

Shortness of Breath



And Rapid Respiratory Rescue

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Dyspnea

- Types of Dyspnea - What Happens
- Diagnostic Tricks of the Trade
- Treatments Available
- Rapid Respiratory Rescue (ALS and BLS)

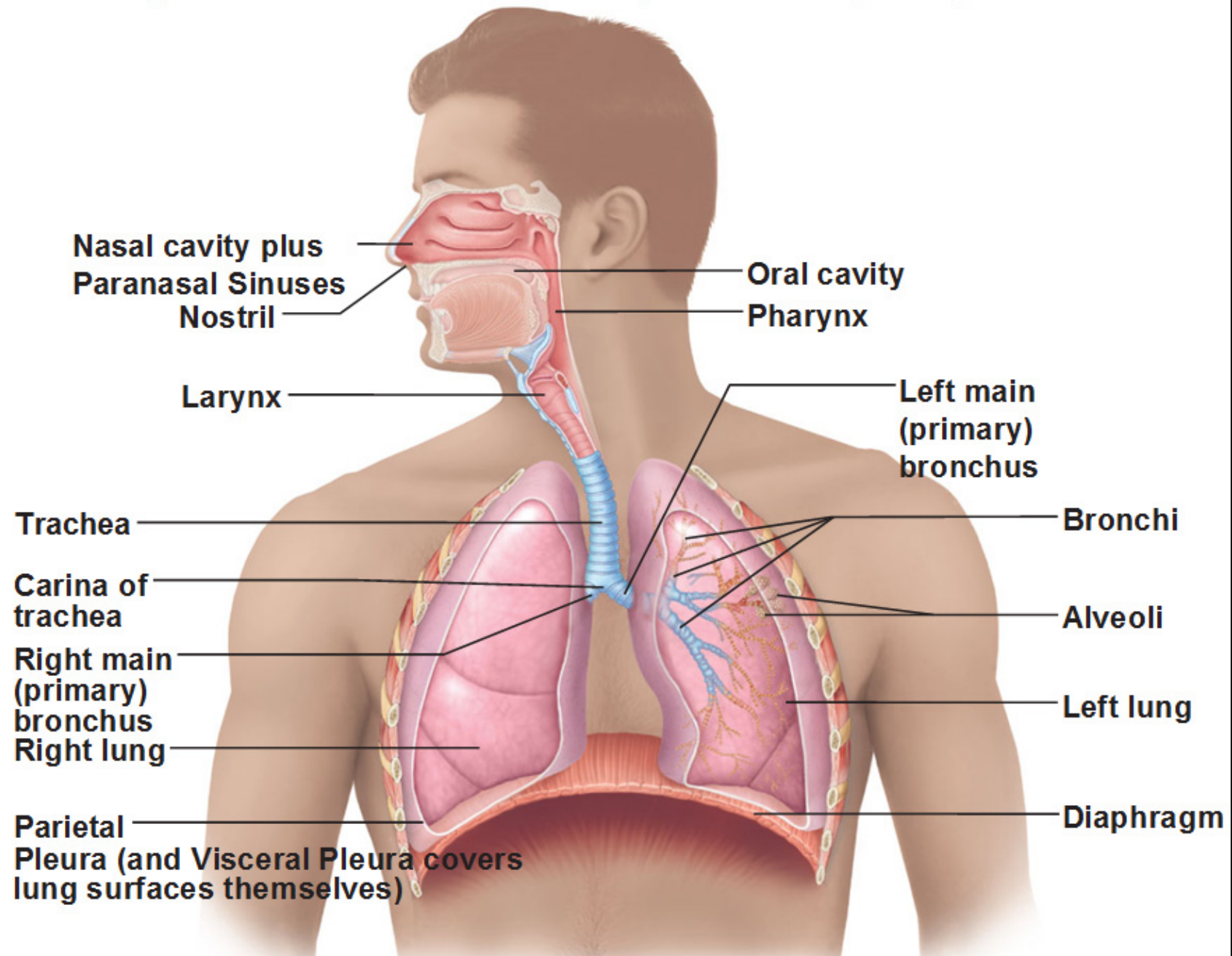
Types of Dyspnea

- Mechanical (Trauma)
- Medical

Mechanical

- The Mechanics of Breathing
 - Structures
 - Inspiration
