



มหาวิทยาลัยราชภัฏนครปฐม



Mechanism and Illness of Human Body 2

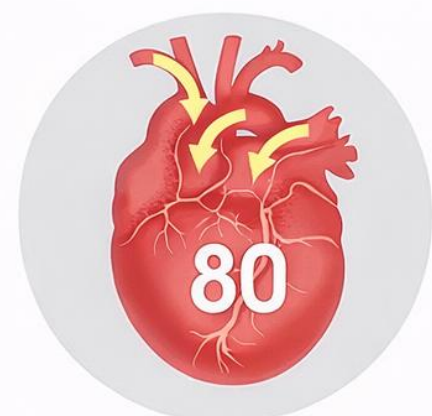
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Disorders of the Cardiovascular System (part 2)

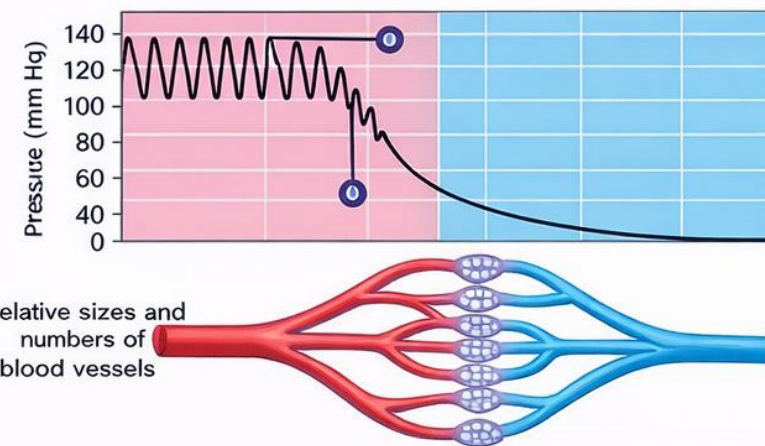


Hypertension



Systolic | Diastolic

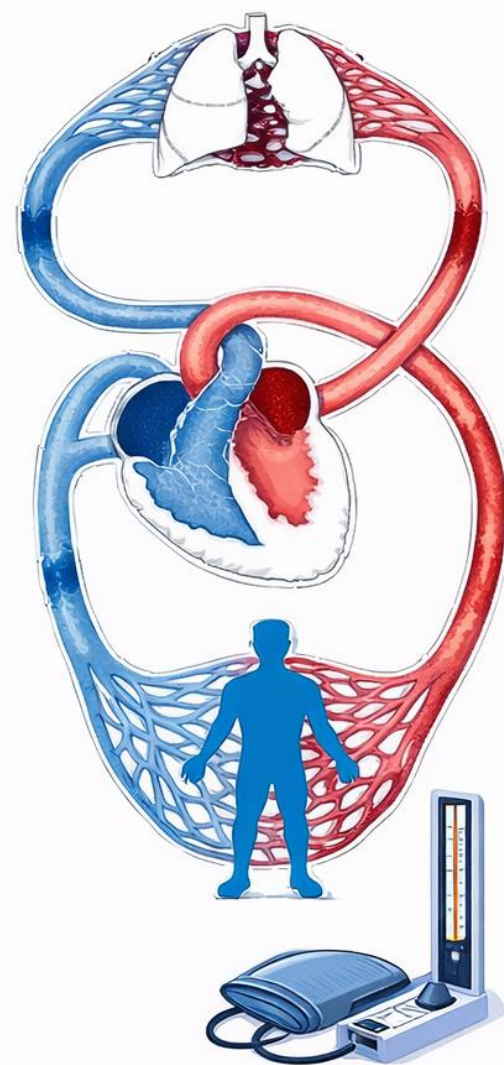
The highest, normal blood pressure reading: 120/80



High blood pressure number = Systolic pressure (SP)

Lowest blood pressure number = Diastolic pressure (DP)

Mean arterial pressure: $mABP = 1/3 (SP + 2DP) = DP + 1/3 PP$



The World Health Organization (WHO) and the International Society of Hypertension (ISH) define **hypertension (high blood pressure)** as a condition in which the pressure of blood against the walls of the arteries is persistently higher than normal. Specifically:

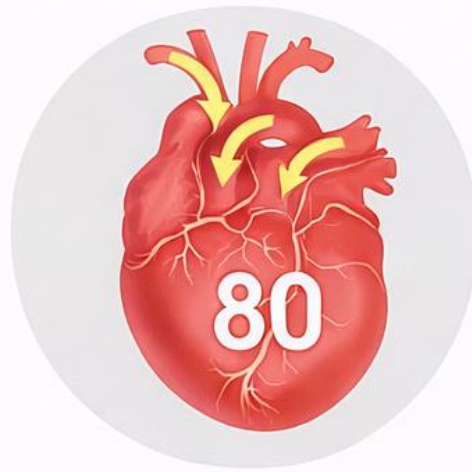
Diagnosis:

- **Systolic blood pressure (SBP)**, or the pressure when the heart contracts, is **equal to or greater than 140 mmHg**, and/or
- **Diastolic blood pressure (DBP)**, or the pressure when the heart relaxes, is **equal to or greater than 90 mmHg**.

