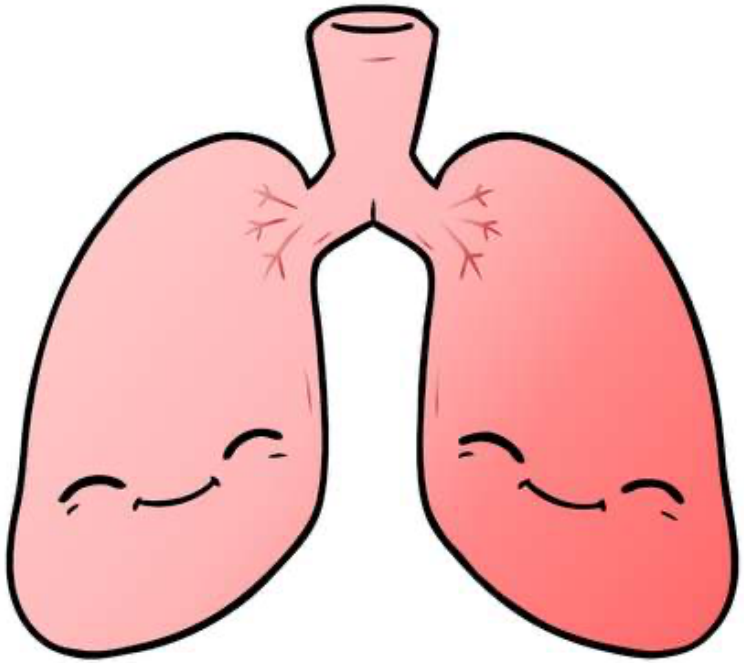
Respiratory with Naomi and Savannah



The plan

The basics of respiratory conditions

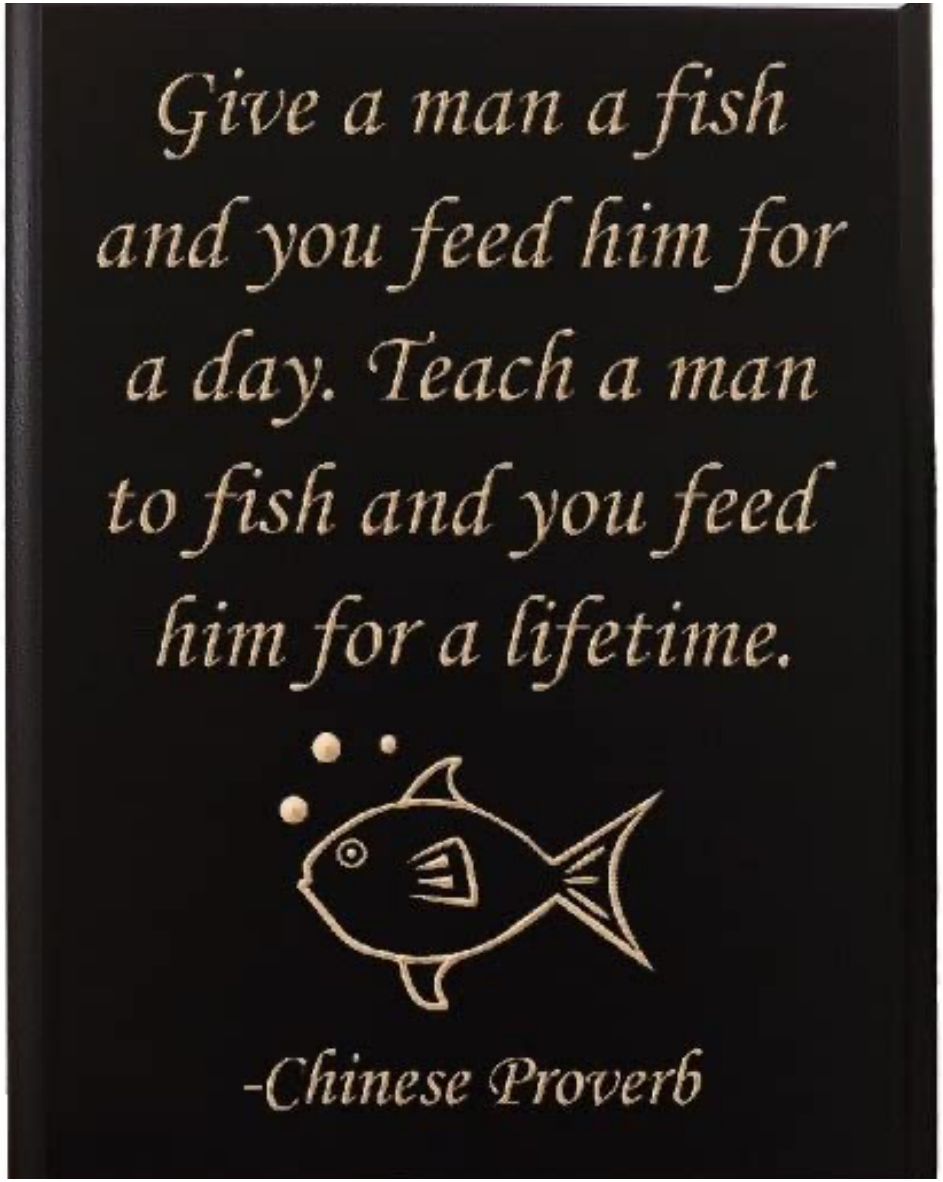
Investigations

- History
- Examination
- Peak flow
- ABG
- CXR

Key conditions to know!

