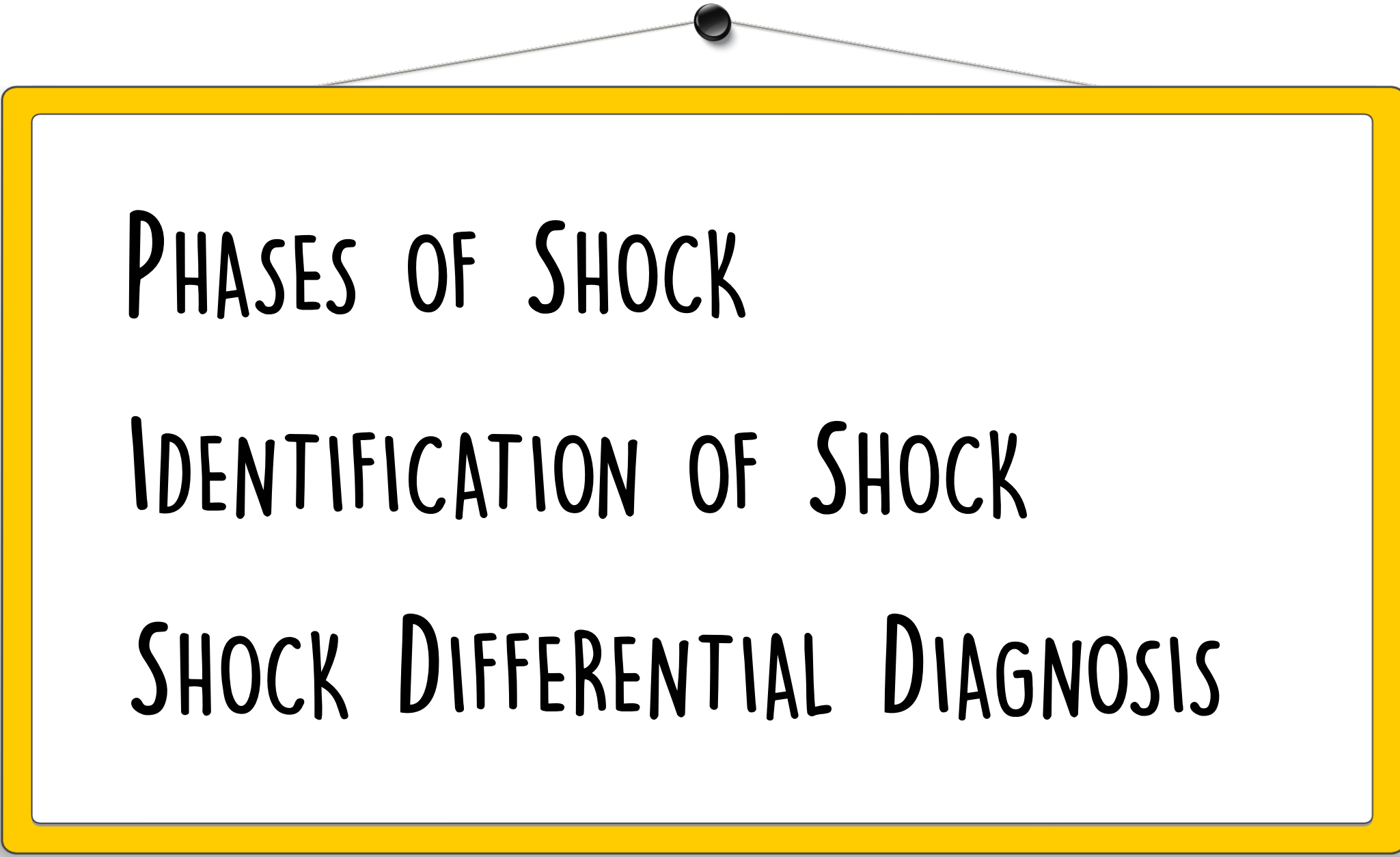


REFRAMING SHOCK I: THE SHOCK CONTINUUM





PHASES OF SHOCK

IDENTIFICATION OF SHOCK

SHOCK DIFFERENTIAL DIAGNOSIS



PHASES OF SHOCK

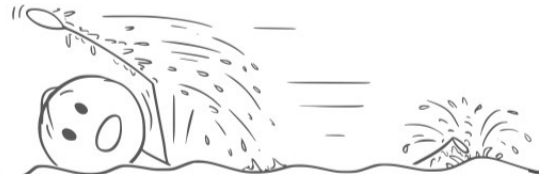
