

Iterative Learning

The Road to Resuscitologist

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Disclosures

No Conflicts of interest

Lesson Plan

- Discuss how humans think and make decision under stress
- Learn techniques for optimal team work in resuscitation
- Review the pathophysiology of shock



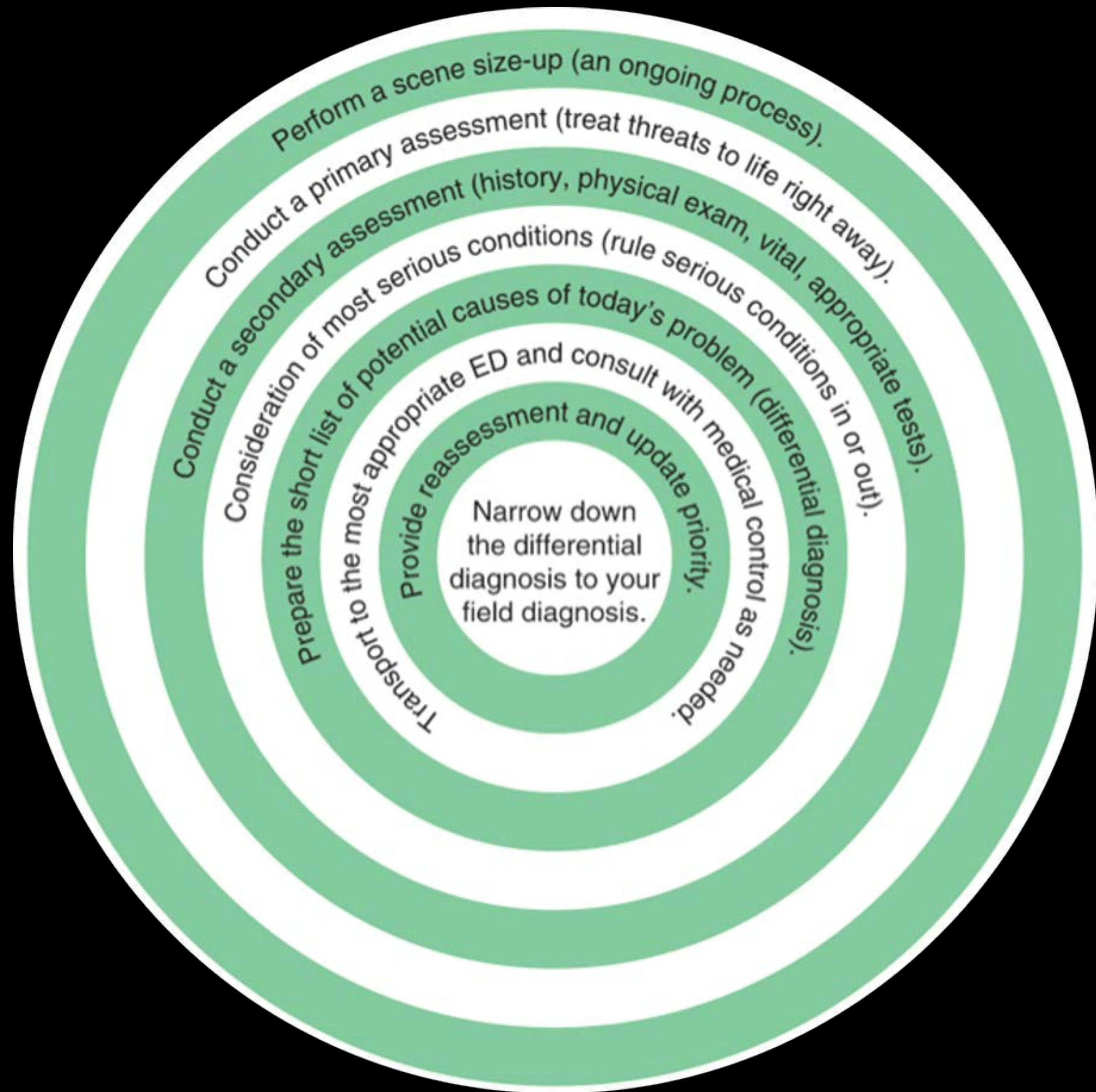
**How do we make high stakes
decisions, rapidly, with incomplete
information?**





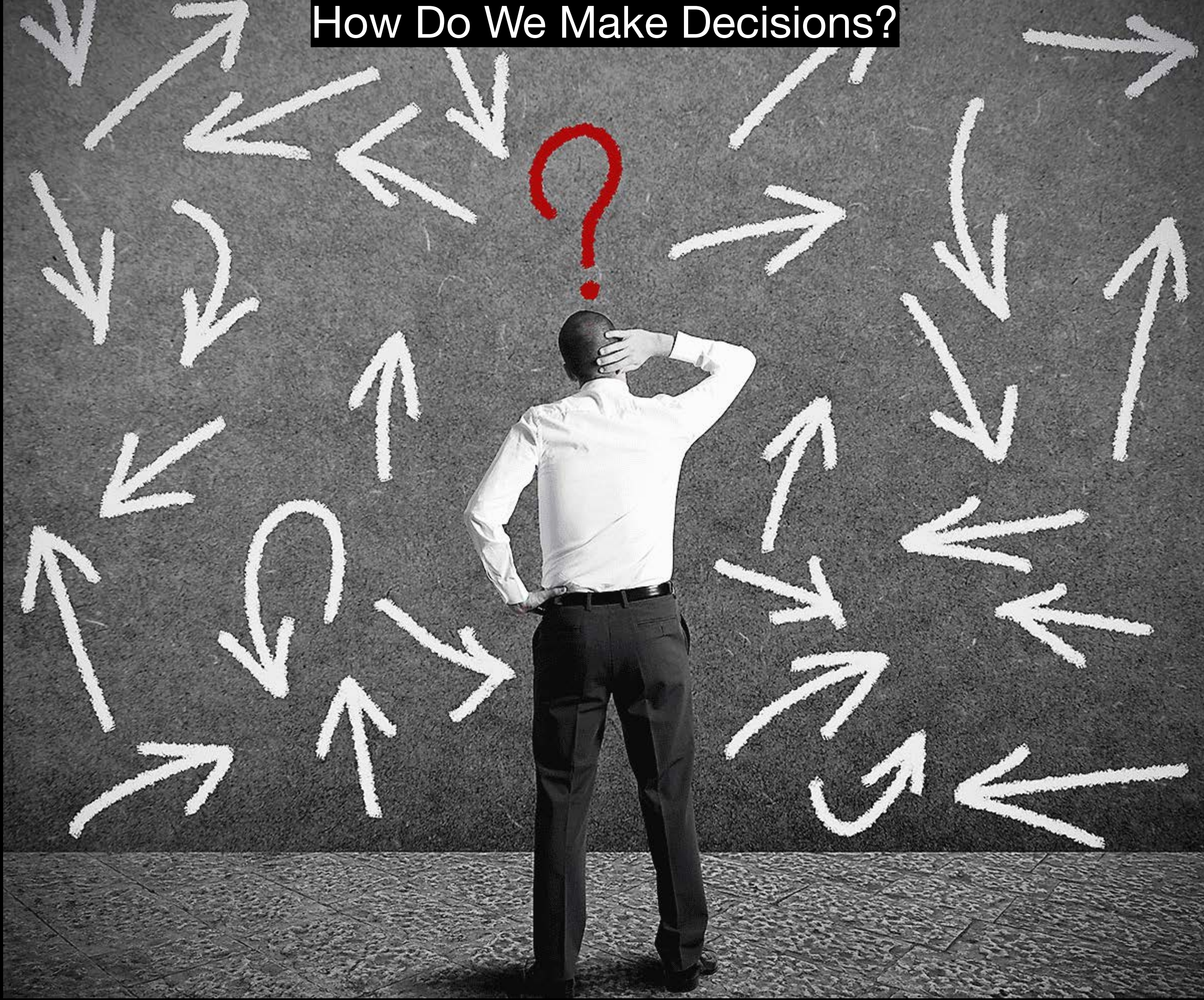
F HD





SICK / NOT SICK

How Do We Make Decisions?



