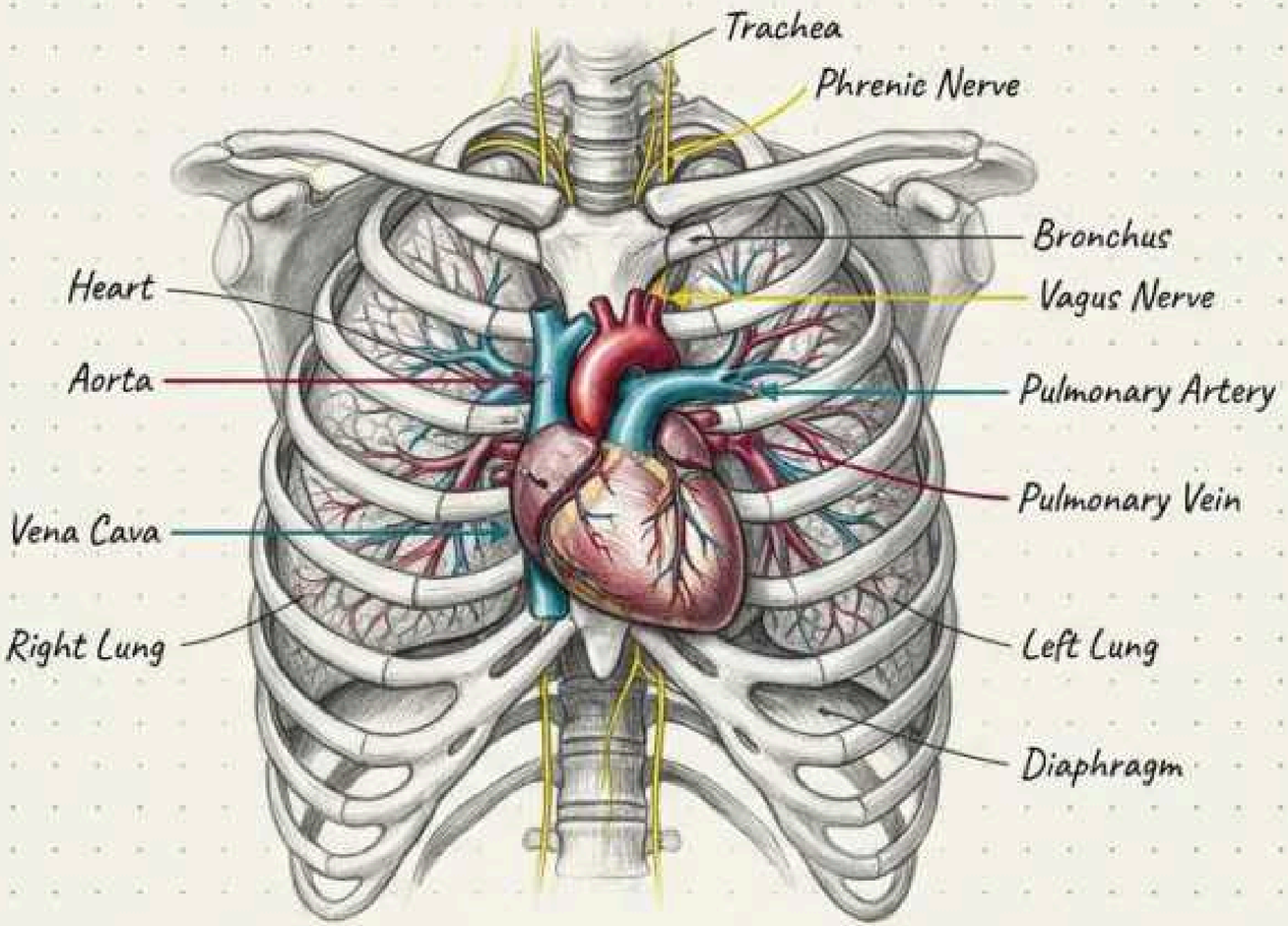
The Thorax: Heart, Lungs and Breathing

MED 501 B Lecture 3

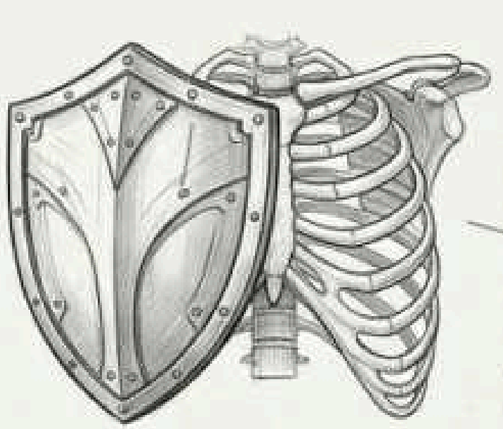


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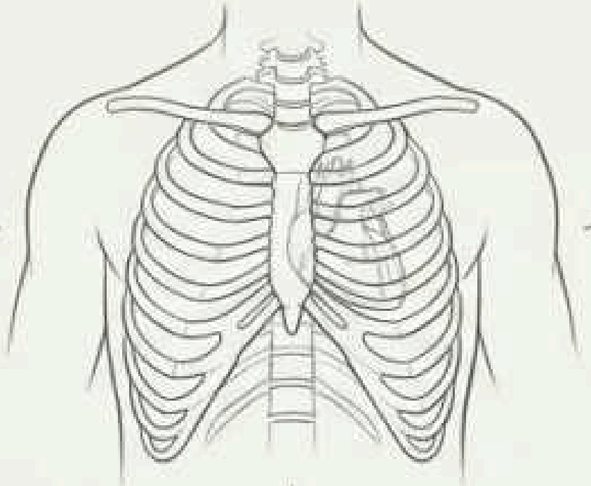
The Functional Triad of the Thorax

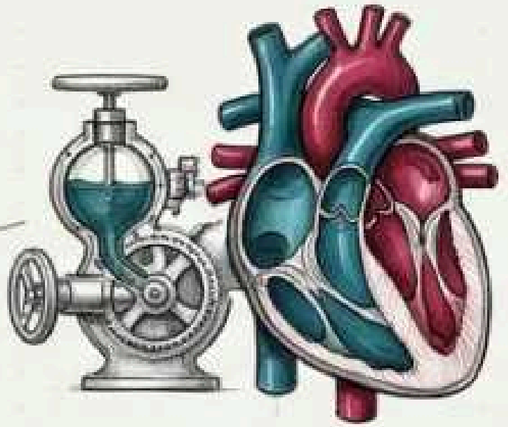
¶ 3.1

The thorax forms the upper trunk, housing the two organs essential for minute-to-minute survival. The anatomy is dictated by three primary jobs: protecting vital structures, pumping blood, and moving air.