IDENTIFICATION OF SHOCK

SHOCK DIFFERENTIAL DIAGNOSIS

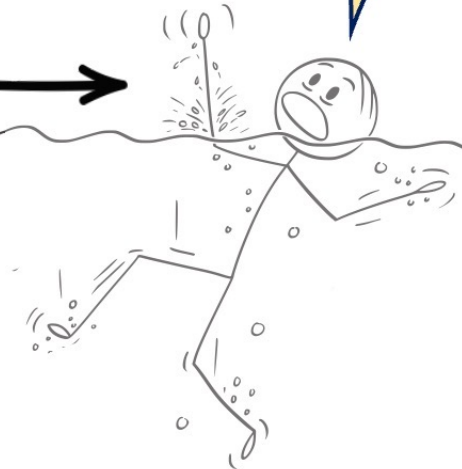
You



Compensated Shock



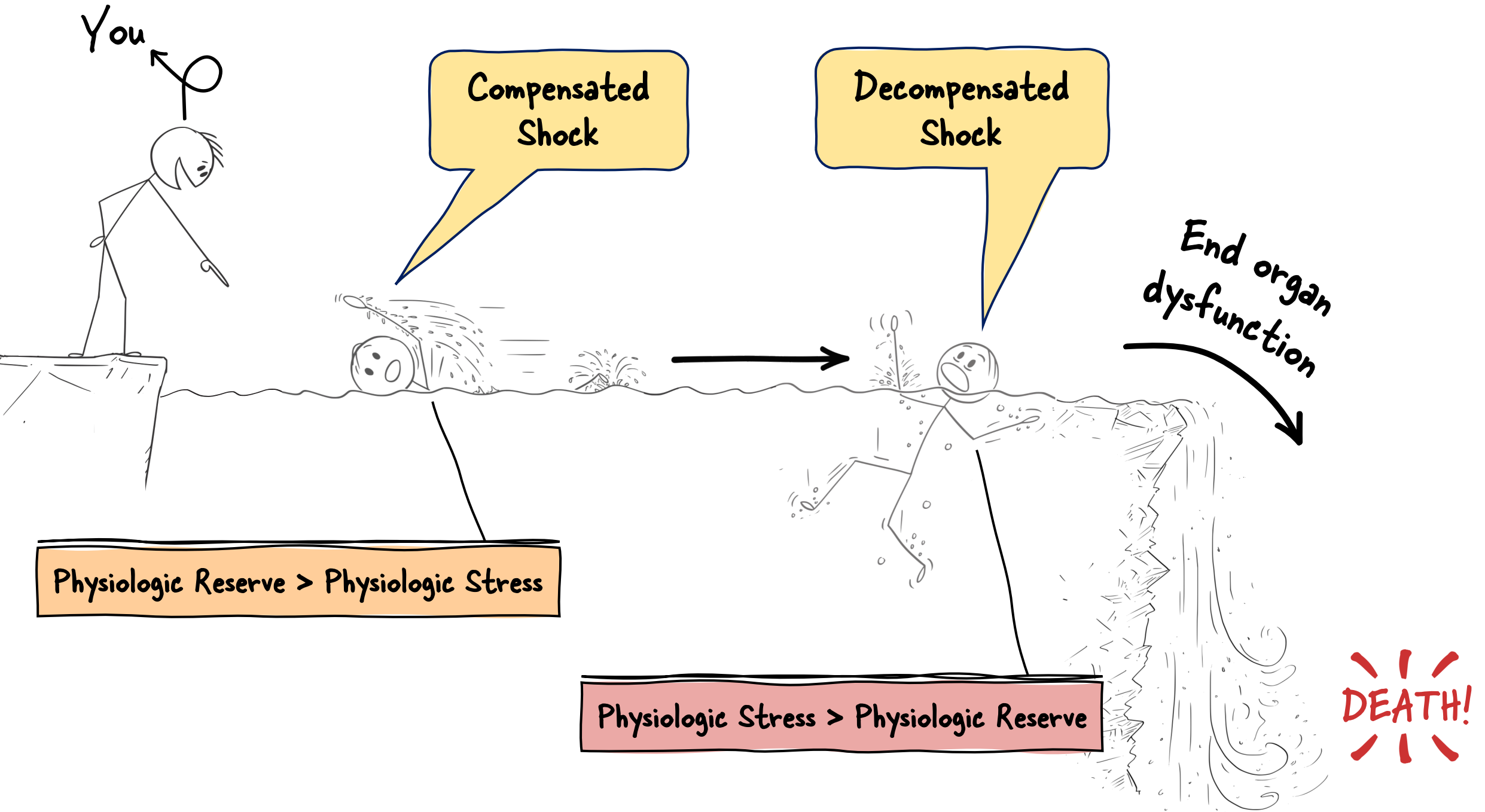
Decompensated Shock



End organ dysfunction



DEATH!



