Uncovering the Shocking Truth: An Approach to Undifferentiated Shock

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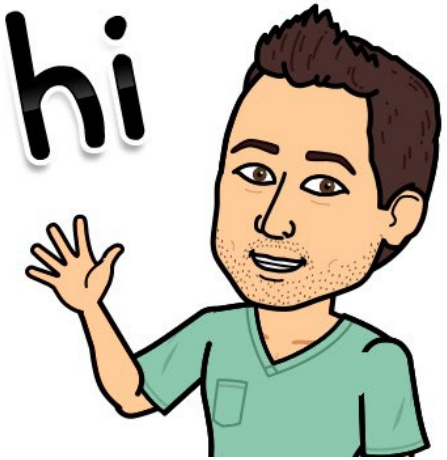


Objectives

Create a simplified, working frame work to view undifferentiated shock

Discuss the early diagnostic steps when approaching undifferentiated shock

Establish initial steps in the management of undifferentiated shock

Not Objectives:

An approach to *differentiated* shock

A nuanced discussion of critical care practice

A fool-proof, life-proof, Murphy's Law-proof algorithm

Your Patient

- Is a 64 year old gentleman with a history of DM, HTN, HL

- Admitted 4 days ago with SBO, now POD #3 s/p bowel resection

On your morning rounds…

"He seems confused this morning and he's not very awake. He is breathing very fast. I'm not sure when that started."

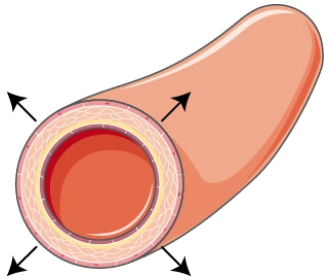
His HR is 116 bpm and his BP by non-invasive cuff is 74/35 mmHg.

What’s the actual diagnosis?

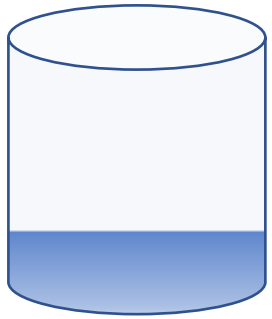
I don’t know.