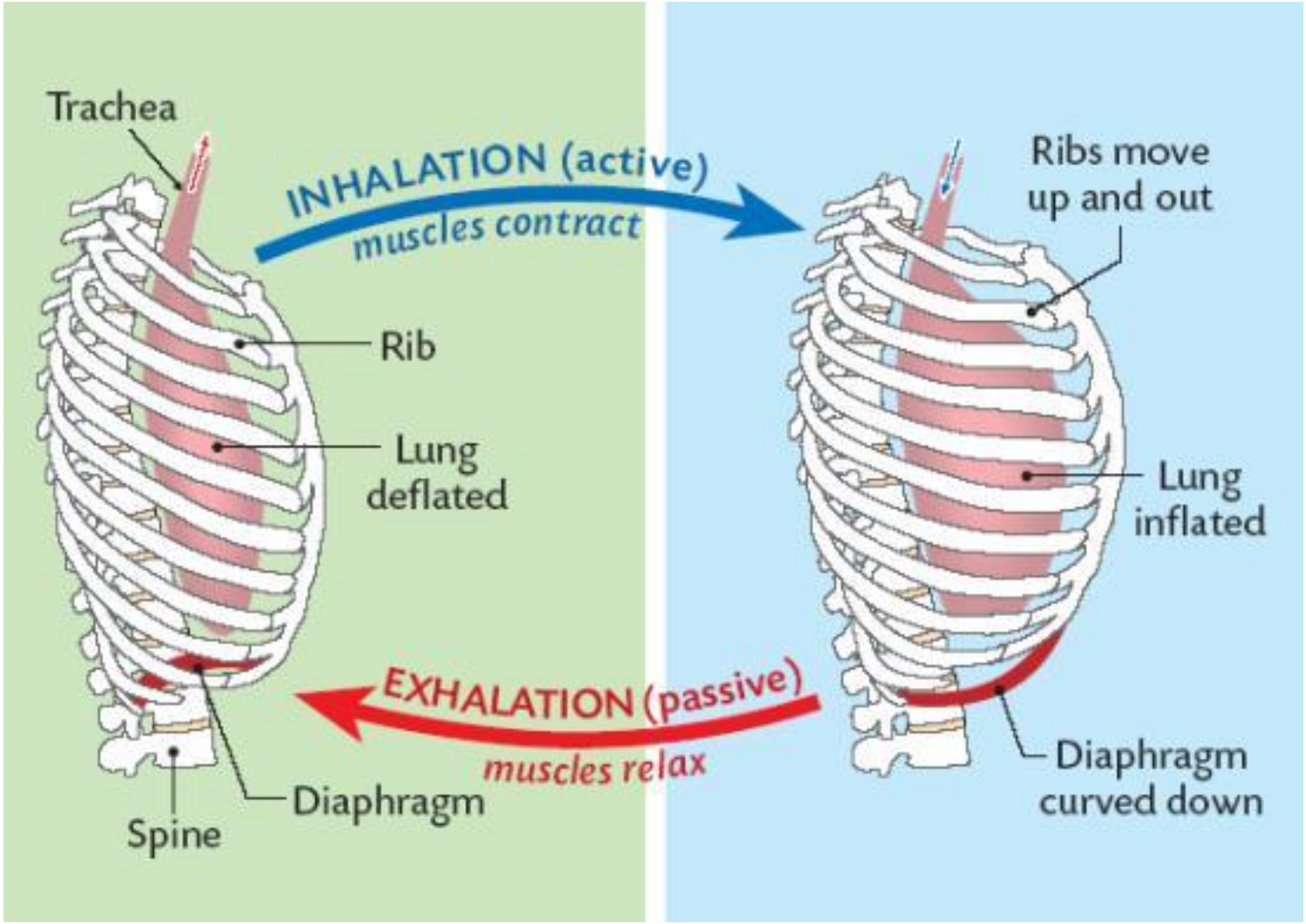
Suggested take home/approach

- Use as guide
- Take what you want from it
- Find your style of learning

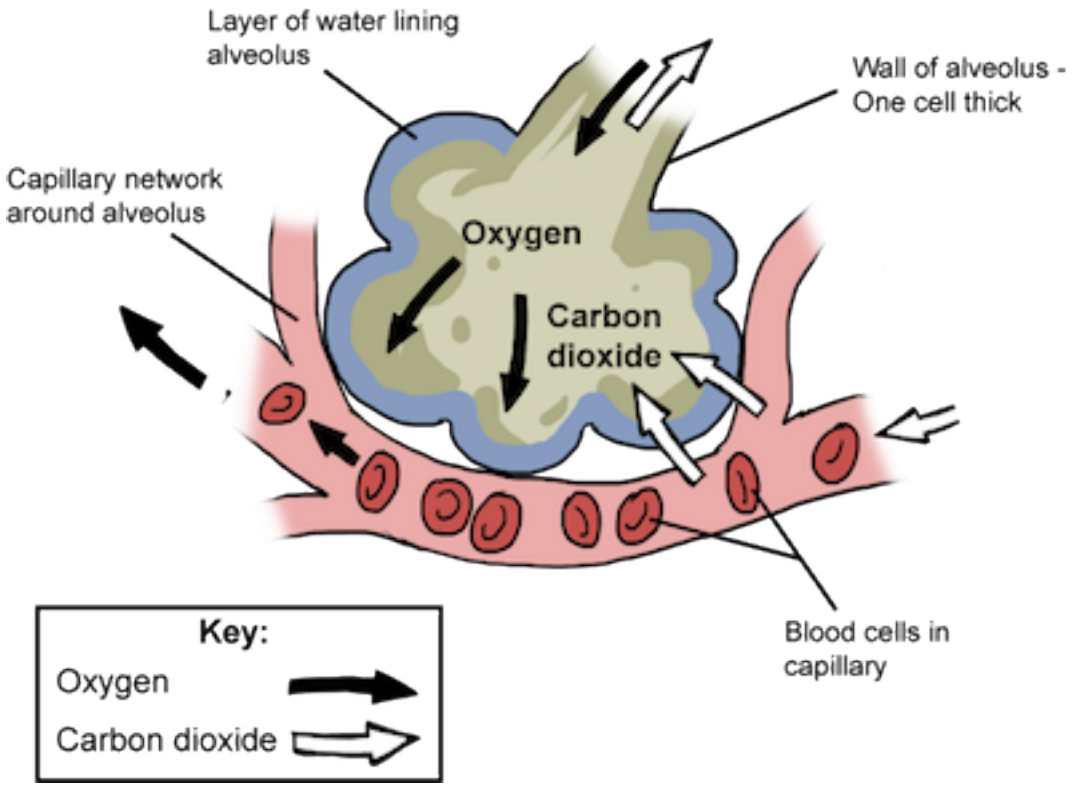


BACK TO BASICS

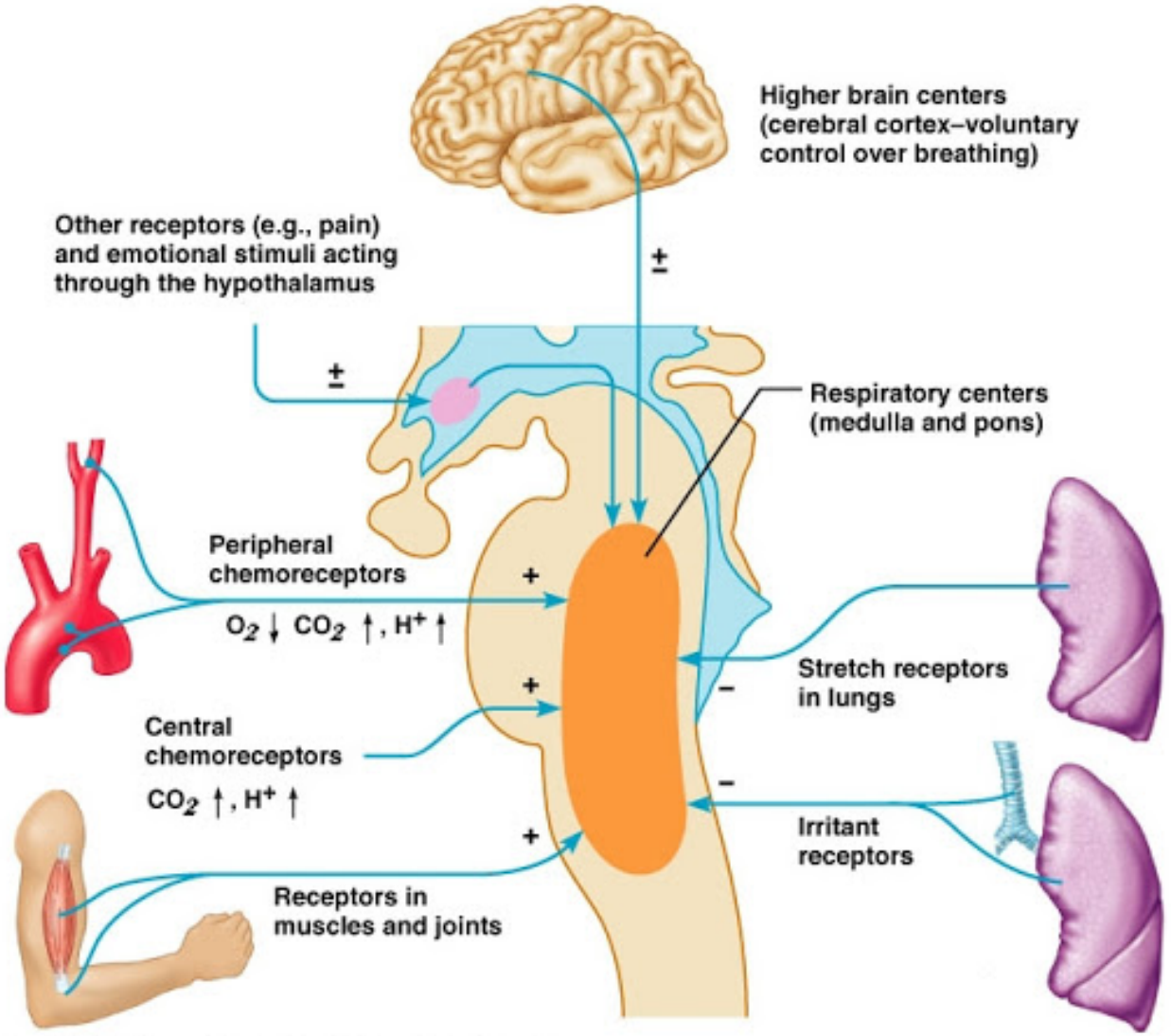
https://tchetcuti.wordpress.com/2014/09/24/cinema-4d/