 - Expiration

Organs of the Respiratory System



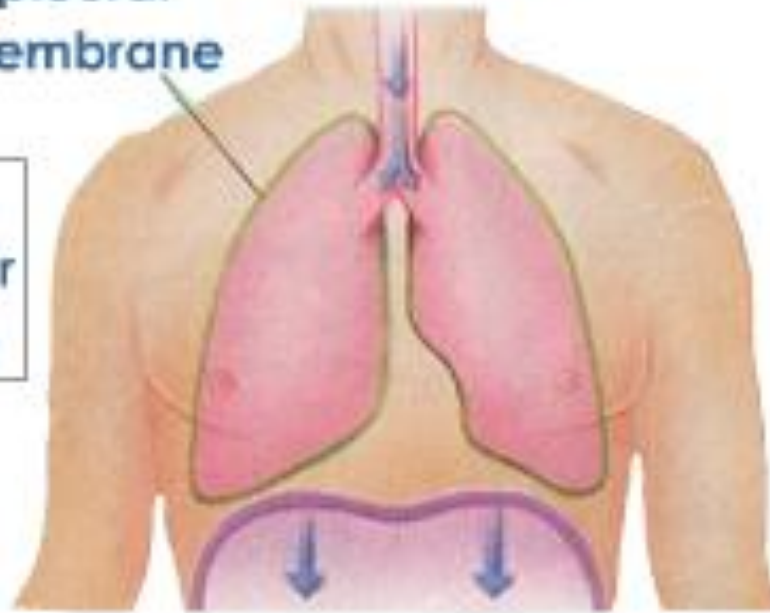
Rib cage moves up and out

Diaphragm contracts and moves down

Pressure in lungs decreases, and air comes rushing in



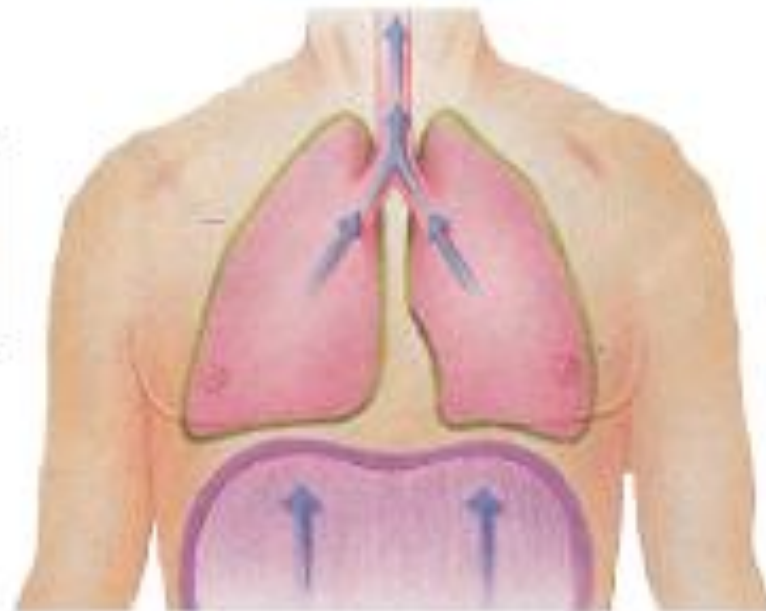
pleural membrane



Rib cage moves
down and in

Diaphragm relaxes
and moves up

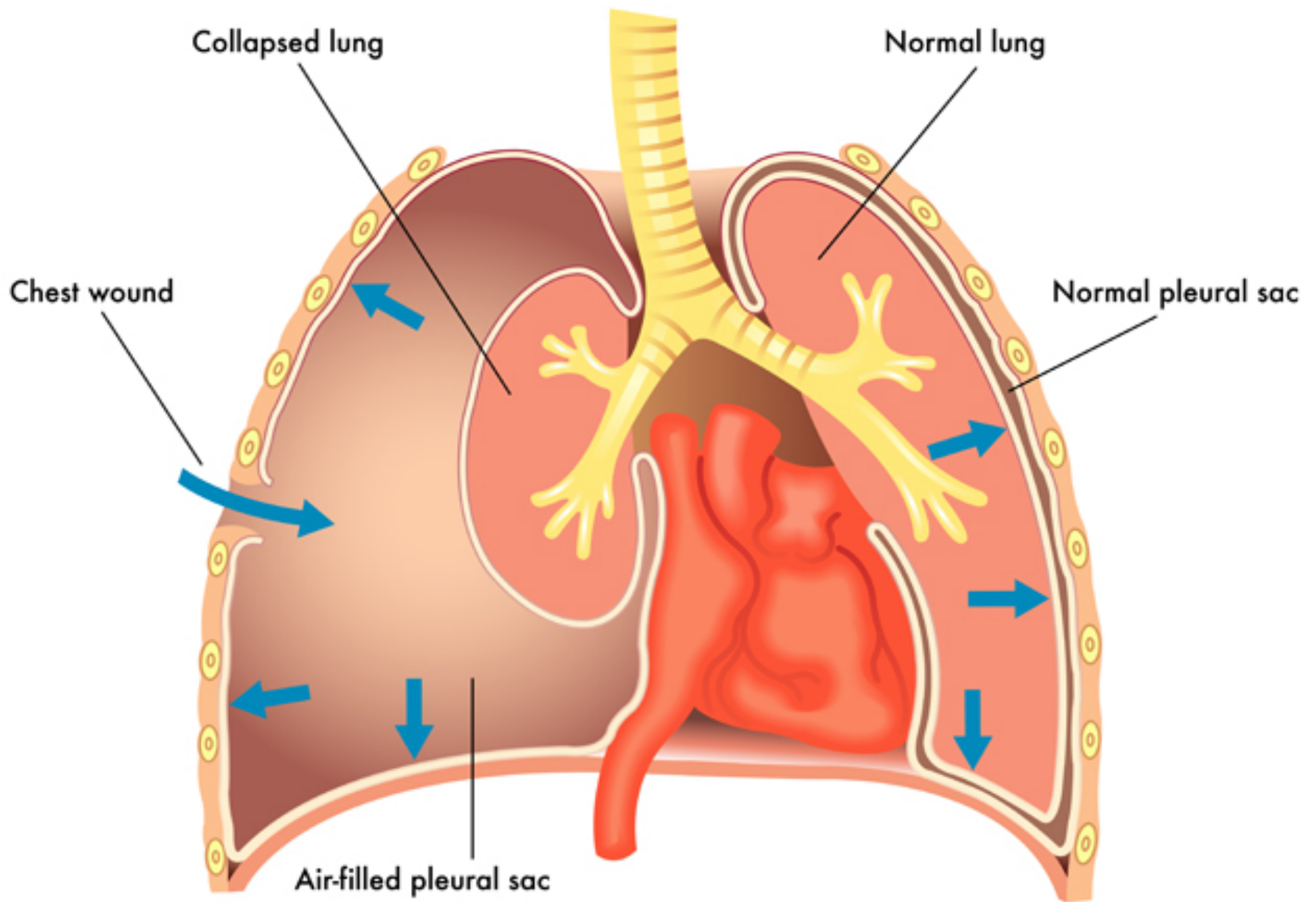
Pressure in lungs
increases, and air
pushed out