Additional Criteria:

- A condition in which **systemic arterial pressure at rest is persistently elevated**.
- **Blood pressure > 140/90 mmHg**.
- Measurements should be taken **at least three times while at rest**, with **intervals of at least 20 minutes between each measurement**.

Disorders of the Cardiovascular System (part 2)



Diastolic

The highest, normal blood pressure reading:

120/80

Hypertension

Systolic blood pressure

- Ejection of blood from the heart into the Aorta
- Increase in:
 - Stroke volume (amount of blood ejected per heartbeat)
 - Force of contraction
 - Arterial stiffness

Diastolic blood pressure

- ขึ้นกับ
 - Expansion of blood vessels
 - Peripheral resistance
 - Aortic valve function
 - Stiffness of blood vessels
- **Additional** Criteria: **Systemic arterial pressure** at rest is persistently elevated.
- Blood pressure > **140/90** mmHg.

Disorders of the Cardiovascular System (part 2)



Hypertension

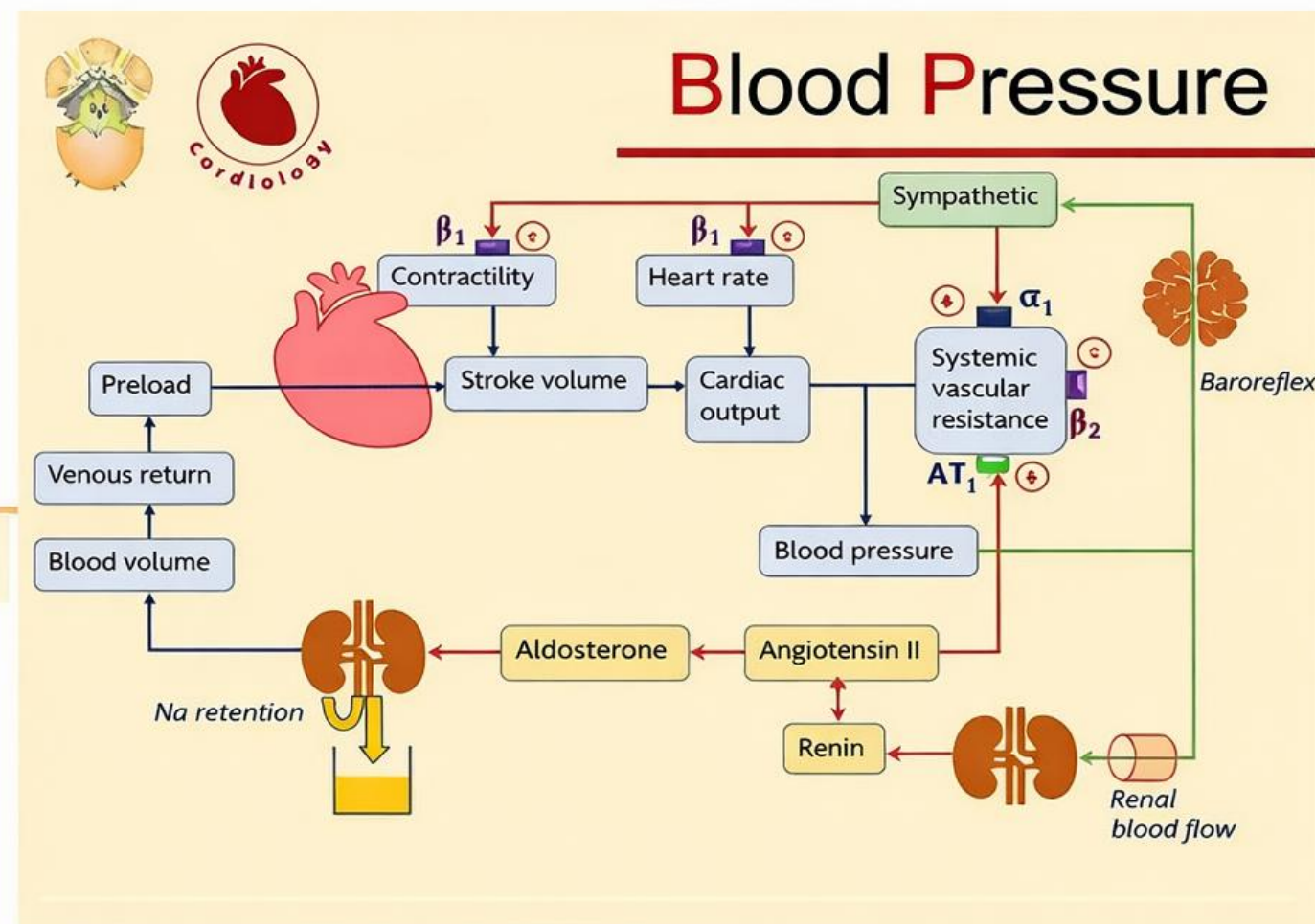
Factors Controlling Blood Pressure

$$BP = CO \times TPR$$

$$CO = SV \times HR$$

Factors Controlling Blood Pressure

1. **Cardiac output** (the amount of blood the heart pumps)
2. **Resistance of the circulatory system** (vascular resistance)
3. **Blood volume**
4. **Changes in hormone levels**



