



Diagnosis and Management of SHOCK



Lekshmi Santhosh, M.D., M.A.Ed.
Assistant Professor, Pulm/Critical Care & Hosp Med
Associate Program Director, UCSF Pulm/CC Fellowship



Disclosures

I have no conflicts of interest to disclose.

Quick Poll

In my practice setting, I take care of:

- A. Both outpatients and inpatients
- B. Inpatients on acute care & step-down
- C. Inpatients in B AND patients in the ICU
- D. Patients in a post-acute care facility
- E. All of the above!



All That is Hypotensive is Not Sepsis...and



All That is Hypotensive Does not Need Fluids



But Sepsis Is Having a Big Year!



Roadmap for the Hour

Diagnosis and Management of Shock

Objectives:

2019 Updates in Dx of Sepsis

Sepsis Mimics

2019 Updates in Management of Sepsis

Non-Septic Shock Management Pearls

Post-Sepsis Care

Roadmap for the Hour

Diagnosis and Management of Shock

Objectives:

2019 Updates in Dx of Sepsis

Sepsis Mimics

2019 Updates in Management of Sepsis

Non-Septic Shock Management Pearls

Post-Sepsis Care



**AT LEAST 1.7 MILLION
ADULTS IN THE U.S.
DEVELOP **SEPSIS**
EACH YEAR, AND
NEARLY 270,000 DIE
AS A RESULT.**

**GET AHEAD
OF SEPSIS**

KNOW THE RISKS. SPOT THE SIGNS. ACT FAST.



Sepsis Awareness Month



As many as
80% of
sepsis deaths
could be prevented
with **rapid diagnosis**
and **treatment**.

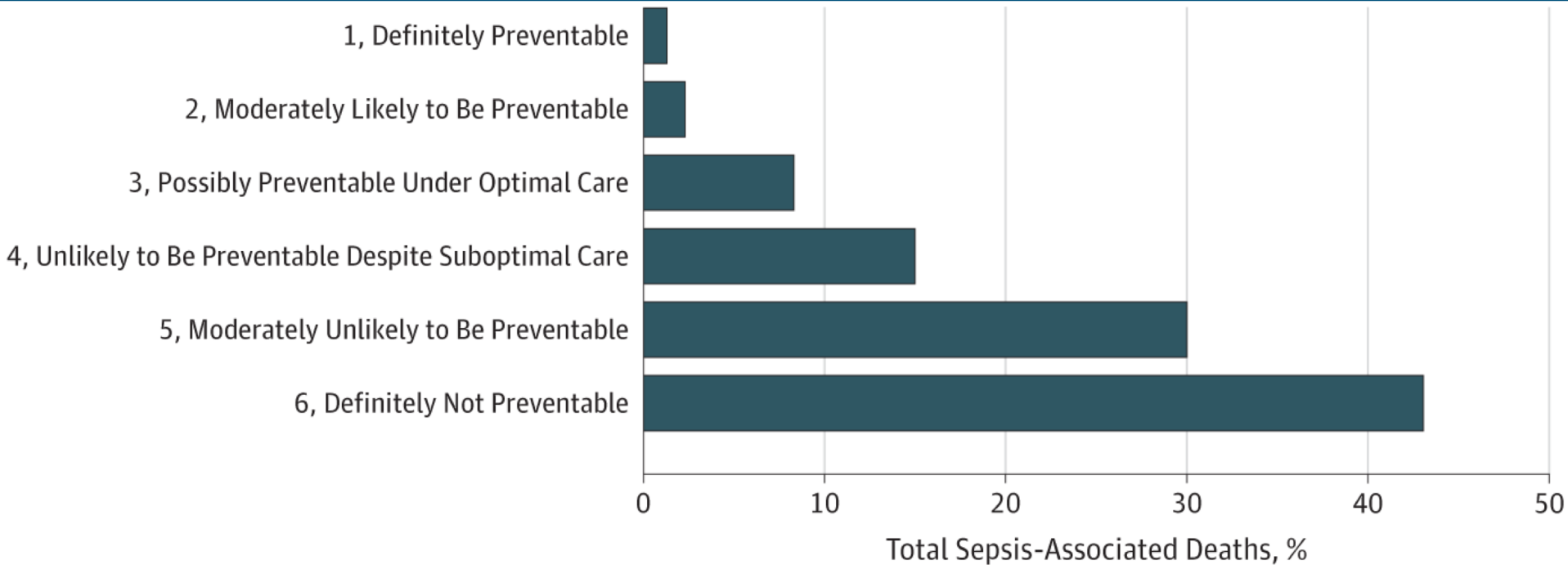
When it comes to sepsis,
remember: **IT'S ABOUT TIME™**.
Watch for:

- T** **TEMPERATURE**
that's abnormal
- I** Signs of an
INFECTION
- M** **MENTAL DECLINE**
- E**™ Feeling
EXTREMELY ILL