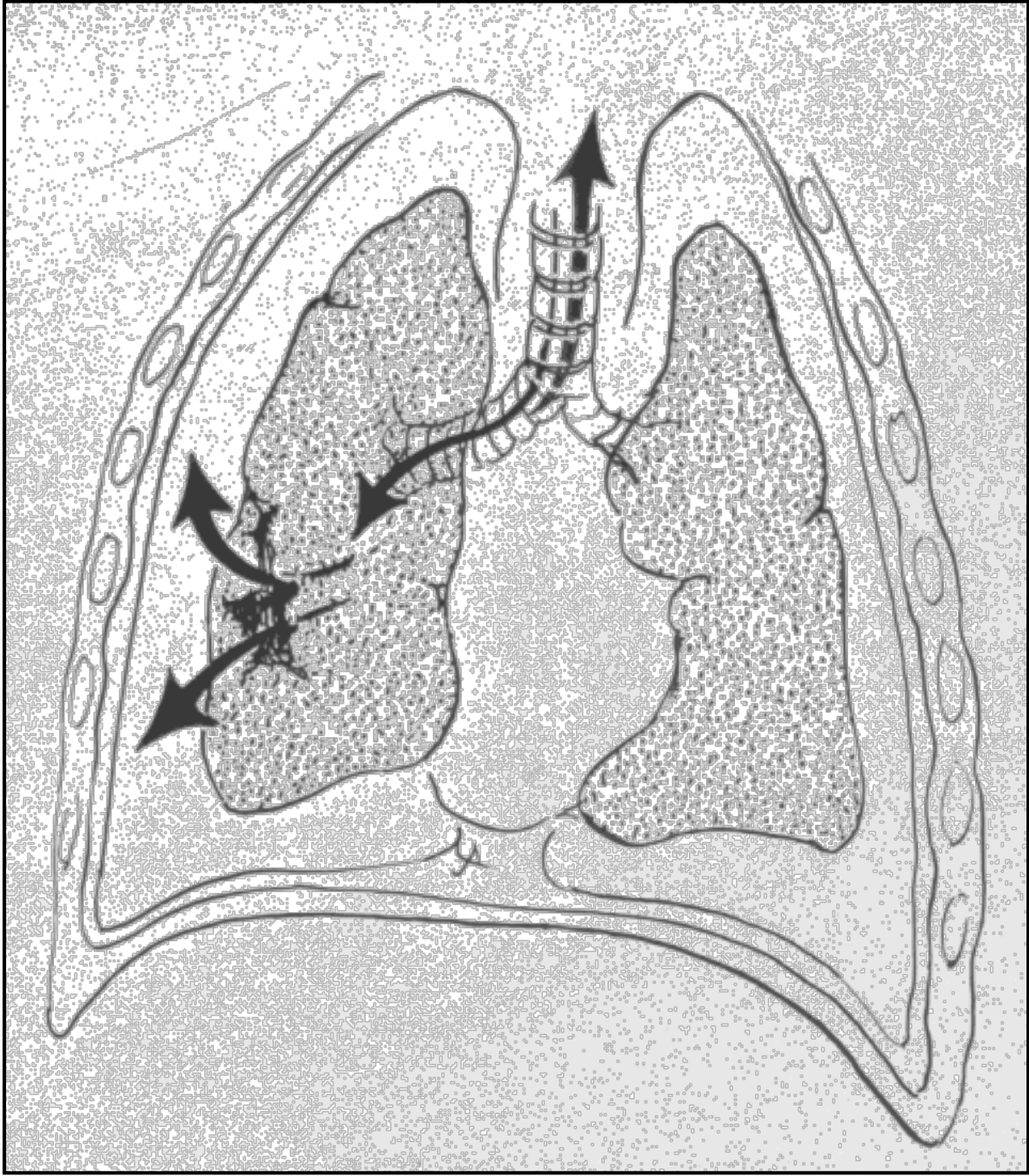


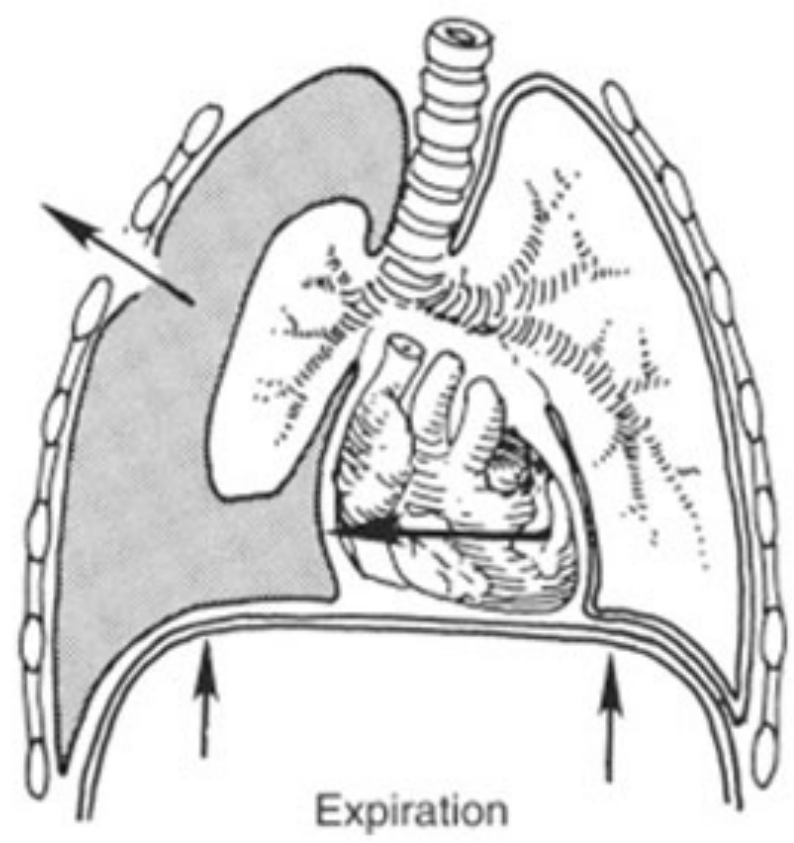
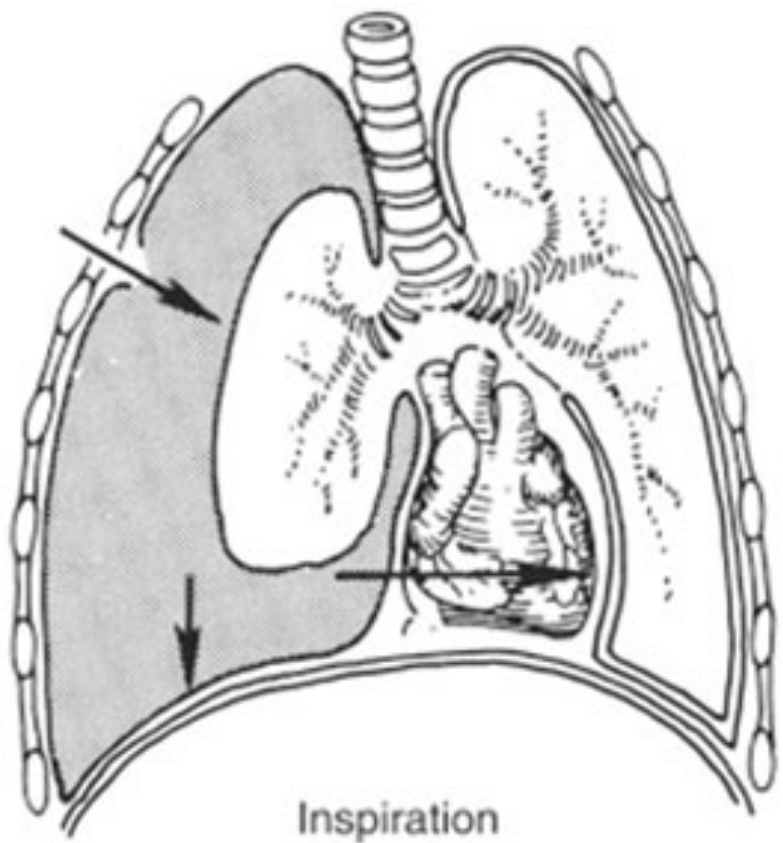
Breathing

