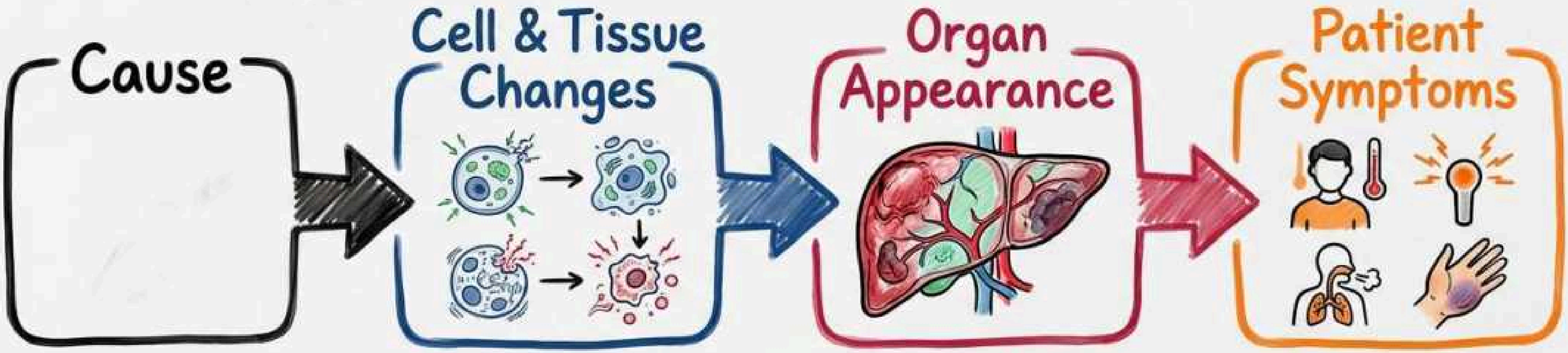
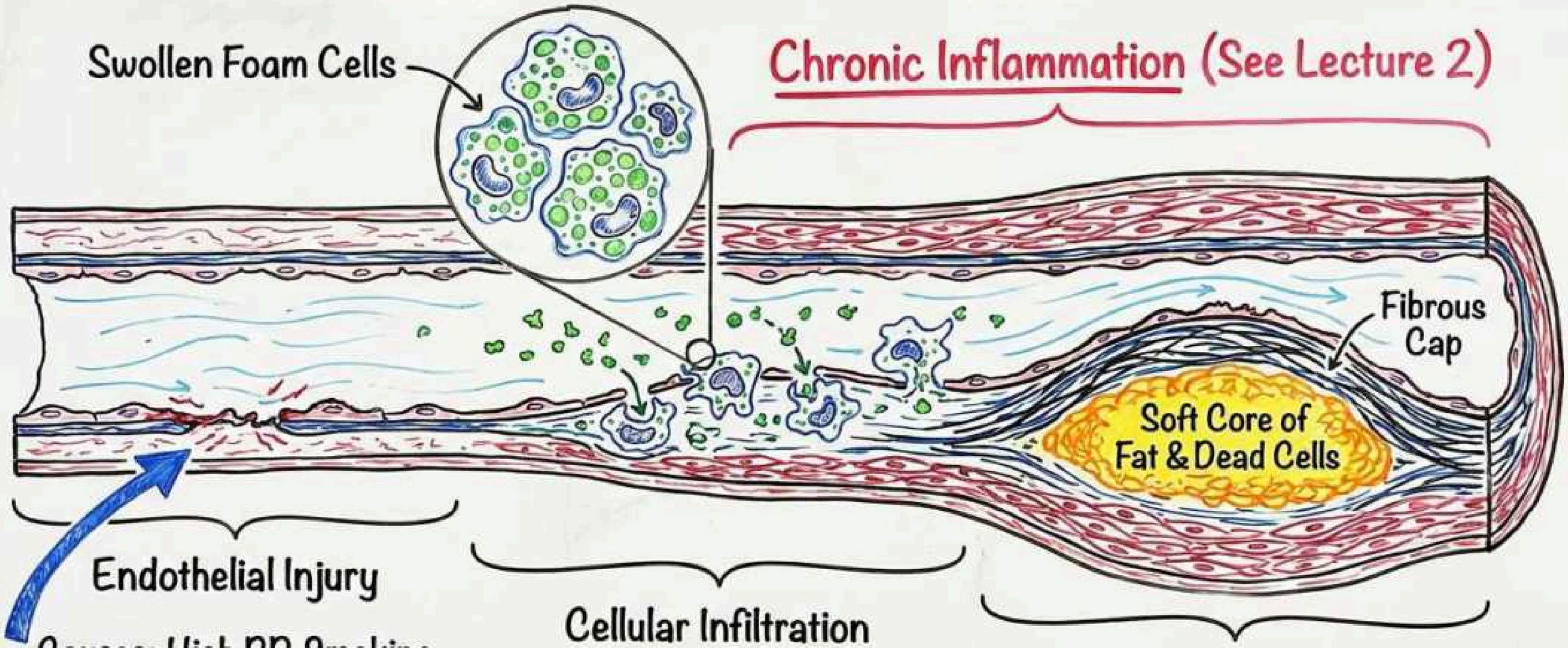
The Chain of Pathology