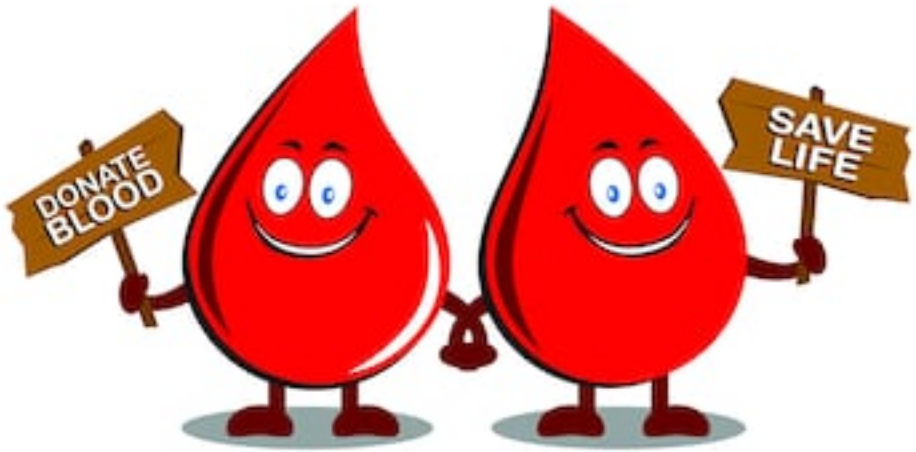
https://anjungsainssmkss.wordpress.com/2011/05/02/inhalation-and-exhalation/



https://pmgbiology.com/2015/10/19/alveoli-and-gas-exchange-a-understanding-for-igcse-biology/



Other bits to think of …



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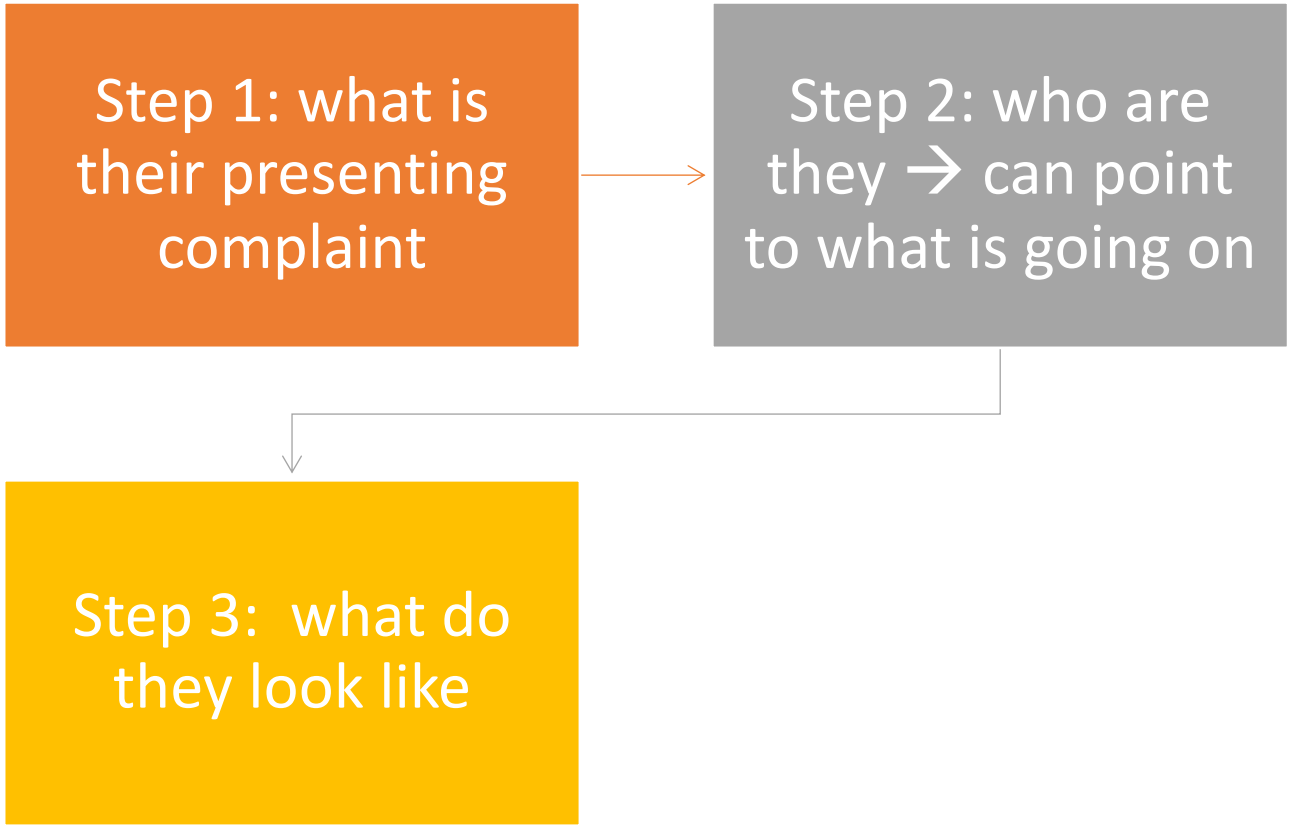
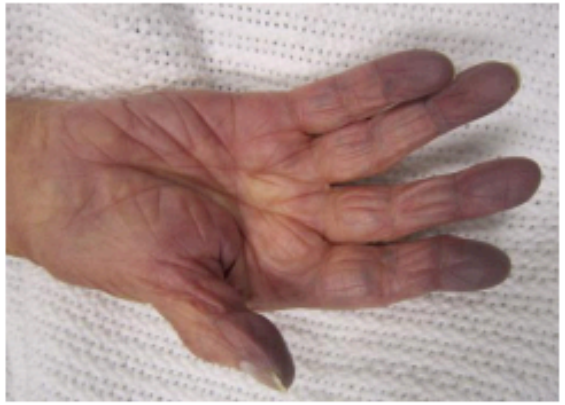
A patient presenting with a respiratory problem…