THE NEW YORK TIMES BESTSELLER

THINKING,

FAST AND SLOW



DANIEL

KAHNEMAN

WINNER OF THE NOBEL PRIZE IN ECONOMICS

"[A] masterpiece . . . This is one of the greatest and most engaging collections of insights into the human mind I have read." —WILLIAM EASTERLY, *Financial Times*

Your gut has sh*t for brains

System 1 is gullible and biased to believe, System 2 is in charge of doubting and unbelieving, but System 2 is sometimes busy, and often lazy.

Heuristics



Rational thinking



Examples of Heuristics and Biases

- Anchoring
- Availability
- Recency
- Representativeness
- Recognition
- Tallying

"I know of no one who combines theory and observation—intellectual rigor and painstaking observation of the real world—so brilliantly and gracefully as Gary Klein."

Malcolm Gladwell, author of *Outliers* and *Blink*

Experts can and should trust their guts

"In fact the commanders usually generated only a single option, and that was all they needed."

GARY KLEIN



Streetlights and Shadows

Searching for the Keys
to Adaptive
Decision Making

Conditions for Intuitive Expertise

A Failure to Disagree

Daniel Kahneman *Princeton University*
Gary Klein *Applied Research Associates*

Intuitive decision making is most reliable when:

- Observable Characteristics
- Quantifiable Changes
- Variables reliably predict outcome

The situation has provided a cue; this cue has given the expert access to information stored in memory, and the information provides the answer. Intuition is nothing more and nothing less than recognition.”

Herbert Simon

The Role of Intuition in Critical Decision Making- Verbalize it

Karl Weick's process for communicating intuitive decisions:

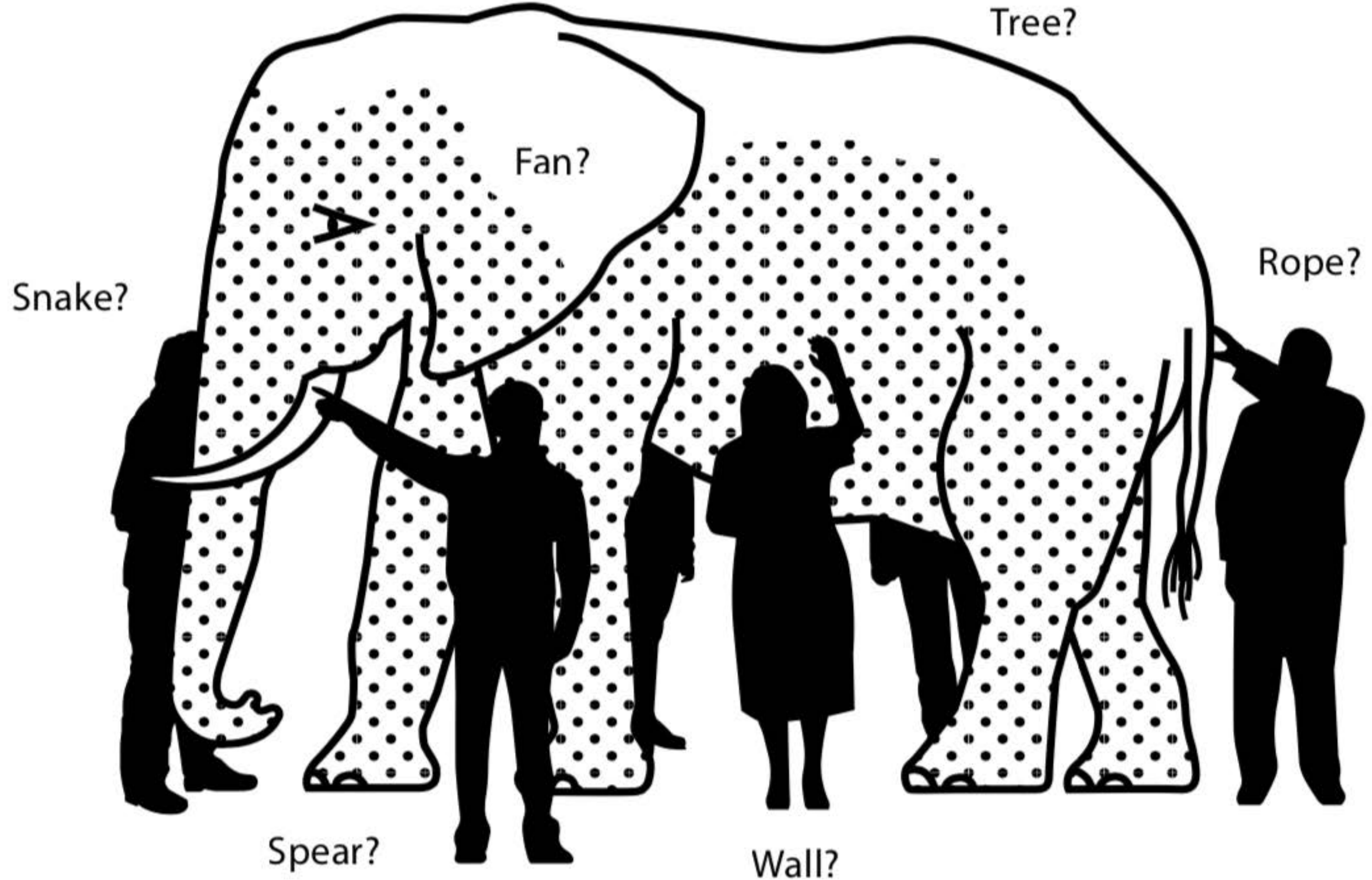
Here is what I think we are dealing with.

Here is what I think we should do.

Here is why.

Here is what we should keep our eyes on.

Are there any other concerns?



Snake?

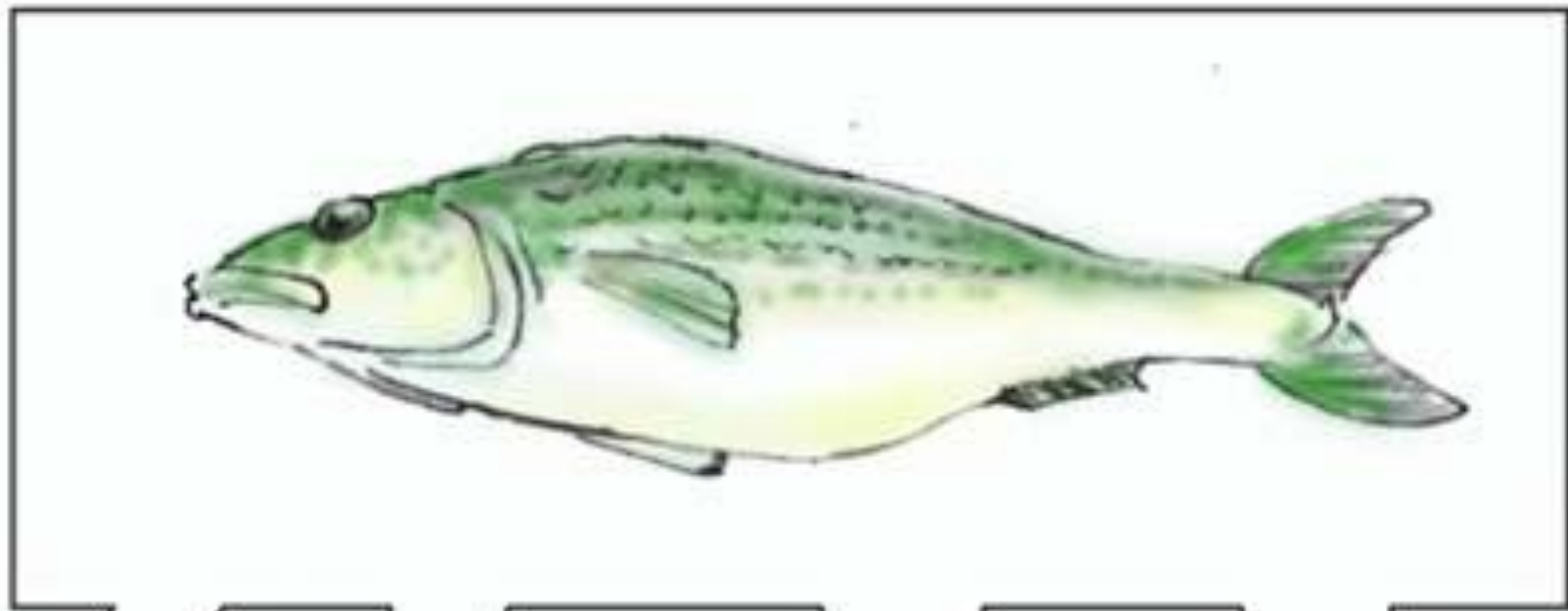
Fan?