Traditional Teaching: Types of Shock

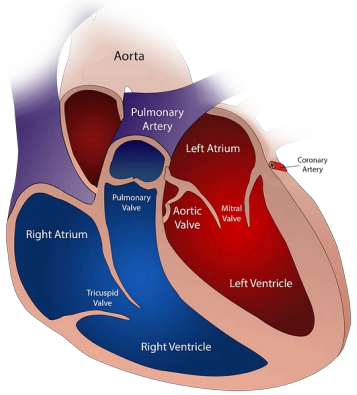
- Distributive



- Hypovolemic



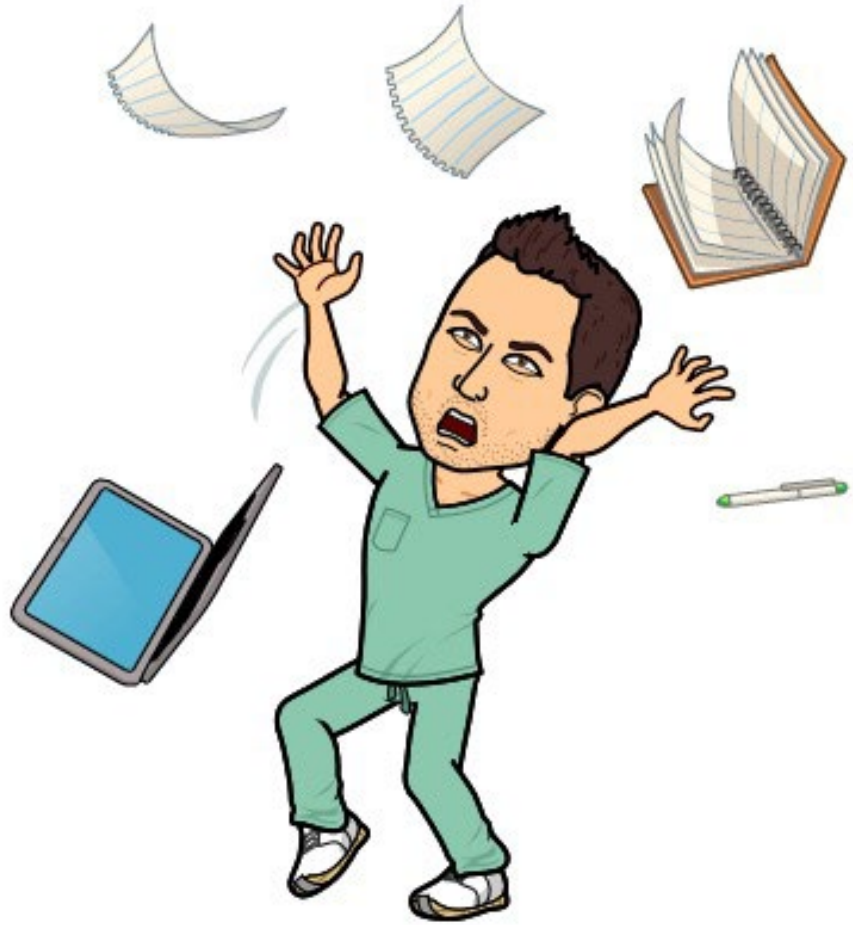
- Cardiogenic
- Obstructive



- Neurogenic

The Problem with Tradition

Doesn't the pathophy
distributive shock an
hypovolemic shock



massive PE causes
ilure, isn't that
genic shock?

Why is tamp
obstructive
pericarditis

't you just say
genic shock is
utive???

Are you even my real mom?!?

The Problem with Tradition

Traditional classification of shock requires a final diagnosis

Your Patient

- 64 year old gentleman with a history of DM, HTN, HL

- Admitted 4 days ago with SBO, now POD #3 s/p bowel resection

This Morning:

- Altered mental status, somnolence
- Tachypnea
- HR: 116 bpm
- BP: 74/35 mmHg

A “traditional” approach to shock…

History

Evidence for infection

Risk for PE

Risk for CAD/ACS

Risk for hypovolemia or bleed

Medications

Physical Exam

Heart/lung sounds

Edema

JVD

Skin temperature/tu

Capillary refill

CURRENT OPINION

Clinical examination for diagnosing circulatory shock

Bart Hiemstra, Ruben J. Eck, Frederik Keus, and Iwan C.C. van der Horst

"clinical examination equals a coin flip"

Labs and Imaging

Go ahead and send them…

…I won’t wait.

A new paradigm:

The Pump, then the Tank

"The ***greatest*** chance to ***help***

The ***smallest*** chance to ***hurt***"

But first…

What is shock?

Shock is not hypotension.

Hypotension is not shock.

Perfusion
matters.