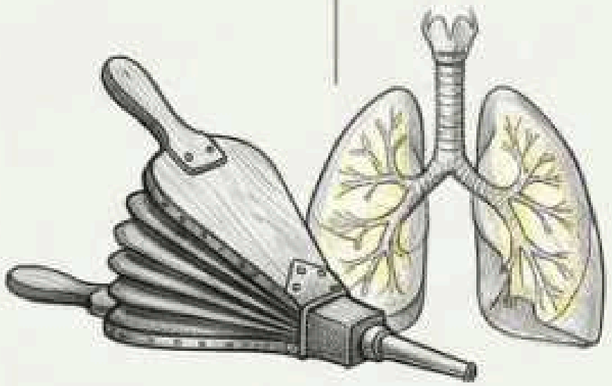


Protection



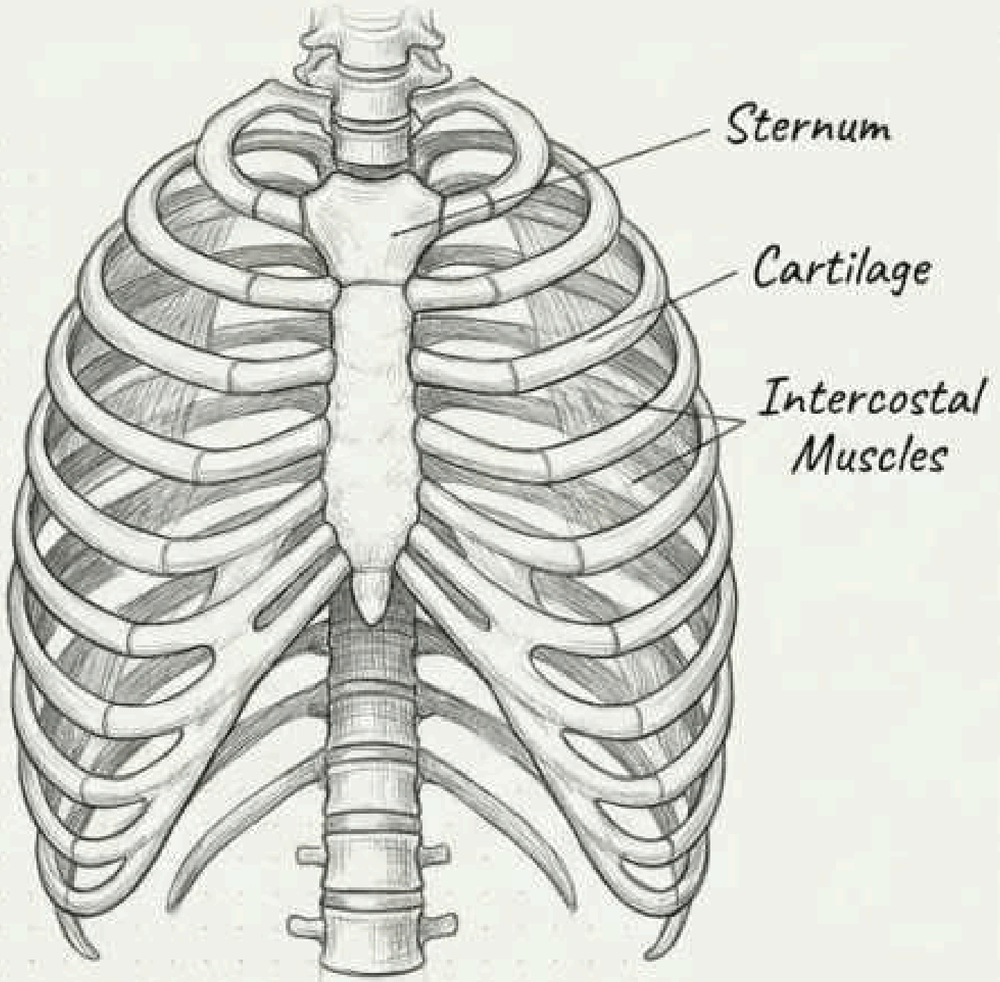


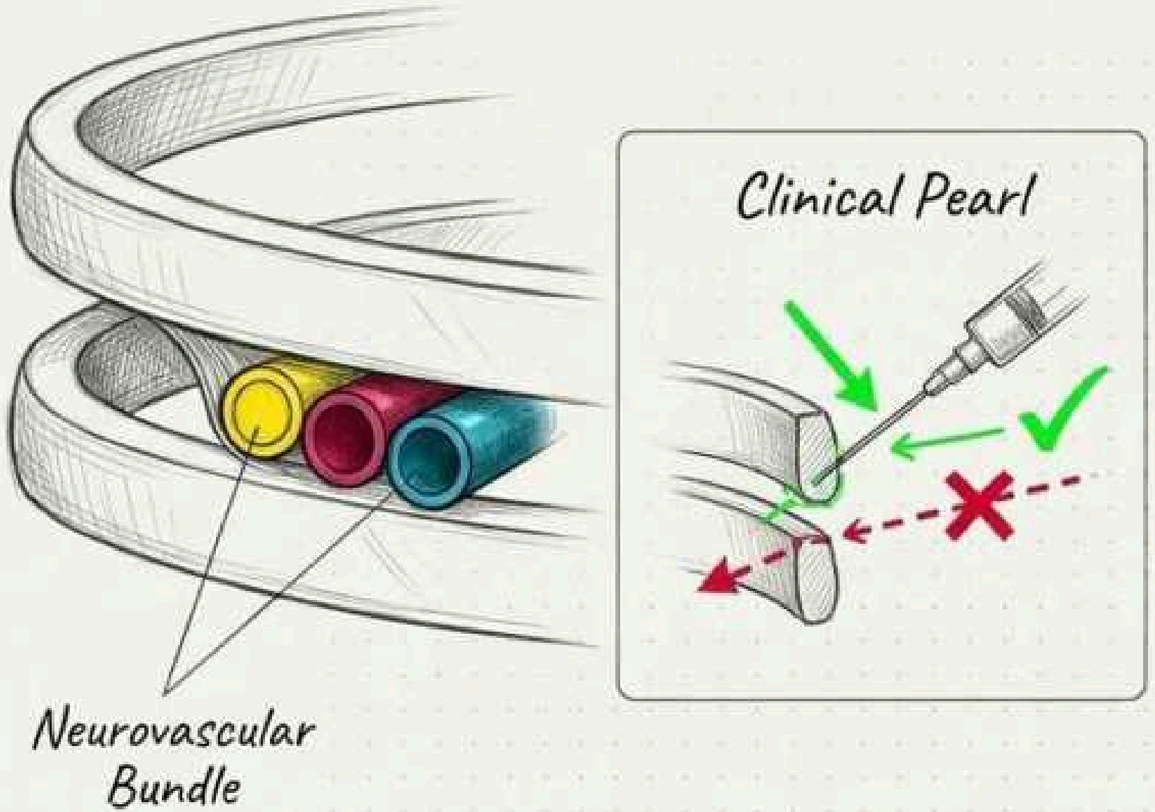
Pumping



Breathing