Tree?

Rope?

Spear?

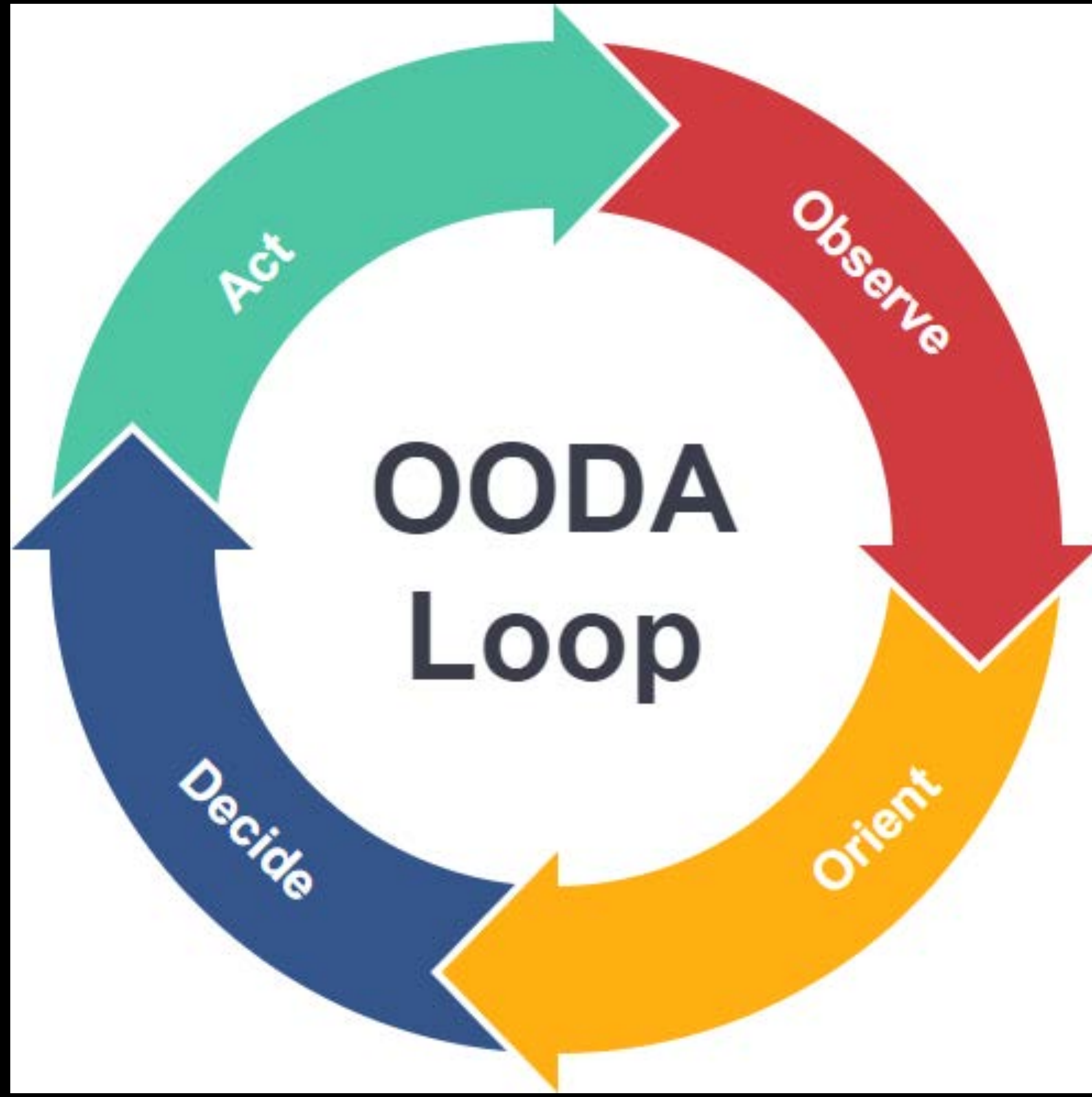
Wall?





**“Of course we can make fast decisions ...
once we have considered the 4872 factors.”**







Too complex for man too fly



RESTRICTED

APPROVED B-17F and G CHECKLIST

REVISED 3-1-44

PILOT'S DUTIES IN RED
COPILOT'S DUTIES IN BLACK

BEFORE STARTING

1. Pilot's Preflight—COMPLETE
2. Form 1A—CHECKED
3. Controls and Seats—CHECKED
4. Fuel Transfer Valves & Switch—OFF
5. Intercoolers—Cold
6. Gyros—UNCAGED
7. Fuel Shut-off Switches—OPEN
8. Gear Switch—NEUTRAL
9. Cowl Flaps—Open Right—OPEN LEFT—Locked
10. Turbos—OFF
11. Idle cut-off—CHECKED
12. Throttles—CLOSED
13. High RPM—CHECKED
14. Autopilot—OFF
15. De-icers and Anti-icers, Wing and Prop—OFF
16. Cabin Heat—OFF
17. Generators—OFF

STARTING ENGINES

1. Fire Guard and Call Clear—LEFT Right
2. Master Switch—ON
3. Battery switches and inverters—ON & CHECKED
4. Parking Brakes—Hydraulic Check—On—CHECKED
5. Booster Pumps—Pressure—ON & CHECKED
6. Carburetor Filters—Open
7. Fuel Quantity—Gallons per tank
8. Start Engines: both magnetos on after one revolution
9. Flight Indicator & Vacuum Pressures CHECKED
10. Radio—On
11. Check Instruments—CHECKED
12. Crew Report
13. Radio Call & Altimeter—SET

ENGINE RUN-UP

1. Brakes—Locked
2. Trim Tabs—SET
3. Exercise Turbos and Props
4. Check Generators—CHECKED & OFF
5. Run up Engines

BEFORE TAKEOFF

1. Tailwheel—Locked
2. Gyro—Set
3. Generators—ON

AFTER TAKEOFF

1. Wheel—PILOT'S SIGNAL
2. Power Reduction
3. Cowl Flaps
4. Wheel Check—OK right—OK LEFT

BEFORE LANDING

1. Radio Call, Altimeter—SET
2. Crew Positions—OK
3. Autopilot—OFF
4. Booster Pumps—On
5. Mixture Controls—AUTO-RICH
6. Intercooler—Set
7. Carburetor Filters—Open
8. Wing De-icers—Off
9. Landing Gear
 - a. Visual—Down Right—DOWN LEFT
Tailwheel Down, Antenna in, Ball Turret Checked
 - b. Light—OK
 - c. Switch Off—Neutral
10. Hydraulic Pressure—OK Valve closed
11. RPM 2100—Set
12. Turbos—Set
13. Flaps $\frac{1}{2}$ — $\frac{1}{2}$ Down