Find how your brain processes things… mine



Examination findings



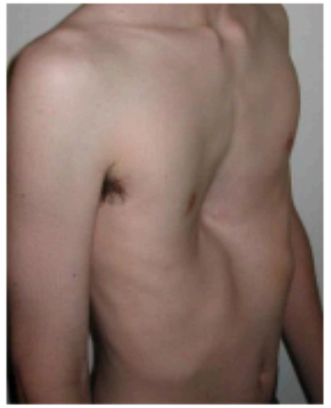
Peripheral cyanosis

Tar staining

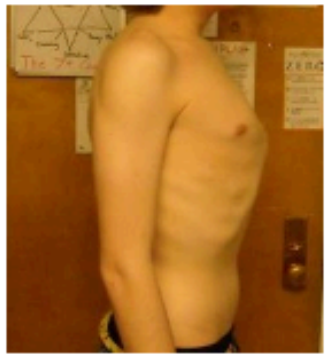
Nail clubbing

Horner's syndrome: ptosis, miosis, anhidrosis

Nautiyal A, Singh S, DiSalle M, O'Sullivan J (2006) Painful Horner Syndrome as a Harbinger of Silent Carotid Dissection. PLoS Med 2(1): e19 doi:10.1371/journal.pmed.0020019



Pectus excavatum: sunken chest. May be congenital or develop at puberty



Pectus carinatum: protrusion of sternum. May be congenital, post-surgical or develop at puberty

Peak Expiratory Flow Rate

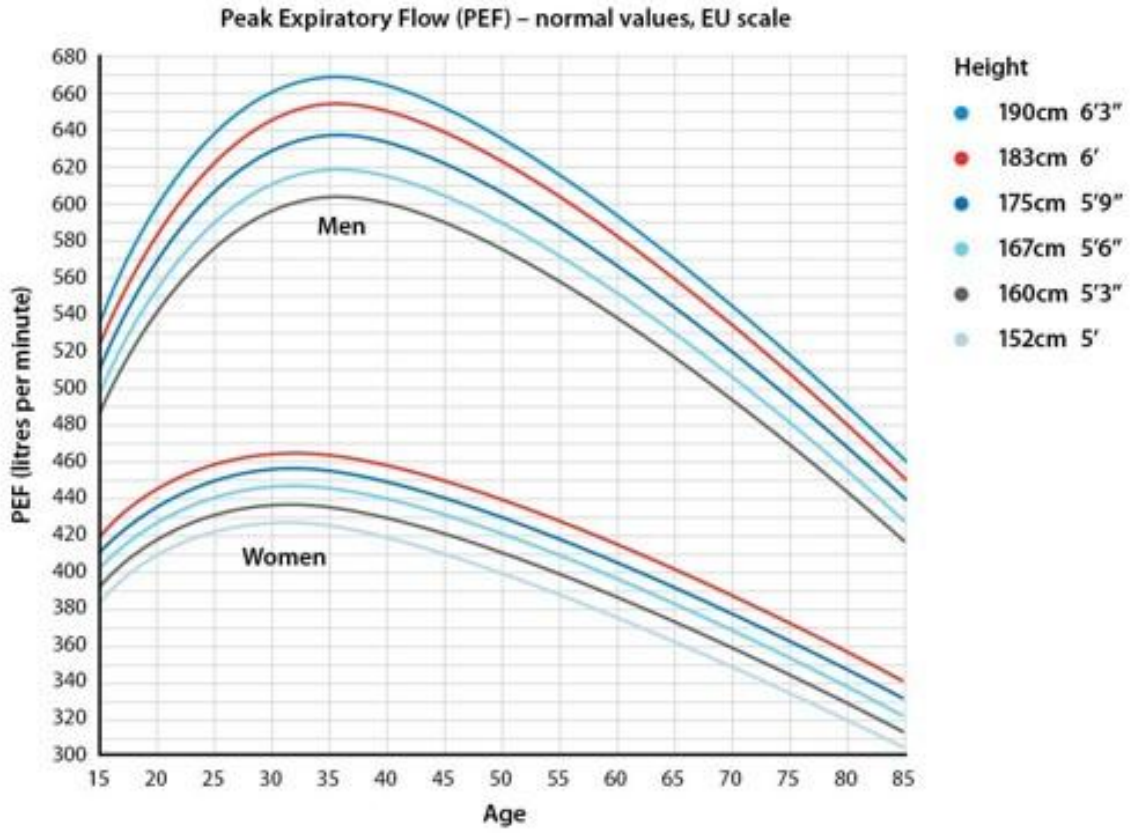
- Measures how fast you can breathe out after you've taken a full breath in
- Measured with peak flow meter – in L/min

How to use:

- Deep breathe in
- Tight seal
- Short, fast blow
- Best of 3

How To Interpret PEFR

- Predicted values are dependent on sex, age, height and ethnicity
- Asthma and COPD
  - Spirometry
  - Reversibility testing



Respiratory failure

- Type 1 = 1 problem (hypoxaemia Pao2 < 8kPa)
- Type 2 = 2 problems (hypoxaemia AND hypercapnia PaCO2 >6kPa)

Type 1 → V/Q mismatch – the ventilation does not match perfusion
Air in not matched with blood flow
2 possible causes… an air problem (bronchoconstriction) OR a perfusion problem (PE)

Type 2 → Hypoventilation
Breathing is not good overall…
Can be due to obstruction, restriction, neuromuscular, central

Type 1 Pulmonary		Type 2 Extrapulmonary	
Disorder	**Disease (Ex.)**	**Disorder**	**Disease (Ex.)**
Alveolar hypoventilation	Pneumonia ARDS Pulmonary edema	Central	Coma Intracerebral hemorrhage
Distribution / diffusion	Pulmonary fibrosis	Neuromuscular	Muscular dystrophy
Perfusion	Pulmonary embolism	Obstruction	COPD Asthma
		Restriction	Pulmonary fibrosis Pneumothorax
Type 3 Combined disorder			

Table 2: Types of respiratory insufficiency, modified from [1]

Interpreting ABGs

- Look at the pH
- Look at the CO2
- *Is it a respiratory problem? I.e. is something wrong with the CO2 and does this match what is happening with the pH*
- *Or is the CO2 normal/not matching the pH*
- Look at the HCO3-
- Is there compensation

Its not always this simple… check out Geekymedics for more information

	pH	CO_2	HCO_3^-
Respiratory acidosis	↓	↑	Normal
Respiratory alkalosis	↑	↓	Normal
Respiratory acidosis with metabolic compensation	↓ / ↔	↑	↑
Respiratory alkalosis with metabolic compensation	↑ / ↔	↓	↓

	pH	HCO_3^-	CO_2
Metabolic acidosis	↓	↓	Normal
Metabolic alkalosis	↑	↑	Normal
Metabolic acidosis with respiratory compensation	↓	↓	↓
Metabolic alkalosis with respiratory compensation	↑	↑	↑

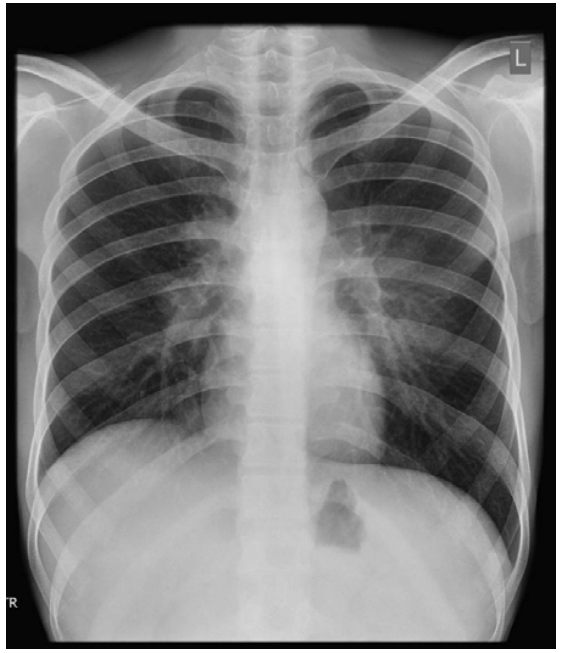
Example ABG ninja question… Whats going on here?