Pathology provides explanations, not diagnostic tools.
The chain links microscopic mechanisms to clinical reality.

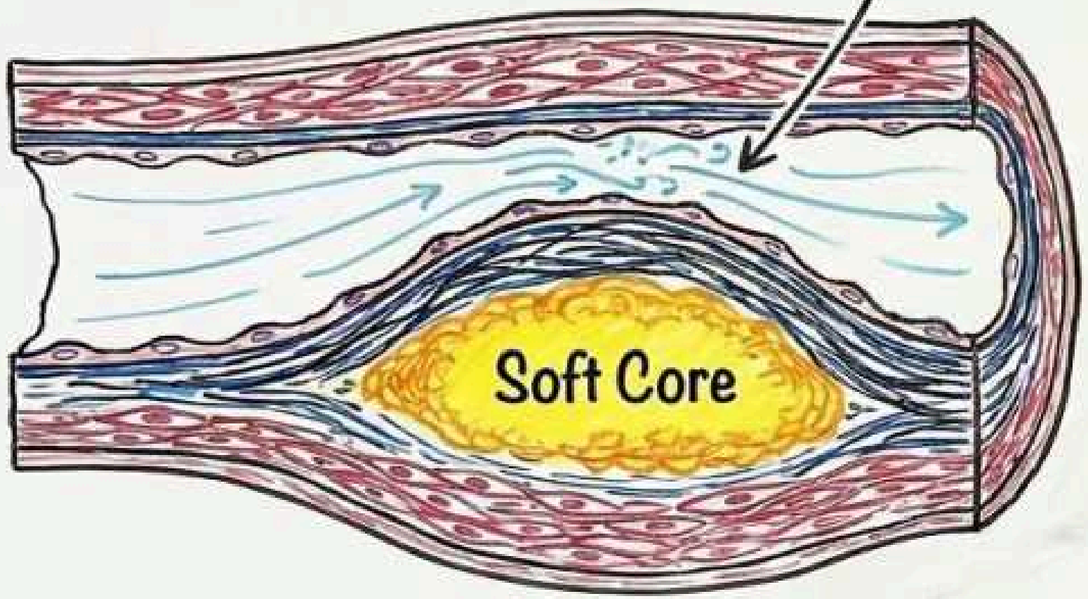
Atherosclerosis: Origin and Progression



The Breaking Point: Angina vs. Thrombosis

