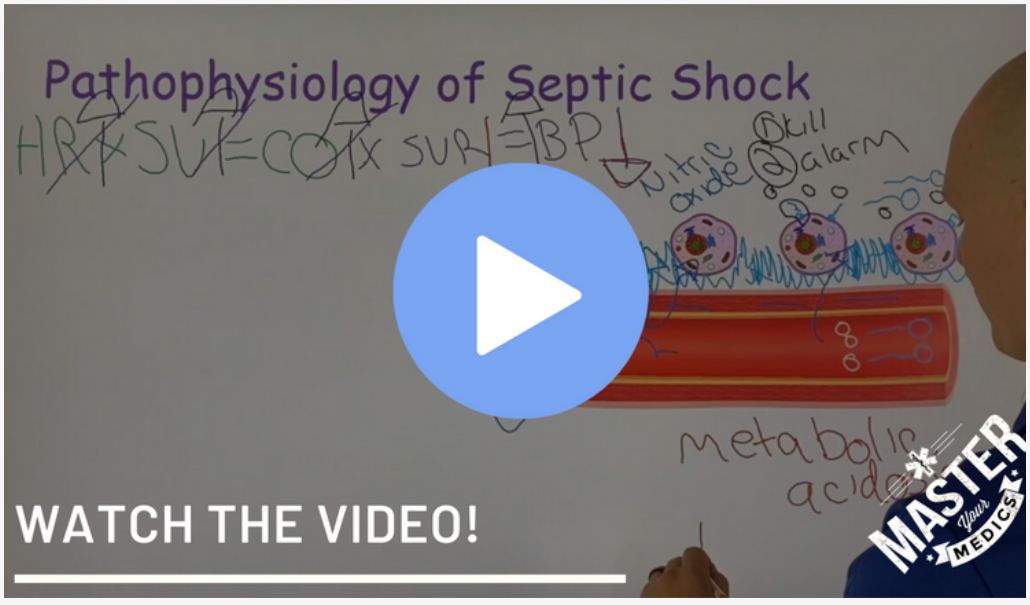
SHOCK

LEARNING OBJECTIVES

1. HAVE AN UNDERSTANDING OF WHAT SHOCK IS
2. ABLE TO IDENTIFY THE DIFFERENCE BETWEEN COMPENSATED AND DECOMPENSATED SHOCK IS
3. UNDERSTANDING THE PATHOLOGICAL PROCESS DURING THE PROGRESSION OF SHOCK
4. UNDERSTANDING OF WHAT SYMPTOMS TO EXPECT
5. UNDERSTANDING OF THE DIFFERENT TYPES OF SHOCK
6. UNDERSTAND THE PATHOPHYSIOLOGY AND MANAGEMENT OF EACH SHOCK TYPE



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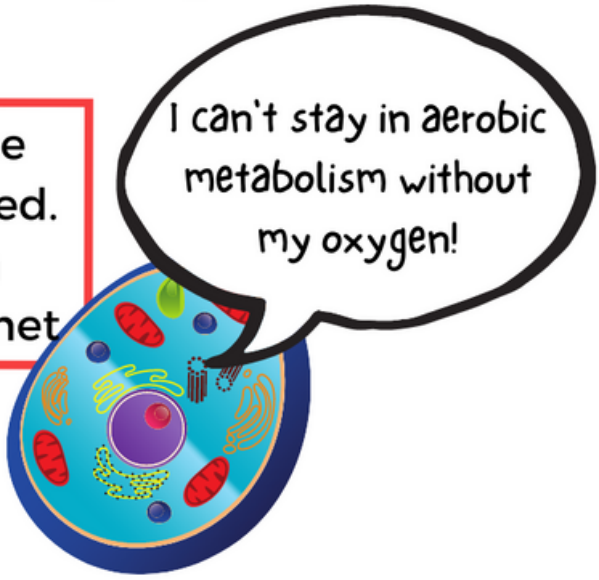
What is shock?