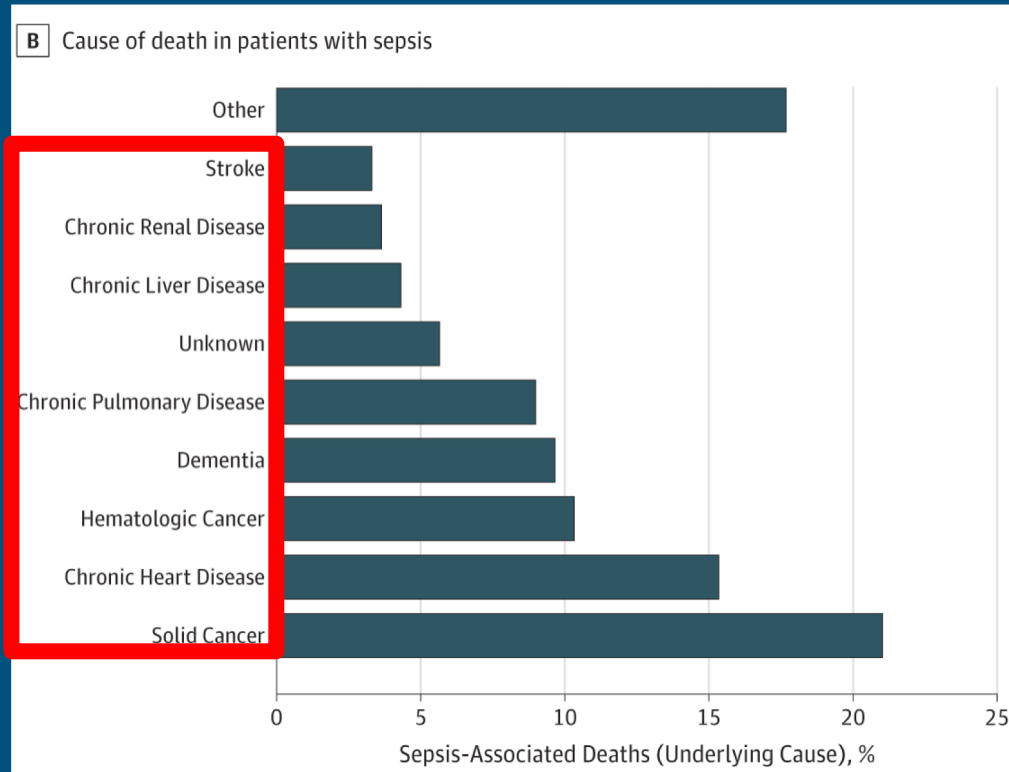
Take the time now to learn more at sepsis.org.



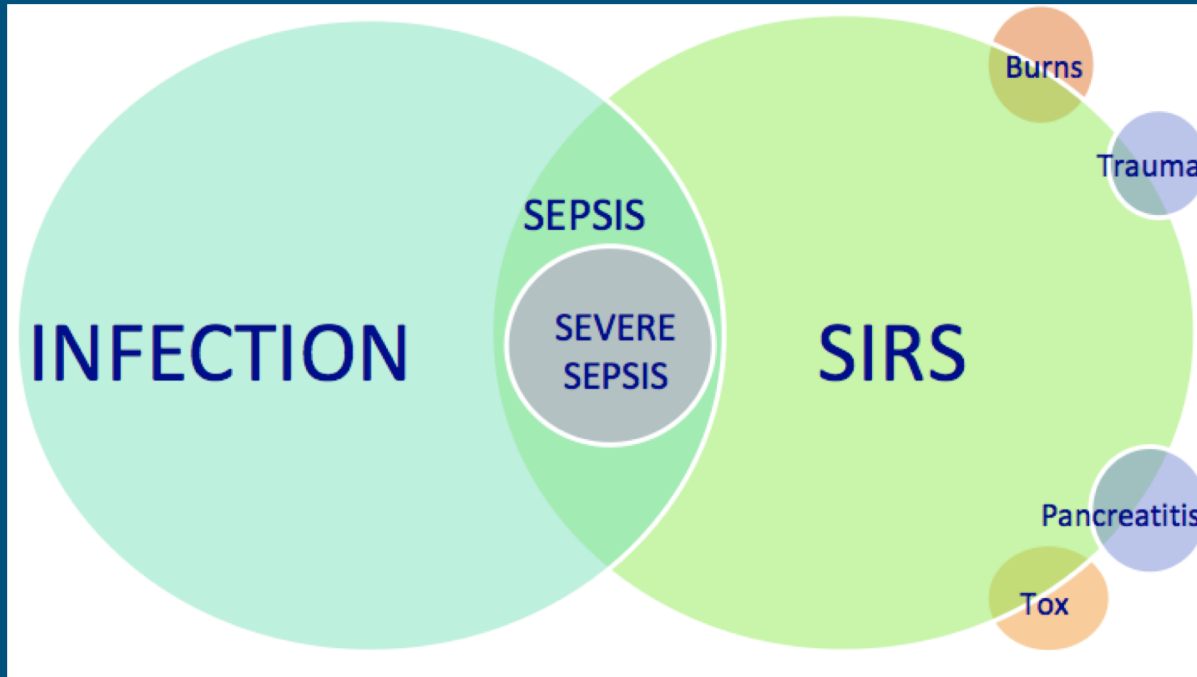
Can We Really Prevent Mortality?