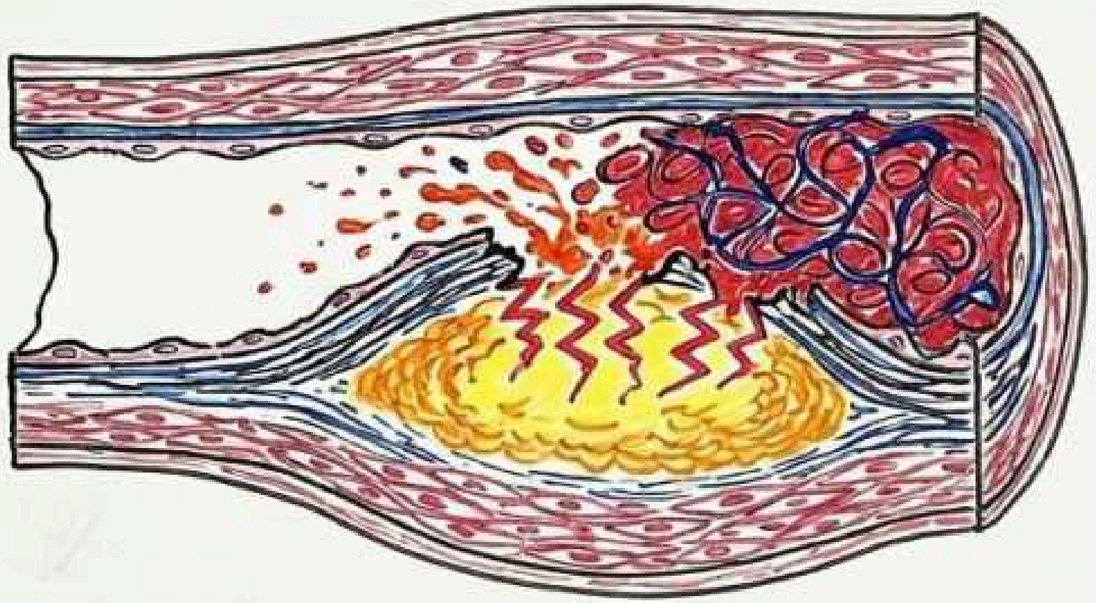
Stable Plaque

$R \propto \frac{1}{r^4}$



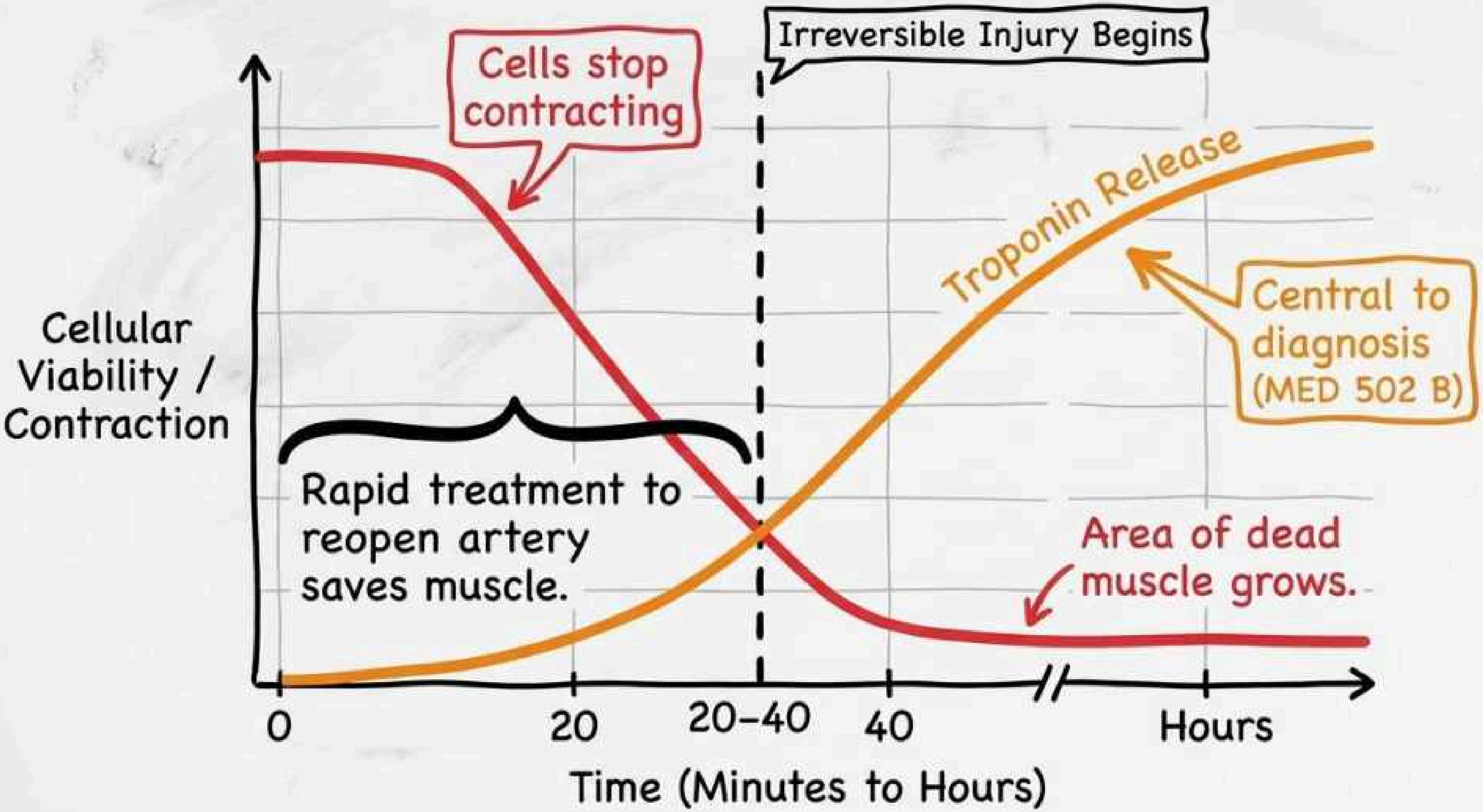
Stable Plaque → Blood flow restricted during exertion → Chest pain (Angina) → Settles with rest.