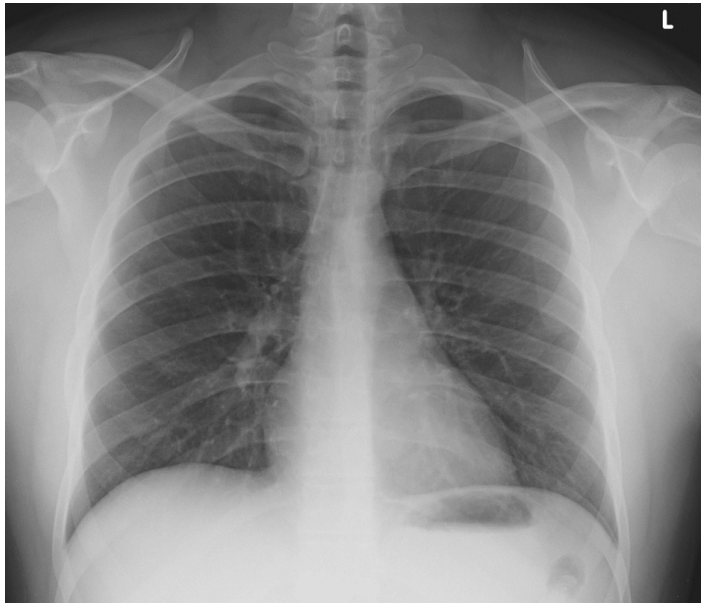
Test	Value	Normals
pH:	7.30	7.35-7.45
$PaCO_2$:	29 mmHg	35-45 mmHg
$[HCO_3^-]$:	14 mEq/L	22-26 mEq/L

Test	Value	Normals	Analysis
pH:	7.30	7.35-7.45	**Acidotic (low)**: Overall state is (still) an acidosis
$PaCO_2$:	29 mmHg	35-45 mmHg	**Alkalotic (low)**: CO_2 tension is low (respiratory alkalosis)
$[HCO_3^-]$:	14 mEq/L	22-26 mEq/L	**Acidotic (low)**: HCO_3^- concentration is low (metabolic acidosis)

How To Interpret A CXR

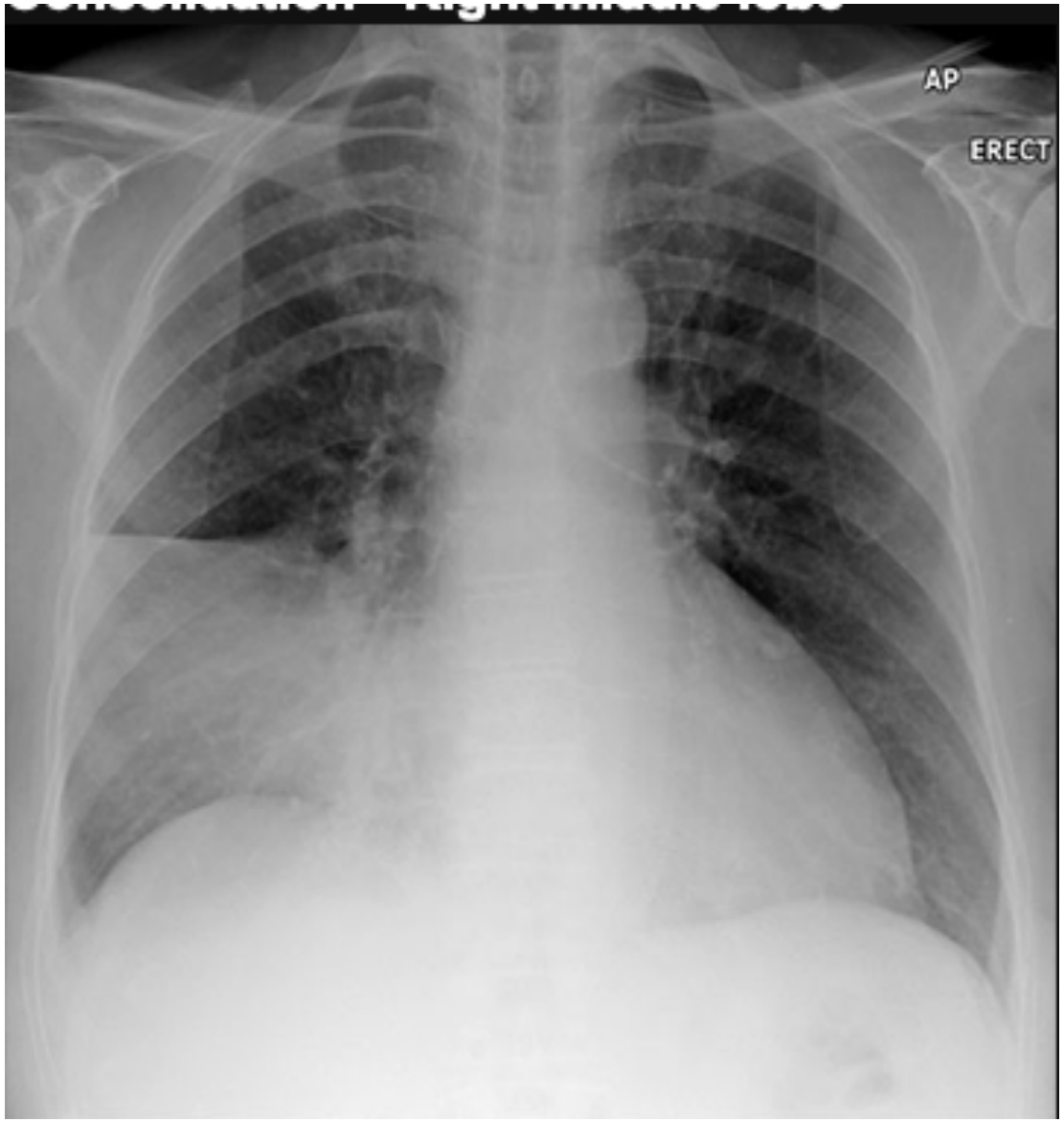
- Confirm details
  - Patient identifiers
  - Date and time of film
  - Previous imaging for comparison
- Assess the image quality - **RIPE**
  - **R**otation
  - **I**nspiration
  - **P**rojection
  - **E**xposure