Shock is simply a state where the body's cells are being hypoperfused. Hypoperfused means there is a demand for oxygen is not being met



The amount of blood pumped per minute

[Heart Rate X Stroke Volume] = Cardiac Output

Amount of blood pumped per ventricular contraction

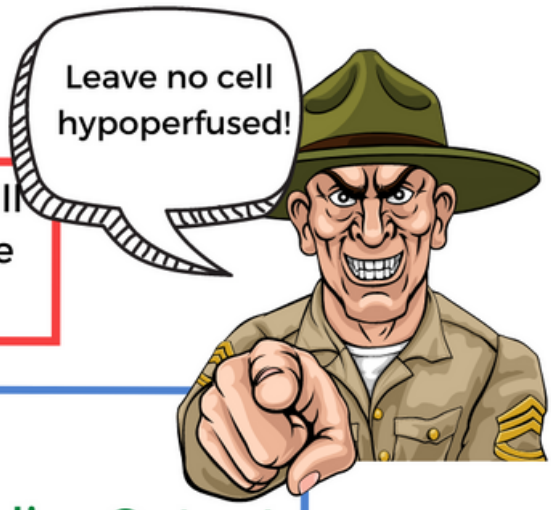
Cardiac Output + Systemic Vascular Resistance = Mean Arterial Pressure

The amount of pressure blood is generating against the vessel walls

The above equations, while confusing at first, are the building blocks to understanding hypoperfusion and the root cause. If the heart rate goes down than Cardiac output would decrease, meaning the MAP would decrease. If MAP decreases too much hypoperfusion occurs.

Using another example, if Systemic vascular resistance decreased then MAP would decrease, leading to hypoperfusion. So the goal in shock is to increase MAP. It will be our job to determine whats causing the decrease, HR, Stroke Volume, or Systemic Vascular Resistance.

How the body compensates for shock?



When the body has a decrease in MAP it will try to restore homeostasis and compensate for the decrease.

Compensation ↑ Heart Rate X Problem ↓ Stroke Volume = Cardiac Output

Compensation ↑ Cardiac Output + Systemic Vascular Resistance = Mean Arterial Pressure ↓ Problem

As you can see in the above image, Stroke Volume is the problem and is decreasing MAP. When MAP decreases we see compensation measures take place. In this case the Heart Rate and Systemic Vascular Resistance will compensate to restore MAP.

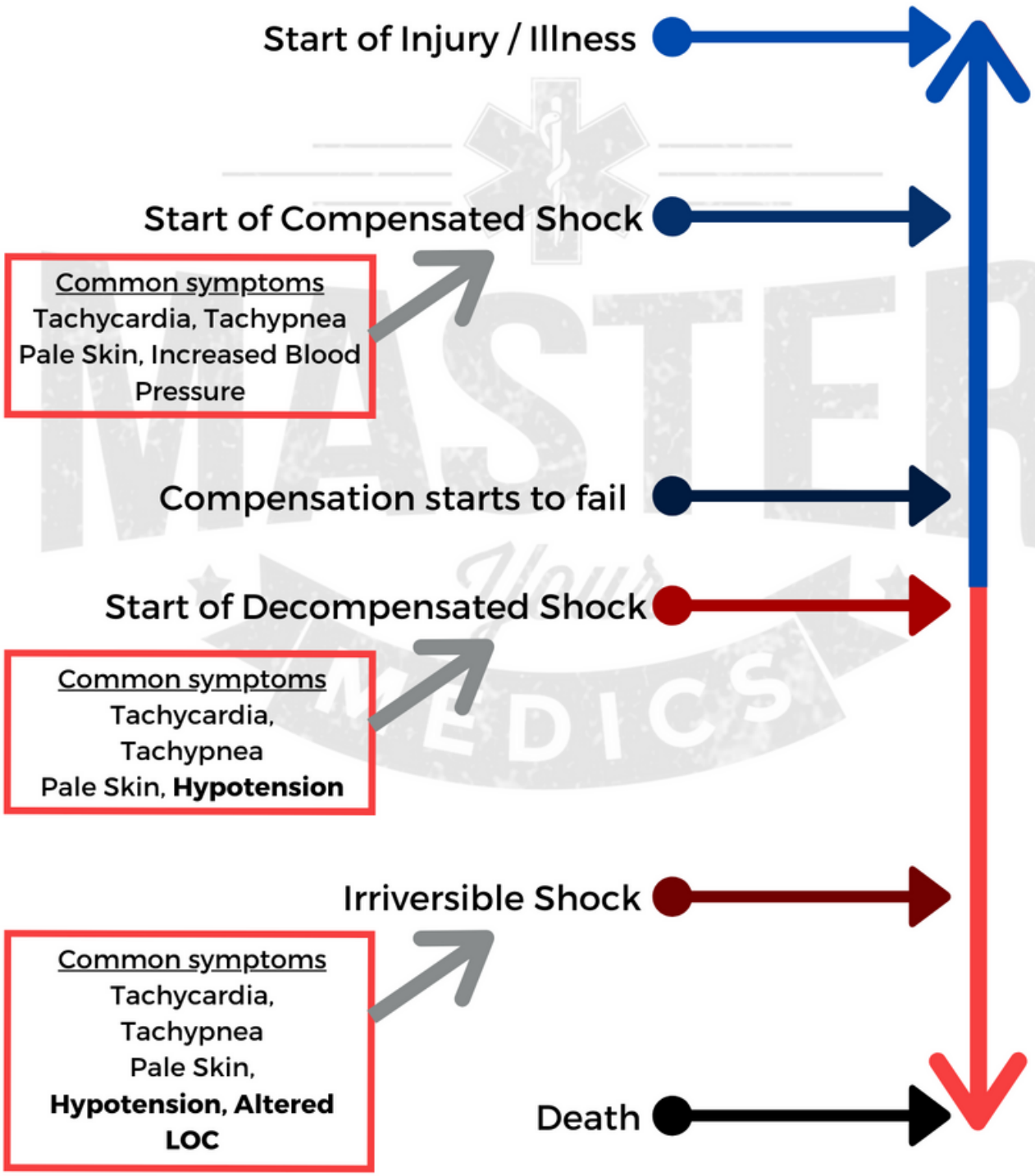
Compensation ↑ Heart Rate X Compensation ↑ Stroke Volume = Cardiac Output