Plaque Rupture



Cap Ruptures → Exposed contents trigger Thrombosis (Lecture 3) → Clot completely blocks artery.

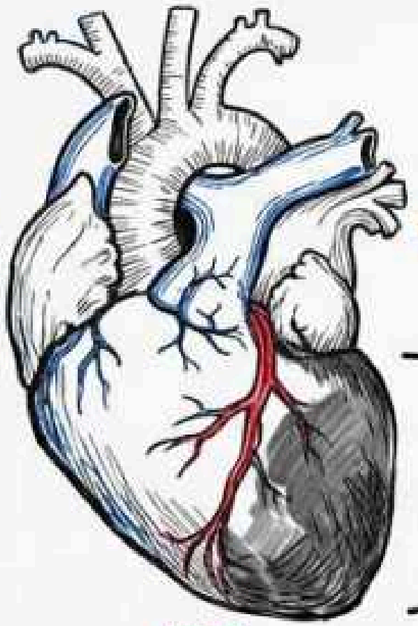
Myocardial Infarction: The Timeline of Ischaemia



Systemic Consequences of Infarction

Pump Failure

Leads to Heart Failure and Cardiogenic Shock



Healed Scar Tissue

Electrical Failure

Leads to dangerous Rhythm Disturbances

Prevention

Controlling atherosclerosis risk factors is the most effective approach

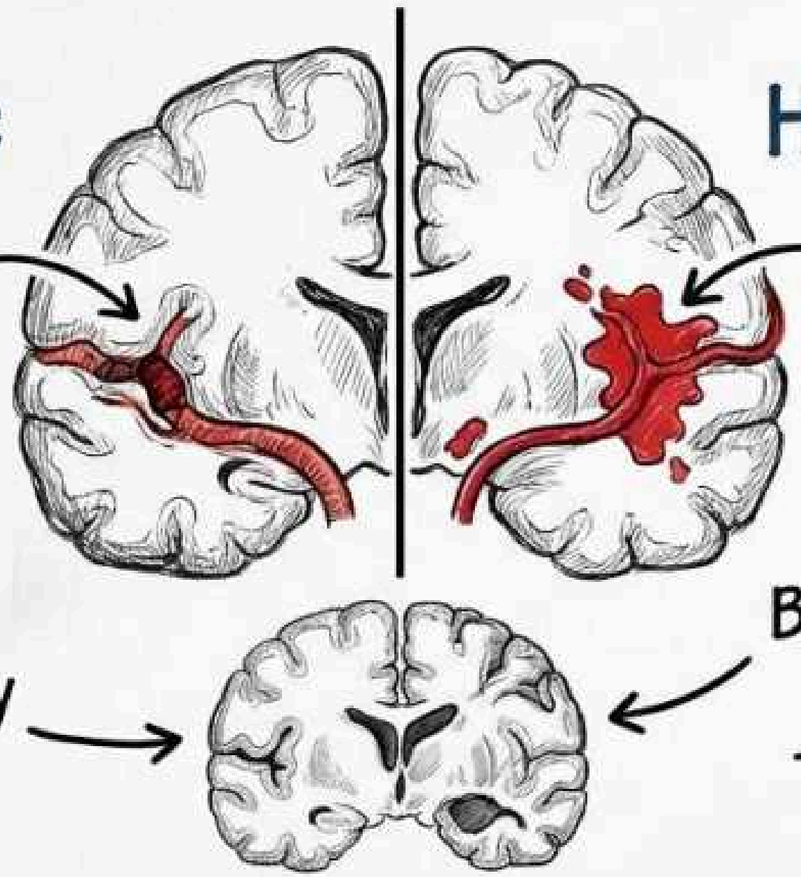
Stroke: Brain Blood Supply Emergencies

Ischaemic

Blockage from neck atherosclerosis or atrial fibrillation.