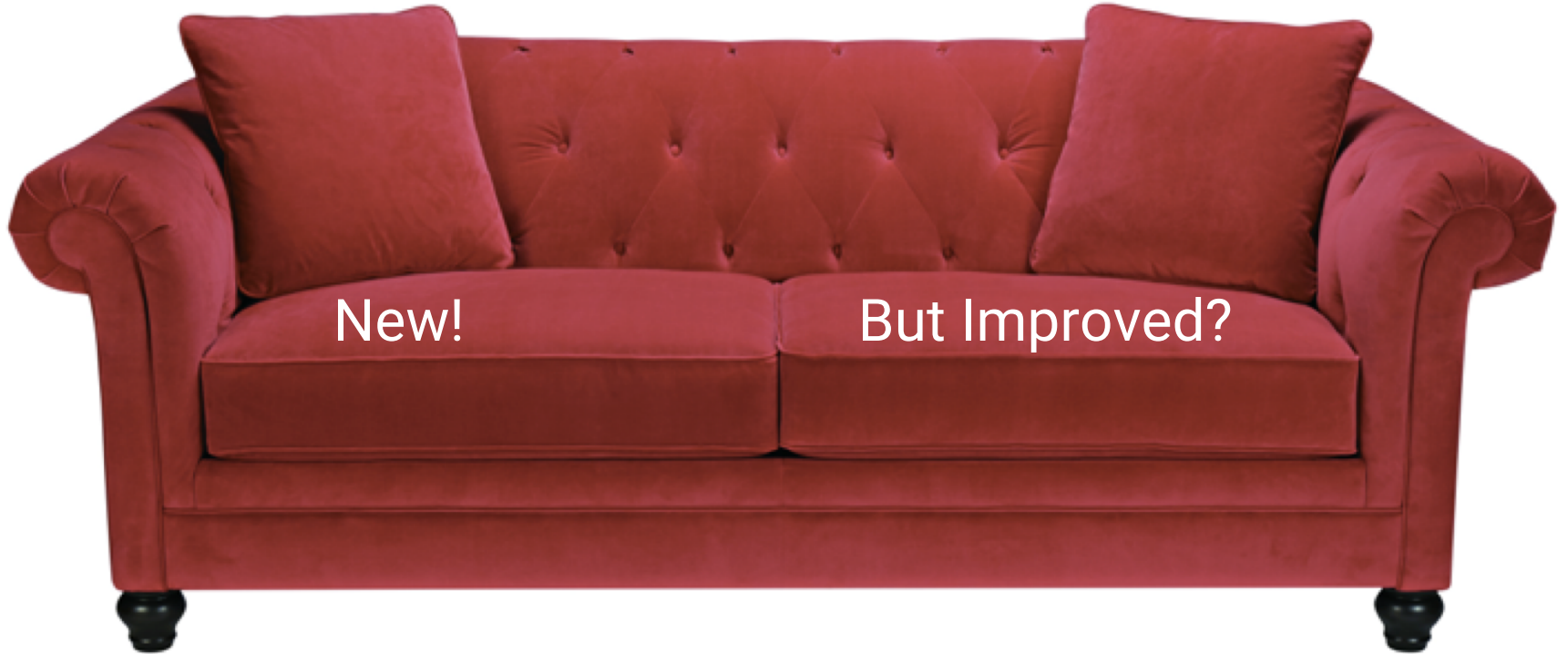
These Patients Come In SICK Already...



The Trouble with SIRS Criteria



Updates on SEPSIS-3, SOFA, & qSOFA



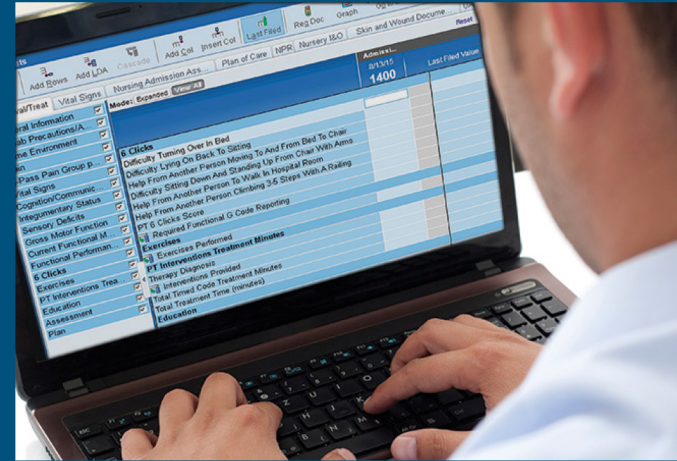
New!

But Improved?