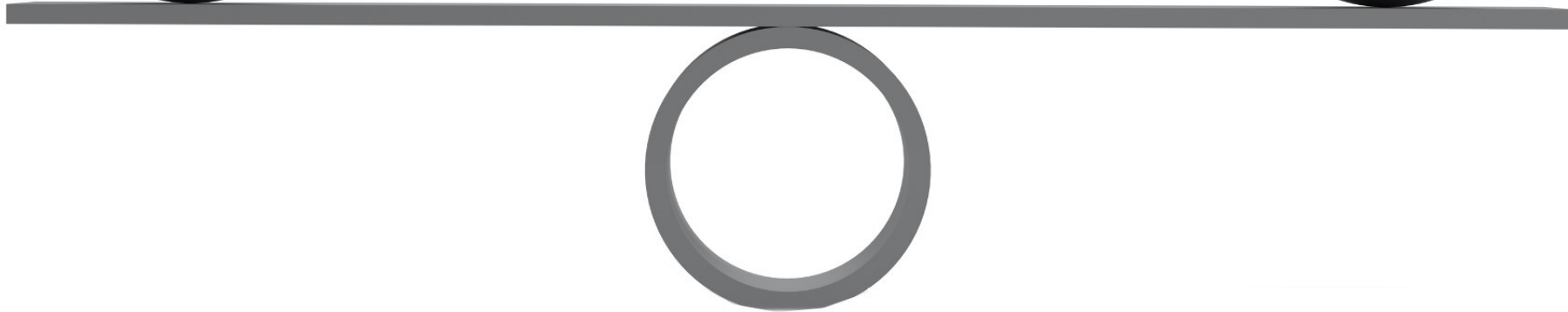
PHYSIOLOGIC
STRESS

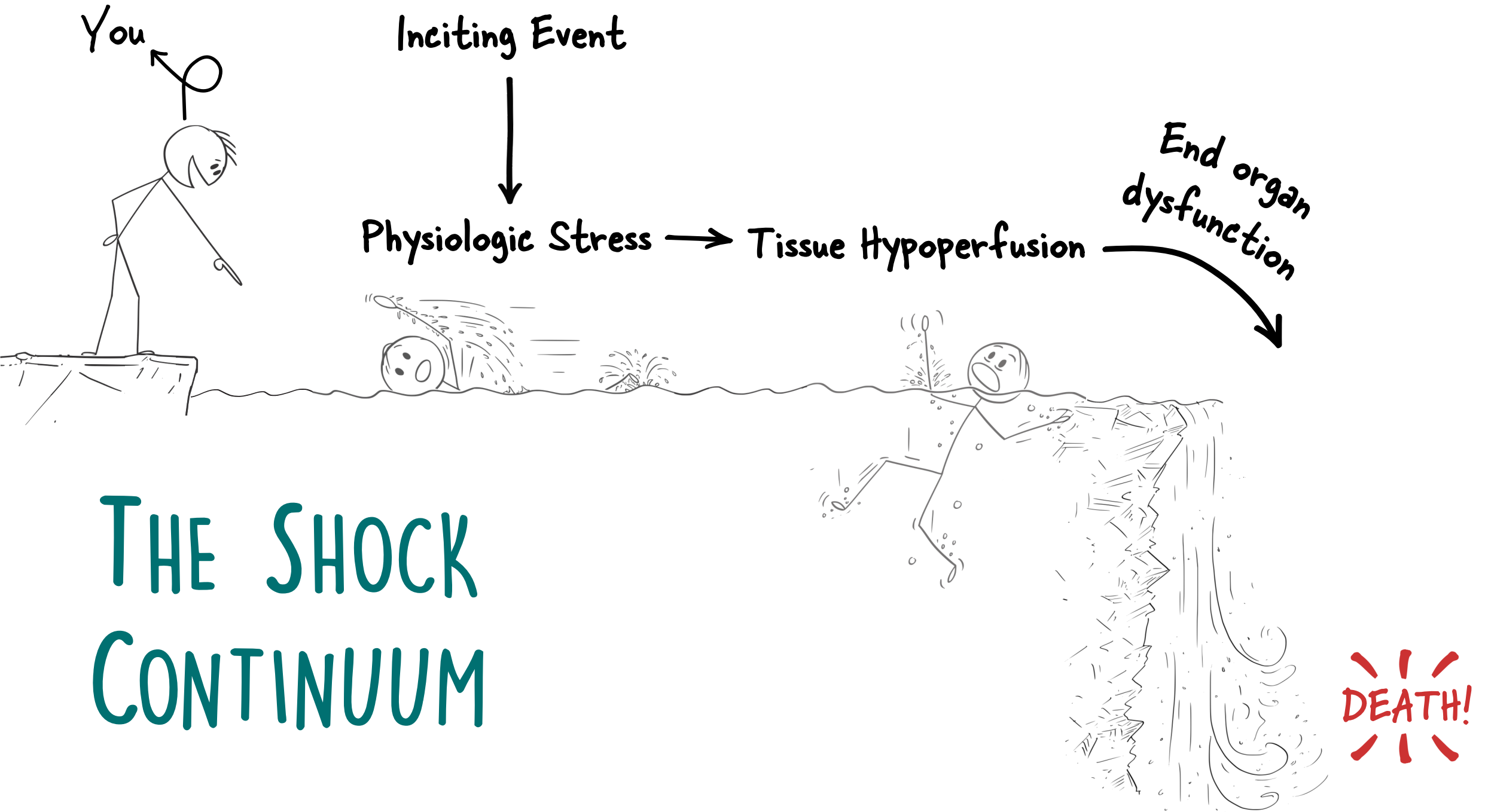
Stressor Intensity



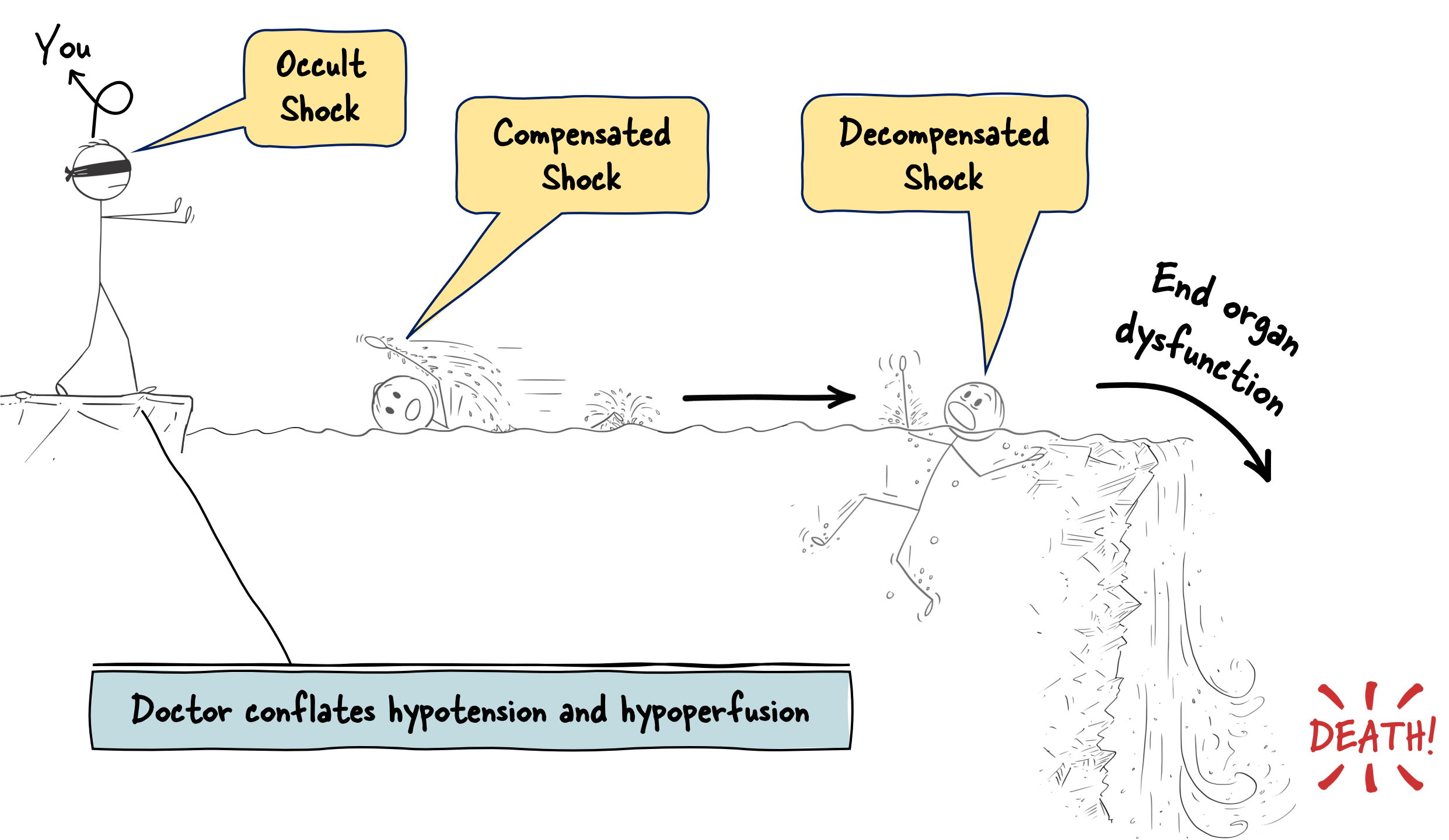
PHYSIOLOGIC
RESERVE

Patient Protoplasm





THE SHOCK CONTINUUM

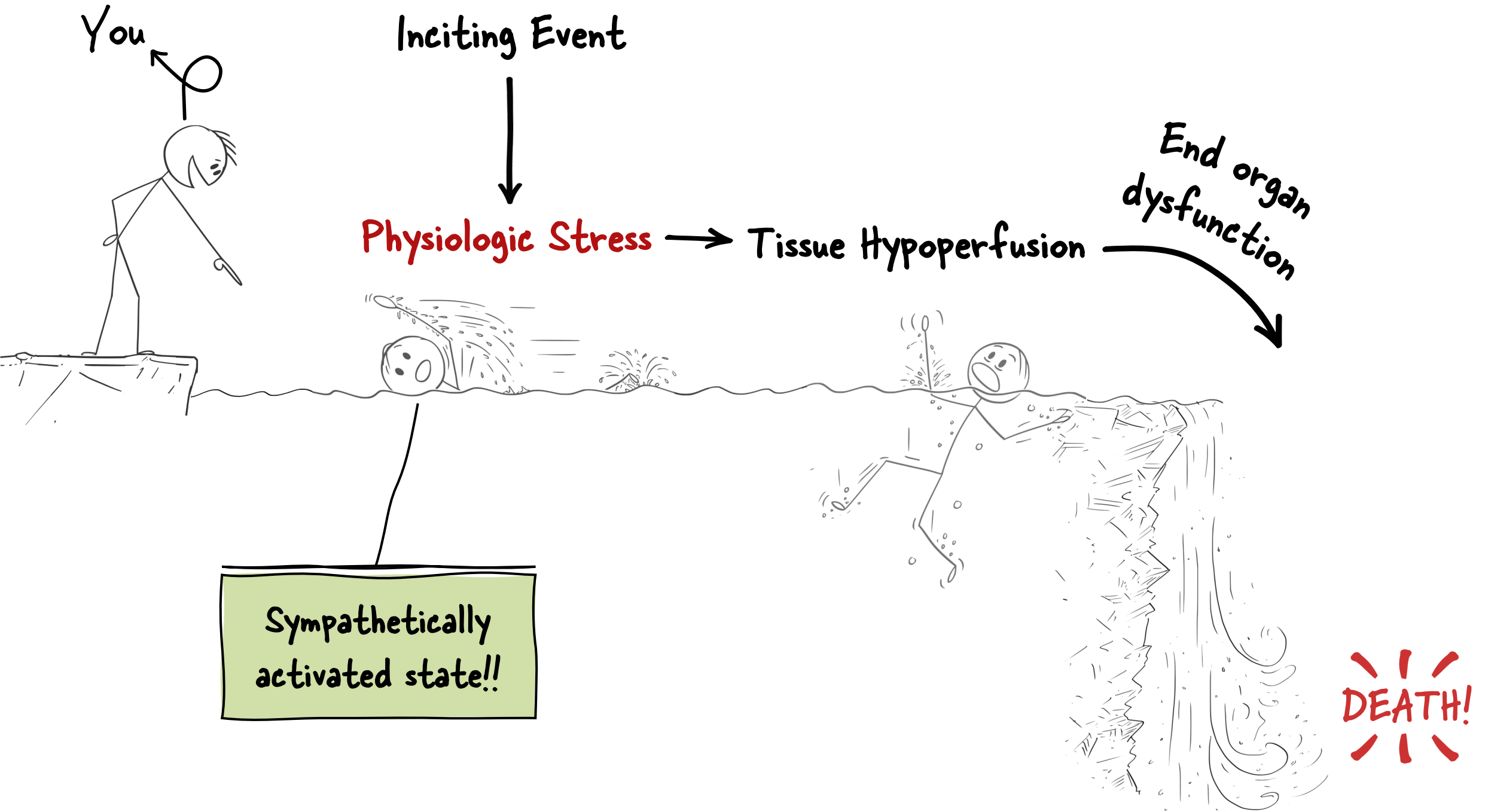




PHASES OF SHOCK

IDENTIFICATION OF SHOCK

SHOCK DIFFERENTIAL DIAGNOSIS

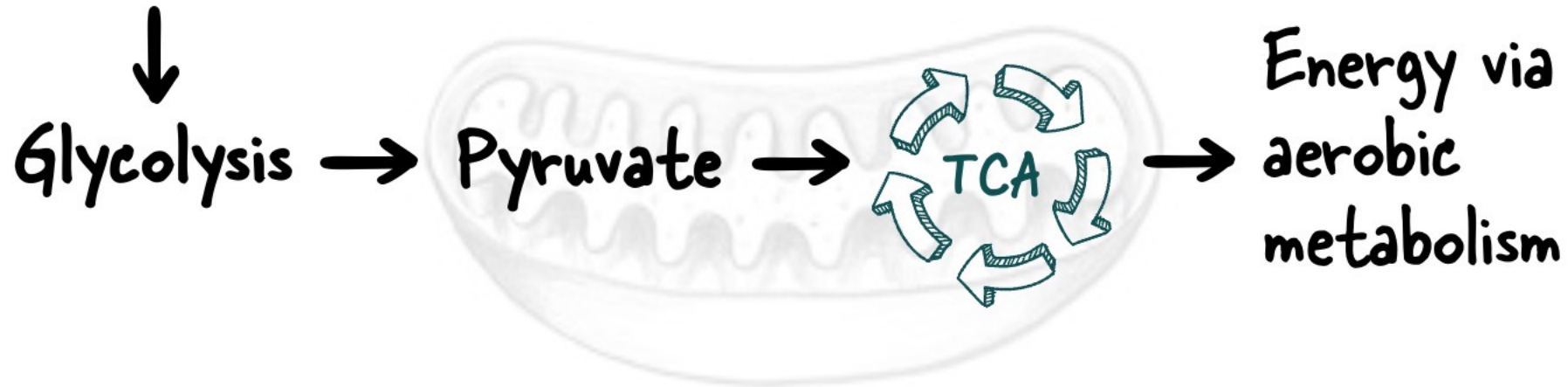




RELYING ON BLOOD
PRESSURE IS A GREAT
WAY TO MISS YOUR
GOLDEN HOUR

STRESS HYPERLACTEMIA

Epinephrine $\xleftarrow{+}$ Physiologic Stress





Understanding critically ill sepsis patients with normal serum lactate levels: results from U.S. and European ICU cohorts

Nearly 50% of severely ill septic patients in the ICU had normal serum lactate measurements

Problem #1

I do not think it means
what you think it means...

Problem #2

Making the numbers pretty
≠ making the patient better

SHOCK MARKERS?



There is no single test, metric or score that
can be used to definitively identify shock

(Sorry...)



EXAM

Mental status

Work of breathing

Skin exam

Capillary refill time

Urine output

LABS

Physiologic stress +/-
tissue hypoperfusion:

Lactate, Base excess,
 HCO_3 , WBC, glucose

Organ dysfunction:

Cr, BNP, INR, LFTs

MONITOR

Heart rate

Blood pressure

SpO_2 Waveform

Pleth peripheral
perfusion index
(PPI)