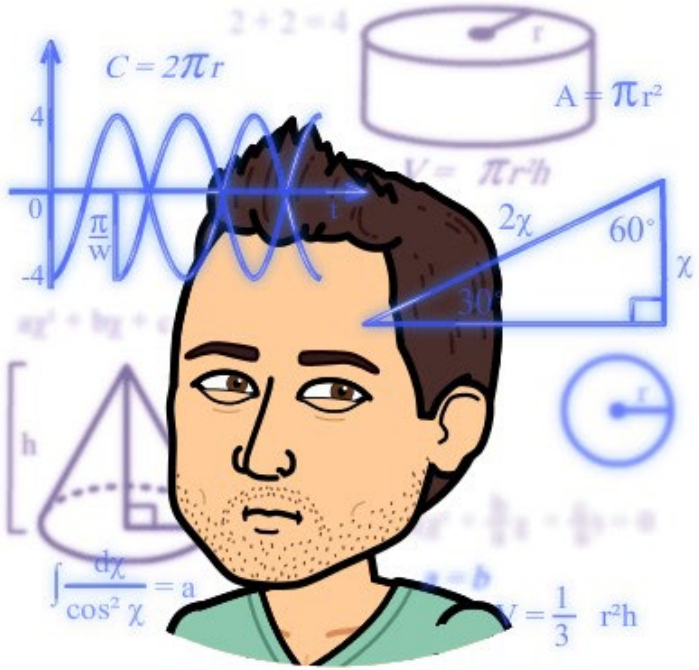
Imperfect surrogates of perfusion

- Blood pressure
- Mental status
- Pulses
- Capillary refill
- Skin exam
- Urine output
- Laboratory evidence of organ function/damage
  - BUN/Creatinine
  - Liver-related tests
  - Troponin

DO_2= CO x [(Hb x 1.39 x SaO_2) + (PaO_2 x 0.003)] x10

Perfusion = Cardiac output x (He)