- **Cardiac output** (the amount of blood the heart pumps)
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- **Changes in hormone levels**

Disorders of the Cardiovascular System (part 2)



Hypertension

Mechanisms Regulating Blood Pressure

Mechanisms Regulating Blood Pressure

1. Sympathetic nervous system

- Stimulates the heart and blood vessels

2. Renin-angiotensin-aldosterone system (RAAS)

- Renin angiotensin aldosterone system (RAAS)
- Regulates fluid and electrolytes (Na^+ , K^+)

3. Vasopressin (Antidiuretic hormone, ADH)

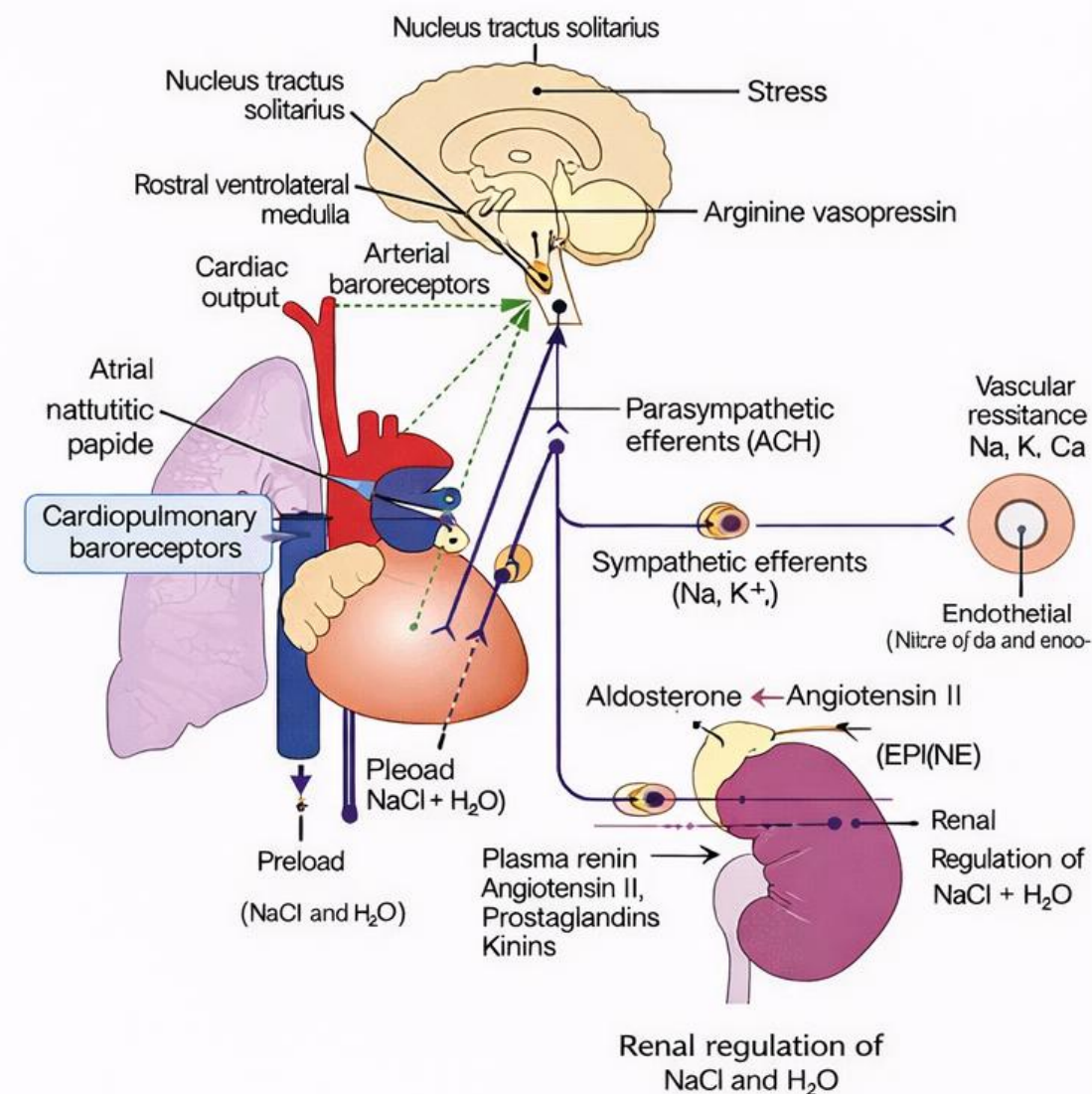
- Increases water reabsorption in the kidneys
- Raises blood volume

4. Autoregulation (Capillary fluid shift)

- Manages blood flow within the microcirculation

5. Autoregulation (Capillary fluid shift)

- Manages blood flow within the microcirculation



Disorders of the Cardiovascular System (part 2)



Hypertension

Classification of Hypertension

Primary Hypertension (Essential or Idiopathic Hypertension)

- Accounts for about 90-95%
- No identifiable cause but linked to a variety of important risk factors related to lifestyle and environment

Risk Factors



- Genetics
- Aging
- Gender
- Obesity
- Lack of physical activity
- Smoking
- Excessive alcohol accion
- Smoking : Tar, CO, nicotine