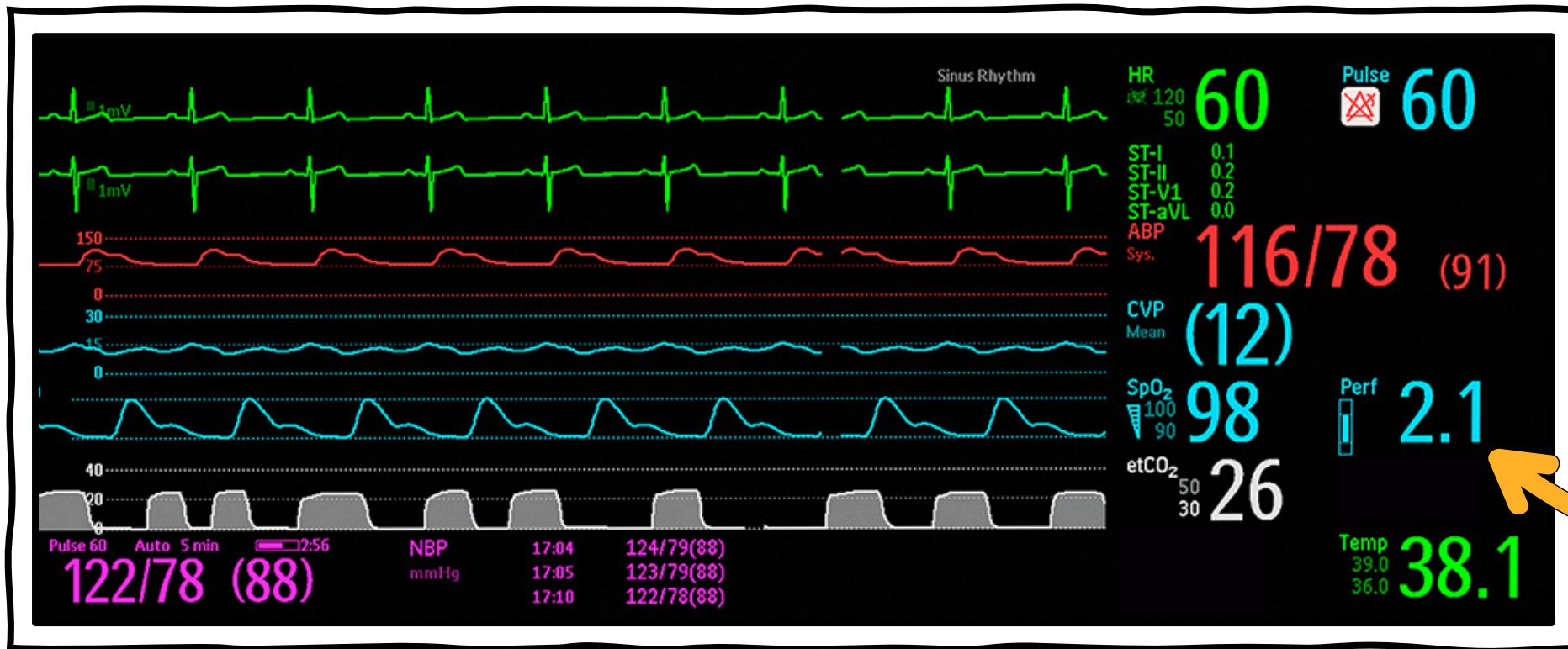
JAMA

Hernández et al. *JAMA* 2019;321(7):654-664

Effect of a Resuscitation Strategy Targeting Peripheral Perfusion Status vs Serum Lactate Levels on 28-Day Mortality Among Patients With Septic Shock: The ANDROMEDA-SHOCK Randomized Clinical Trial

Resuscitation guided by capillary refill time (<3 seconds) associated with a trend toward lower 28-day mortality (43% vs 34%) compared to lactate-guided resuscitation





Useful data
hiding in
plain sight!

LOW PPI SUGGESTS:

Decreased cardiac output
Elevated sympathetic tone

++ VARIABILITY IN 'NORMAL' VALUE:

<0.2 usually = badness, but the trend
is much more important than the number...



PHASES OF SHOCK

IDENTIFICATION OF SHOCK

SHOCK DIFFERENTIAL DIAGNOSIS

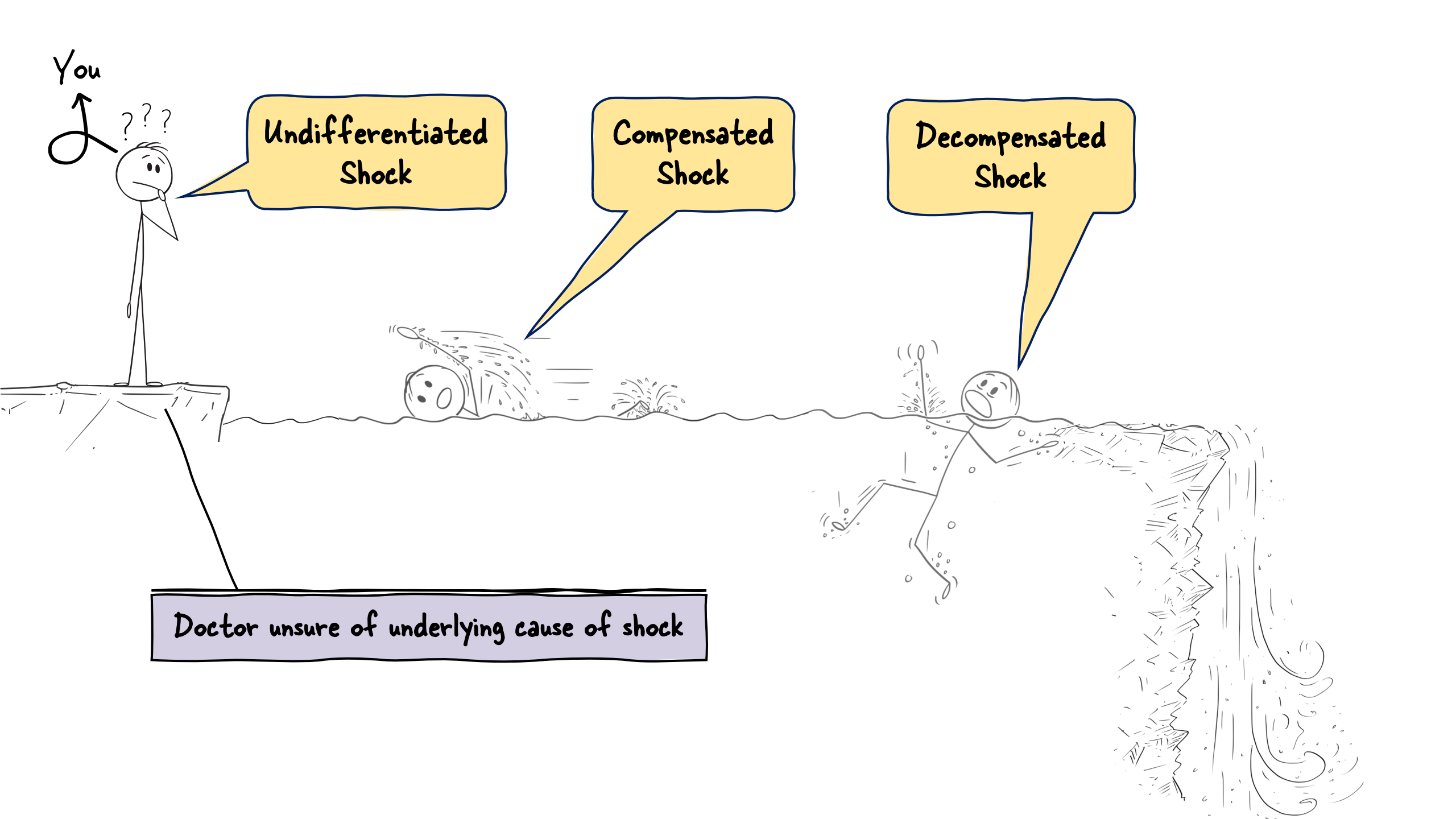
You
???