The Outer Walls & The Safe Zone

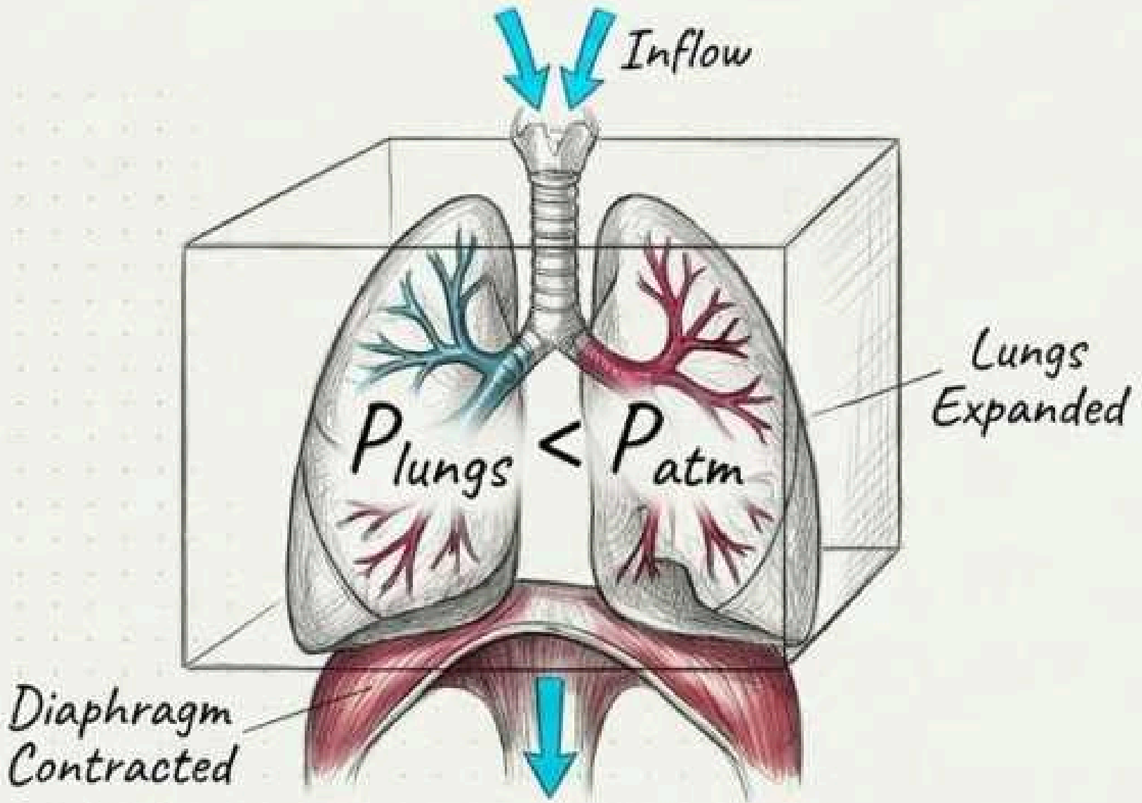




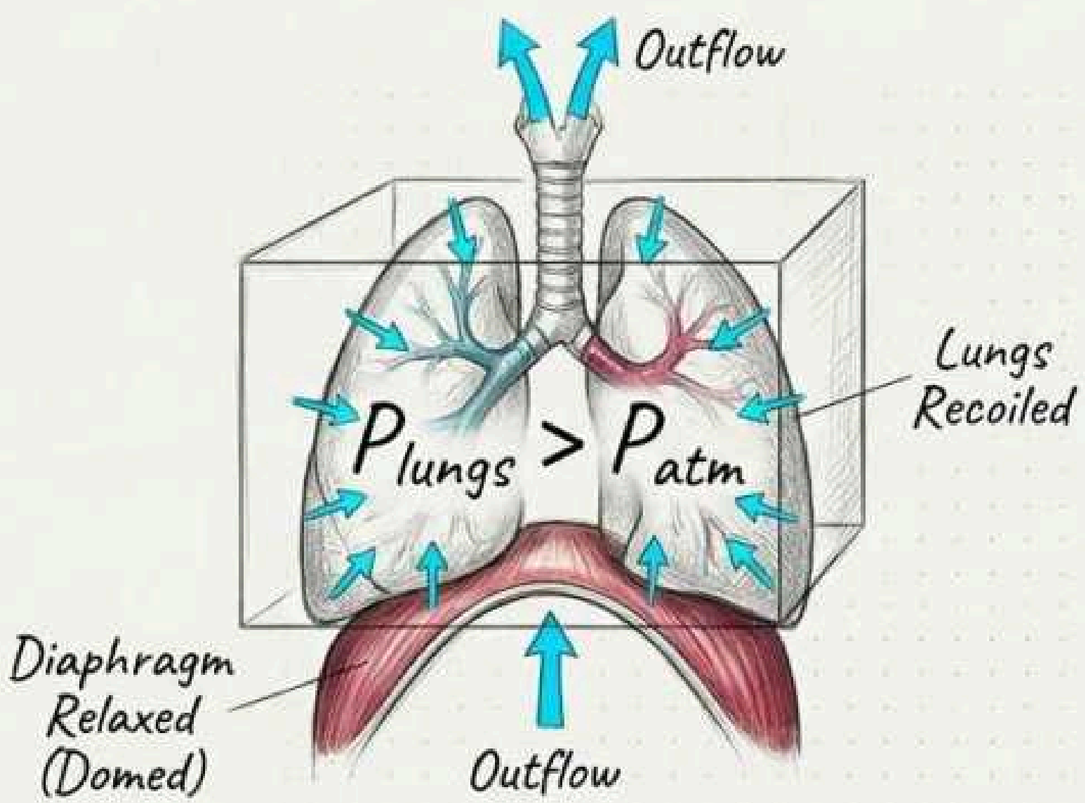
The Engine of Breathing: Pressure & Volume