Problem ↓ Cardiac Output + Systemic Vascular Resistance = Mean Arterial Pressure ↓ Problem

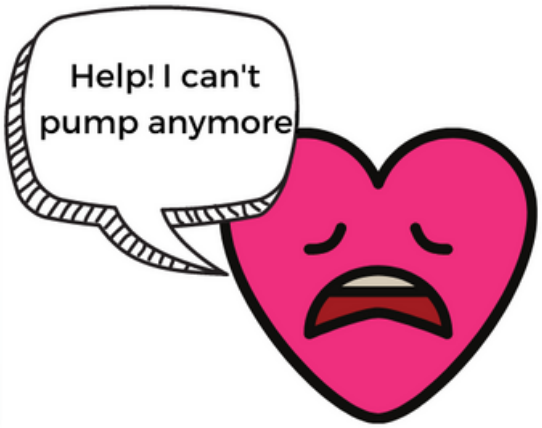
As you see here the problem is systemic vascular resistance. Common in sepsis, anaphylaxis, even neurogenic shock. During times of SVR problems we see compensation from the Stroke Volume and Heart Rate

Levels of shock

After injury or illness the body goes through a progression of shock. Starting at the beginning with compensated shock



Cardiogenic Shock



Cardiogenic shock is defined as when the heart can no longer pump enough blood to maintain perfusion. Common cause of this type of shock would be an acute myocardial infarction or congestive heart failure.

The 3 main factors that make up stroke volume are Preload, Afterload and Contractility

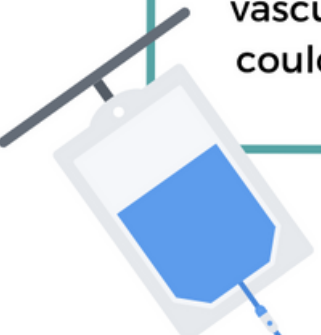
Compensation ↑ Heart Rate X Problem ↓ Stroke Volume = Cardiac Output

Compensation ↑ Cardiac Output + Systemic Vascular Resistance = Mean Arterial Pressure ↓ Problem

During a MI or CHF the main problem is the inability to contract the ventricles enough to pump sufficient blood. When MAP decreases we see compensation measures take place. In this case the Heart Rate and Systemic Vascular Resistance will try ro compensate to restore MAP.

Management

In order to correct hypoperfusion we need to fix the MAP. Typically that would mean we need to improve systemic vascular resistance (isotonic fluids, and or vasopressors) We could also attempt to improve contractility by introducing medications like dobutamine.



CHECK YOUR UNDERSTANDING

LEARNING OBJECTIVES - CHECK OFF IF YOU UNDERSTAND

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