Undifferentiated Shock

Compensated Shock

Decompensated Shock

Doctor unsure of underlying cause of shock



SHOCK
PRECIPITANT



SHOCK
PHYSIOLOGY



The same inciting
event can be
associated with
different shock
phenotypes!



Impact of Right Ventricular Dysfunction on Short-term and Long-term Mortality in Sepsis: A Meta-analysis of 1,373 Patients

Metanalysis: 1373 patients with sepsis and septic shock

>33% of patients had RV dysfunction

RV dysfunction associated with increased mortality (OR 2.4)



Circ Cardiovasc Qual Outcomes 2020;13(12): e006956

Inflammatory Response Syndrome Is Associated With Increased Mortality
Across the Spectrum of Shock Severity in Cardiac Intensive Care Patients

Single center: ~9000 patients admitted to the cardiac ICU

>34% of patients were positive for SIRS criteria

SIRS criteria associated with increased mortality (OR 2.1)

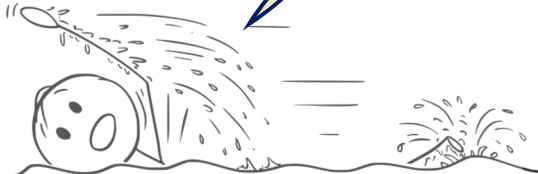
You



Mixed Shock