¶ 3.3

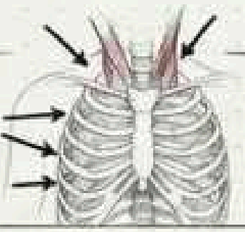
Inspiration



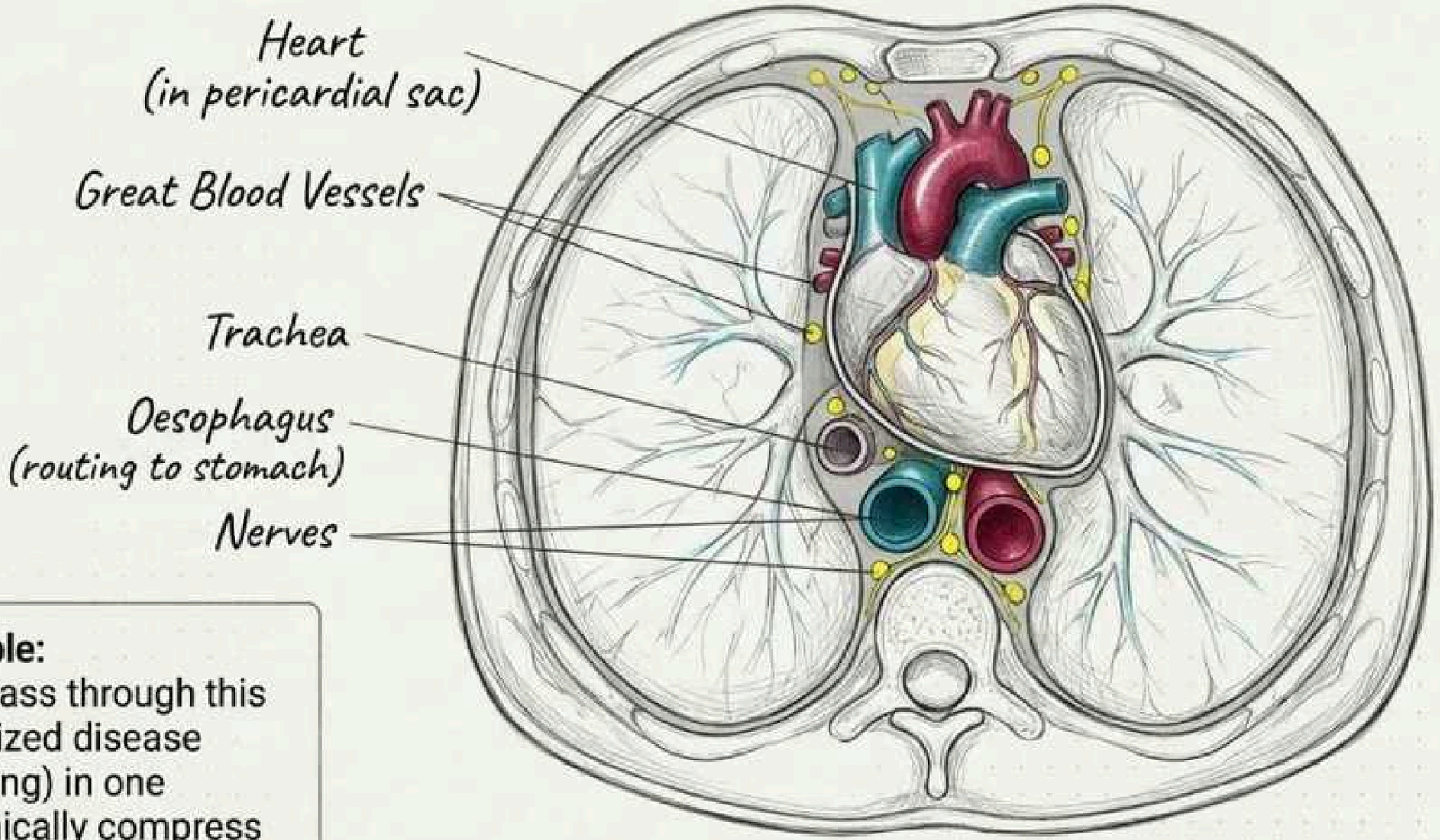
Expiration



During heavy breathing, accessory muscles in the ribs and neck engage to further lift and widen the rib cage.

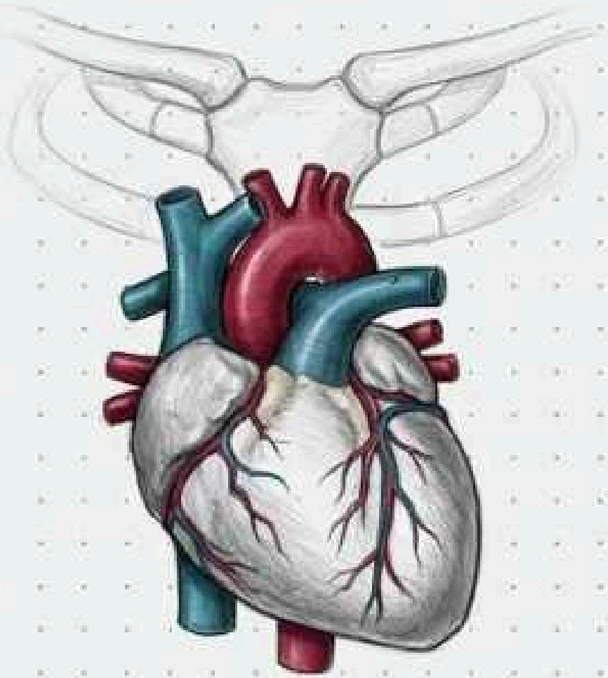


The Mediastinum: The Crowded Core



The Crowding Principle:
Because vital tubes pass through this confined space, localized disease (like a tumor or swelling) in one structure will mechanically compress its neighbors.

The Dual Pump System



Right Heart

Returns blood from the body
→ Pumps to the lungs.



