





The limitations of the current definition

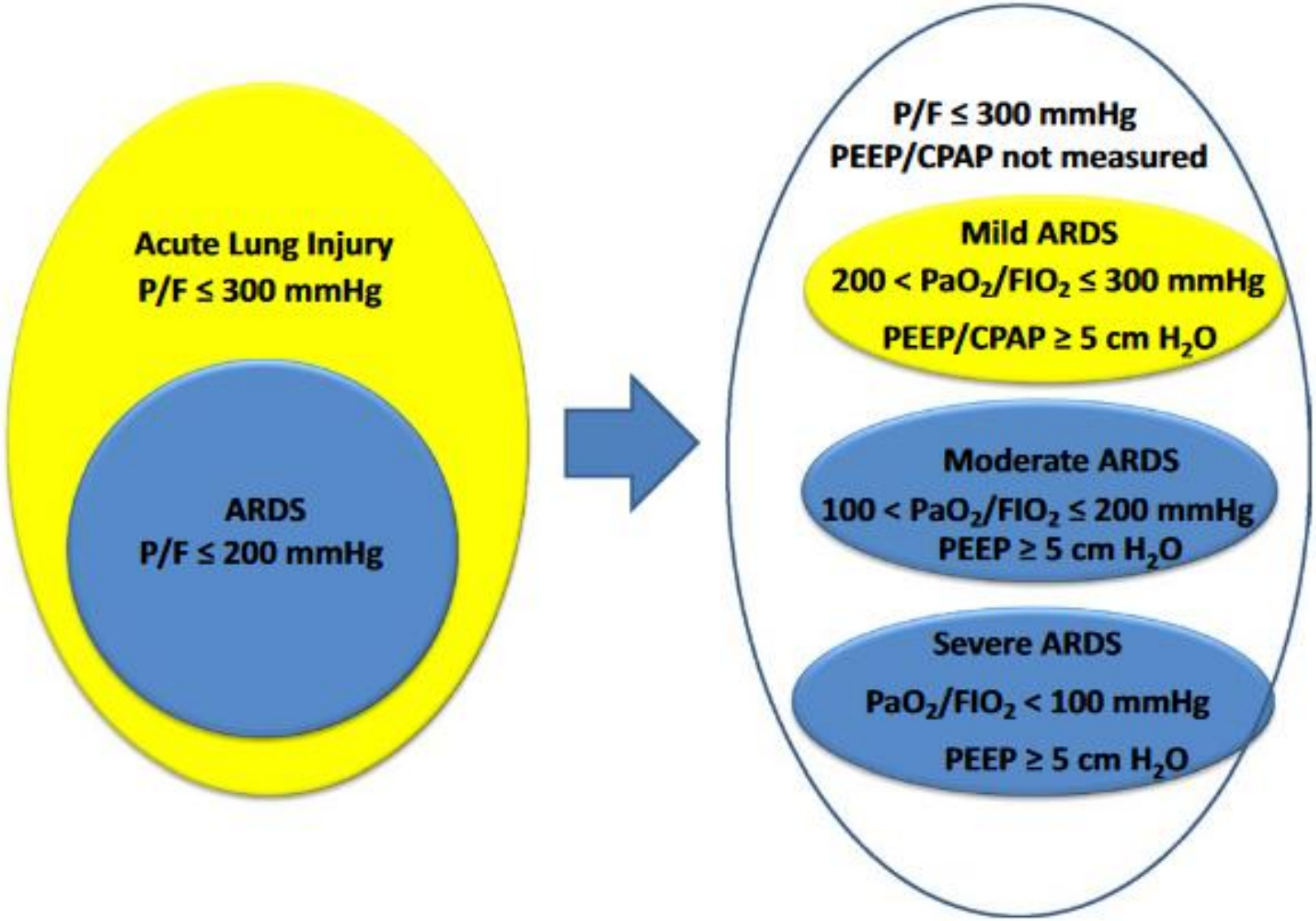
- chest radiography
- movements of the chest wall
- radiograph film placed posterior to the thorax
- sub-optimal orientation of the radiograph beam
- pleural effusion superimposed on lung opacities
- lacks of sensitivity and specificity to detect pulmonary edema
- may be mistaken with pleural effusions, that are not necessarily related to increased EVLW