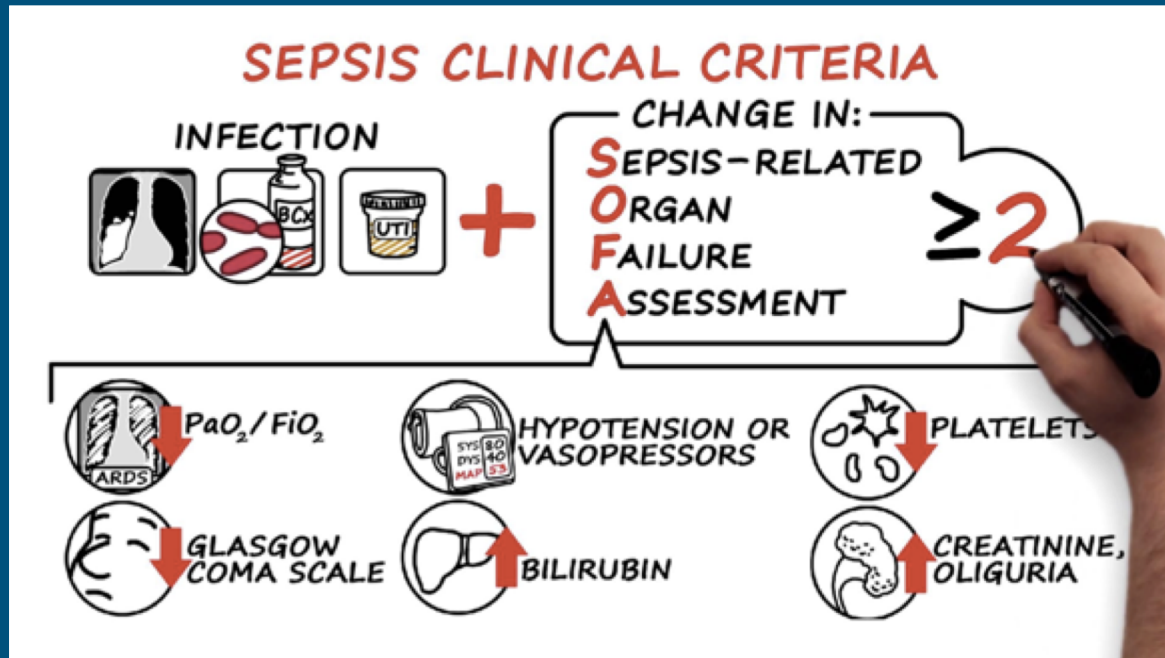
Quick Poll

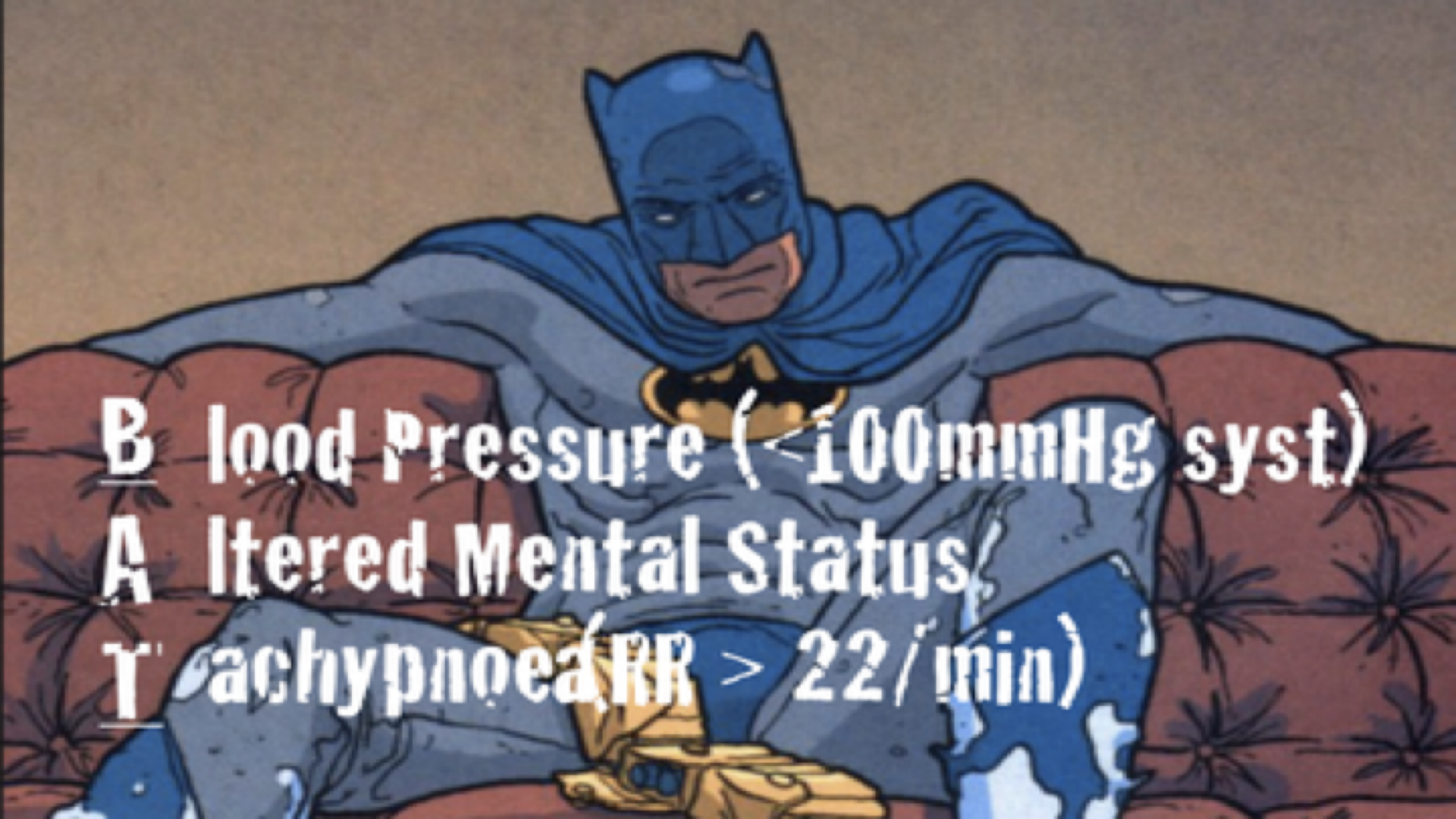
At my institution, we document using:

- A. SIRS, Sepsis, Severe Sepsis, Septic Shock
- B. Infected, Sepsis, Septic Shock
- C. SIRS and SOFA/qSOFA
- D. Only SOFA/qSOFA



SOFA Score ≥ 2 Reflects Mortality Risk of 10%





Blood Pressure ($< 100 \text{ mmHg syst}$)

Altered Mental Status

Tachypnoea ($\text{RR} > 22 / \text{min}$)

Real-World Data: Only 1/6 qSOFA + Had Sepsis

- ❑ 85 hospitals, > 1 mill pts
- ❑ PPV for Sepsis only 17.4%
- ❑ Only 1/3 pts qSOFA + has infection
- ❑ Only 1/6 pts qSOFA + has sepsis

Quick Sequential
Organ Failure
Assessment Is Not
Good for Ruling Sepsis
In or Out

Take Home Point

Medicare and Critical Care Societies are still not using the Sepsis-3 Definitions, and newer data are casting their clinical validity into doubt.

Roadmap for the Hour

Diagnosis and Management of Shock

Objectives:

2019 Updates in Dx of Sepsis

Sepsis Mimics

2019 Updates in Management of Sepsis

Non-Septic Shock Management Pearls

Post-Sepsis Care

All That is Hypotensive is Not Sepsis...and

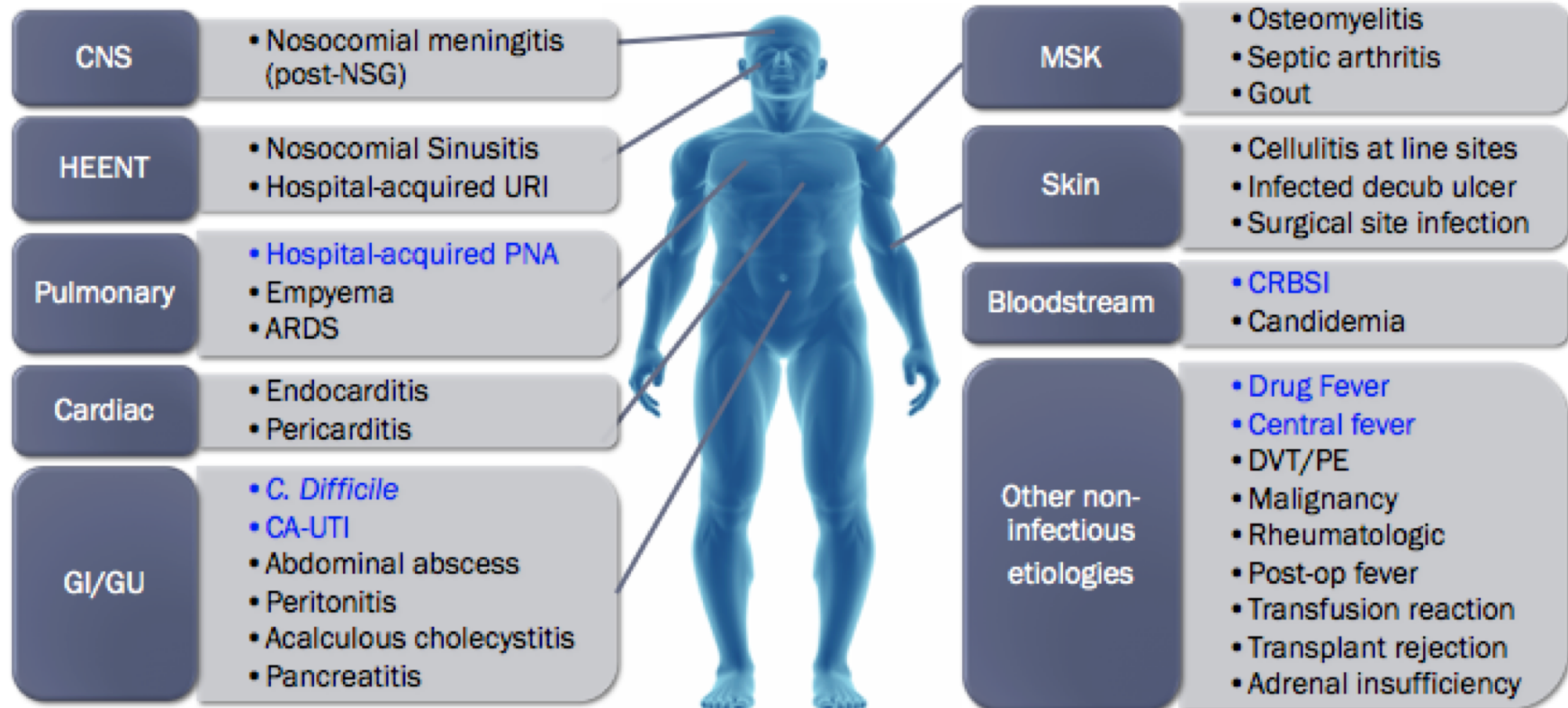
what are other
words for
mimicker?