Hypertension

Classification of Hypertension

Secondary Hypertension

- Accounts for about 5-10%
- Caused by an underlying condition

Caused by an underlying condition:

- Renal hypertension
- Endocrine hypertension
- Coarctation of the Aorta (Narrowing of the aorta)
- Drug induced hypertension (Chronic use of certain medications such as NSAIDs, steroids, or contraceptive)
- Sleep apnea: Snoring, daytime sleepiness, morning headaches



Disorders of the Cardiovascular System (part 2)



Hypertension Symptoms

Signs & Symptoms



Headache

Dizziness

Shortness



Shortness of Breath

Chest pain (angni)

Dizziness

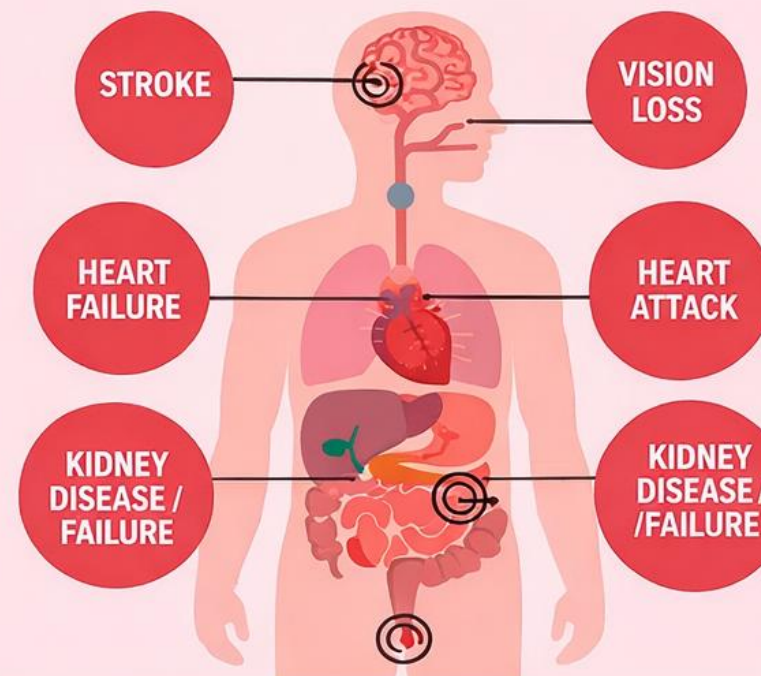
Signs & Symptoms:

- Headache (often the first sign)
- Severe blood vessel constriction
- Irregular heartbeat
- Chest pain (angina)
- Dizziness, blurred vision, and fatigue



Hypertension Complications

Risks of Hypertension



Risks of Hypertension:

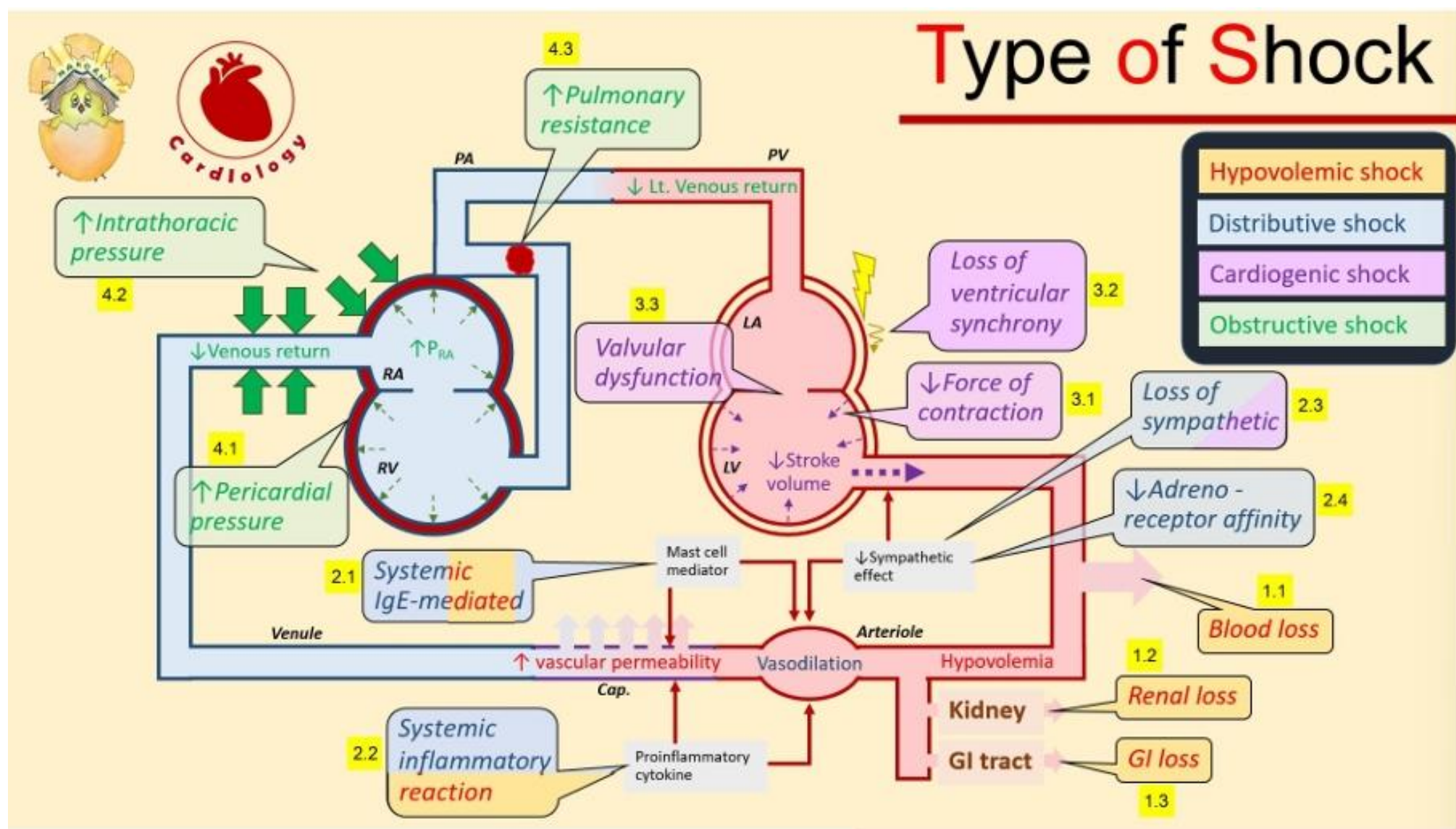
- Coronary artery disease
- The buildup of substances in artery walls causes narrowing, which increase the risk of rupture
- Heart thickening and increased risk of heart failure
- Pulmonary edema (fluid in the lungs)