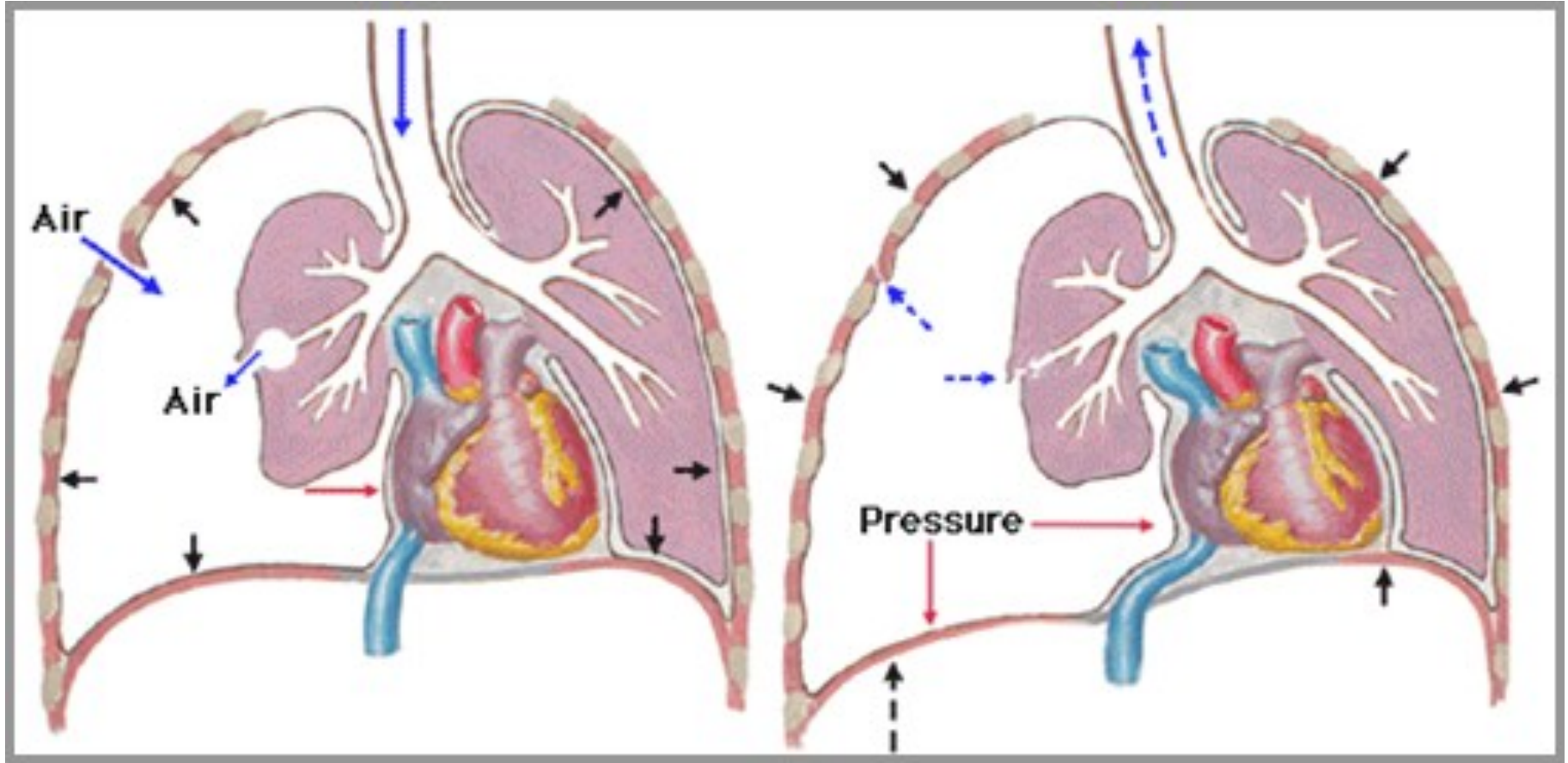
- Inspiration is an *ACTIVE* process
- Expiration is a *PASSIVE* process

Pneumothorax



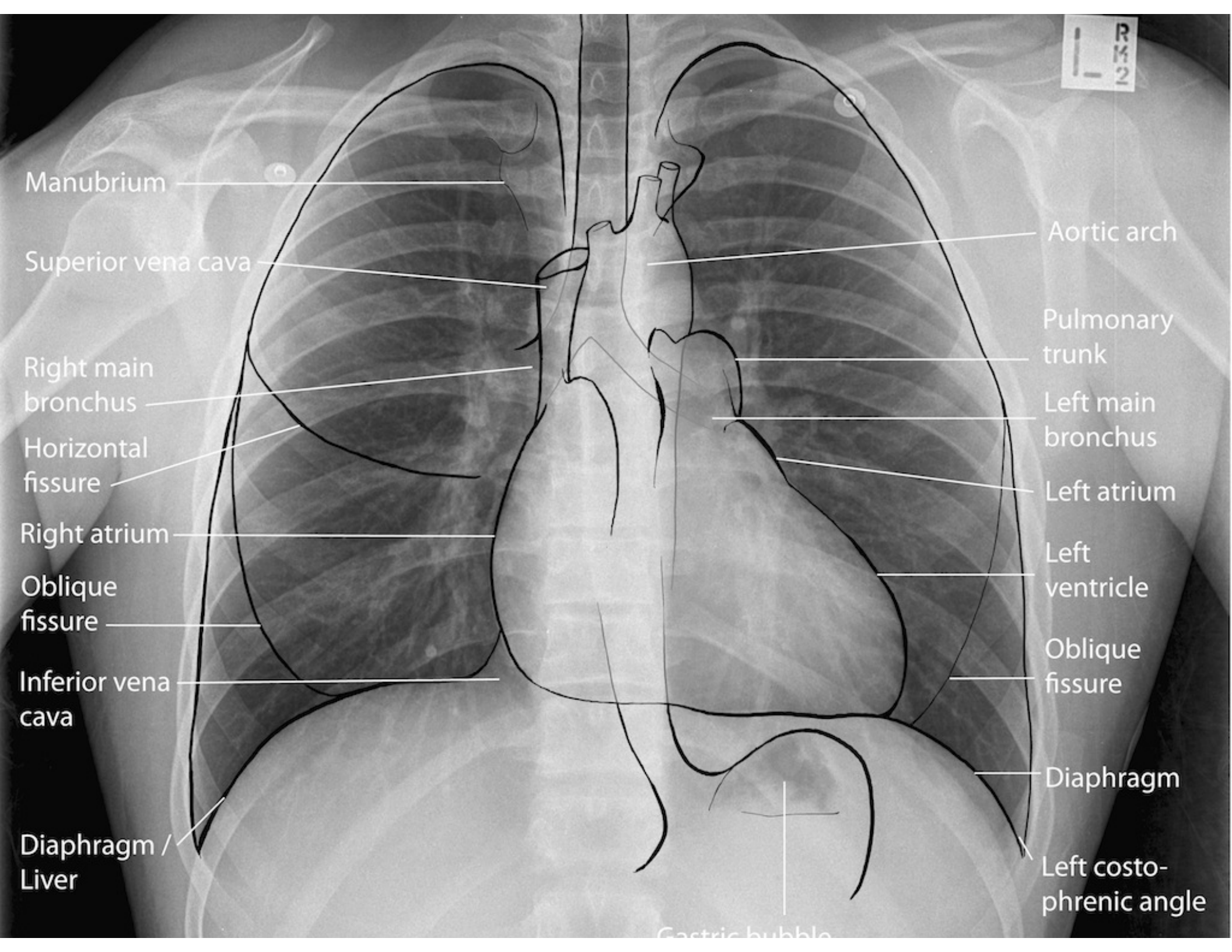






Pneumothorax

- Tachycardia
- Tachypnea
- Reduced expansion of chest
- Hyper-resonance to percussion
- Quiet or absent breath sounds
- Subcutaneous emphysema