The limitations of the current definition

- the PaO_2/FiO_2 ratio depends on FiO_2 non linear
- As a result, decreasing FiO_2 decreases the PaO_2/FiO_2 ratio, which may wrongly suggest a worsening of lung inflammation.
- PaO_2/FiO_2 ratio depends on the level of PEEP

The limitations of the current definition

- primary or secondary ALI/ARDS ???
- the role of intra-abdominal pressure (IAP)????
- the evidence for cardiac dysfunction does not imply causality: patients with chronic cardiac diseases have an abnormal cardiac function on echocardiography also when they develop lung injury. *Therefore, the existence of a disease known to increase pulmonary vascular permeability seems more important than the lack of left ventricular dysfunction in order to accurately diagnose ALI/ARDS*

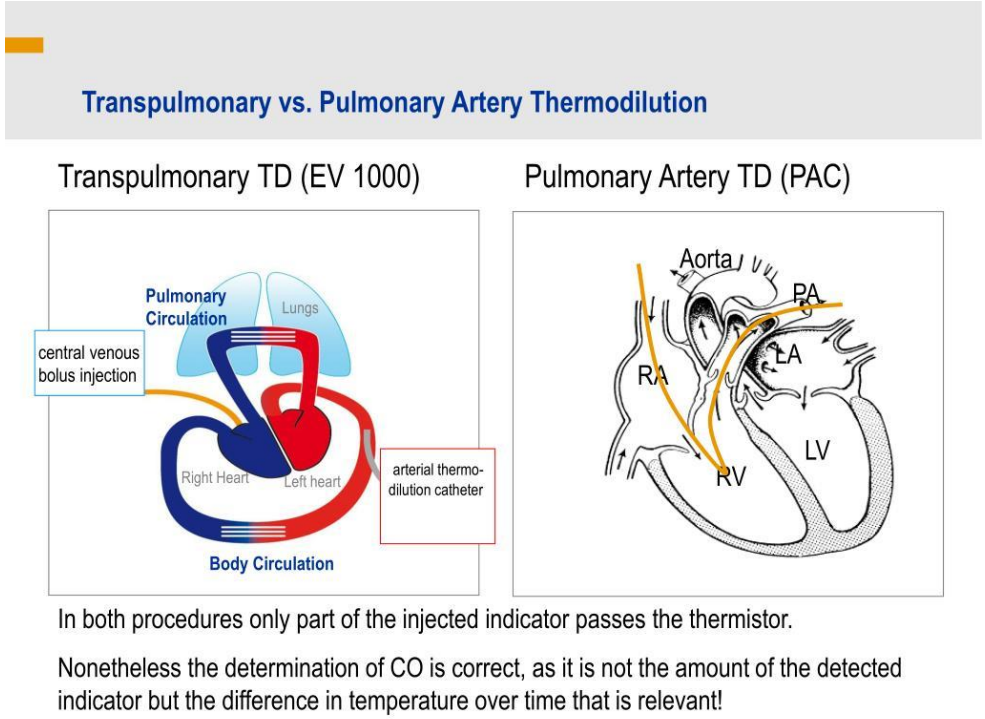

Acute Lung Injury
P/F ≤ 300 mmHg
ARDS
P/F ≤ 200 mmHg
P/F ≤ 300 mmHg
PEEP/CPAP not measured
Mild ARDS
200 < PaO2/FIO2 ≤ 300 mmHg
PEEP/CPAP ≥ 5 cm H2O
Moderate ARDS
100 < PaO2/FIO2 ≤ 200 mmHg
PEEP ≥ 5 cm H2O
Severe ARDS
PaO2/FIO2 < 100 mmHg
PEEP ≥ 5 cm H2O

Towards a new definition for ALI and ARDS

- Although not a bedside technique
- the CT scan is dramatically useful to characterize the lung disease process
- bilateral or not
- patchy or posterior condensations
- to quantify pleural effusion
- assess lung recruitment induced by PEEP or other maneuvers.
  Therefore, the information provided by the CT scan – when performed - could be integrated to the definition of ALI/ARDS.