Haemorrhagic

Bleeding into/around brain, driven by high blood pressure.

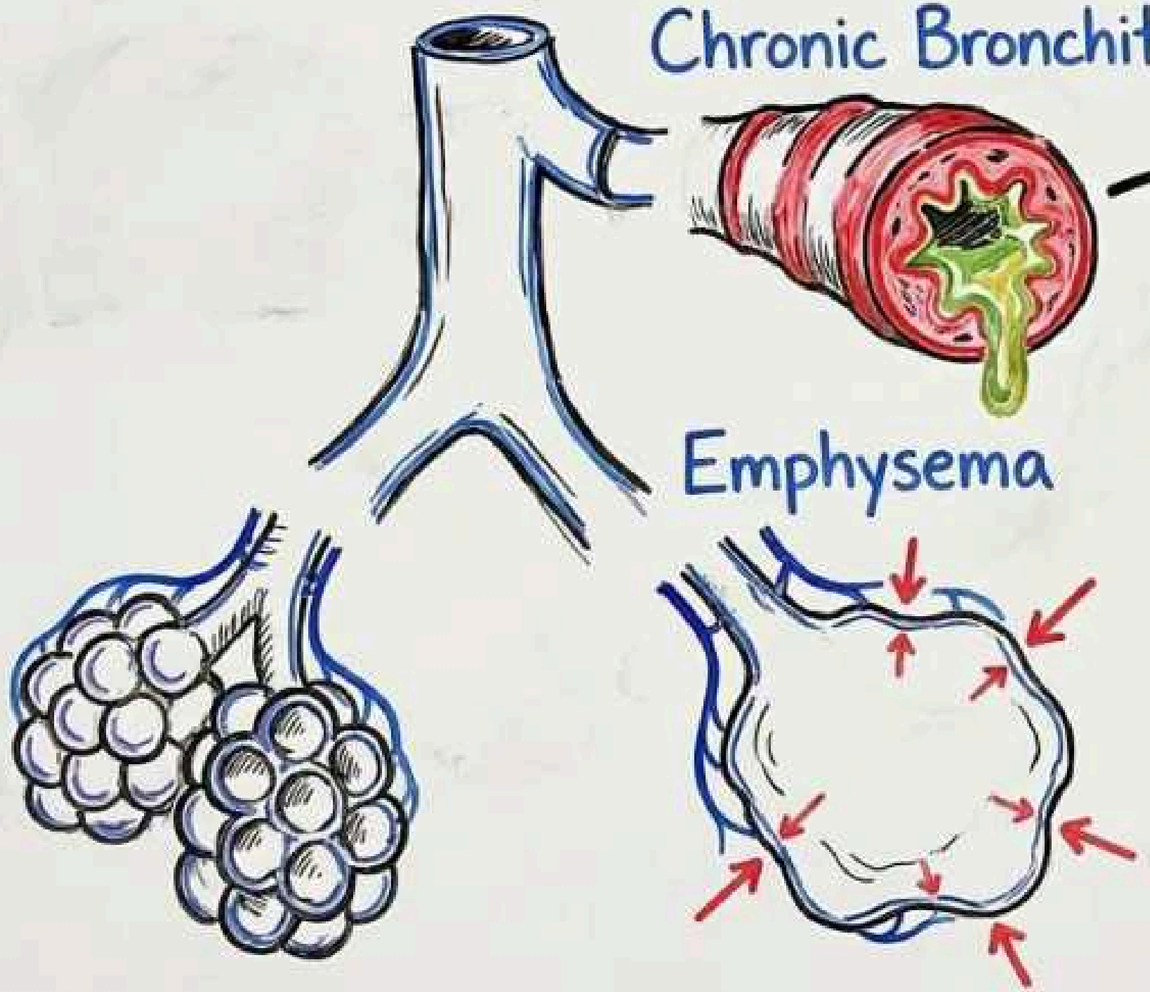


Fluid-filled cavity and scarring.

Brain tissue regenerates so little (Lecture 2) -> Loss of function is often permanent.

Urgent Treatment required to restore flow!
Sudden facial/arm weakness or speech difficulty is a strict emergency.