Shock



A condition in which the body receives insufficient blood supply or loses a large amount of blood, leading to a decrease in circulating blood volume. This results in inadequate oxygen delivery to body cells (**cellular hypoxia**).

- If not promptly corrected, cells and tissues will be damaged, leading to severe clinical manifestations.



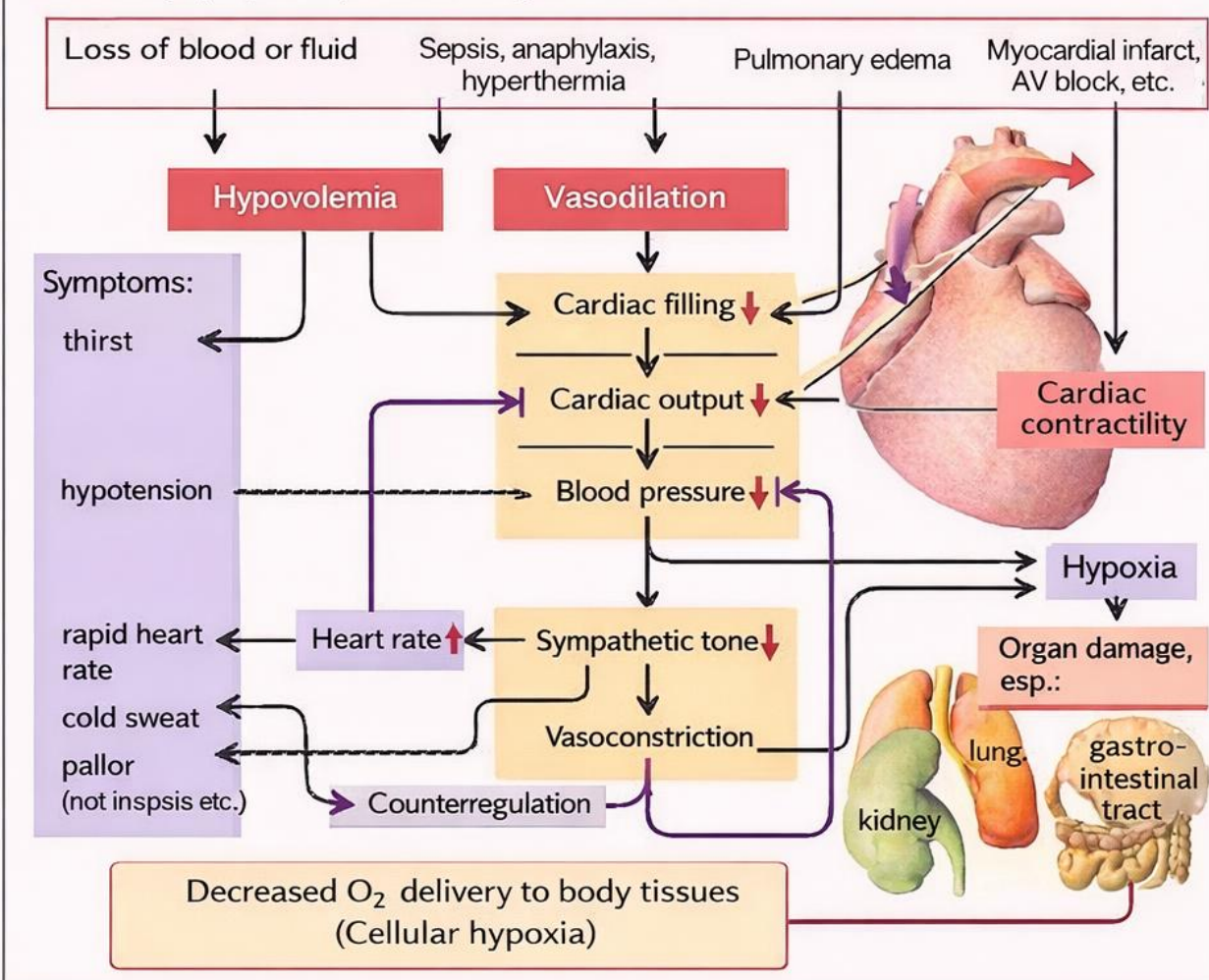
1. Hypovolemic shock
2. Cardiogenic shock
3. Distributive Shock
 - Septic shock
 - Neurogenic Shock
 - Anaphylactic shock
4. Obstructive shock