Towards a new definition for ALI and ARDS

- EVLW
- TPTD
- TPTD measurements also allow to calculate the pulmonary vascular permeability index (PVPI)
- Differentiate primary (pulmonary) versus secondary (extrapulmonary)
- increased IAP



wise to integrate FiO2 in the definition

- PaO2/FiO2 ratio < 300 by the need to use a FiO2 > 40% to maintain a SaO2 > 95%
- PaO2/FiO2 ratio < 200 by the need to use a FiO2 > 60%.
- Although this suggestion has also limitations since a patient may be on 70% FiO2 but he/she may not need it (eg underlying COPD)
- the combination between FiO2 and P/F ratio makes sense in specific cases

A new definition for Acute Lung Injury & ARDS

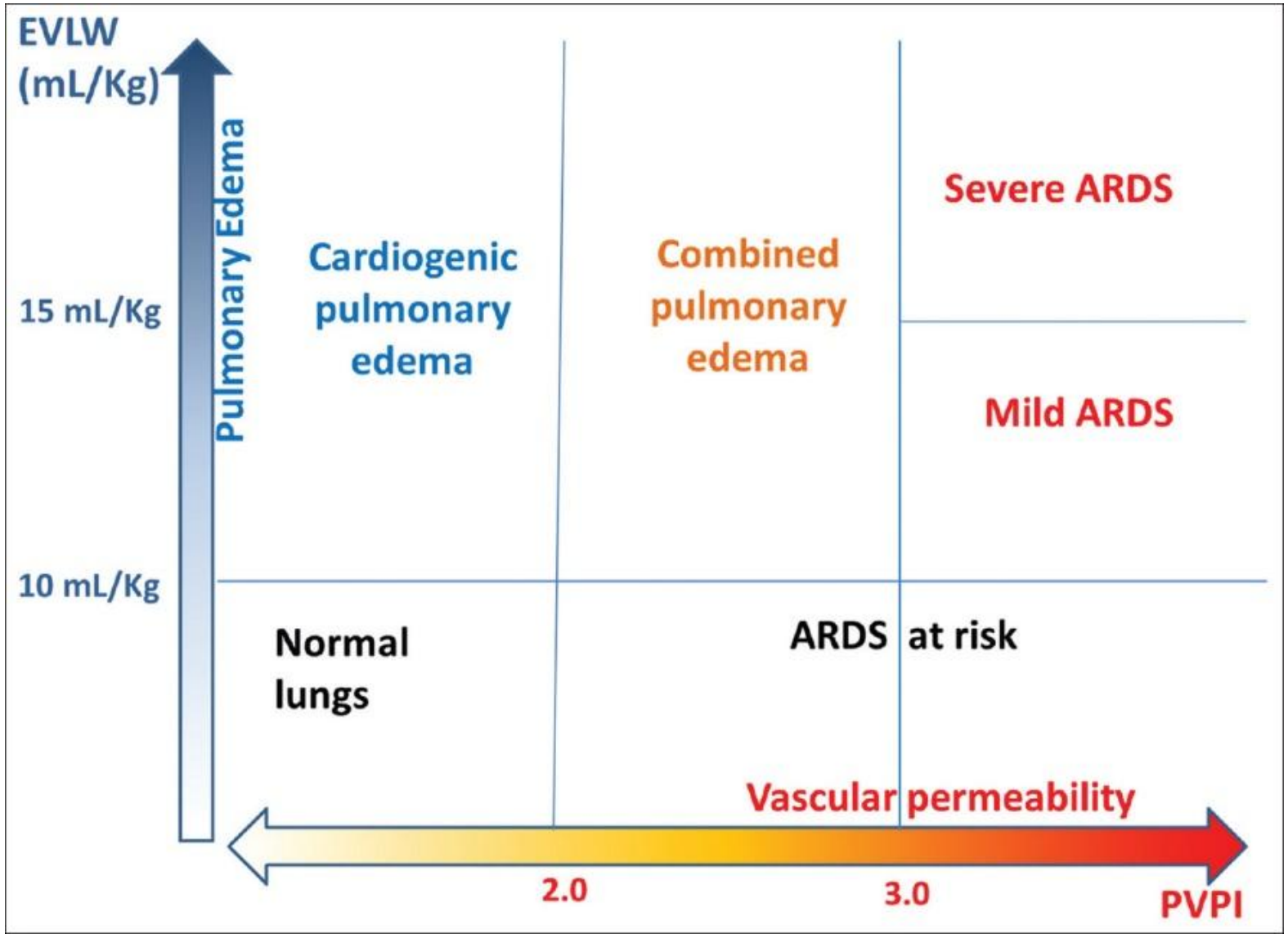
- A PULMONARY disease process known to increase pulmonary vascular permeability (normal IAP)
  a. Viral or bacterial pneumonia
  b. Gastric or smoke inhalation
  c. Other…
- An EXTRAPULMONARY disease process known to increase pulmonary vascular permeability (increased IAP > 12 mmHg)
  a. Chest trauma and/or polytrauma and/or polytransfusion
  b. Pancreatitis or severe burns or severe sepsis or septic shock
  c. Other…