Manubrium

Superior vena cava

Right main bronchus

Horizontal fissure

Right atrium

Oblique fissure

Inferior vena cava

Diaphragm / Liver

Aortic arch

Pulmonary trunk

Left main bronchus

Left atrium

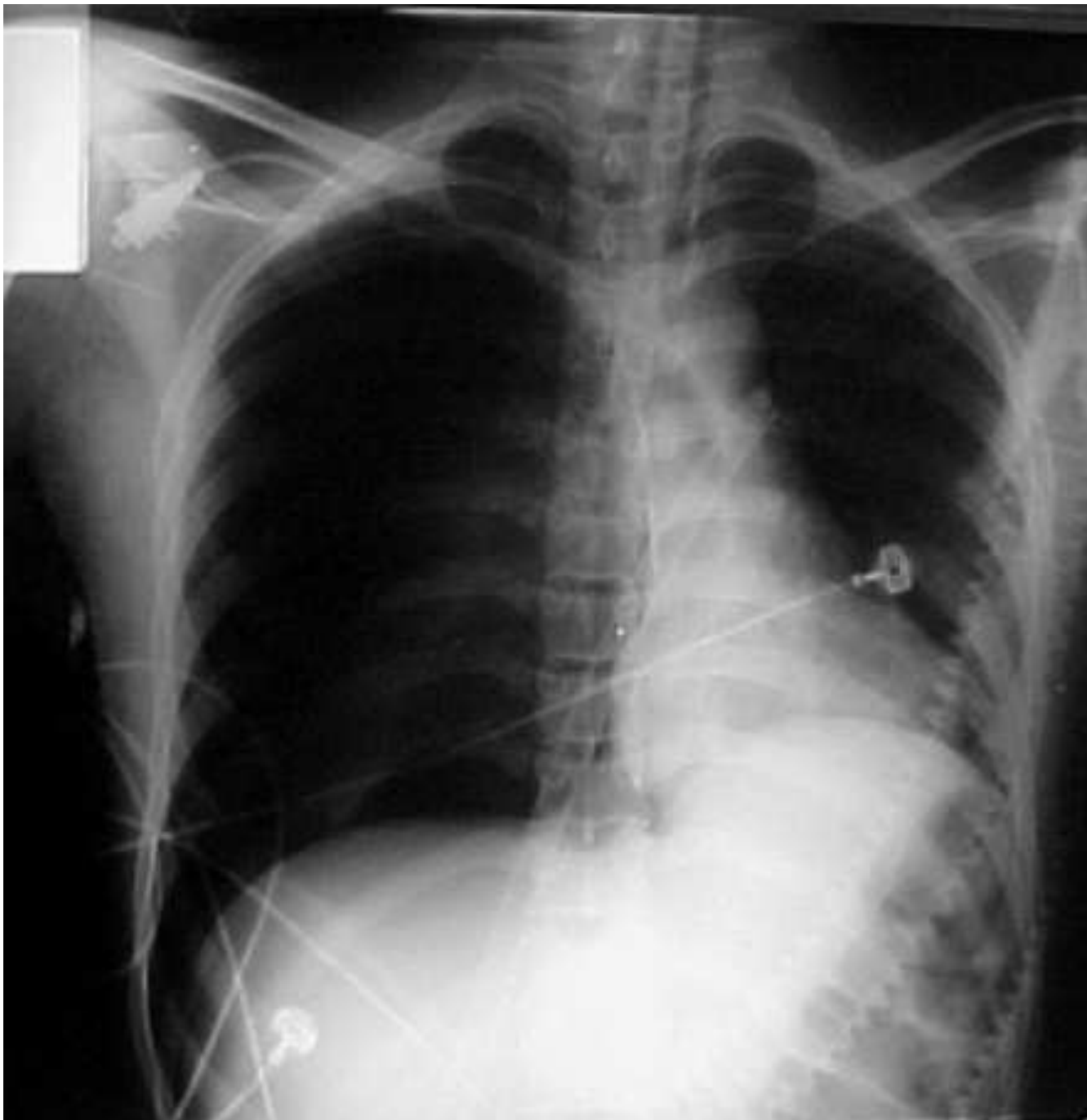
Left ventricle

Oblique fissure

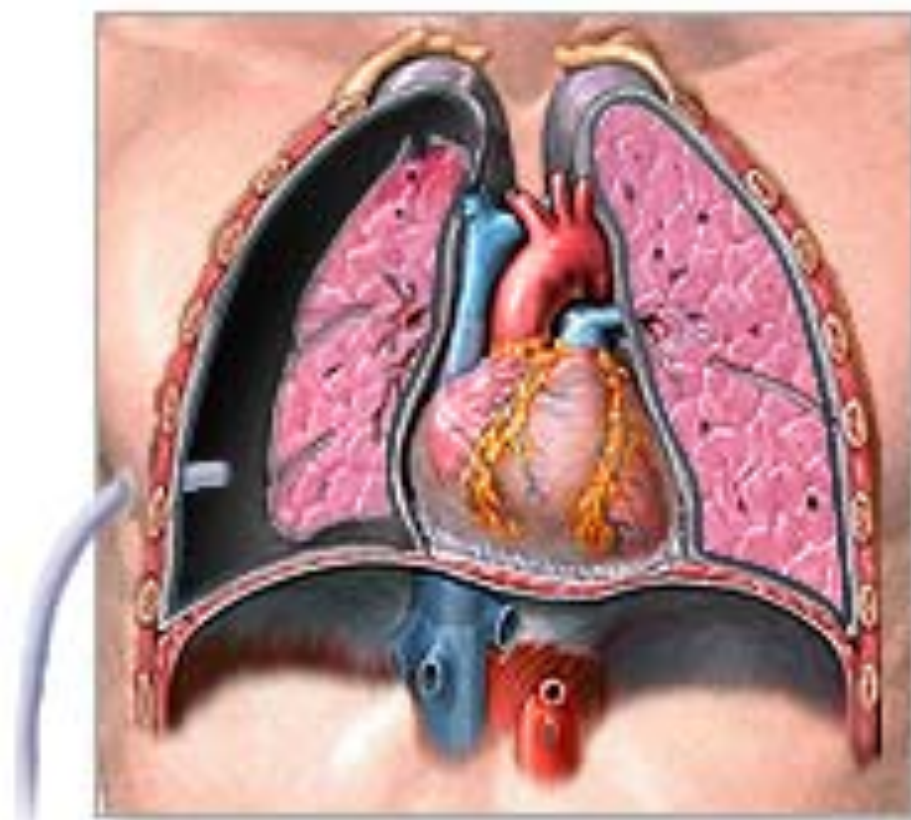
Diaphragm

Left costo-phrenic angle

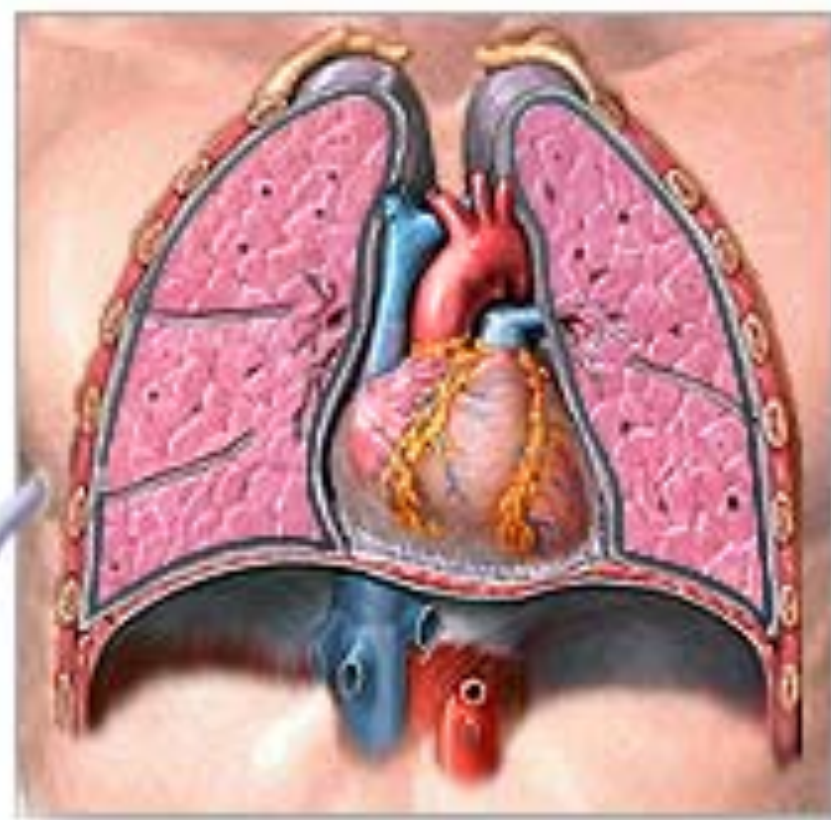
Gastric bubble