mimic, imitator, impersonator,
simulator, copyist, echo, panto,
pantomime, mimick, mimer



DDx: Dr. Jen Babik's Head-to-Toe Approach



Mimics/Mimickers of Septic Shock

More Common:

Hypovolemic

Hemorrhagic

Pulmonary Embolism

Cardiogenic

Obstructive/Tamponade

More Rare:

Anaphylactic Shock

Adrenal Crisis

Myxedema Coma

HLH

Toxidromes

Take Home Point

Think head-to-toe for sepsis mimics. A careful history, physical exam, and tools like POCUS and labs are key.

Roadmap for the Hour

Diagnosis and Management of Shock

Objectives:

2019 Updates in Dx of Sepsis

Sepsis Mimics

2019 Updates in Management of Sepsis

Non-Septic Shock Management Pearls

Post-Sepsis Care

The Sepsis 6

Oxygen

Blood test

Antibiotics

Fluids

Escalate

Inotropes



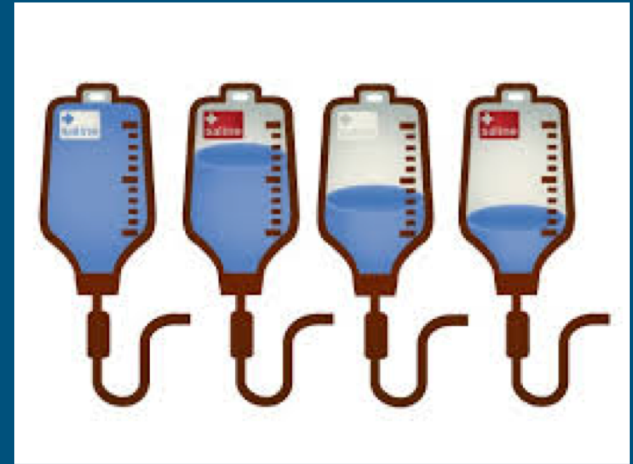
Quick Take: Blood Cx BEFORE Antibiotics!

Blood cultures' yield decreased from **51%** in septic patients **before** antibiotics to **28%** in patients already **on antibiotics**.

Quick Poll

For resuscitation in septic shock, I use:

- A. pRBCs
- B. 0.9% Normal Saline
- C. IV Albumin
- D. Plasmalyte
- E. Lactated Ringer's
- F. D5-½ NS
- G. Just lower the MAP goal





13,347

Patients received $\geq 500\text{mL}$ isotonic crystalloids in ED and subsequently hospitalized outside an ICU



Balanced crystalloids
(Lactated Ringer's/Plasma-Lyte)
N=6,708



Isotonic crystalloids
(0.9% normal saline)
N=6,639



25



25

Hospital-free days
(OR 0.98; 95% CI, 0.92 to 1.04; P=0.41)

4.7%



Major kidney
adverse events

5.6%

(OR 0.82; 95% CI 0.70-0.95; P=0.01)



SALI-
ED
Trial

Quick Poll

When someone is hypotensive, I:

- A. Start vasopressors right away
- B. Fluid resuscitate 2-3 L & then press
- C. Fluid resuscitate, transfuse, & then press
- D. Transfuse right away
- E. POCUS, POCUS, more POCUS



2019

CENSER TRIAL

Early Use of Norepinephrine in Septic Shock Resuscitation

Phase II, randomized, double-blind, placebo-controlled



To assess if early low-dose norepinephrine in adults with sepsis with hypotension increases shock control by 6 hours compared with standard care.

310

Adults (18 years or older) who presented at the ED with hypotension determined by MAP lower than 65 mmHg and infection as the suspected cause



early
norepinephrine
(n = 155)

VS

standard
treatment
(n = 155)



PRIMARY OUTCOME

76.1

Achieved target MAP + tissue perfusion goal by 6 h
OR 3.4 95% CI (2.09–5.53), P <0.001

48.4

31.0

Achieved target MAP + urine output + lactate clearance >10% by 6 h
OR 2.13 95% CI (1.24–3.64), P=0.005

17.4

SECONDARY OUTCOME

15.5

Mortality at 28 d
OR 0.79 95% CI (0.53–1.11), P=0.15

21.9

Conclusion: Early norepinephrine was significantly associated with increased shock control by 6 hours. Further studies are needed before this approach is introduced in clinical resuscitation practice.

Quick Poll

At my institution, we are urged to abide by a:

- A. 3-hour sepsis bundle
- B. 1-hour sepsis bundle
- C. We don't use a sepsis bundle
- D. What is a sepsis bundle?





Initiate bundle upon recognition of sepsis/septic shock.