FINAL APPROACH

14. Flaps—PILOT'S SIGNAL
15. RPM 2200—PILOT'S SIGNAL

RESTRICTED

PRE-RSI CHALLENGE-RESPONSE

- Monitoring - BP, ECG, SpO2, ETCO2 **CHECK**
- Nasal Cannulae at 15l/min PLUS Mask O2 **CHECK**
- Pre-oxygenation for FOUR minutes **CHECK**
- Suction checked working & available **CHECK**

IV & DRUGS

- IV Cannula connected to fluid & running **CHECK**
- NIBP on contralateral arm and BP seen **CHECK**
- Spare cannula in situ **CHECK**
- INDUCTION AGENT drawn up, dose checked **CHECK**
- SUX or ROC drawn up, dose checked **CHECK**
- VASOPRESSORS drawn up, labelled **CHECK**
- POST INTUBATION drugs drawn up & labelled **CHECK**

INTUBATION EQUIPMENT

- BVM connected to oxygen **CHECK**
- Guedel & two NPO airways available **CHECK**
- Laryngoscope blade chosen, light working **CHECK**
- ET tube size chosen, cuff tested **CHECK**
- Alternate tube size chosen & cuff tested **CHECK**
- Syringe for cuff inflation **CHECK**
- Stylet & Bougie available **CHECK**
- Gooseneck, filter, inline ETCO2 (or EasyCap) **CHECK**
- Tube Tie available **CHECK**
- Ventilator settings determined **CHECK**
- Anticipated difficult airway plan's B, C, D **CHECK**

TEAM BRIEF

- In-line immobilisation person briefed **CHECK**
- Cricoid pressure person briefed **CHECK**
- Drug giver briefed **CHECK**
- Anticipated problems & post RSI care brief **CHECK**

BOUGIE with COUDE TIP (or can use FROVA OXYGENATING BOUGIE)



NASO-PHARYNGEAL & ORO-PHARYNGEAL AIRWAYS

ET ADAPTOR, IN-LINE FILTER and ETCO2 LINE or EASYCAP

SELF-INFLATING BAG-VALVE-MASK CONNECTED TO HIGH FLOW OXYGEN



TWO ET TUBES OF APPROPRIATE SIZE

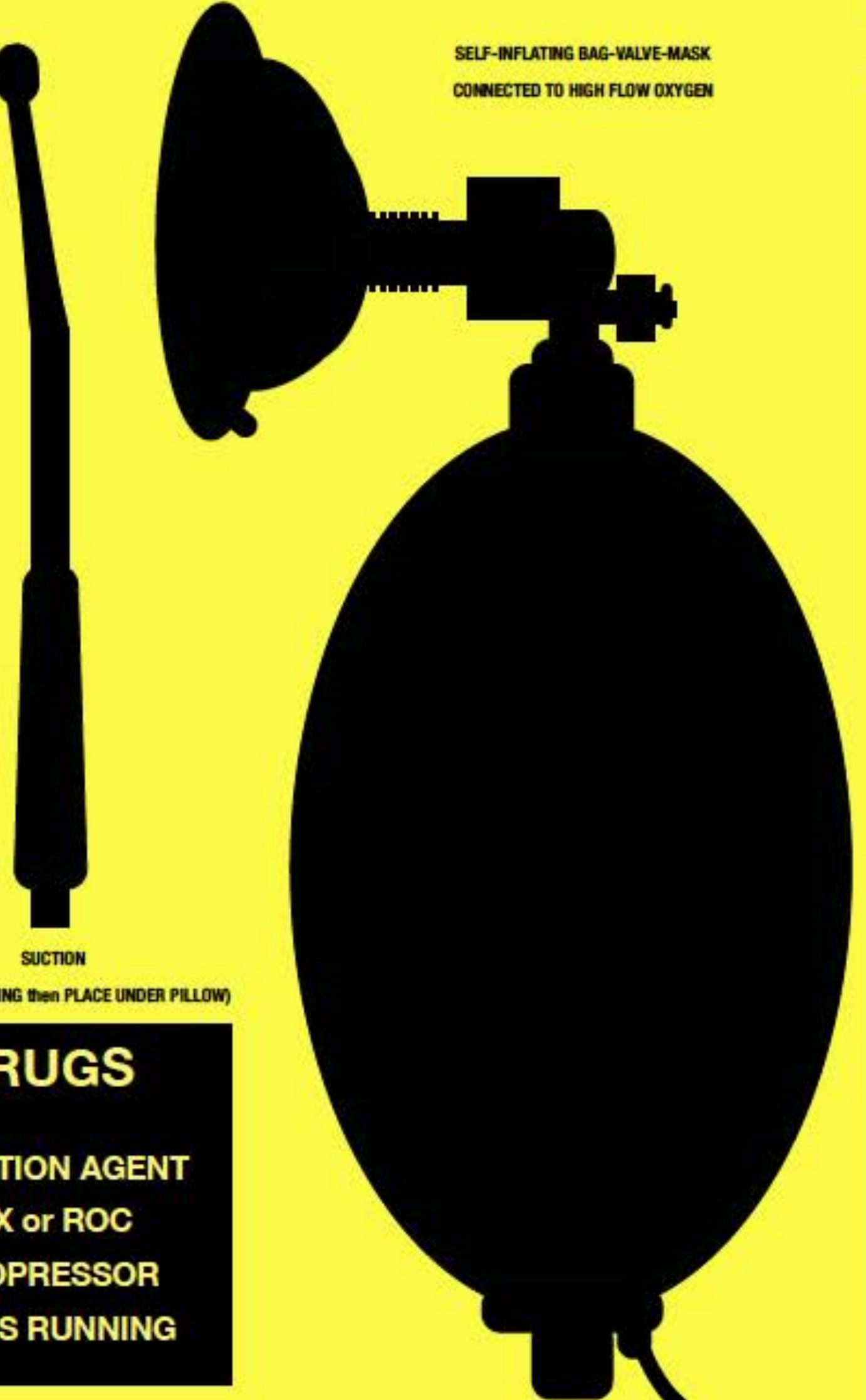
CONSIDER LOADING A STRAIGHT-TO-CUFF ATRAUMATIC STYLET



10 or 20 ml syringe

LUBE

TAPE



SUCTION

(CONFIRM WORKING then PLACE UNDER PILLOW)

DRUGS
 INDUCTION AGENT
 SUX or ROC
 VASOPRESSOR
 FLUIDS RUNNING

PLAN IN CASE OF A FAILED RSI ?

Difficult Airway Kit Available


15 l/min O2

SURGICAL AIRWAY KIT & PREPARED TO USE IT ?