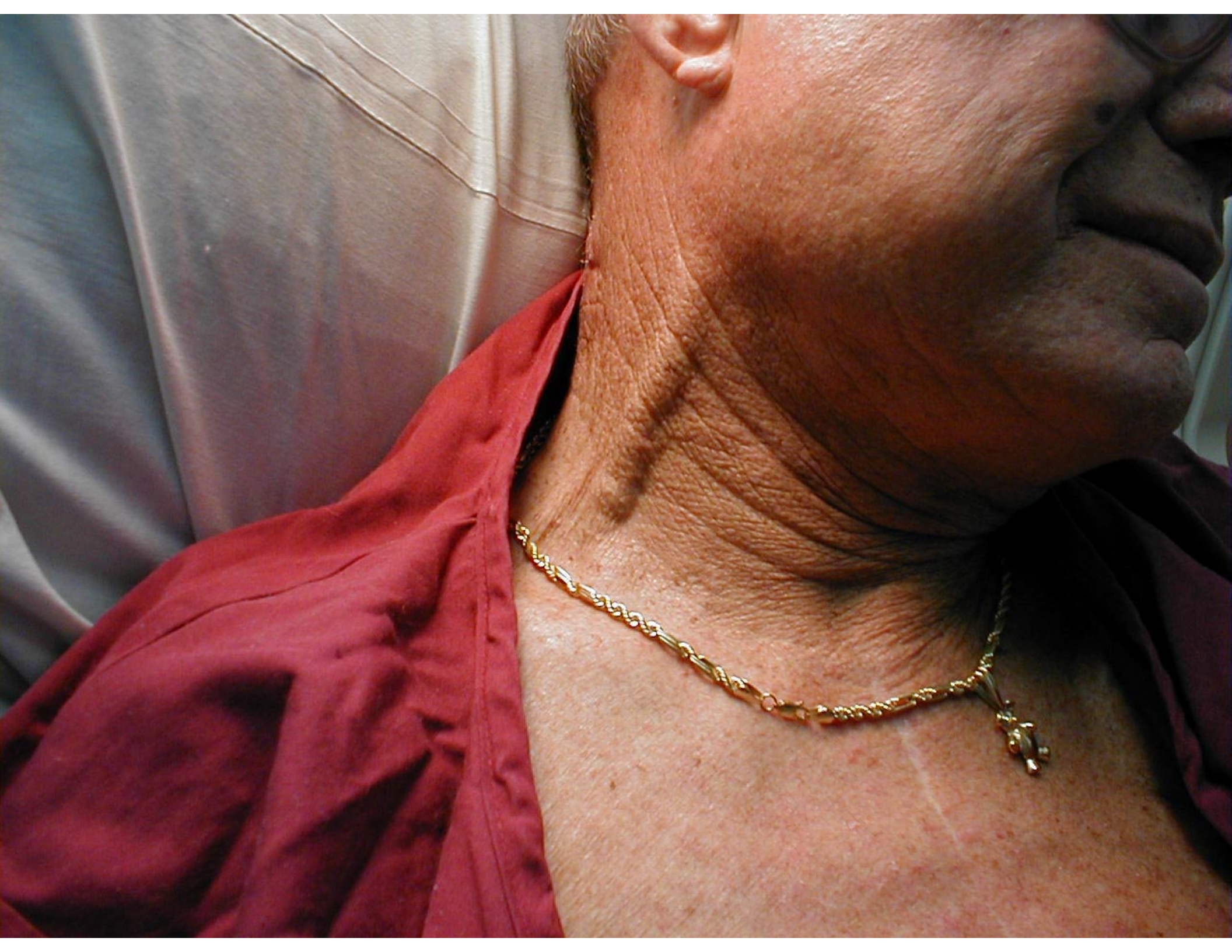
Chest tube



Pneumothorax



Re-expanded lung



Mechanical

- Can complicate any patient with dyspnea
 - Seen in both trauma and non-trauma patients
 - Clinical diagnosis
 - Tension = 6 breaths from death

Asthma/CHF/COPD

- Asthma - Spasm of the airways/Inflammation of the airways
- CHF - Fluid fills up the alveoli
- COPD - Lose ability of alveoli to function. Spectrum of problems