Wall: Thin
(requires less force)

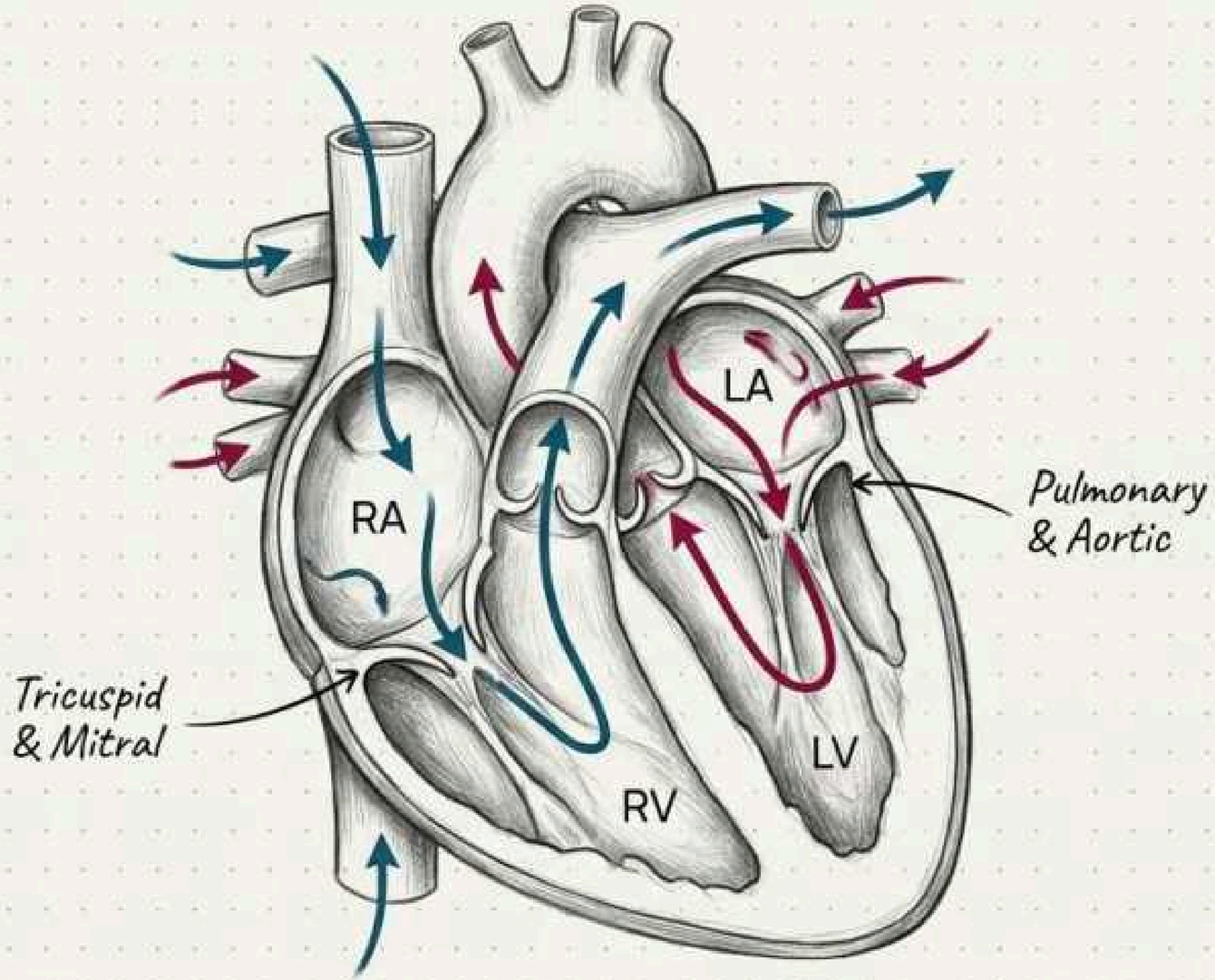
Left Heart

Returns oxygen-rich blood from lungs
→ Pumps to the whole body.



Wall: Thick
(pushes blood farther)

Chambers & One-Way Flow

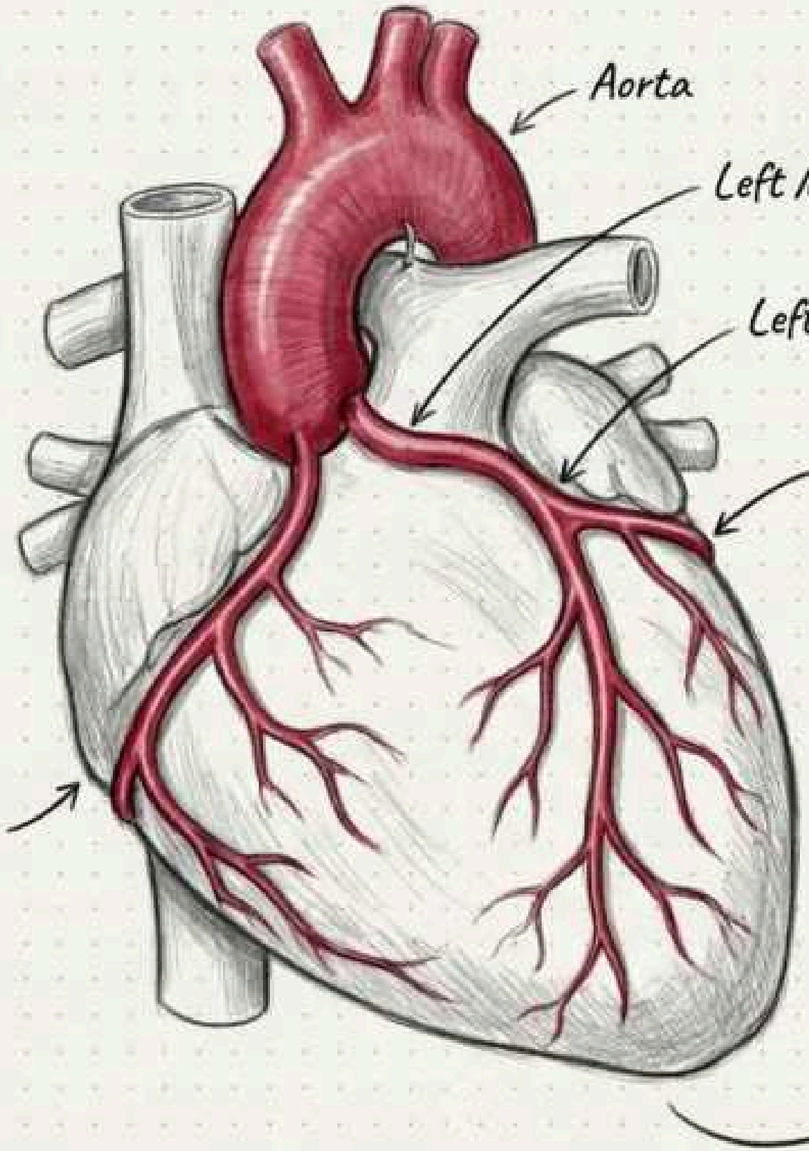


Clinical Callout

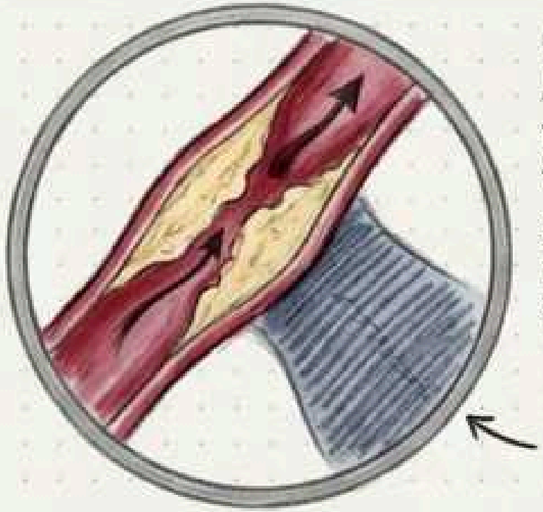


The Acoustic Signature:
The 'lub-dub' heartbeat heard by a doctor is not the muscle contracting, but mechanical closing of these four valves.