Shock

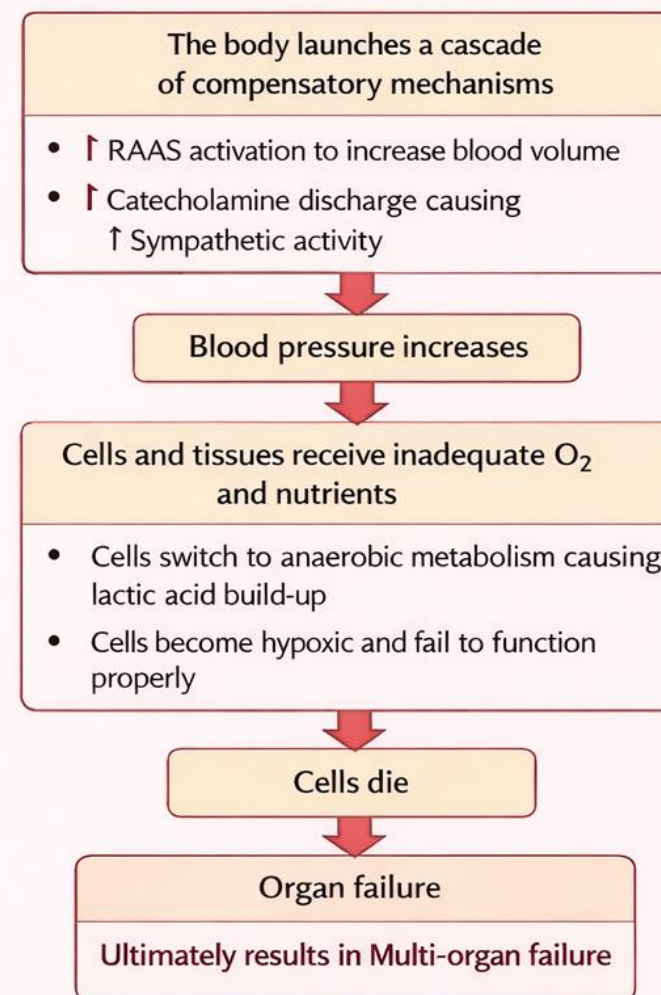


Shock

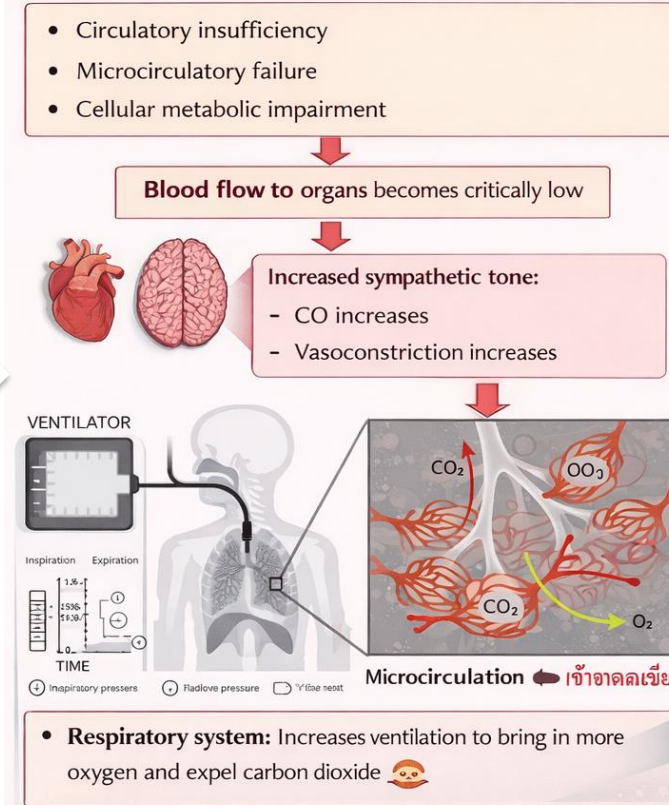
B. Causes, Symptoms, and Consequences of Shock