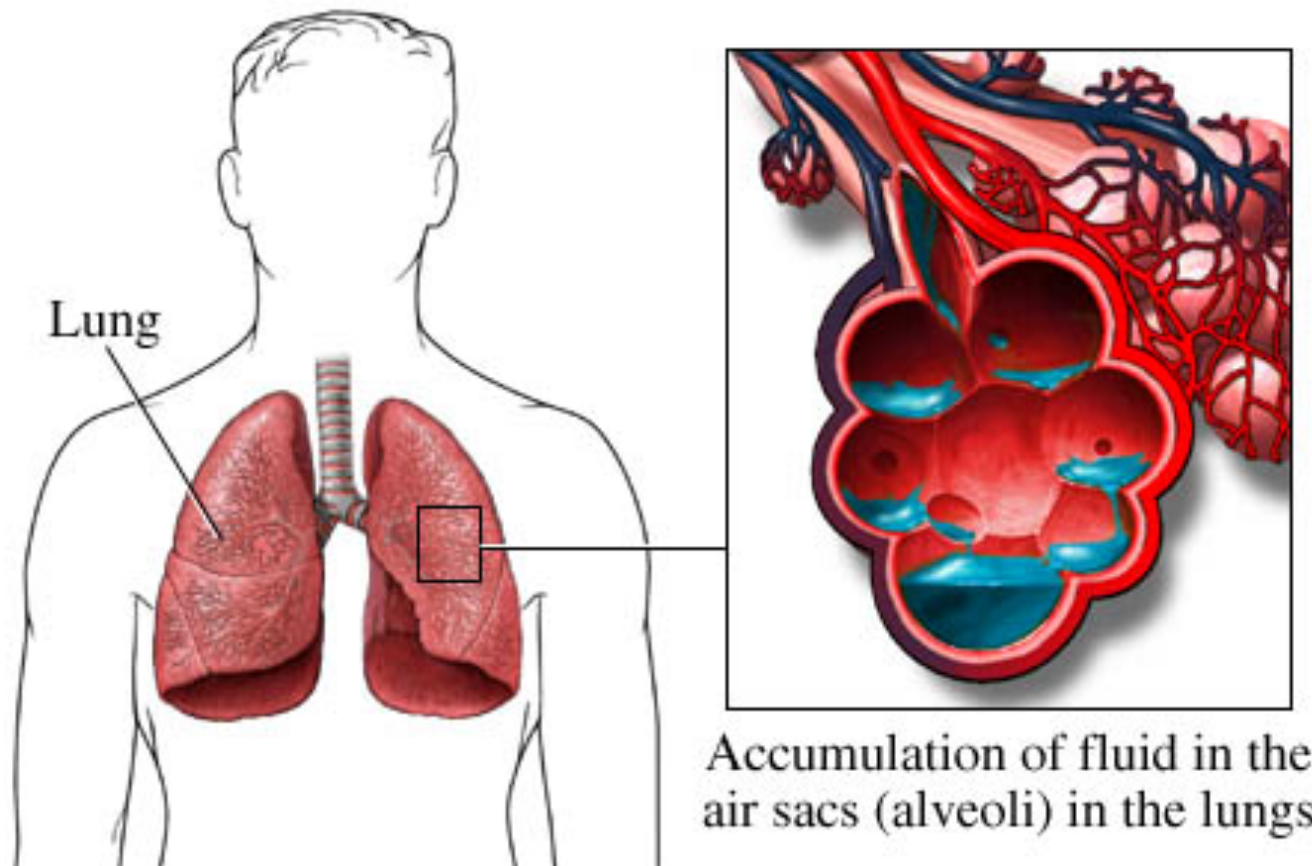
CHF

- Normal - Heart pumps blood thru the lungs (right side of heart). Then pumps blood thru the body (left side of heart)
- In CHF
 - If the left side loses function then the blood backs up into the lungs
 - Can be due to heart (pump) failure or the heart having to pump against more resistance

CHF

- Can also occur if the patient just has too much fluid in the body that leaks out to all the tissues including the lungs
- Why do we see so much CHF at Thanksgiving?

Why is it hard to breath in CHF?



Fluid in the Alveoli....

- Causes
 - Greater distance for oxygen to travel into blood
 - Thicker fluid for oxygen to diffuse over
 - Alveoli lose ability to stay open

Rales

- What is a rale (crackle)?
 - Fine rales are due to the alveoli collapsing shut because the surfactant is disrupted. They then stick shut and you have to take a deep breath in to open them up. When they open - they crackle

Rales

- Why is it more common to hear rales at the lung bases?

The CHF patient

- Sitting upright.....if they lay down what happens?
- Tripod position
- Distended neck veins
- Peripheral edema
- ***High Blood Pressure***

Basic Treatment

- Position
- Oxygen - Increases the gradient
- Prevent the alveoli collapsing?
- Push the fluid back into the blood?
- Stop the blood pushing fluid into the lung?
- Dry out the fluid somewhere else?

CPAP

- Continuous Positive Airway Pressure
 - For the alveoli to collapse the pressure in the alveoli must drop - CPAP prevents this happening
 - For collapsed alveoli - delivering oxygen at pressure helps pop them open - CPAP does that
 - To push the fluid in the alveoli back into the blood the fluid must be subjected to pressure - CPAP does that

CPAP

- Holds open alveoli - decreases the work the patient has to do
- Pops open alveoli that were closed - allows more lung to be used (reduces dead space)
- Pushes fluid into the blood stream - decreases the distance that oxygen has to cover to get to the blood

CPAP

- CPAP is like sticking your head out of a window in a moving car and facing into the wind with your mouth open.....

Removing the Fluid

- Diuretics
- Dialysis
- Nitroglycerin

Asthma

- Asthma is a 2 part process
 - The airways spasm - causing wheezes
 - The airways inflame - causing rhonchi

Flash Back

- Inspiration is an *ACTIVE* process
- Expiration is a *PASSIVE* process

If the airways spasm...

- Do the patients have a problem getting air in or getting air out?

Alveoli Pressure

- If the patient has problems getting the air out.....
- More air remains in the alveoli.....
- So there is more pressure in the alveoli.....
- So the alveoli are more likely to burst open.....
- And if they burst open they can form a.....

The Asthmatic Patient

- Wheezing (or maybe not!)
- Distended neck veins
- Generally NOT hypertensive
- Saturations are normally 100% (it is not an oxygen problem it is a)

The Asthmatic Patient

-CO2 problem.....why?

The Asthmatic Patient

- CO₂ is expired, asthmatics have a problem breathing out (it is not an oxygenation problem, it is a ventilation problem).
- A rising CO₂ level is a bad sign in an asthmatic

The Asthmatic Patient

- As asthma progresses.....patient breaths faster, so despite having problems breathing out CO₂ they compensate by breathing faster, so sometimes CO₂ drops
- As the asthma gets worse they can no longer compensate.....and the CO₂ rises

The Asthmatic Patient

- How can they be treated.....

The Asthmatic Patient

- By opening the airways
 - This can be done by BLS is 4 ways.....

The Asthmatic Patient

- Albuterol
- Atrovent
- EpiPEN
- and.....

The Asthmatic Patient

- CPAP - which works by pressing open all of the airways (the pressure generated by CPAP is not just exerted on the alveoli but on all the airways)

RETT FAVRE SPEAKS OUT ON HOW CPAP CHANGED HIS LIFE


Sports Illustrated

www.si.com

“My CPAP makes me feel like a man.”

Brett Favre

Michael Vick makes amends by starting pro-bono dog walking service p. 5



The CPAP review
hecpapreview.blogspot.com

Detailed description: This is a magazine cover for Sports Illustrated. At the top, a purple banner contains the text 'RETT FAVRE SPEAKS OUT ON HOW CPAP CHANGED HIS LIFE'. Below this, the magazine title 'Sports Illustrated' is written in large, bold, purple letters. The main image shows Brett Favre, a former NFL quarterback, sitting on a wooden bench. He is wearing a purple and gold Minnesota Vikings jersey with the number 4. He is also wearing a CPAP mask over his nose and mouth, with a clear plastic tube leading down to a CPAP machine on the floor. He has his hands clasped in his lap. To the left of the main image, there is a quote: 'My CPAP makes me feel like a man.' Below the quote is the name 'Brett Favre'. To the right of the main image, there is a small article preview: 'Michael Vick makes amends by starting pro-bono dog walking service p. 5'. At the bottom left, there is a small graphic of a hand with the text 'The CPAP review' and a URL 'hecpapreview.blogspot.com' at the bottom.