Cardiac Output = Stroke Vol



Preload Contractility Afterload

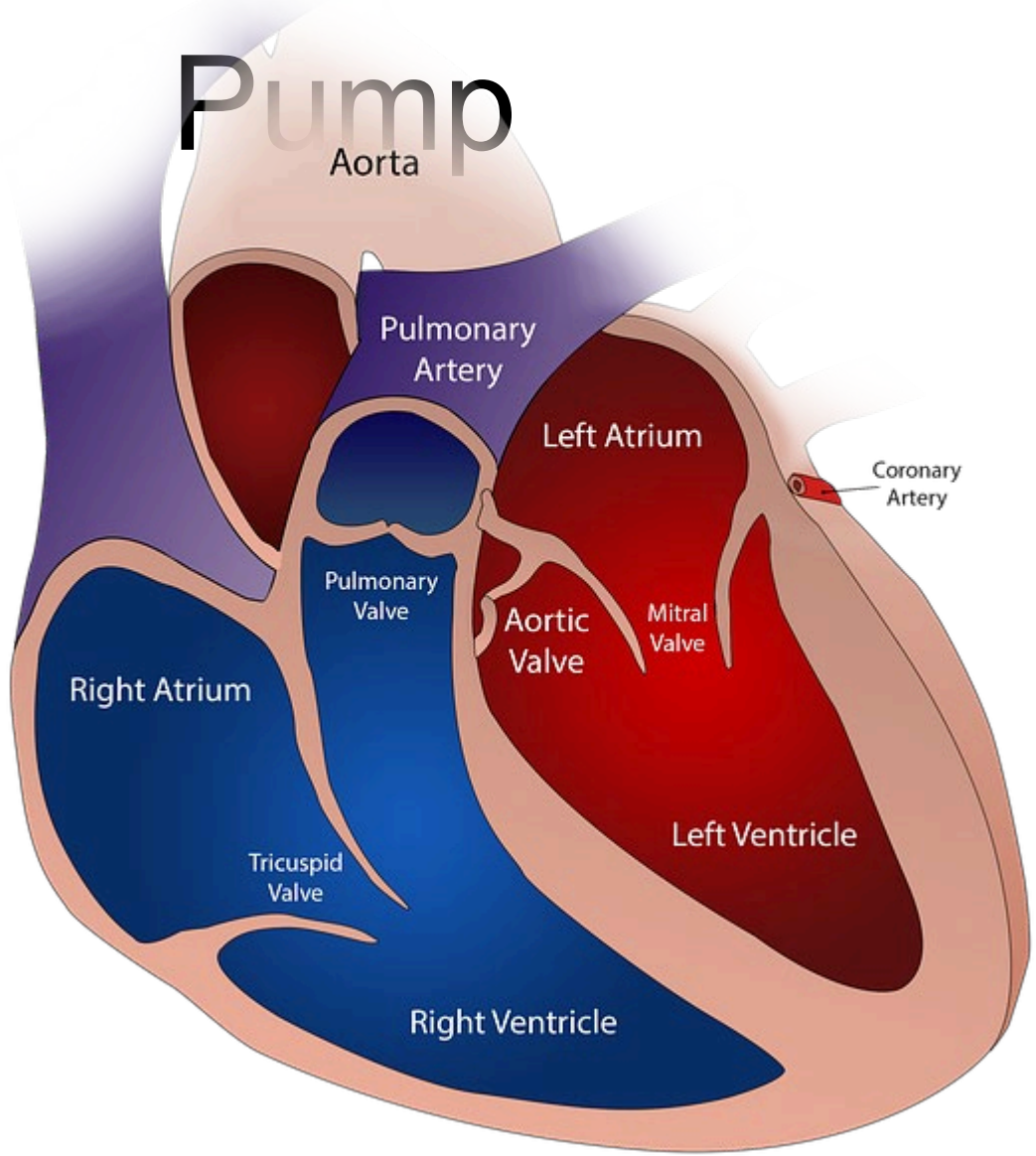
The Pump, then the Tank

Contractility

Preload/Afterload

Part I: Assessment

The Pump

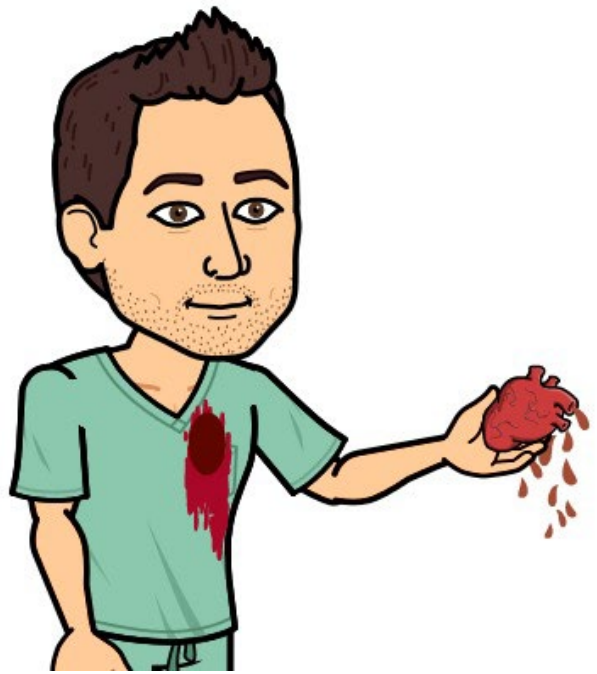

Aorta
Pulmonary Artery
Left Atrium
Coronary Artery
Pulmonary Valve
Aortic Valve
Mitral Valve
Right Atrium
Left Ventricle
Tricuspid Valve
Right Ventricle

Assessment: The Pump

1. Is there an effusion?

2. How is the LV function?

3. How is the RV function?



Frederiksen et al. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2013, 21:87
http://www.sjtrem.com/content/21/1/87

SCANDINAVIAN JOURNAL OF trauma, resuscitation & emergency medicine

ORIGINAL RESEARCH Open Access

Assessment of cardiac pathology by point-of-care ultrasonography performed by a novice examiner is comparable to the gold standard

Christian Alcaraz Frederiksen[1,3*], Peter Juhl-Olsen[2,3], Niels Holmark Andersen[1,3] and Erik Sloth[2,3]

- Compared residents to cardiologists
- Assessed
  - Pericardial effusion
  - LV dilation
  - RV dilation
  - LVH
  - LV failure
  - Aortic Stenosis

95% agreement between resident and cardiologist

Aorta
Pulmonary artery
Right atrium
Tricuspid valve
Bicuspid valve
Right ventricle
Left atrium
Aortic valve
Left ventricle
Coronary artery

Assessment: The Tank

The Tank

1. Is there a problem with the fluid level?
2. Is there a problem with the container?
3. Is there a hole in the bucket (a bleed)?