LARYNGEAL MASK AIRWAY

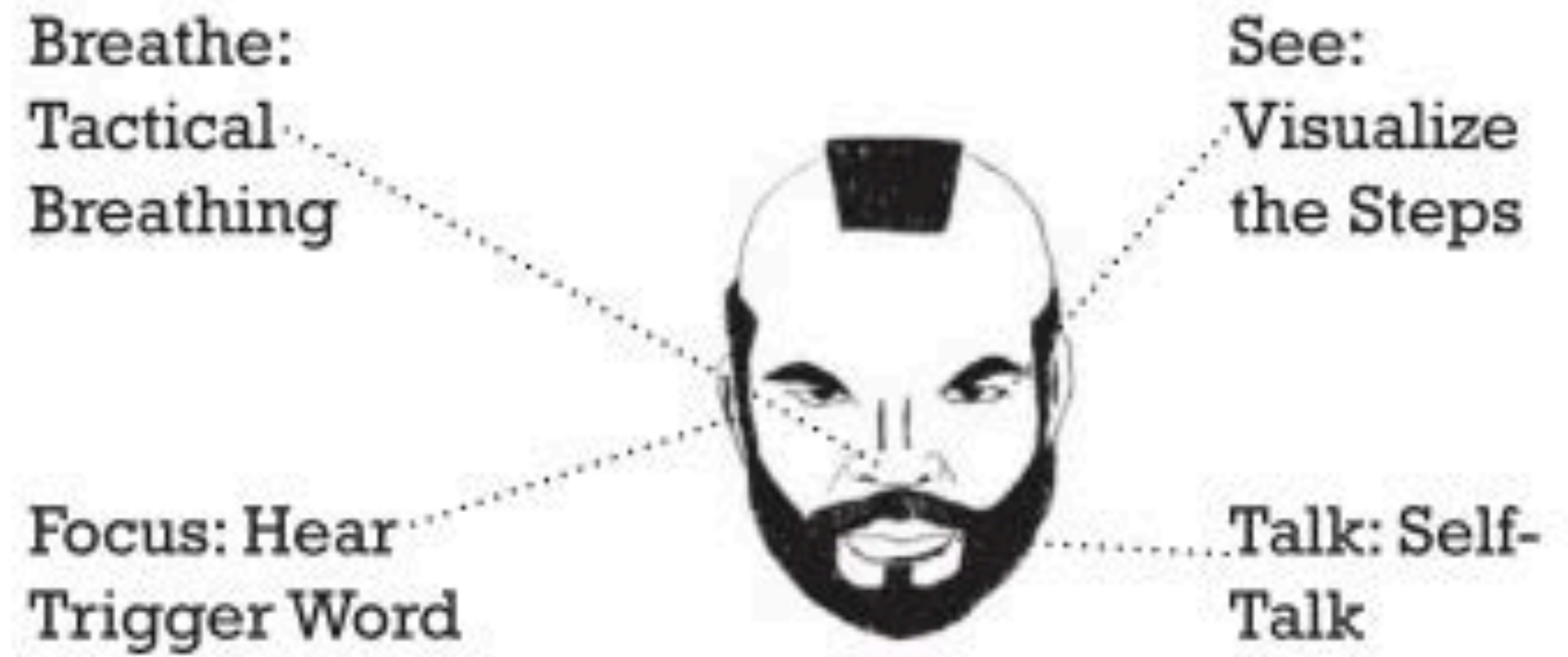


LARYNGOSCOPE with WORKING BULB & APPROPRIATE BLADE

A man with short brown hair, wearing a dark blue shirt, is sitting in the driver's seat of a car. He has a distressed expression, with his mouth slightly open and his eyes looking towards the camera. His right hand is raised, palm facing forward, as if gesturing or pleading. The car's interior, including the steering wheel and rearview mirror, is visible. The background outside the car is a blurred, hazy landscape.

I don't know what any of this **stuff** is,
and I'm **frigging** scared.

Beat the Stress Fool!



- B** - Breathe
- T** - Talk (Self)
- S** - See (Mental Rehearsal)
- F** - Focus with Trigger Word

Debriefing
helps us
improve



So far

- Intuition is a good thing but it takes time to develop
- Communication is critical
- Cognitive aids can help us think better under pressure
- Next up... Medicine



What Makes a Patient critical?



Key Terms

Systemic
Vascular
Resistance

Stroke
Volume

Cardiac
output

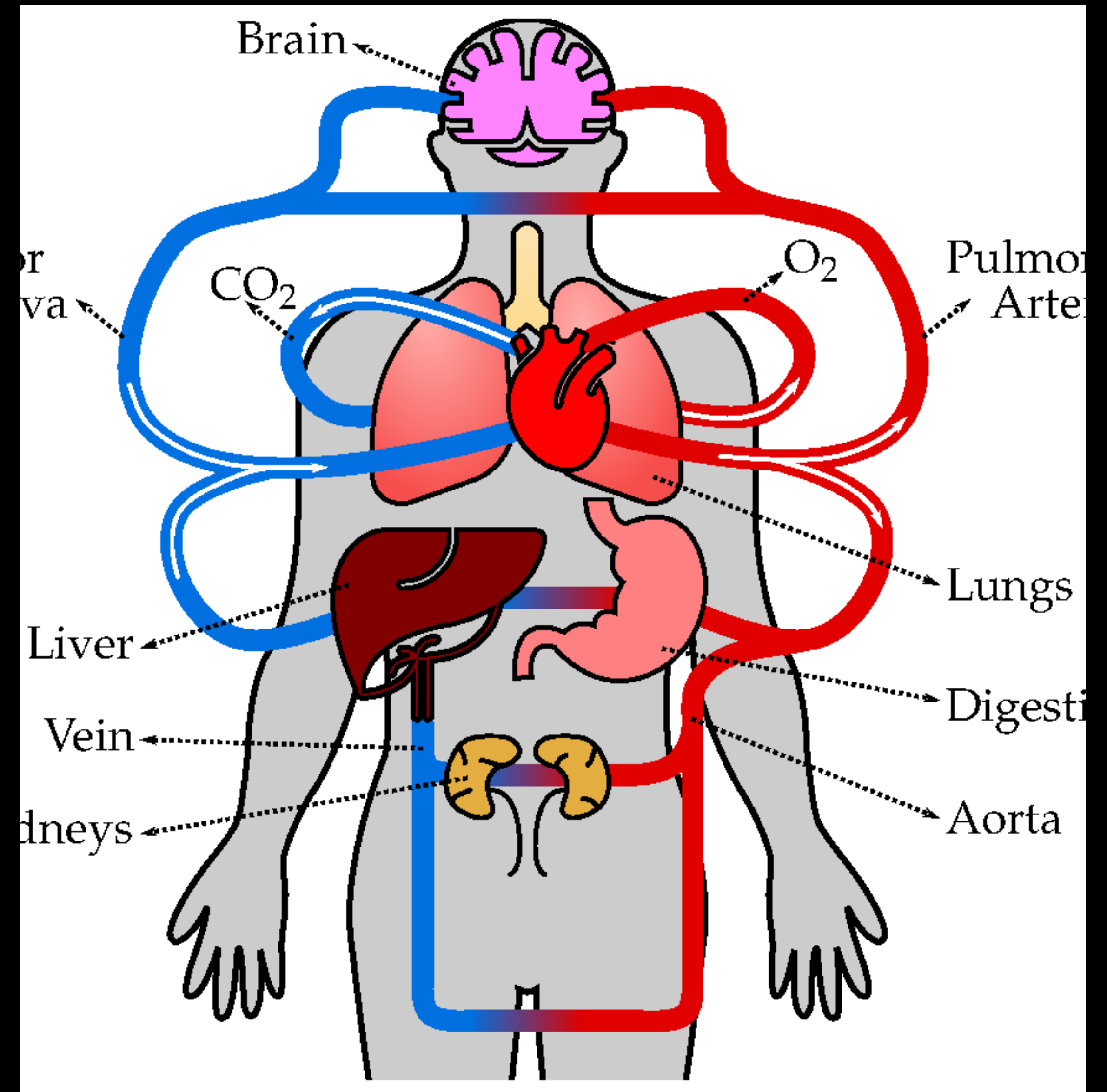
Blood
pressure

MAP

Pulse
pressure

Perfusion is a function of:

- Circulating Volume
- Pump Function
- Container size



**Shock Index:
HR/Systolic
>0.9 = uh oh**

How does the body auto-regulate perfusion?