EpiPEN

- Epinephrine is quickly becoming a standard way of treating severe asthma because.....

EpiPEN

- Epi is delivered via the blood, albuterol/atrovent rely on being delivered by breathing
 - BLS - EpiPen
 - ALS - EpiDrip

The Inflammation

- Treated with steroids
 - Now being routinely given by ALS providers.

COPD

- COPD is a mixture of lots of pathologies all related to destruction of lung tissue typically by smoking

What Happens When You Smoke?

- Cilia are paralyzed - debris remains in lungs
- Debris (Tar) remain in the alveoli - and disrupt the surfactant.....causing.....and the alveoli are more likely to collapse
- Debris causes inflammation (bronchitis) and breakdown of the alveoli, causing them to join together, lose function and be more likely to collapse (emphysema)

COPD

- Wheezes - from airway irritation and spasm
- Rhonchi - from inflammation of the airways
- Rales - from destruction of the airways

COPD

- How to treat
 - Decrease inflammation
 - Improve oxygen exchange
 - Decrease work of breathing

COPD and CHF

- What happens if you dry out a COPD patient (one of the treatments for CHF)?
- What happens if you give news to a CHF patient (one of the treatments for COPD)?

Telling the Difference

- Often you can't - so you treat what you see and hear.

COPD

- Treatment includes.....
 - Nebs
 - Steroids
 - EpiPEN
 - and.....

COPD

- CPAP
 - Holds open the airways and the alveoli (and thus decreases the work of breathing)

CPAP

Treats Everything

Oxygen

- “Oxygen is one of the most harmful drugs we carry on the ambulance”
- Topic will be covered by Bebee on Sunday AM
- Oxygen has been shown to be detrimental in MI, Stroke and Trauma Patients

What Does It Mean for Oxygen?

- You will see more “titrate” oxygen protocols
- It will be acceptable to allow sats down to 88-92% without giving oxygen
- ALS are already removing more NRBs than they are placing

Rapid Respiratory Rescue

- Respiratory Complaints are a Done Deal by the time they get to hospital
 - All respiratory treatments have made it to EMS
 - Aggressive treatment in the field leads to improved outcomes in the hospital (less ICU days, shorter hospital stays).

Rapid Respiratory Rescue

- BLS
 - Albuterol/Atrovent
 - Oxygen when needed
 - Aggressive use of CPAP
 - EpiPen

Rapid Respiratory Rescue

- ALS
 - All BLS interventions
 - Asthma - Magnesium, Steroids
 - **Option of the EpiDrip**
 - **RSI/DSI - Ketamine vs Etomidate**

EpiDrip

- The Easiest Drip to Set Up
 - 1mg of Epi 1:10,000 into 1 L NS.
 - Concentration is 1mcg/ml - Titrate to effect

Takotsubo Cardiomyopathy

- Transient cardiac syndrome that involves left ventricular apical akinesis and mimics acute coronary syndrome.
- Present with chest pain, have STEMI on ECG but clean coronaries on cath
- Also known as Broken Heart Syndrome

Takotsubo Cardiomyopathy

- 2.2% of AMI
- Mean age 67
- 90% are post menopausal females
- The most commonly discussed possible mechanism for TCM is stress-induced catecholamine release, with toxicity to and subsequent stunning of the myocardium.

Intubation - Old Way

- Brutane
 - Held mask on, held down patient, intubated patient, pushed down gas pedal
- Sedation not an option due to dropping LOC and losing airway
- “Facilitated intubation” - Visiting death!

New Way

- Ketamine
 - Dissociative anesthesia agent
 - Bronchodilatory effect
 - Does not cause hypotension
 - Intubating medication of choice in sepsis and asthma/copd

Sequence Intubation

- Rapid Sequence Intubation
 - Patient is given sedative and paralytic, wait until effect seen, then patient is intubated
- Newer still - Delayed Sequence Intubation (DSI)
 - Patient is given sedative that does not suppress respiratory effect and then managed with non-invasive methods to increase saturation, at that point is given paralytic and then intubated

Newest

- Facilitated Non-Invasive Ventilation with optional DSI
 - Ketamine is given and when it takes effect patient is managed in a non-invasive way
 - Reevaluation is done and a determination is made to continue current plan or proceed to paralytic and intubation

Respiratory Rescue

- Phase 1 - Traditional Response
- Phase 2 - Alternative Response
- Phase 3 - Decompensating Response
- Phase 4 - Failed Response

Traditional

Alternative

Decomp

Failed

Traditional

If **Hypoxia** Present

Titrate oxygen to maintain sats >87%

Initiate CPAP

If **Wheeze** Present

Albuterol 2.5mg Neb Q15 minutes

Atrovent 0.5mg Neb Q15 minutes

Magnesium 1-2g IV over 10 minutes

If **Stridor** Present

Epinephrine 1:1000 5ml Neb Q15 minutes

If **Anaphylaxis** is present then manage accordingly

If **Asthma/COPD** is suspected by history

Methylprednisolone up to 125mg IVP (1.5mg/kg)

Alternative

If hypotension is present (**MAP<60**) or Clinical Presentation Suggests **COPD/Asthma/Pneumonia**

- Rapid IV Fluid bolus 30cc/kg NS

If Clinical Presentation Suggests **CHF and Mean Arterial Pressure>70**

- NTG 0.4mg SL Q5mins and 1 inch nitropaste to chest
- Hold/remove if MAP drops below 70

If **nebulizer** application is **failing**

- Epinephrine 0.3mg 1:1000 IM Q10mins

or

- 1mcg/min IV and titrate up to effect.

(1mg 1:10000 Epi in 1L NS at 1ml/min)

Decomp

If able to **tolerate CPAP** and **Asthma/COPD/Sepsis** is clinically suspected then

- Continue CPAP with continuous nebs
- If worsening then Ketamine 1.5mg/kg IV over 30 seconds. Rebolus as needed. If no IV then Ketamine 5mg/kg IM.

If **unable to tolerate CPAP** and **Asthma/COPD/Sepsis** is clinically suspected then

- Ketamine 1.5mg/kg IV over 30 seconds. Rebolus as needed. If no IV then Ketamine 5mg/kg IM.
- Then apply CPAP and give continuous nebs

If **CHF** is clinically suspected then **proceed directly to intubation**

Failed

If **Asthma/COPD/Sepsis** is clinically suspected

- Continue Ketamine for sedation, re-bolus as needed
- Succinylcholine 1-2 mg/kg IVP for paralysis
- Intubate the patient

If **CHF** is clinically suspected

- Give etomidate 0.3mg/kg IV for sedation
- Rocuronium 1mg/kg IV for paralysis
- Intubate the patient

Thank You

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