COPD: The Dual Disease of Destruction



Chronic Bronchitis

→ Airway inflammation + Mucus overproduction = Persistent Cough

Emphysema

Fick's Law of Diffusion

$$V \propto \frac{A \cdot \Delta P}{T} \downarrow$$

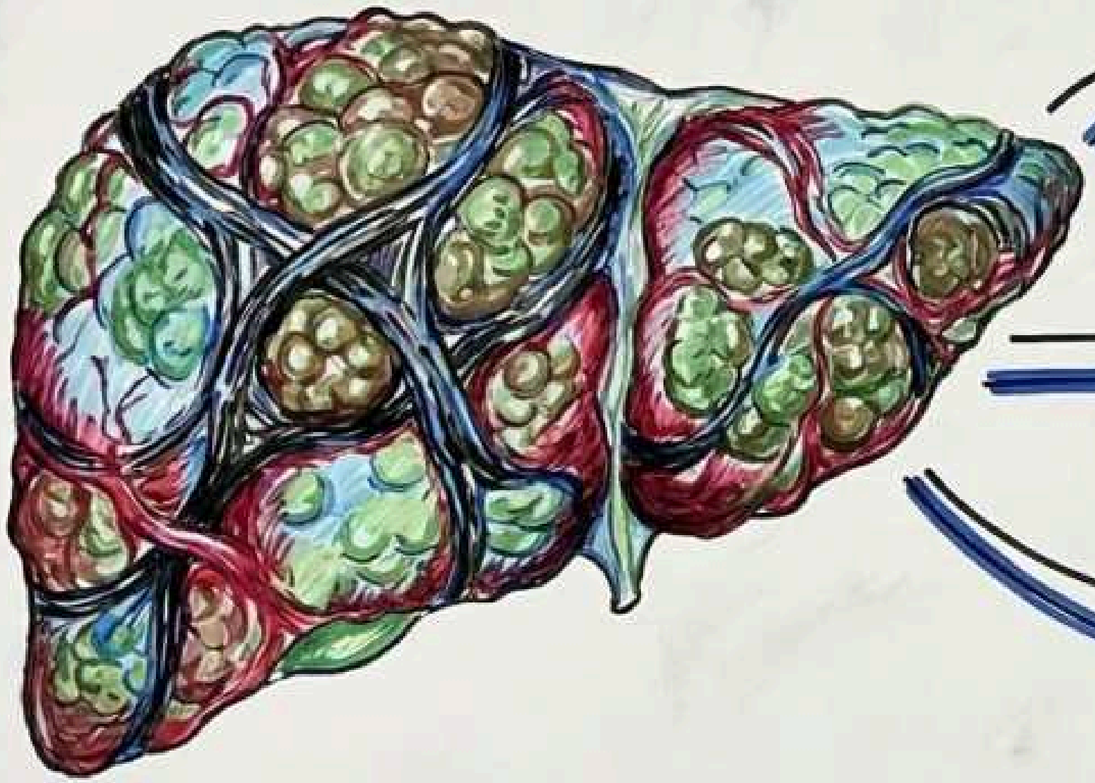
Alveolar walls destroyed by inflammatory enzymes

→ Loss of gas exchange surface area & elastic recoil

→ Air trapping & breathlessness

Primary Driver: Tobacco smoke (with air pollution/occupational exposures)