- Neurologic
- Endocrine
- Coagulation Cascade



Stages of Badness

- Respiratory Failure
 - Compensated
 - Decompensated
 - Impending Arrest
 - Cardiac arrest

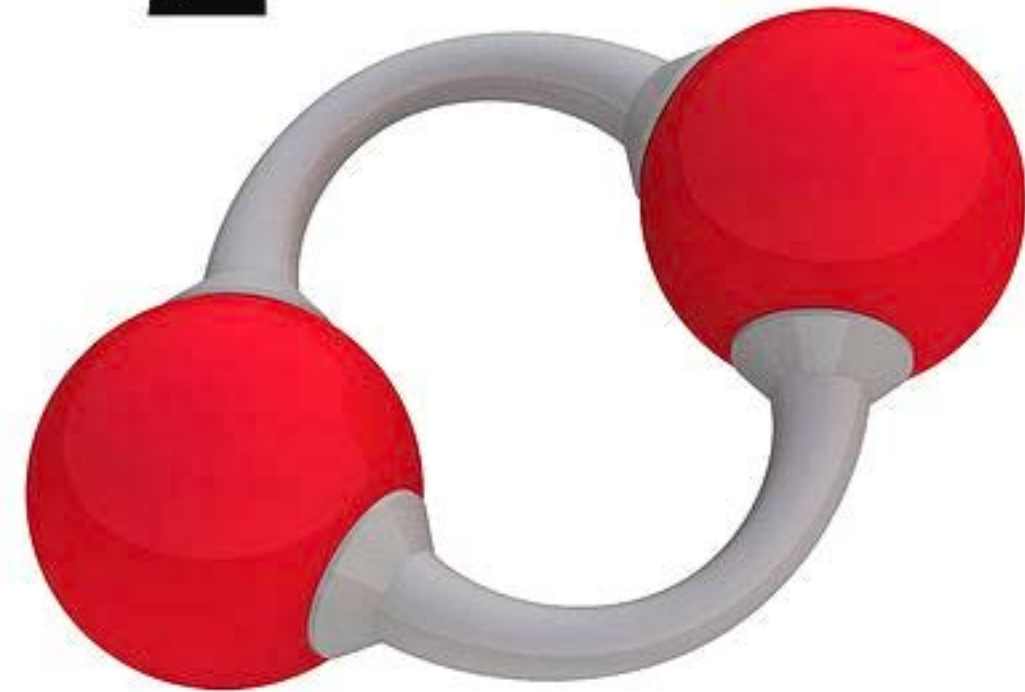
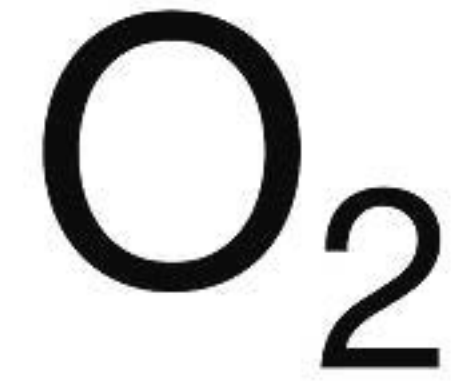


- Shock
 - Compensated
 - Decompensated
 - Irreversible

Stages of Shock

Signs & Symptoms	Compensated Shock	Decompensated Shock	Irreversible Shock
Heart rate	↑	↑↑	↑ or ↓
Blood pressure	normal or ↑	↓	↓↓
Respiratory rate	↑	↑ or ↓	↓
Skin - hypovolemia	Delayed capillary refill; cool	Delayed capillary refill; cold; cyanotic	Pale; cold; mottled
Skin - distributive	Delayed capillary refill; warm; moist	Delayed capillary refill; cool	Pale; cold; mottled
Level of consciousness	Normal; lethargy; confusion	Combative; unconscious	Coma
Cardiac output	↑	↑ or ↓	↓
Serum lactate concentration	normal or ↑	↑↑	↑↑↑
Systemic inflammatory response	↑	↑↑	↑↑↑

What is shock?



Tissues can only go so long without O₂

- 4-6 minutes CNS and nervous system
 - Pass out
 - Loose control of motor function
- 5-10 min cardiac muscle
 - Dysrhythmias
 - Arrest
- 2-4 hours skin and muscles

What physical exam findings can we use to assess the circulatory system?

Causes of shock

- Hypovolemic
- Cardiogenic
- Distributive
- Obstructive

What type of cases make you the most uncomfortable to think about managing?

- Ask
 - Why?
 - What part?
 - Lack of knowledge?
 - Lack of skill?
- Think
 - Mentally rehearse
 - What would you do at each step?
 - What are the knowledge gaps?
 - How can you practice?

Cases

72 yo M, weak and short of breath

Pacemaker placed 1 week ago

Thoughts en route?



PMHx: CAD, MI Stent x 2, HTN, HLD

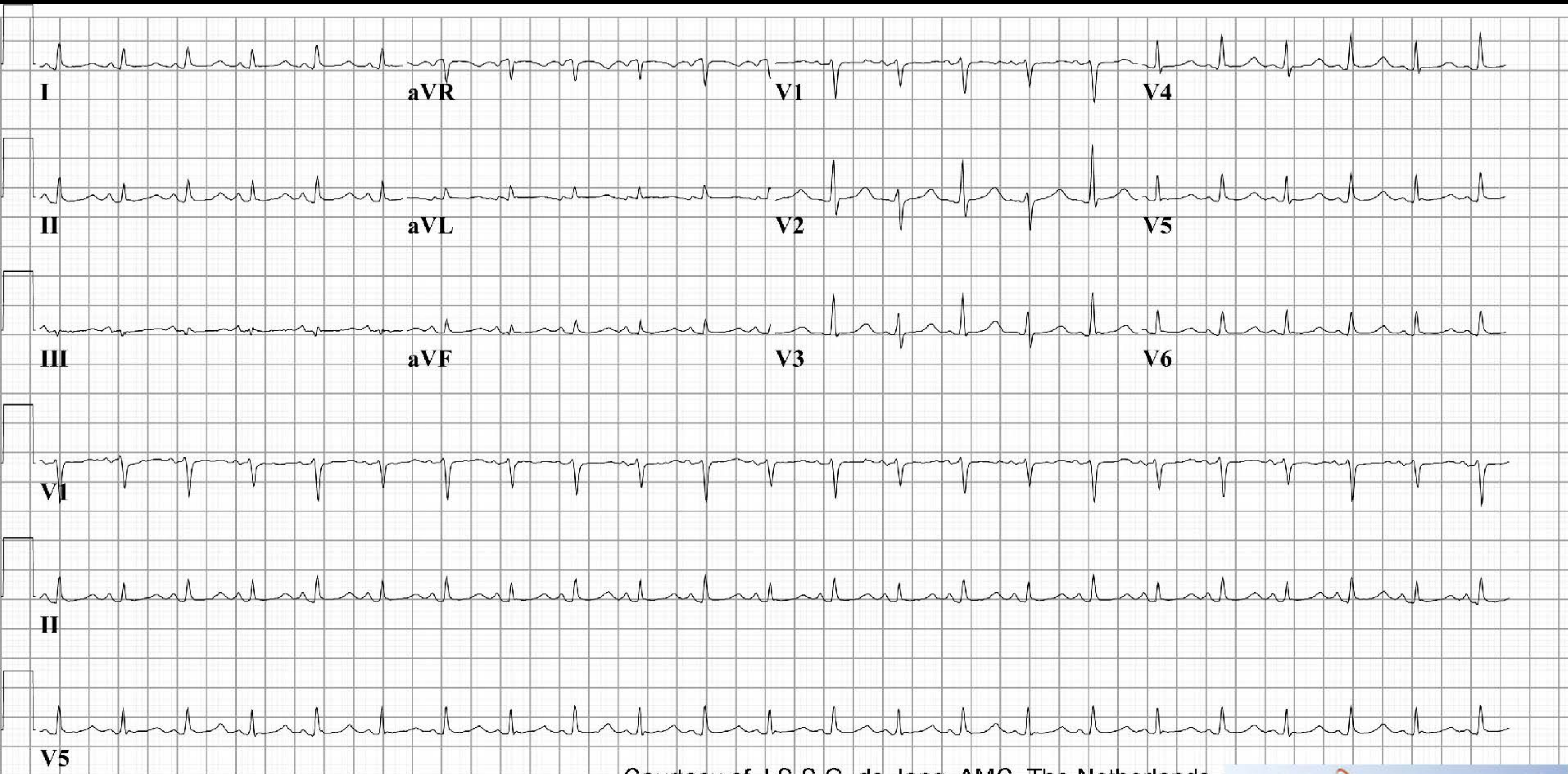
Meds: ASA, Plavix, amlodipine, simvastatin