The Problem with Fluid Response

Current Opinion in Critical Care. 14(3):334–339, JUN 2008
DOI: 10.1097/MCC.0b013e3282fd6e1e, PMID: 18467896
Issn Print: 1070-5295
Publication Date: 2008/06/01

**Prediction of volume respons
patients with spontaneous b**

Jean-Louis Teboul; Xavier Monnet

Clin Exp Emerg Med. 2014 Dec; 1(2): 67–77.
Published online 2014 Dec 31. doi: 10.15441/ceem.14.040

**Dynamic changes in arter
responsiveness in mecha
review of the literature***

Marik, Paul E. MD, FCCM; Cavallazzi, Rodrigo

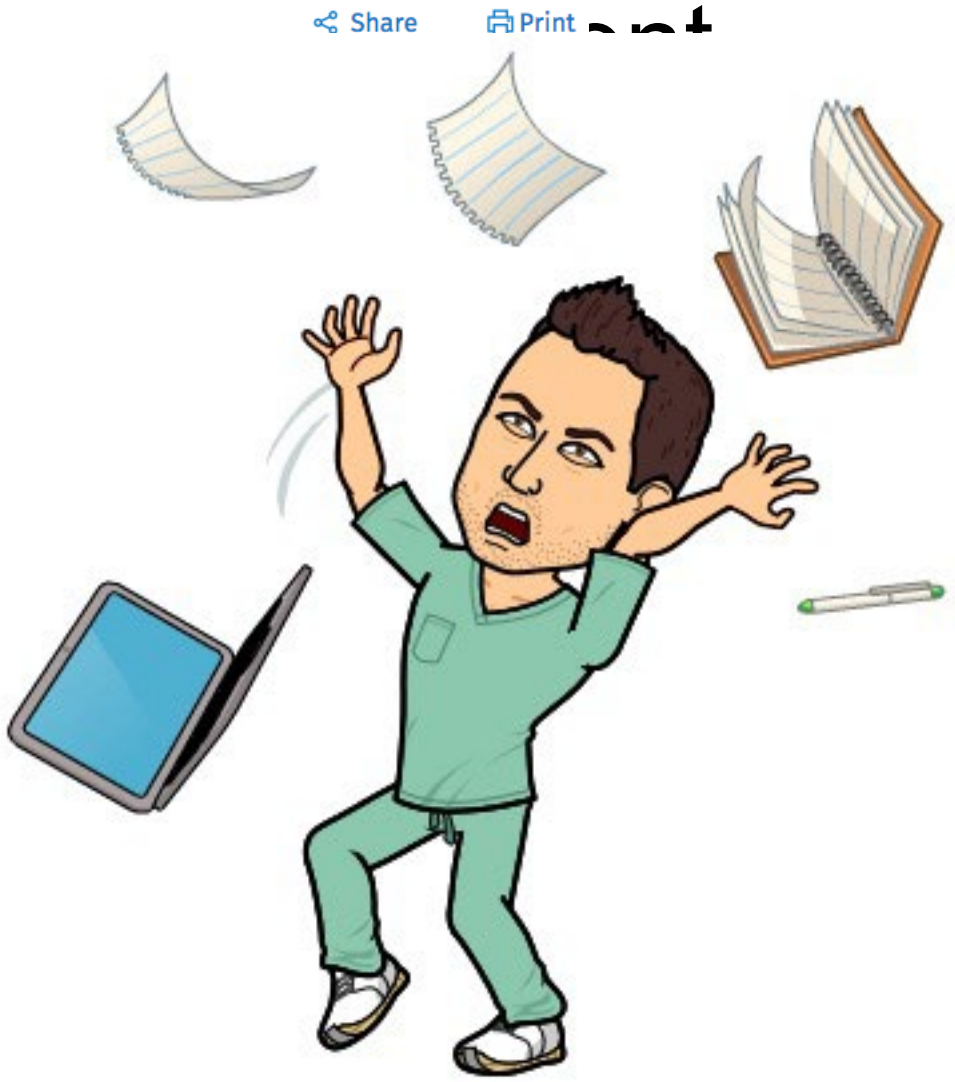
Critical Care Medicine: September 2009 - Volume 3
doi: 10.1097/CCM.0b013e3181a590da