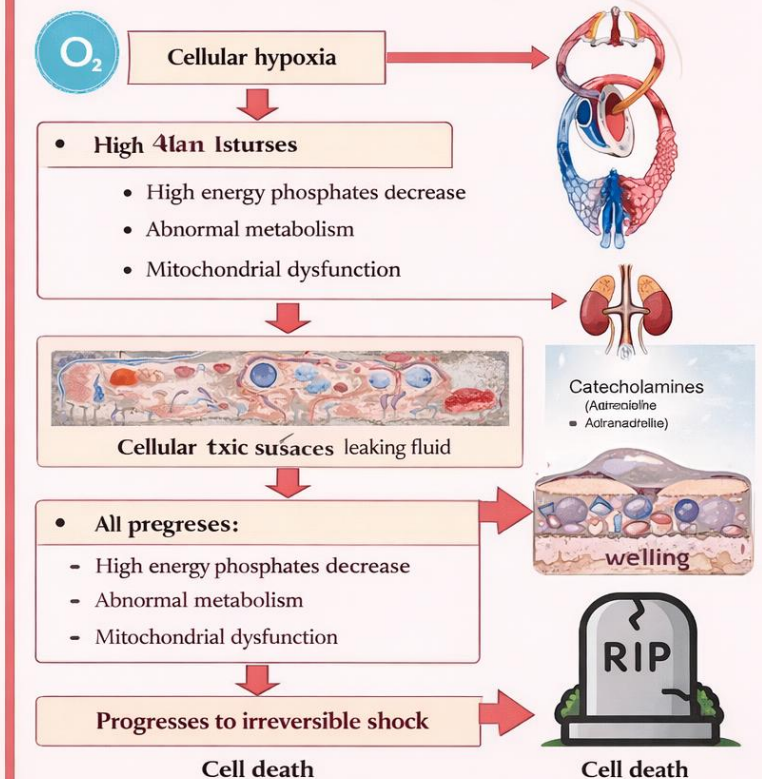
Progression of Shock



Pathophysiology of Shock



Pathophysiology of Shock When the Body Does Not Get Enough Oxygen



$$CO = SV \times HR$$

$$BP = CO \times SVR$$

Shock



Shock

Stages of Shock

1. Non-progressive phase:

The body initiates mechanisms to maintain blood circulation.

Use the Neurohumoral mechanisms with strengthening flon:

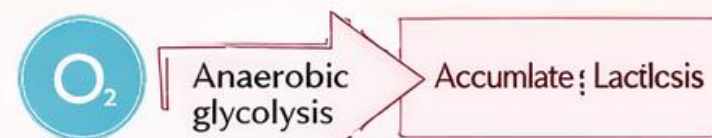
- Baroreceptor reflex,
- Catecholamines,
- Secretion of Renin-angiotensin-aldosterone,
- Antidiuretic hormone release,
- Sympathetic nervous system stimulation

Increases

- Tachycardia
- Peripheral Vasoconstriction
- Reduced urine output

2. Progressive phase:

2. Progressive phase: when shock is not corrected



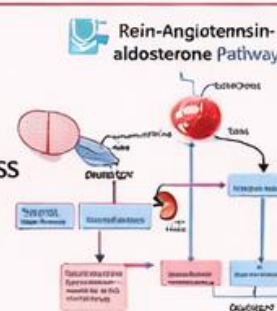
Disseminated intravascular (DIC)

Systemic microthrombi lead to bleeding complications



Results in

- Mental confusion
- Metabolic acidosis
- Acute respiratory distress
- Multiple organ failure



3. Irreversible phase

3. Severe cellular and tissue injury
make recovery impossible

L Lungs:

- Diffuse alveolar damage, or Adult respiratory distress syndrome

L Kidneys:

- Acute tubular necrosis

L Intestines:

- Ischemia, hemorrhage, necrosis,

L Liver:

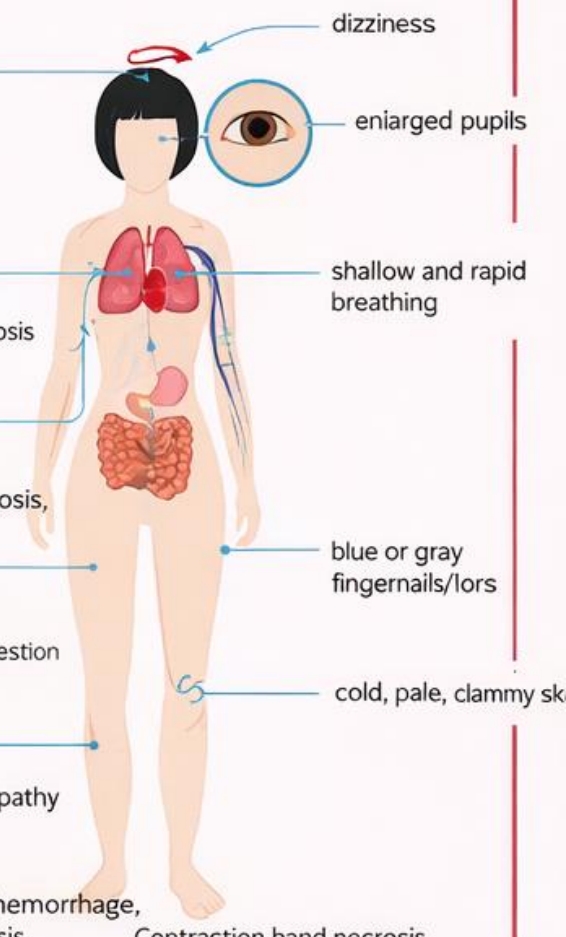
- Fatty change
- centrilobular congestion and necrosis