VS: 66/48, 150, 22, 95% RA,

Alert, but ill-appearing

Cool pale skin





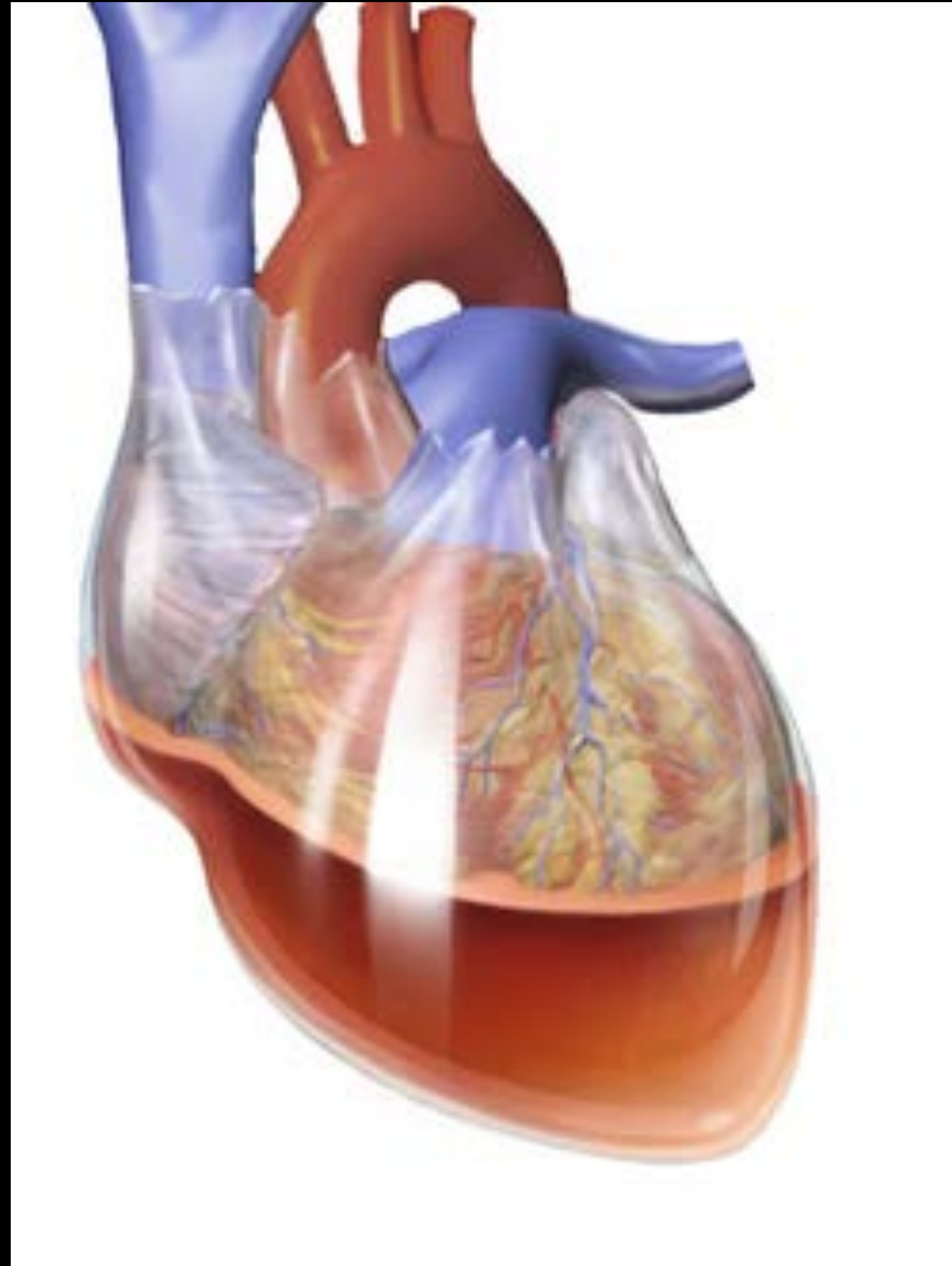
Courtesy of J.S.S.G. de Jong, AMC, The Netherlands

Dx: Cardiac Tamponde

Type of Shock?

-Obstructive

Interventions?



34 yo M

Fell 15 ft from ladder

L arm, L side, L leg pain

Thoughts en route?



PMHx: None

Meds: None

VS: 80/40, 130, 30, 93% RA

Initially alert, becoming somnolent

Rigid abdomen, femur deformity

Cool pale skin



Dx: Internal Hemorrhage

Type of Shock?

-Hypovolemic

Stage of shock?

-Decompensated

Interventions?



M

Massive
Hemorrhage



A

Airway



R

Respirations



C

Circulation



H

Hypothermia



24 yo F

MVC at high speed,
ejected

IFT from critical
access hospital to
Level 1

Thoughts en route?



PMHx: Unknown

Meds: Unknown

VS: 100/70, 130,
18, 98% on vent
100% FiO2

Sedated, Intubated

Bruising, road rash
every where



During transport
BP 60/40, HR 30,
RR 18, 88% on Vent



During transport

BP 60/40, HR 30,
RR 18, 88% on Vent

What now?



Dx: Tension Ptx

Type of Shock?

-Obstructive

Interventions?

DOPE



44 yo F

Short of breath at
truck stop

Thoughts en route?