Intensive Care Medicine
December 2016, Volume 42, Issue 12, pp 1935–1947 |

**Passive leg raising for pred
systematic review and meta**

Authors Authors and affiliations

Xavier Monnet, Paul Marik, Jean-Louis Teboul



Intensive Care Medicine
December 2016, Volume 42, Issue 12, pp 1935–1947 | Cite as

Passive leg raising for predicting fluid responsiveness: a systematic review and meta-analysis

Authors | Authors and affiliations

Xavier Monnet, Paul Marik, Jean-Louis Teboul

Using Cardiac Output: 0.85
Using Blood Pressure: 0.

So far, the only thing on par with a fluid cha
is a fluid challenge…

Fluid Challenge

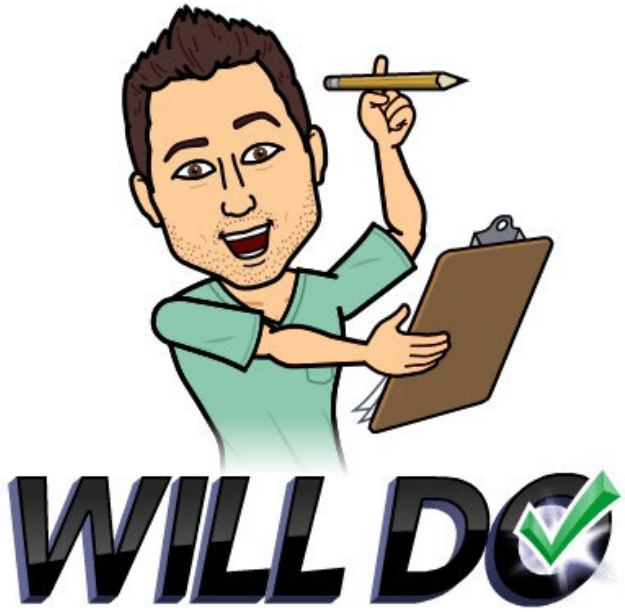
Small bolus of balanced crystalloid

Measure Response:

- Change in Cardiac Output
- Change in Shock Index (HR/Blood Pressure)
- Change in indicators of perfusion (capillary refill, mental status, urine output)

Part II: Management

Early Management of Undifferentiated Shock



1. Airway and Access
2. Mobilize resources
3. Protect the MAP (> 65 mmHg)

Early Management of Undifferentiated Shock

Pump, then Tank

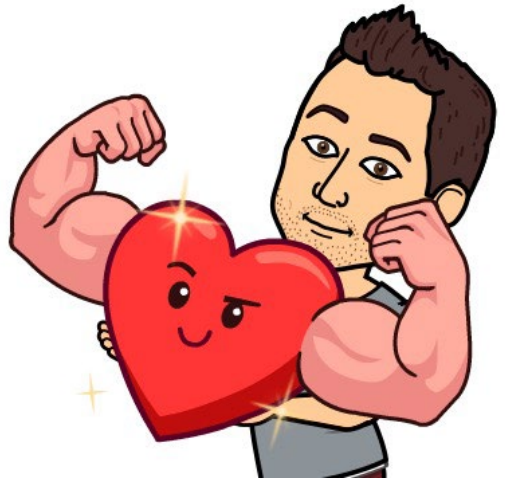
"The highest chance to help,
The lowest chance to hurt."