Cirrhosis: Architectural Collapse



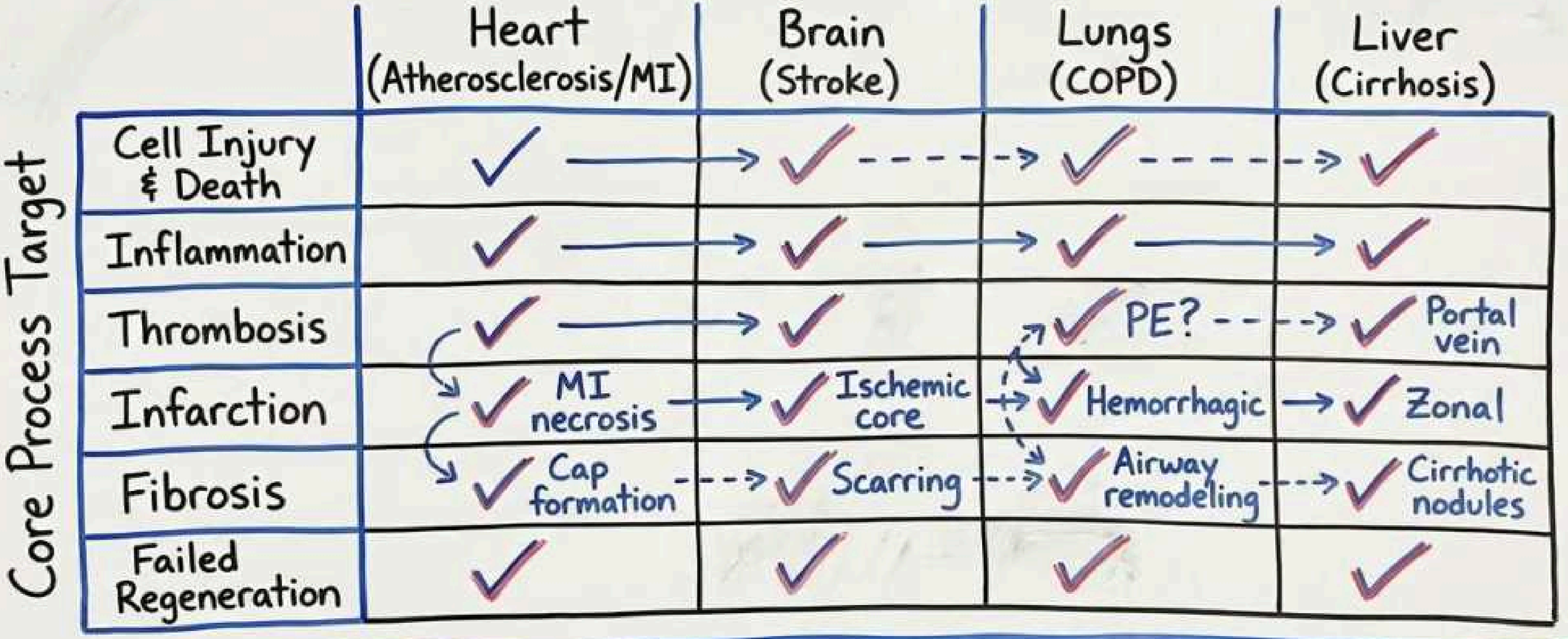
Synthesis Failure: Cannot make blood proteins → Ascites (Fluid collecting in abdomen)

Clearance Failure: Cannot clear bilirubin → Jaundice (Yellowing of skin)

Vascular Blockage: Scarring raises portal vein pressure (MED 501 B) → Dangerous bleeding from swollen oesophageal veins

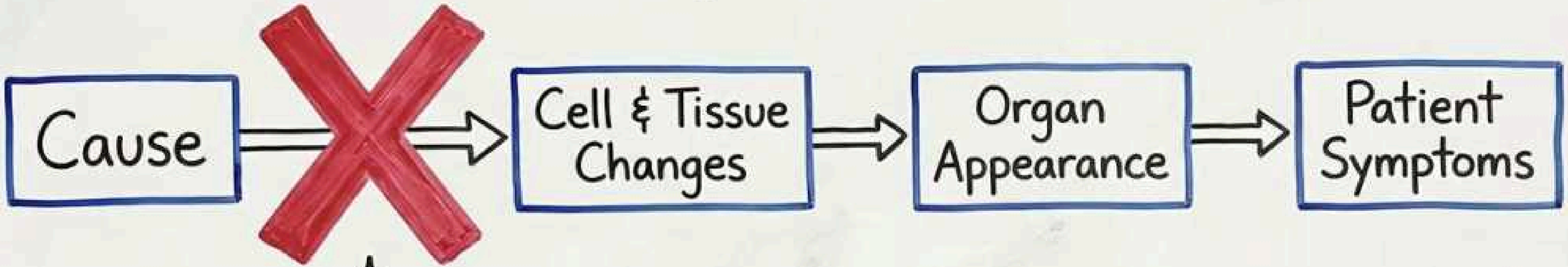
Causes Note: End stage of chronic injury: Alcohol, Viral Hepatitis, Obesity/Diabetes fat accumulation.

The Power of General Pathology



A small number of mechanisms, understood well, explain an enormous range of diseases. To be applied in Year 2: Cardiovascular Pathophysiology through Hematology.