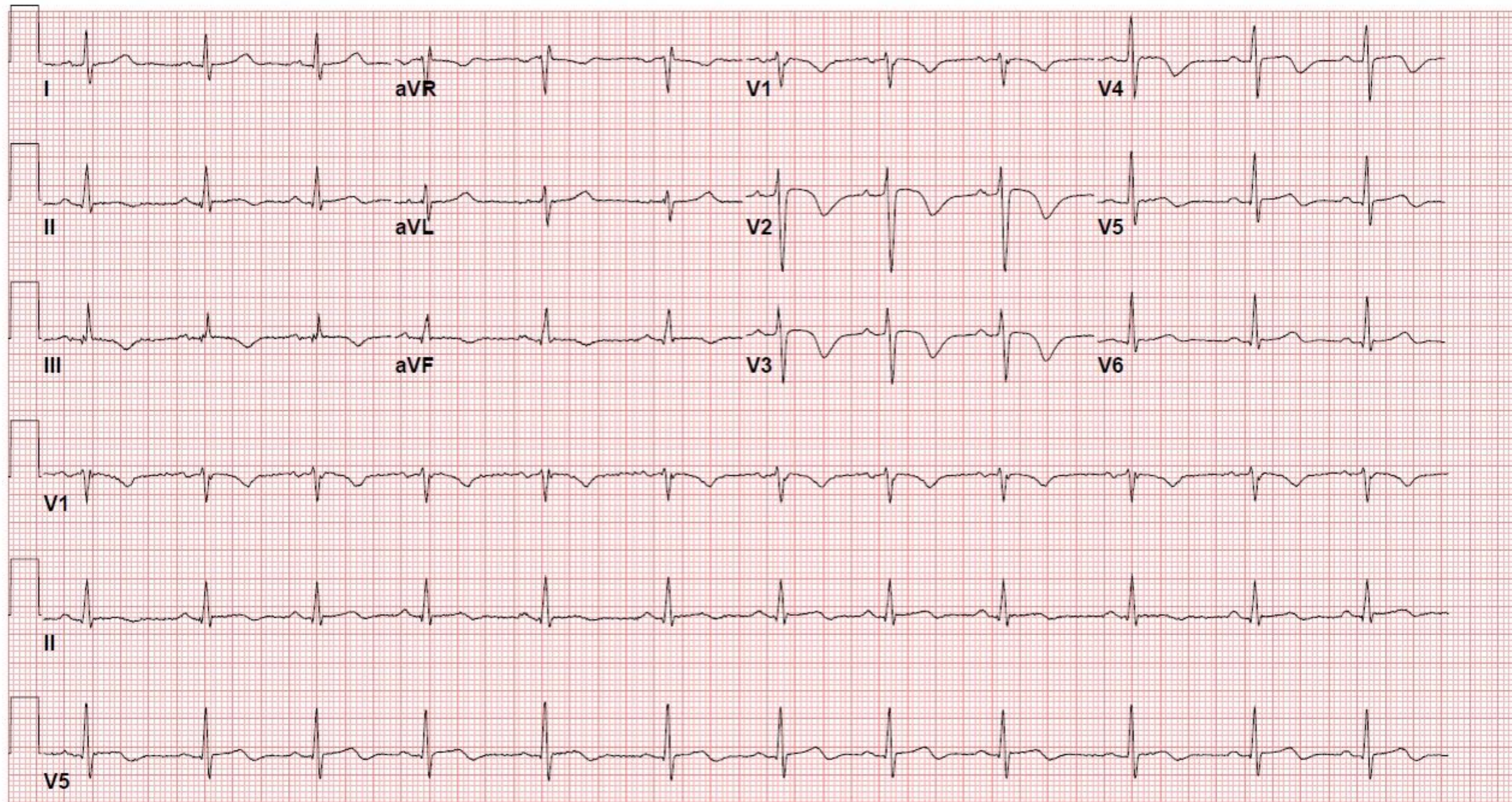
PMHx: Knee
replacement 10
days ago

Meds: None

VS: 86/60, HR 118,
RR 24, Spo2 94%
EtCO2 26

Anxious, dyspneic





Dx: PE

Type of Shock?

-Obstructive

Interventions?



80 yo F

Weakness,
confusion at home

Thoughts en route?



PMHx: HTN, HLD

Meds: a little green one and a pink one

VS: 76/50, HR 36, RR 18, Spo2 94%

Pale somnolent



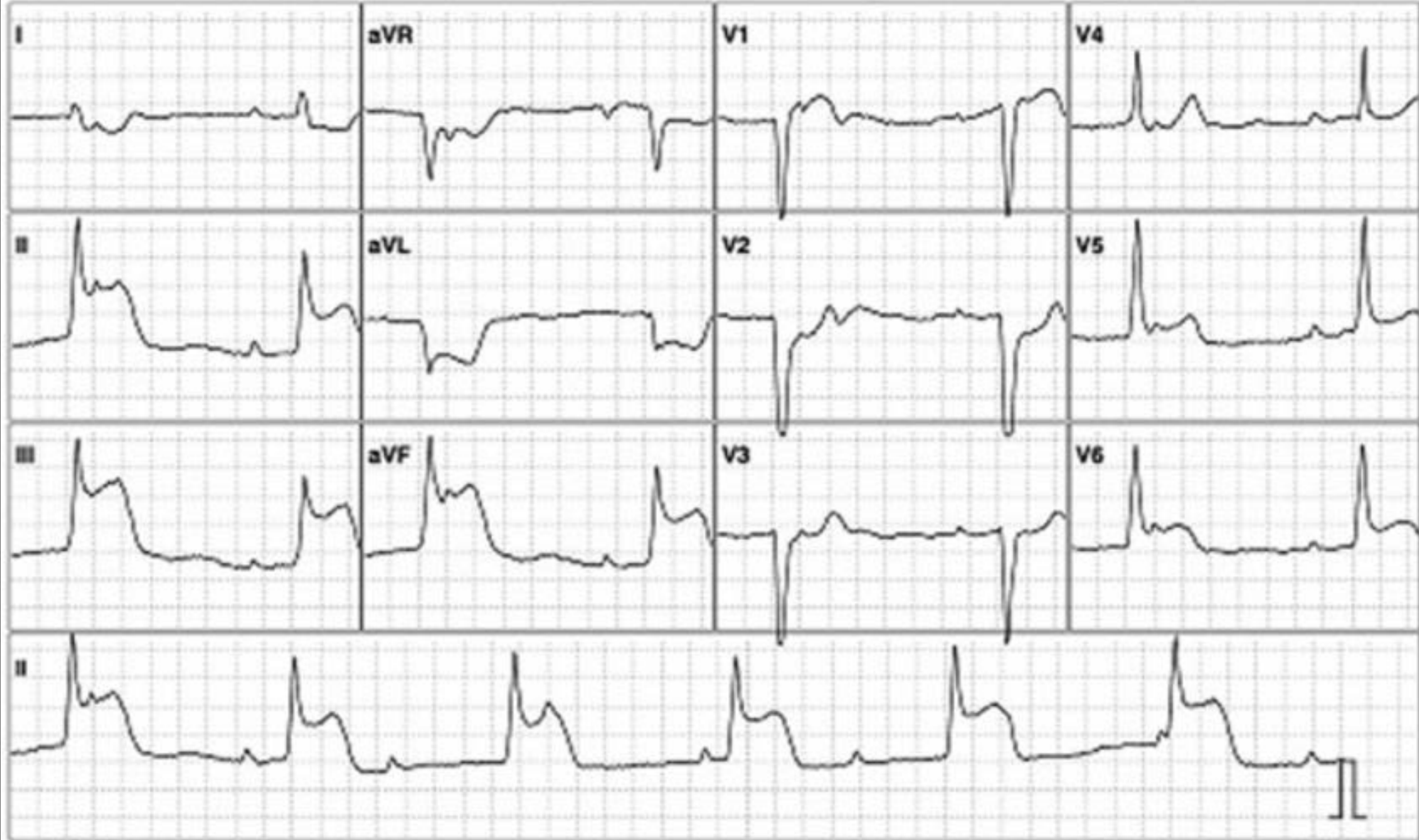
Idade: 83 Sexo: Feminino FC: 118 (bpm) PR: 326 (ms) PR: 40 (ms) QRS: 190 (ms) QT: 594 (ms) QTc: 1040 (ms) ST: 12.36 (mm) Fio2: 18.00348

Laudo:

Ritmo sinusal Área isêmica - Antero-septal. Supra de ST em parede inferior. IAM com supra de ST em evolução. BAVT.

Sintomas:

Epigastria, QUEDA



Resolução: 25 mm/seg 10 mm/mV. Scale markers for mV (0-4) and sec (0-3).

Recebido por: Fabiana Silva Data Recepção: 16/11/2010 11:52:41. Assinatura: Fabio de Carvalho Marinho HCRJ01 12305

Dx: MI with CHB

Type of Shock?

-Cardiogenic

Interventions?



12 yo M

Rash, SOB at
restaurant

Thoughts en route?



PMHx: None

Meds: Epi-Pen

VS: 110/70, HR
145, RR 28, Spo2
90%

Hives, stridor



Dx: Anaphylaxis

Type of Shock?

-Distributive

Interventions?



84 yo F

Fell at home, weak

Thoughts en route?



PMHx: HTN,

Meds: Metoprolol,

VS: 90/50, HR 75,
RR 24, Spo2 88%

Warm, ronchi all R
fields on
auscultation



Dx: Sepsis likely 2/2
pneumonia

Type of Shock?

-Distributive

Interventions?



22 yo M

Bull rider thrown,
altered

Thoughts en route?



PMHx: None

Meds: None,

VS: 90/50, HR 45,
RR 14, Spo2 90%

Warm, no
withdrawal to pain
in bilat lower
extremities



Dx: Neurogenic shock 2/2 spinal cord injury

Type of Shock?

-Distributive

Interventions?



Shock Review

- Shock is inadequate tissue perfusion
- CV homeostasis is a balance of pump, tank, and volume
- Different types of shock have different presentations and different Tx priorities