The Fuel Supply: Coronary Circulation

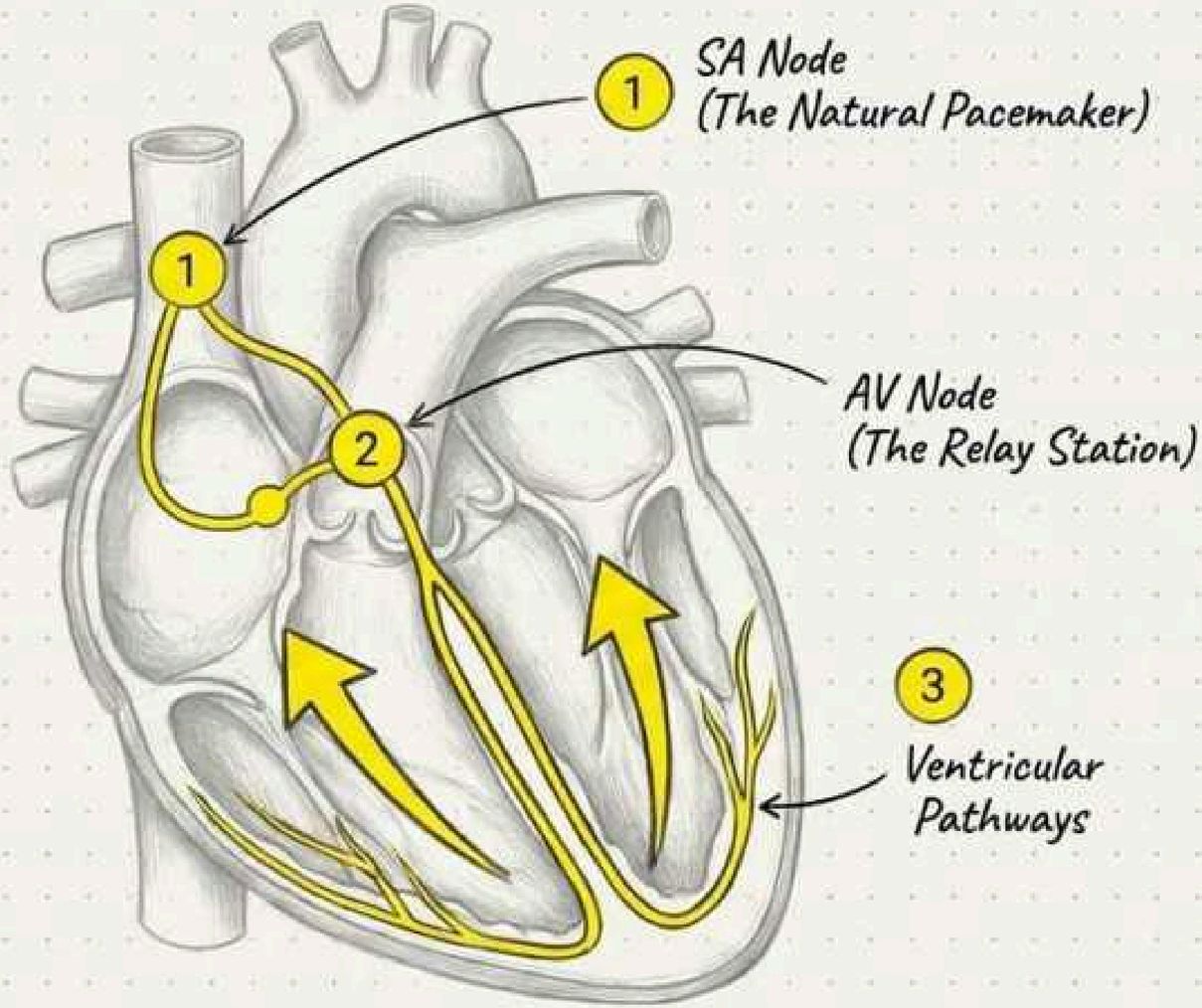


Pathology Focus Box



Clinical Prediction:
A blockage starves a specific territory of muscle. Knowing the exact arterial branching allows doctors to predict the precise structural damage of a heart attack.

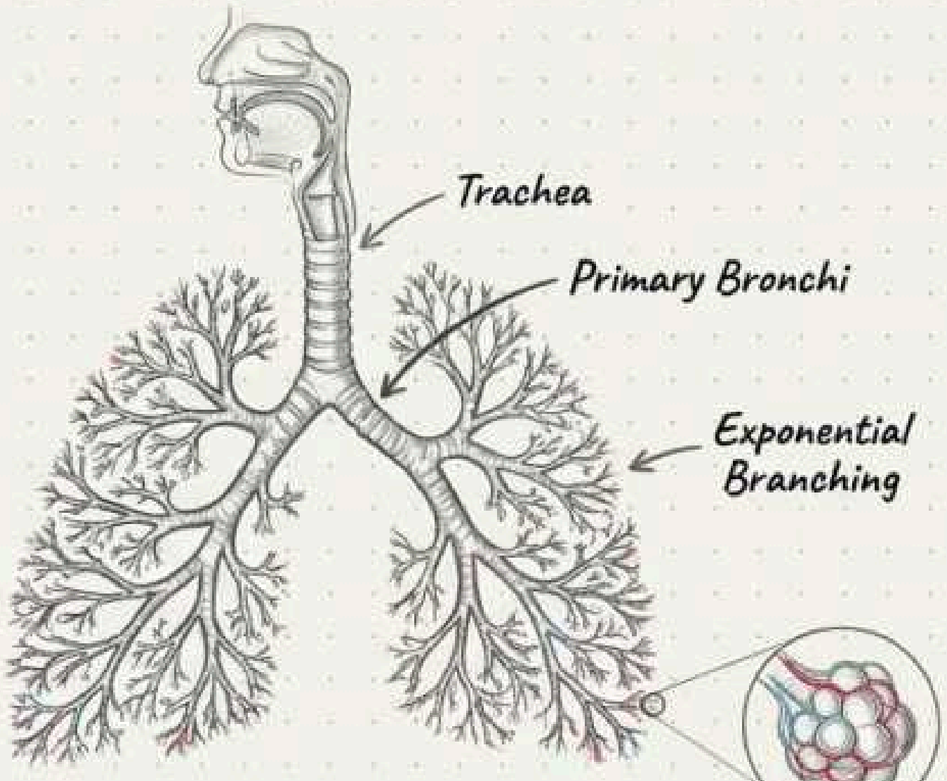
The Built-In Wiring: The Bottom-Up Squeeze



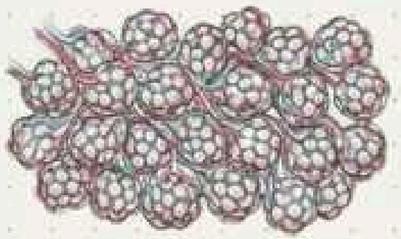
Summary Note: The electrical signal forces the ventricles to contract from the tip upward, squeezing blood efficiently toward the superior exits.