Breaking the Chain

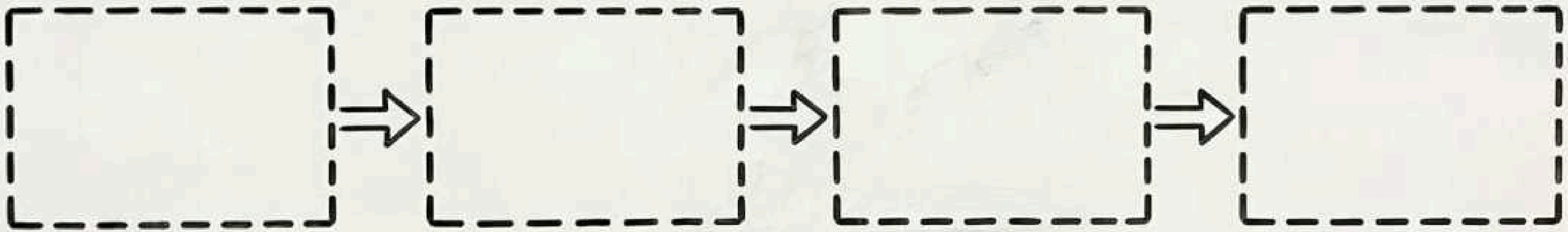


Tobacco Smoke → drives lung disease, cancers, atherosclerosis.
High BP/Cholesterol/Diabetes/Inactivity → drives heart attacks & strokes.
Alcohol & Viral Hepatitis → drives cirrhosis.

Pathology reveals where the chain can be broken.
Vaccination now prevents Hepatitis B.
Prevention is the most hopeful lesson in medicine.

The Final Assignment

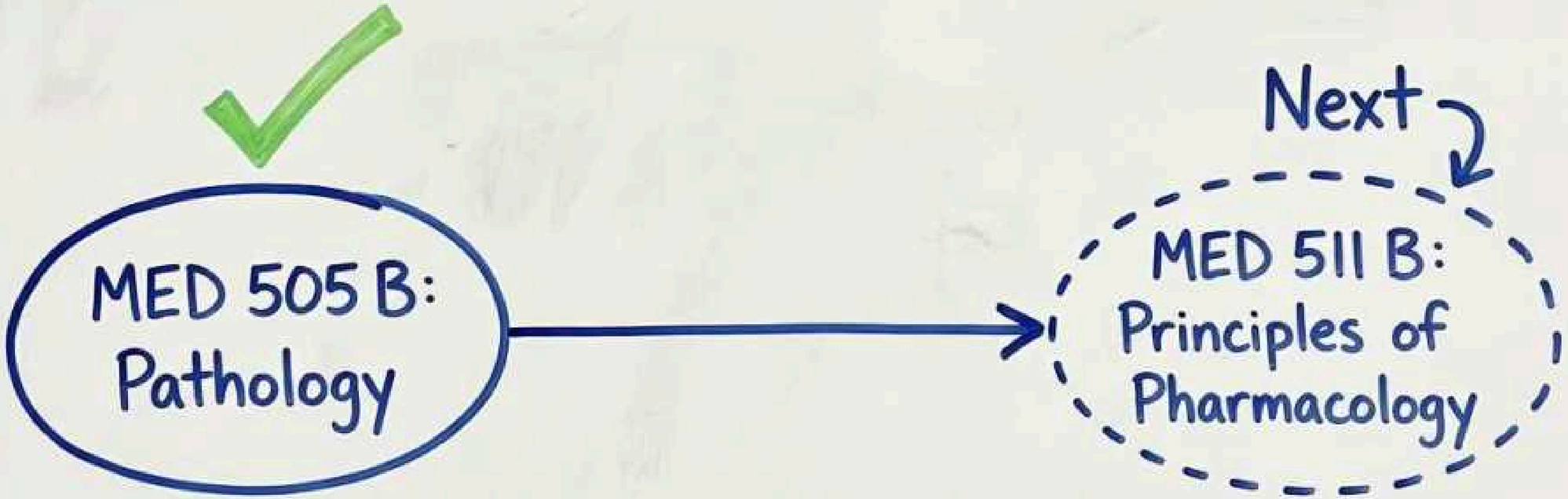
Choose one disease from this lecture. Trace its chain from cause, to cells, to organ, to symptoms.



☐ Name at least three general processes from earlier lectures.

Check your completed chain against the Course Book.

Course Conclusion



Thank you for completing Medicine 505 B.