May not complete all bundle elements within one hour of recognition.

1

Measure lactate level.
Remeasure lactate if initial lactate elevated (> 2 mmol/L).

2

Obtain blood cultures before administering antibiotics.



3

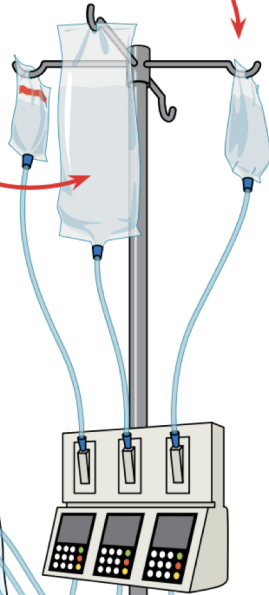
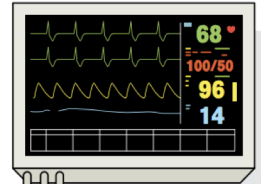
Administer broad-spectrum antibiotics.

4

Begin rapid administration of 30 mL/kg crystalloid for hypotension or lactate ≥ 4 mmol/L.

5

Apply vasopressors if hypotensive during or after fluid resuscitation to maintain a mean arterial pressure ≥ 65 mm Hg.



The
(Dreaded)
(Great)
(Impossible)
1-Hour
SSC
2018 Bundle

Slew of Articles Saying: Nope.

“Compliance with the 2018 Surviving Sepsis Campaign would require a **wholesale alteration** in the management of ED patients with either **vague symptoms or absence of triage hypotension.**”

A Spoonful of Citrus?



- ❑ Cocktail of thiamine, steroids, Vit C
 - ❑ **C 1500q6 + Hydrocort 50q6 + B1 200q12**

- ❑ 47 pts, 47 (retrospective) controls - **40% vs. 8.5% hospital mortality**

Hot Off the Presses! CITRIS-ALI

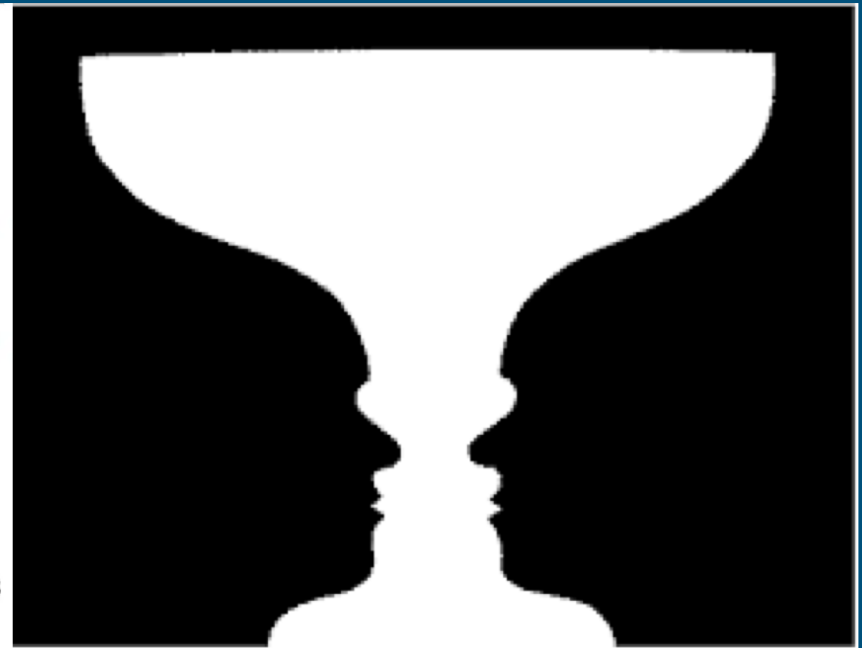
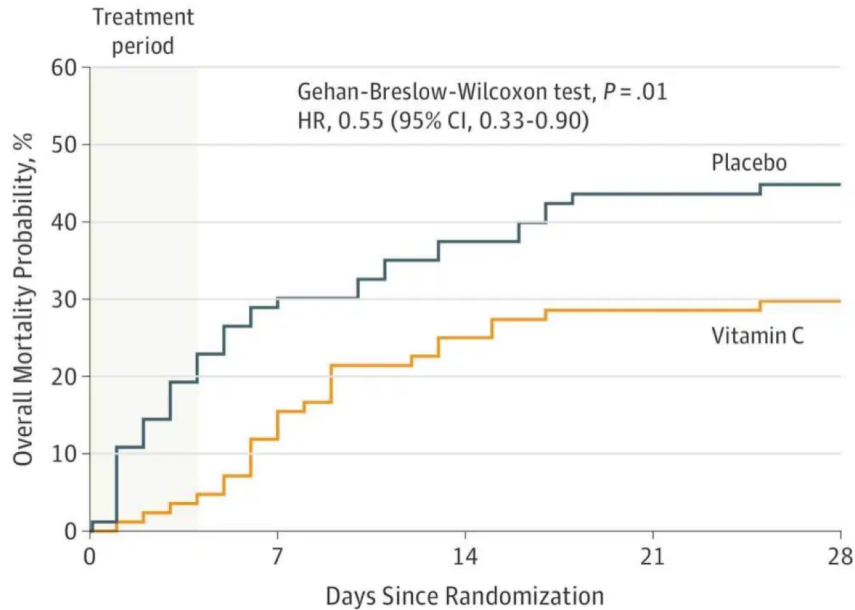