The Airway Tree & Exponential Scale

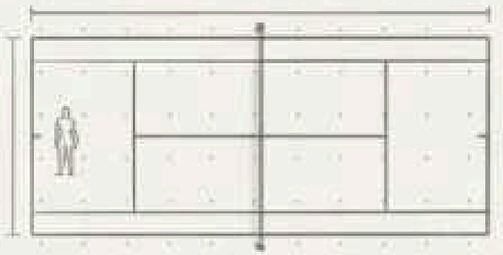
$\approx 2^{20}$ branches



Microscopic Alveoli Clusters



=



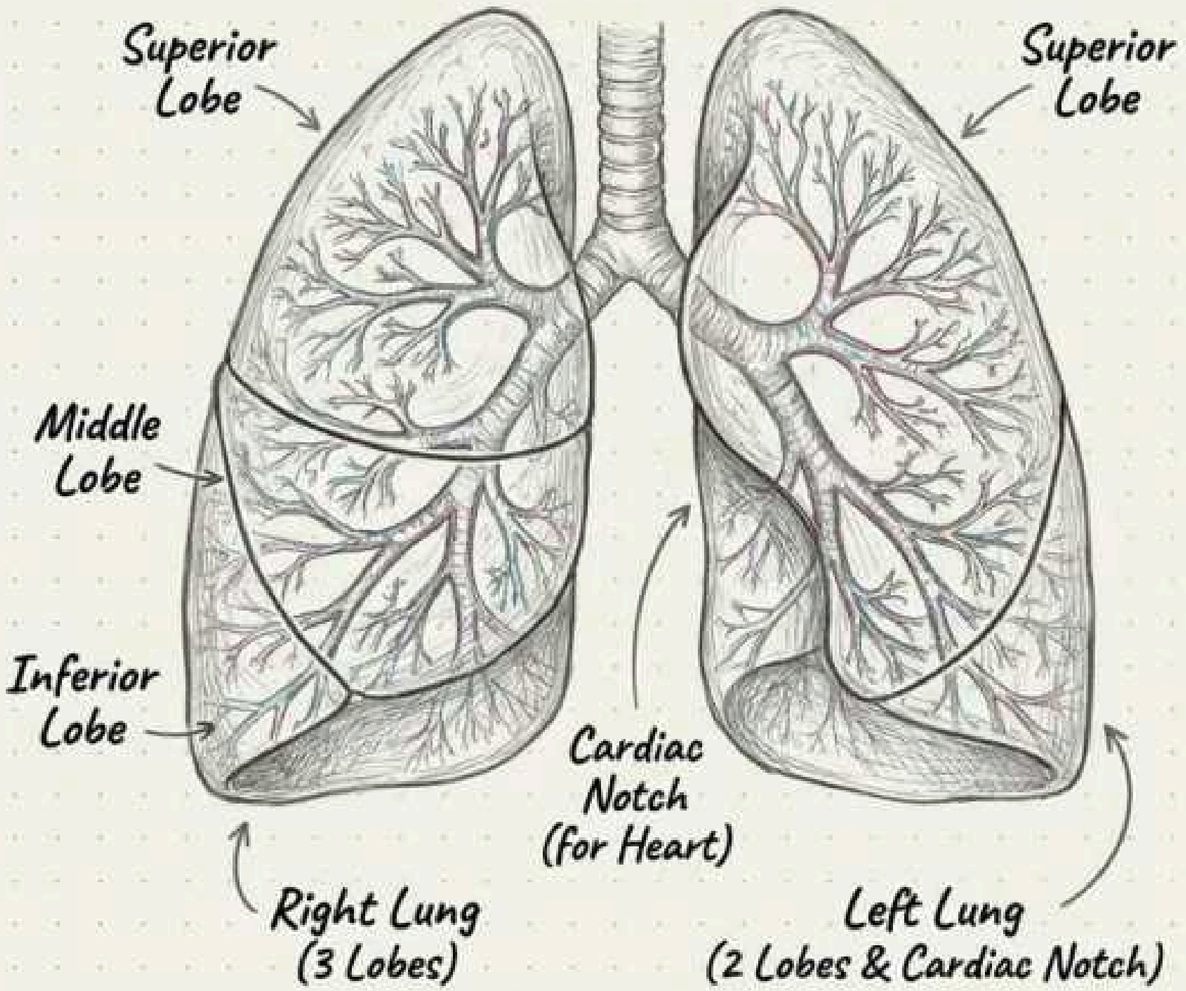
Tennis Court Surface Area

Folded inside the chest: A surface area for gas exchange roughly the size of a tennis court.