Compensated Shock

Decompensated Shock

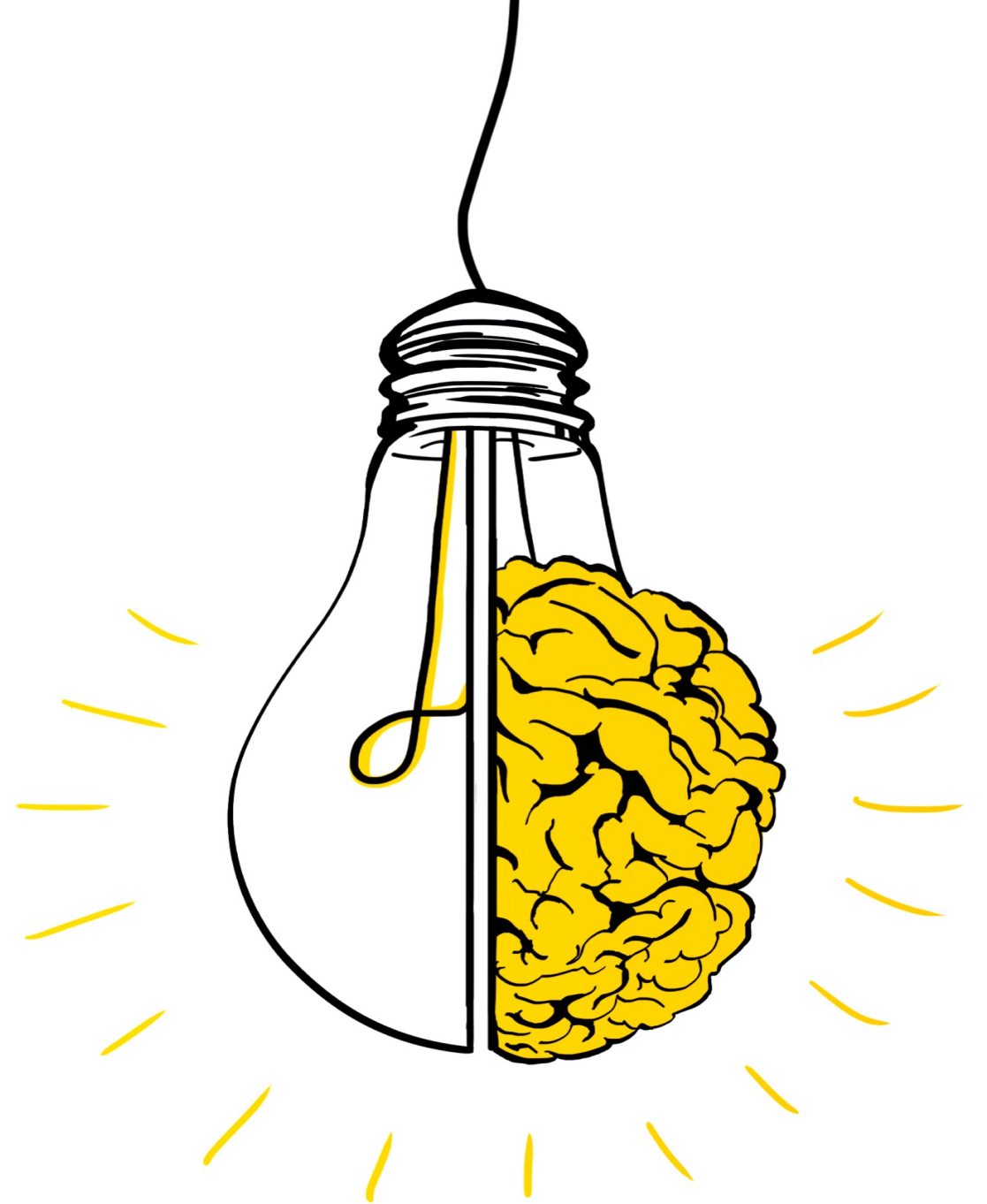


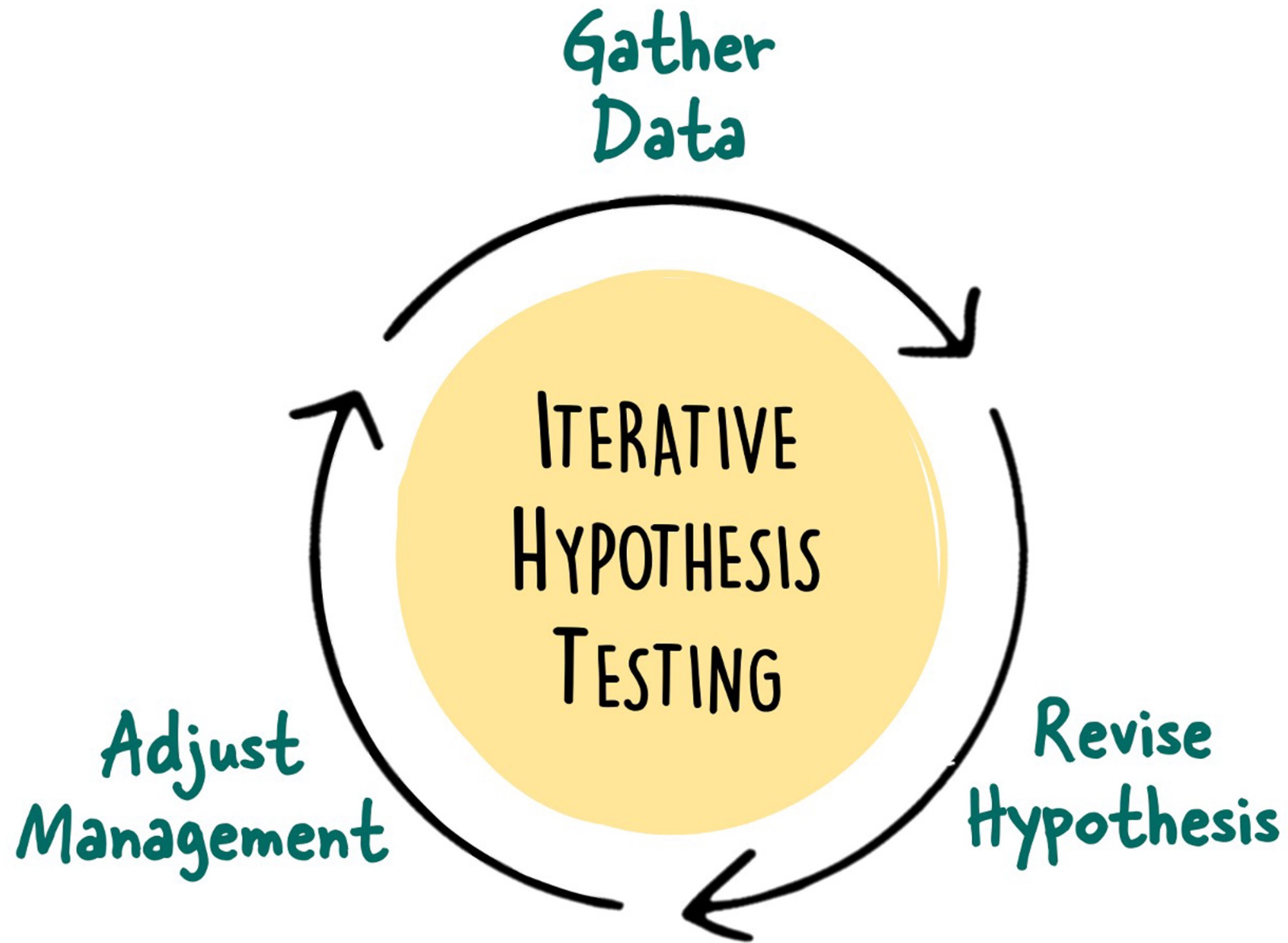
Doctor can't make patient's pathophysiology fit into one of the traditional categories of shock

ITERATIVE HYPOTHESIS
TESTING APPROACH

+

ROBUST MENTAL
MODEL OF PHYSIOLOGY





SHOCK HYPOTHESIS REVISION QUERIES:

Is my patient
getting better?

If **not** then...

1. Adequately offloading physiologic stress?
2. Fully addressing shock precipitants?
3. Correctly identifying shock etiology?
4. Additional shock etiology developing?

1. Correctly identifying underlying shock physiology?

2. Adequately offloading ongoing physiologic stress?

Fluid status

Vasoactives

Respiratory support

Metabolic derangements

3. Identifying and correcting shock precipitants?

Infectious source control

Restore perfusion

Stop bleeding

Relieve obstruction

4. Identifying and addressing shock sequelae?

APPROACH TO SHOCK MANAGEMENT