A new definition for Acute Lung Injury & ARDS

- Evidence for lung edema
  a. Bilateral pulmonary infiltrates on chest radiography (with exclusion of pleural effusion or atelectasis) and/or
  b. EVLWI > 10 ml/kg and/or
  c. PVPI > 2.5 and/or
  d. Bilateral consolidations on chest CT scan

- The need for
  a. FiO2 between 0.4 and 0.6 to maintain SaO2 > 95% (ALI)
  b. FiO2 > 0.6 to maintain SaO2 > 95% (ARDS)
  c. Regardless of PEEP level

pulmonary vascular permeability index



Extra Vascular Lung Water (EVLW)

EVLW : PBV

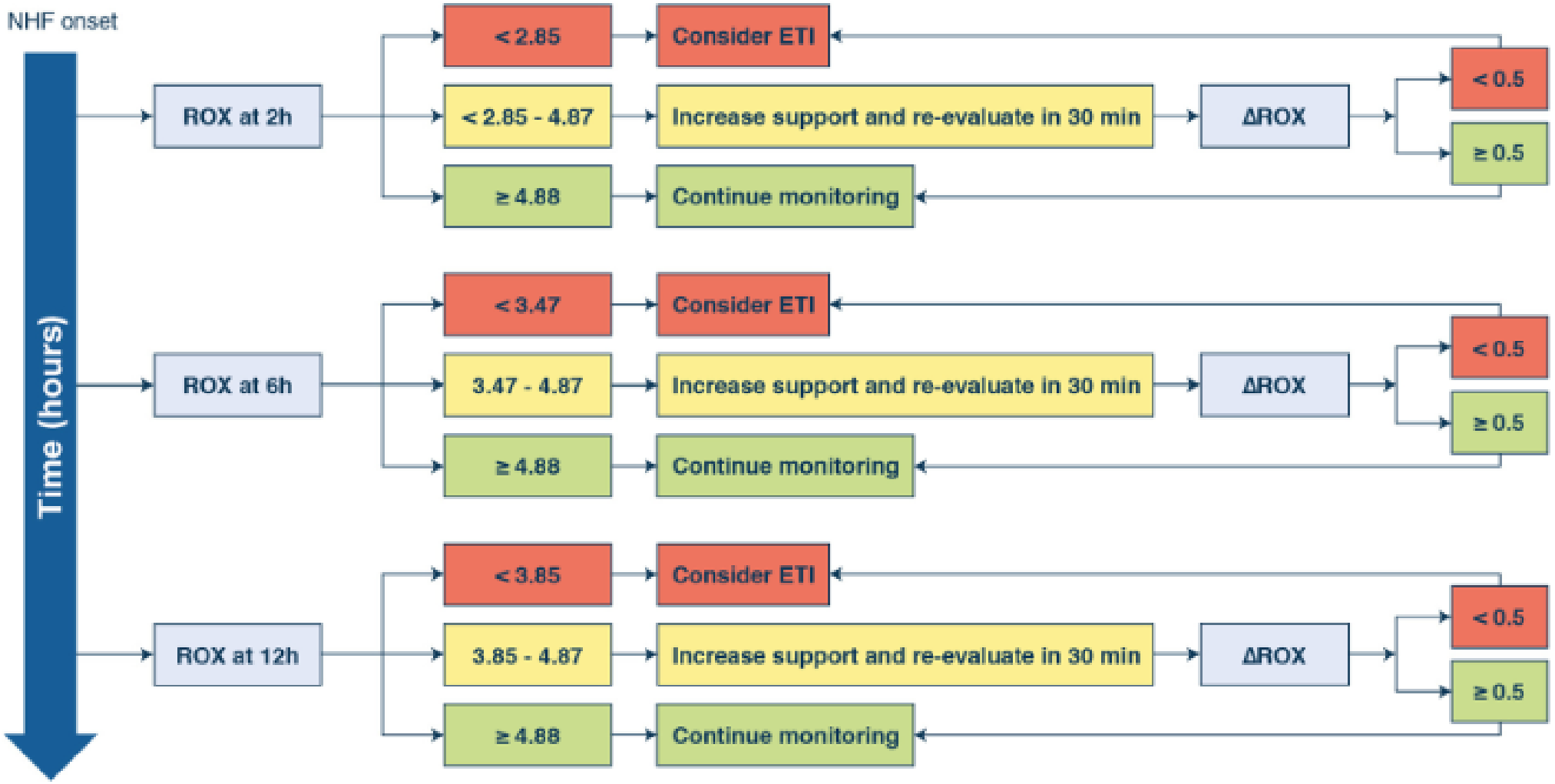
Pulmonary Blood Volume (PBV)