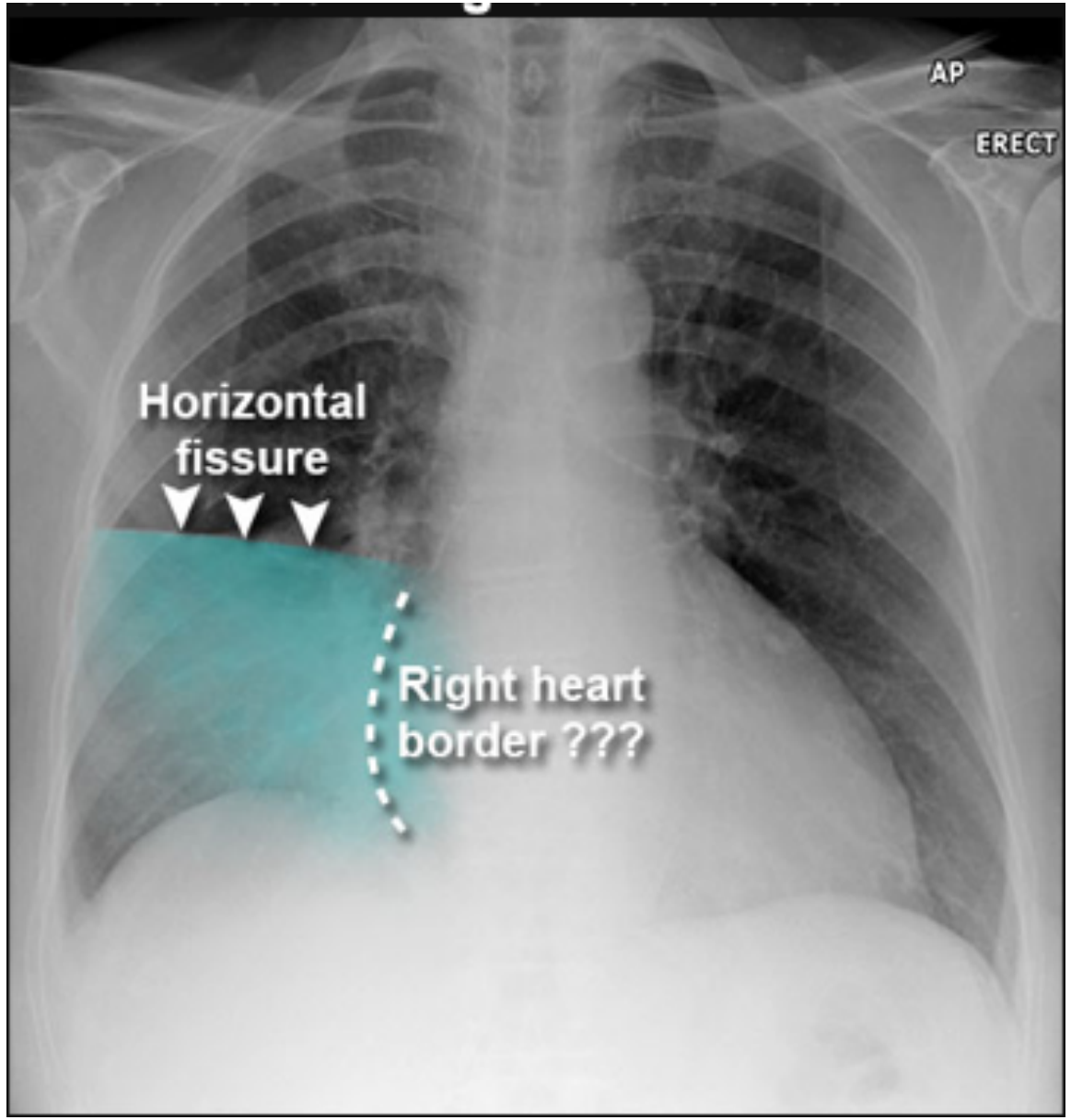


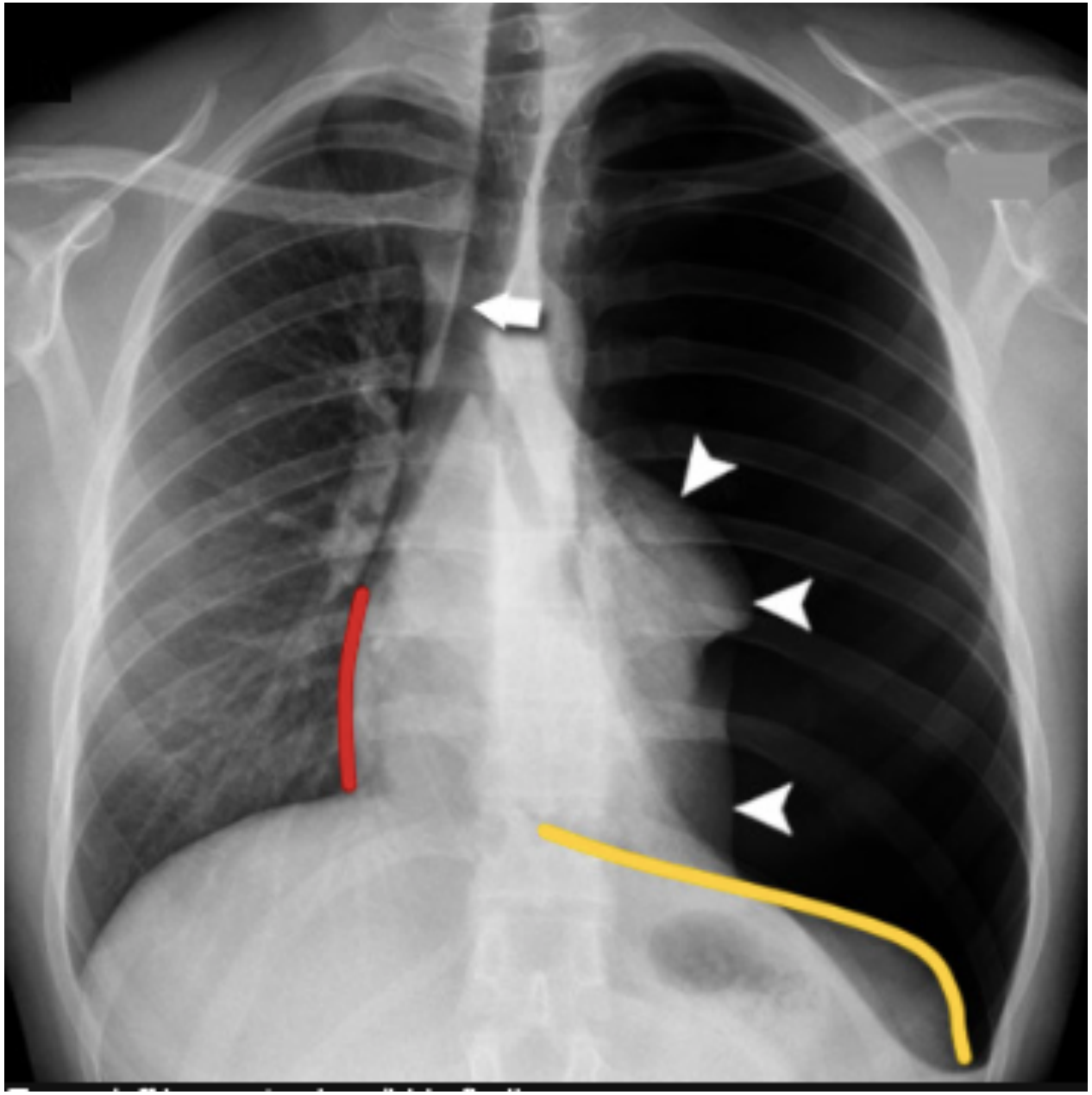


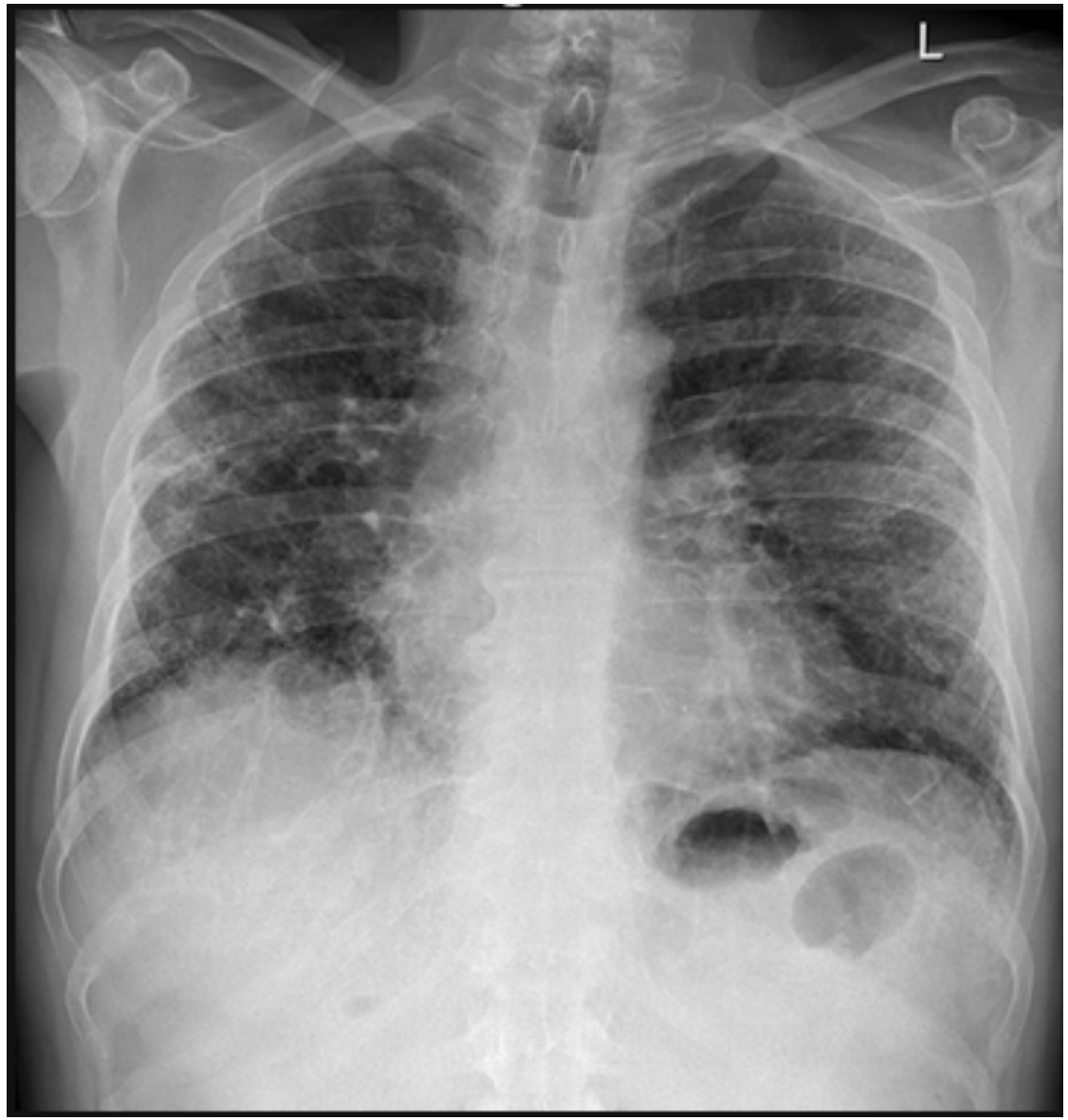
ABCDE approach

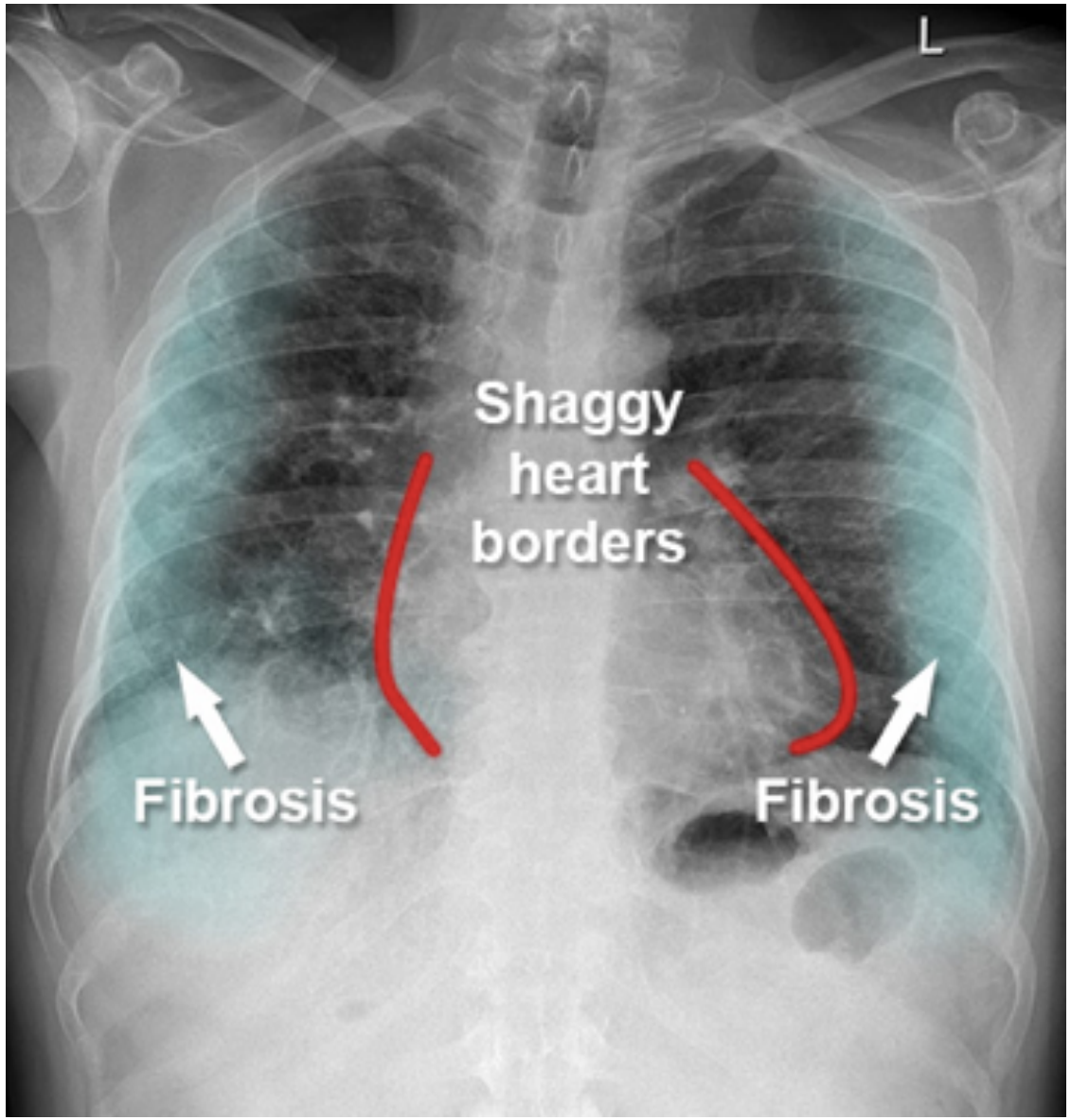
- Airway
  - Tracheal deviation
  - Carina and bronchi
  - Hilar structures
- Breathing
  - Lungs and pleura
- Cardiac
  - Size and borders
- Diaphragm
  - Costophrenic angles
- Everything else
  - Bones, soft tissues, tubes, valves etc


AP
ERECT


AP
ERECT
Horizontal fissure
Right heart border ???