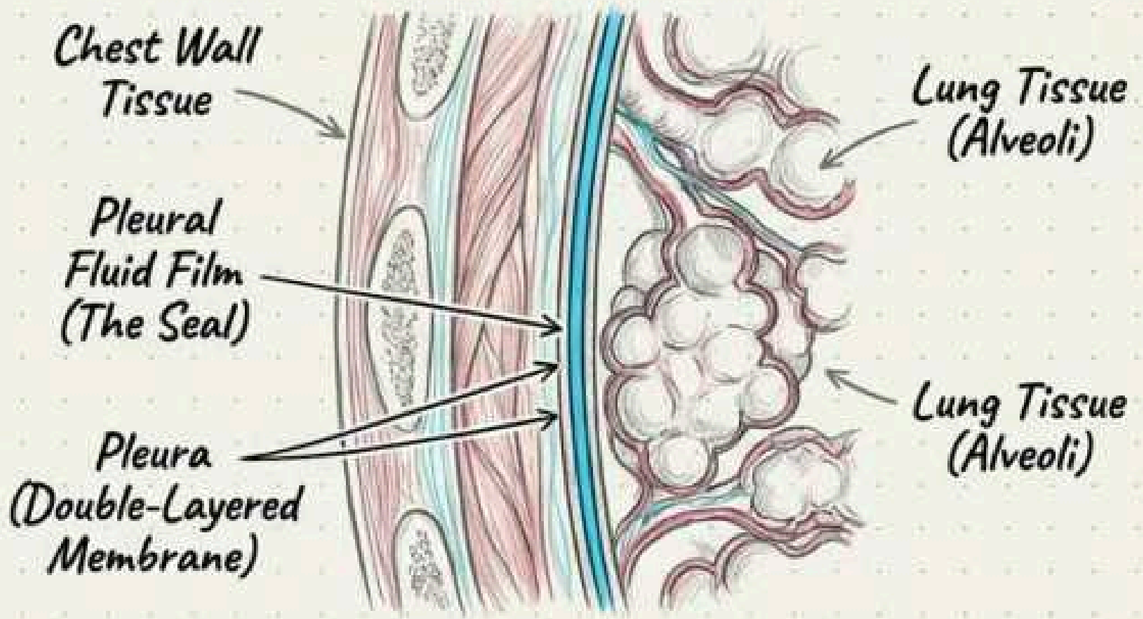
The Sponges & The Fluid Seal

¶ 3.10

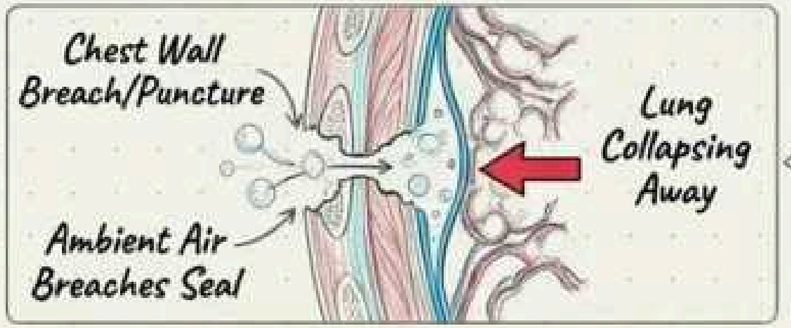
The Sponges



The Seal



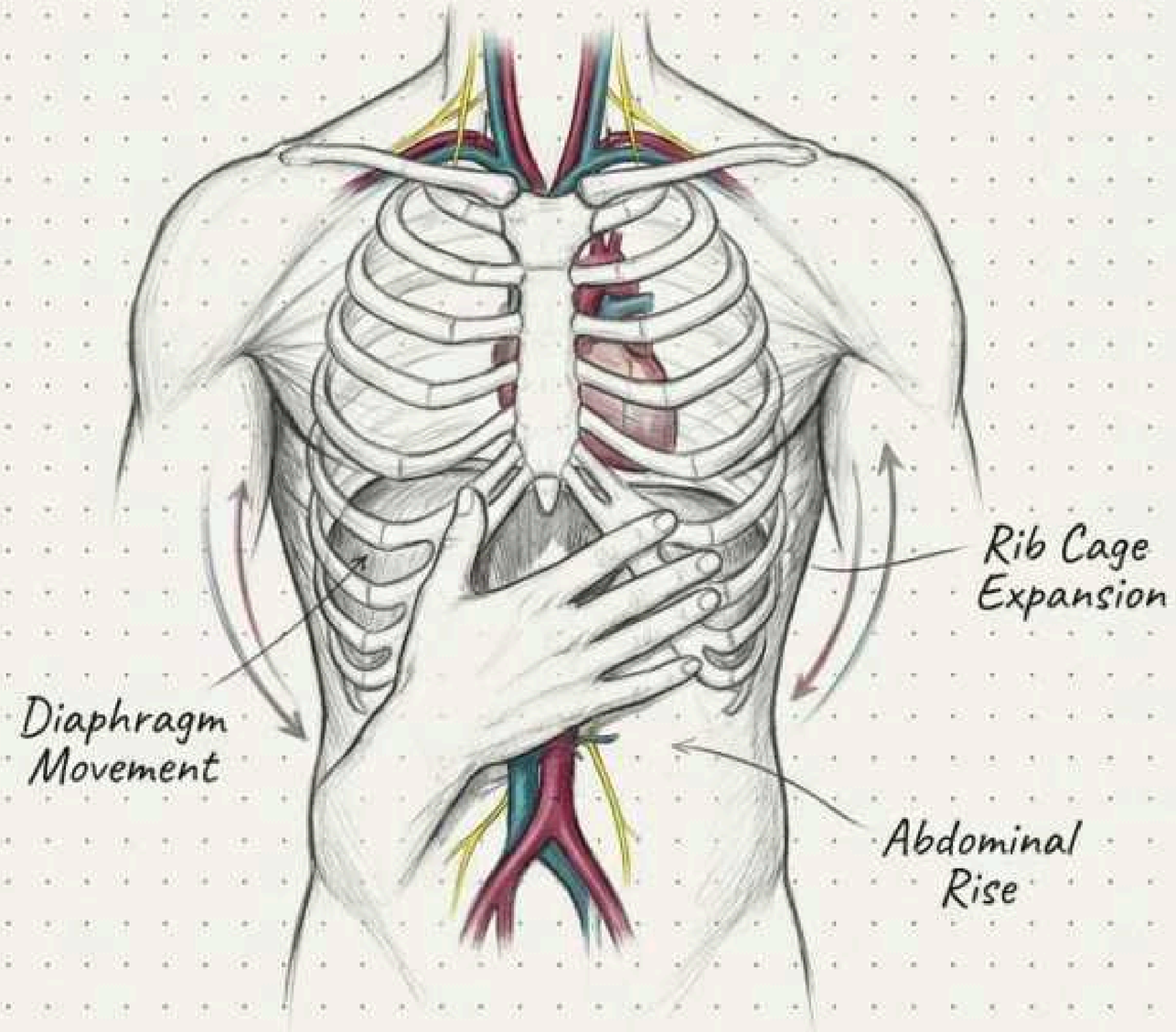
Clinical Mechanics Failure: Pneumothorax



Pneumothorax: Air breaches the pleural layers, breaking the fluid seal and causing the lung to collapse away from the chest wall.

Practical Application: Self-Exam

¶ 3.11



Put your hand flat on the lower front of your chest and take a slow, deep breath.

What do you feel move, and in which direction? Using the anatomy of the diaphragm and ribs, explain what you feel.

Next Steps: Below the Diaphragm

In Lecture 4, we cross the boundary of the diaphragm, entering the anatomy of the abdomen and pelvis.