The Pump

1. Is there an effusion?
2. How is the LV function?
3. How is the RV function?

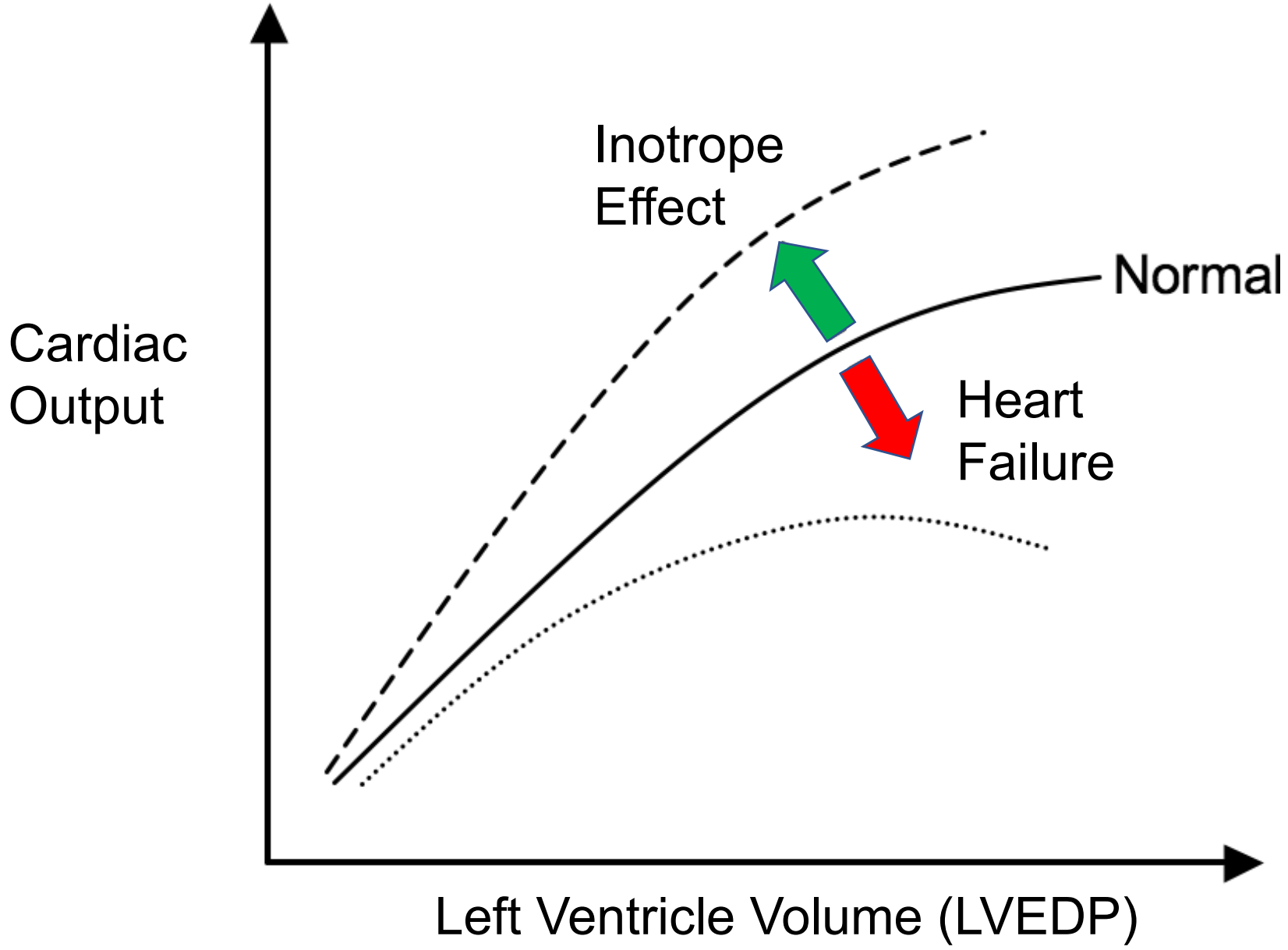
Heart Problems

1. Is there an effusion/tamponade?
    - Give preload
    - Drain the effusion



2. Is there RV or LV dysfunction?
    - Give inotropes (Epinephrine, dobutamine, milrinone)
    - Fix electrolytes
    - Fix major acid/base disturbance

Why the pump is first



Tank Time!