L

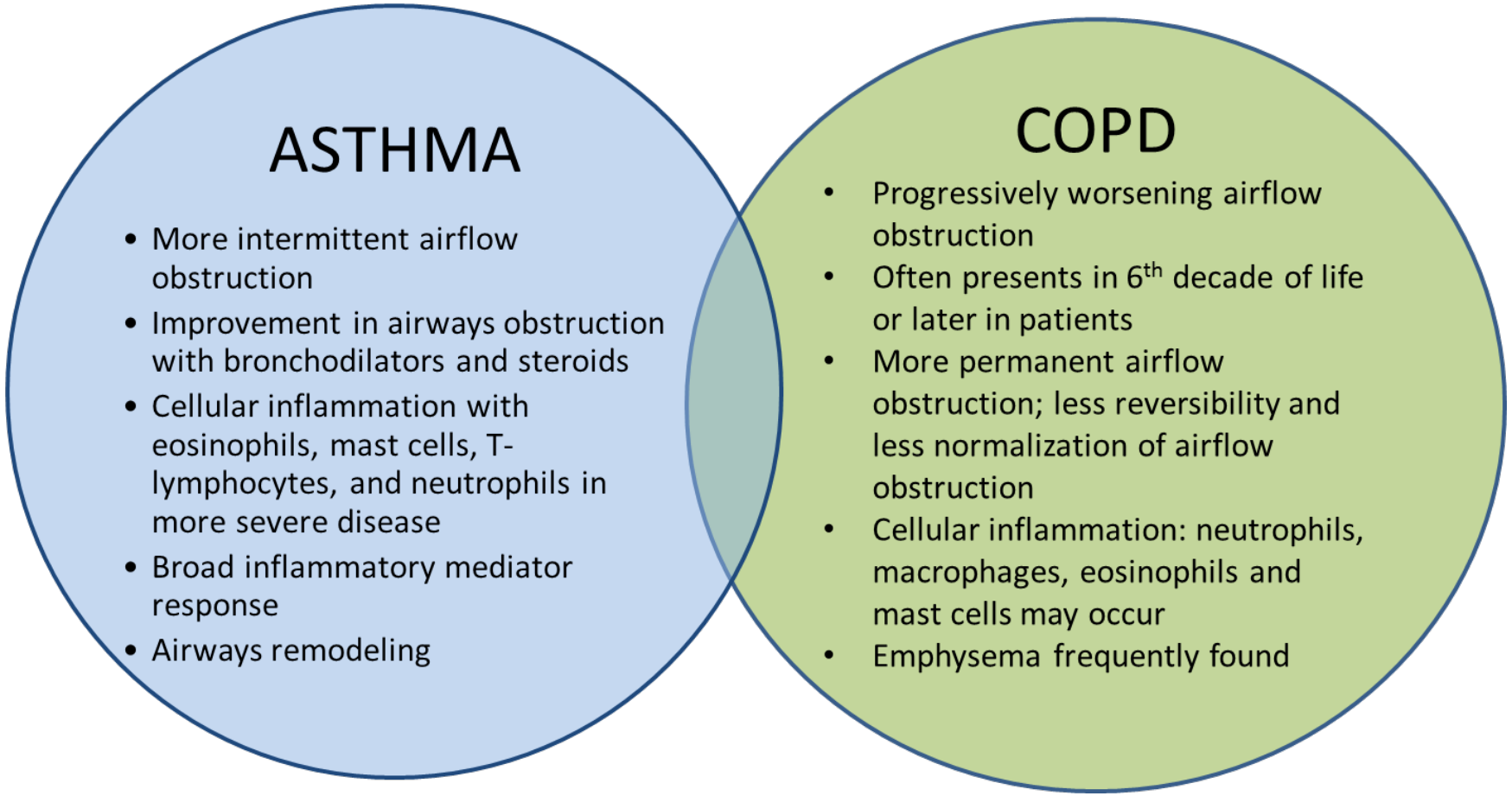

L
Shaggy
heart
borders
Fibrosis
Fibrosis

Why is all of this important

	Respiratory System	
1	Asthma	1*
2	Chronic Obstructive Pulmonary Disease (COPD)	1*
3	Respiratory Failure	1*
4	Pulmonary Embolus (PE)	1*
5	Pneumothorax	1*
7	Pneumonia	1
8	Deep Venous Thrombosis (DVT)	1
9	Carcinoma of the Bronchus	2
10	Pulmonary Tuberculosis (TB)	2
12	Bronchiectasis and Cystic Fibrosis (CF)	3
14	Interstitial Lung Disease	3
	Cardiovascular System	

Asthma and COPD

- Know the differences
- Spirometry
- Reversibility testing
- Management*
- Presentation


ASTHMA
• More intermittent airflow obstruction
• Improvement in airways obstruction with bronchodilators and steroids
• Cellular inflammation with eosinophils, mast cells, T-lymphocytes, and neutrophils in more severe disease
• Broad inflammatory mediator response
• Airways remodeling
COPD
• Progressively worsening airflow obstruction
• Often presents in 6th decade of life or later in patients
• More permanent airflow obstruction; less reversibility and less normalization of airflow obstruction
• Cellular inflammation: neutrophils, macrophages, eosinophils and mast cells may occur
• Emphysema frequently found

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14	Interstitial Lung Disease	3
	Cardiovascular System	

Resp failure:

- ABGs
- Know what are common causes of each

Type 1 Pulmonary		Type 2 Extrapulmonary	
Disorder	**Disease (Ex.)**	**Disorder**	**Disease (Ex.)**
Alveolar hypoventilation	Pneumonia ARDS Pulmonary edema	Central	Coma Intracerebral hemorrhage
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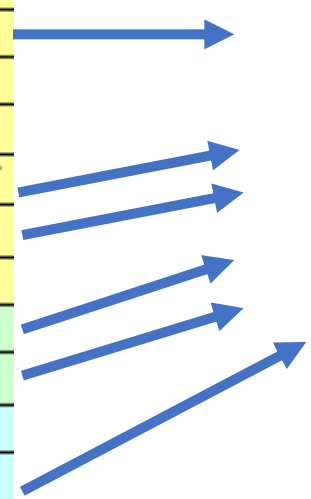

Pneumothorax, COPD, Lung cancer, TB, Pneumonia, ILD

CXR interpretation!!!

Resources for you to check out

- Zero to finals
- Almost a doctor
- Medicine in a minute**
- OSCE stop
- Easy auscultation
- Osmosis *

- https://oscestop.com/Respiratory%20condition%20signs.pdf
- https://www.easyauscultation.com/lung-sounds
- https://almostadoctor.co.uk/shortness-of-breath

- Very cheeky but… Student Q and Study Hub (+all our incredible collaborators)