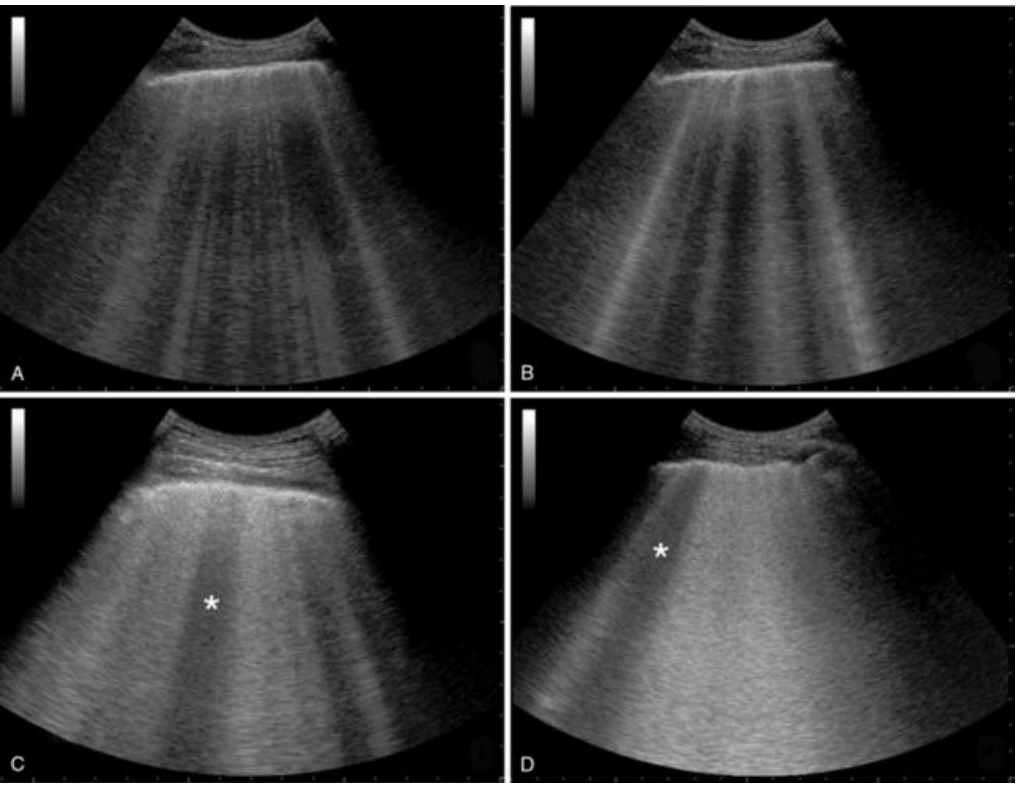
PVPI

1,0 - 3,0
cardiogenic pulmonary oedema

> 3,0
permeability pulmonary oedema

ROX index to help with intubation decision