L Brain:

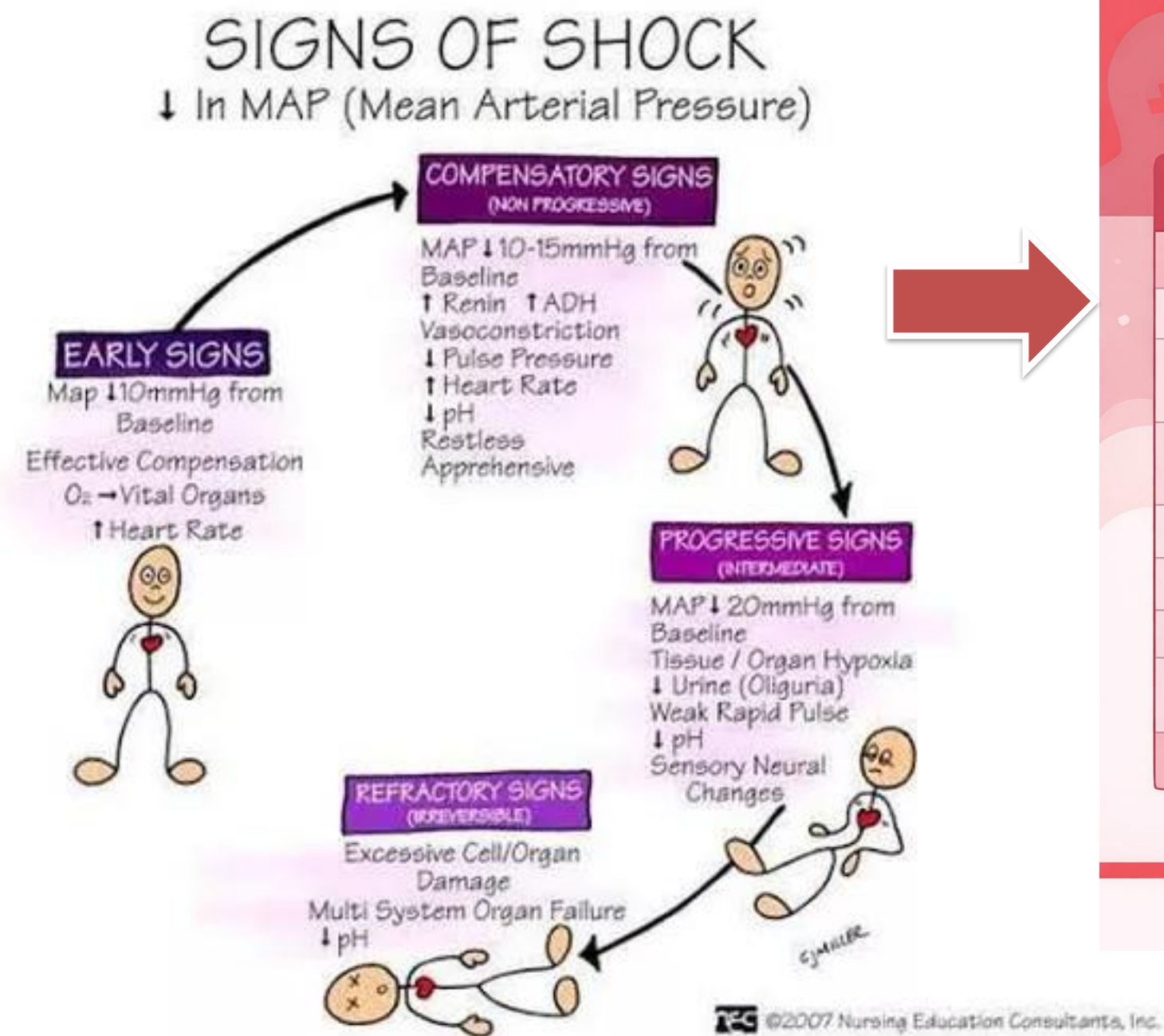
- Ischemic encephopathy

L Heart:

- Subendothelium hemorrhage, coagulative necrosis,
- Contraction band necrosis



Shock



Shock
Clinical Manifestations and Severity Levels

Severity Level / Clinical Signs	Mild	Moderate	Severe
General appearance (skin color)	Pale	Pale	Ashen to cyanotic
Skin temperature	Cool	Cool	Cold
Capillary refill (Pressure blanching response)	Slightly delayed	Delayed	Severely delayed
Level of consciousness	Alert, mild distress	Alert but restless, responds to stimulation	Confused to comatose
Thirst	Normal	Definite thirst	Severe thirst
Respiration	Normal	Increased	Labored
Blood pressure	Normal or ↓ ~20%	↓ 20~40%	↓ ≥40% or unrecordable
Pulse rate	Slightly increased	Increased	Markedly increased or weak, may be unrecordable
Pulse quality	Normal	Decreased	Weak or absent



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