1. Fluid Challenge- Measure response
2. Volume Resuscitation
3. “Shrink the Tank”- Give Vasopressors
   (norepinephrine, phenylephrine, vasopressin)

Let's revisit our patient!

Poll #5

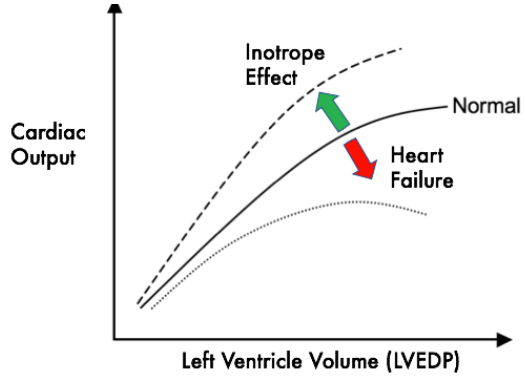
What would be your first step in the management of this patient?

A. Give a bolus of IV crystalloid fluid
B. Start peripheral vasopressors (ie norepinephrine, phenylephrine)
C. Start an inotrope (ie dobutamine, low-dose epinephrine)
D. Do something else!

Reassess after each intervention

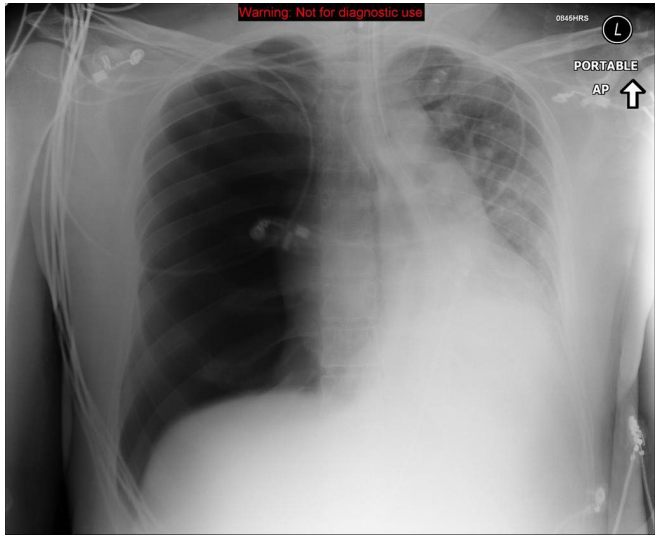
Vasopressor

Inotrope



Fluid challenge

The Traps



Tension Pneumothorax

- Physical Exam
- Chest X-ray
- Ultrasound

Severe valve disease (mitral, aortic)

- Physical Exam
- Ultrasound

Let’s Recap!

- Thought about history, exam, ordering diagnostics
- Secured airway, obtained access

- Looked at the heart

- Addressed tamponade

- Addressed RV or LV failure

- Considered volume status, gave a fluid challenge

- Gave volume resuscitation

- Gave vasopressors

What next?

Consider FAST, lung ultrasound

Obtain Labs
- WBC, hgb
- BMP/Electrolytes
- Lactate
- Troponin
- Cultures

Obtain EKG

Obtain Formal Echocardiogram

Additional imaging
- CXR
- CT Chest- PE, dissection
- Bleeding source

<u>Effusion?</u>
Consider aortic dissection

<u>LV Dysfunction?</u>
Consider ACS/MI
Cardiomyopathies
Electrolytes/Acid Base

<u>RV dysfunction?</u>
Consider PE
Consider RV infarct

Consider sepsis

Consider hypovolemia

Consider hemorrhage

Consider adrenal axis dysfxn

So, what was wrong with our patient?

I don’t know.

And that’s OK.

Questions?

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