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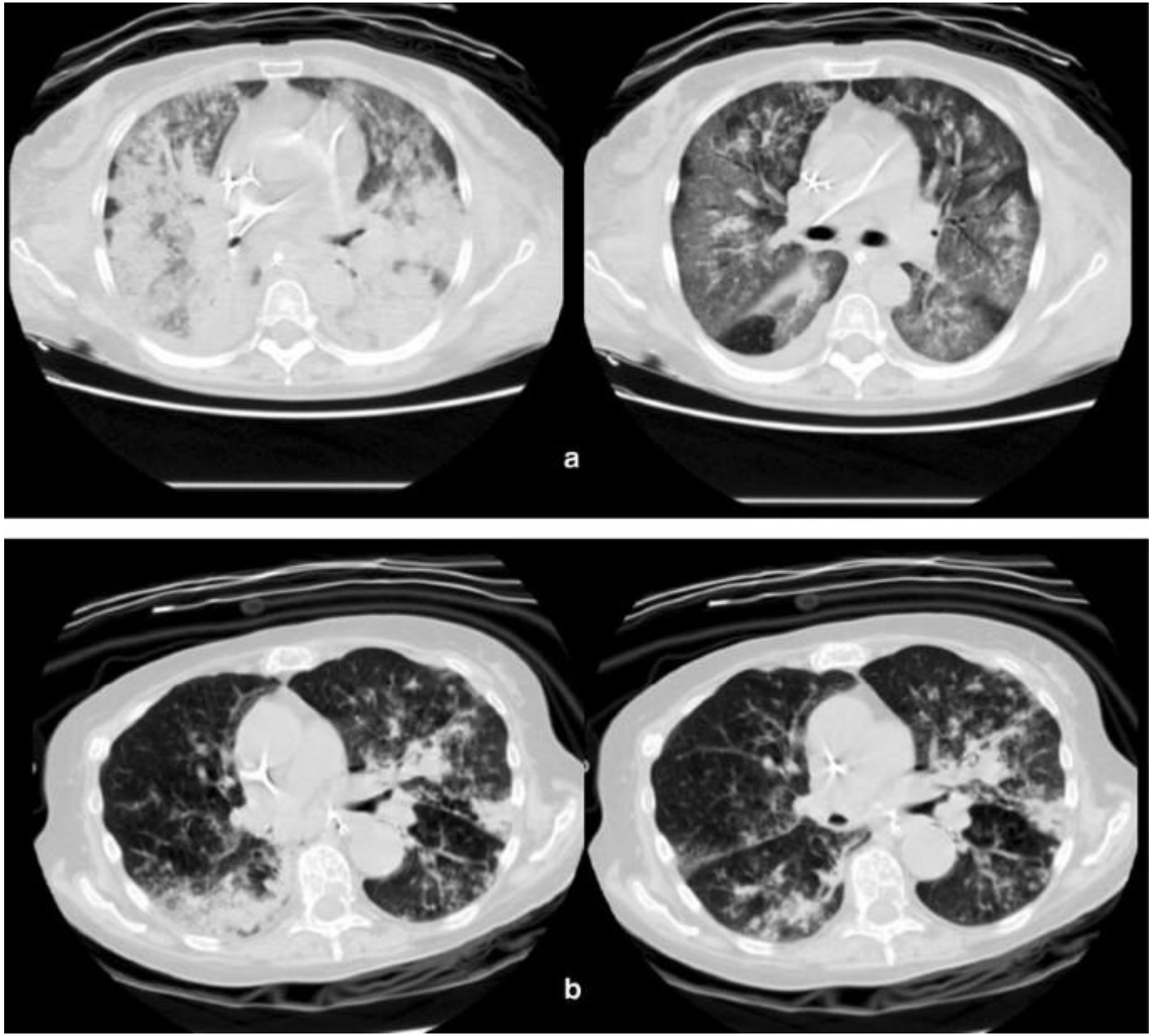
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