JAMA | **Preliminary Communication** | CARING FOR THE CRITICALLY ILL PATIENT

Effect of Vitamin C Infusion on Organ Failure and Biomarkers of Inflammation and Vascular Injury in Patients With Sepsis and Severe Acute Respiratory Failure The CITRIS-ALI Randomized Clinical Trial

- ❑ Multicenter, double-blind, placebo-controlled RCT of IV Vitamin C in Sepsis-Induced ARDS

A Negative Trial? A Positive Trial?



The Controversy Continues



- ❑ Mortality was secondary endpt, **NEGATIVE study for primary endpts**
 - ❑ Change in SOFA score
 - ❑ Biomarkers (CRP, thrombomodulin)

- ❑ Late initiation of Vitamin C (up to 48 hrs post-ARDS)
 - ❑ **Natural history?**
 - ❑ **Survivorship bias?**

Take Home Point

In sepsis, draw blood cx before Abx. Resuscitate with a balanced crystalloid solution (LR or Plyte). Avoid excessive fluidizing before moving to pressors. Bundles & checklists help. Vitamin C at least isn't harmful.

Roadmap for the Hour

Diagnosis and Management of Shock

Objectives:

2019 Updates in Dx of Sepsis

Sepsis Mimics

2019 Updates in Management of Sepsis

Non-Septic Shock Management Pearls

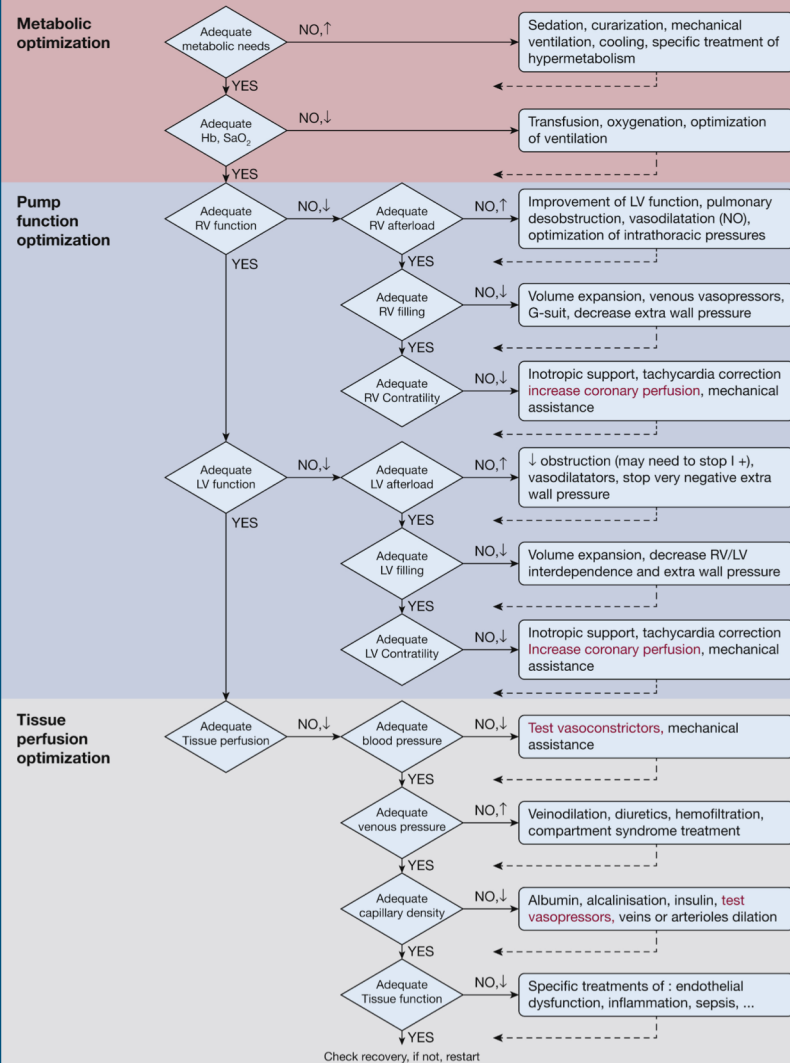
Post-Sepsis Care

The Complexity of Cardiogenic Shock

$$V = IR$$

$$MAP = CO \times SVR$$

1st Line Vasopressor: Norepi



The Complexity of Cardiogenic Shock

Metabolic optimization

Pump function optimization

Tissue perfusion optimization

The Complexity of Cardiogenic Shock

“The treatment of cardiogenic shock must be a compromise between the **best tissue perfusion** possible & the **lowest myocardial energy cost.**”

Take Home Point

Match vasopressors to your physiology. Even though norepi is first-line vasopressor for both cardiogenic & septic shock, mixed shock patients need layers of optimization.

Roadmap for the Hour

Diagnosis and Management of Shock

Objectives:

2019 Updates in Dx of Sepsis

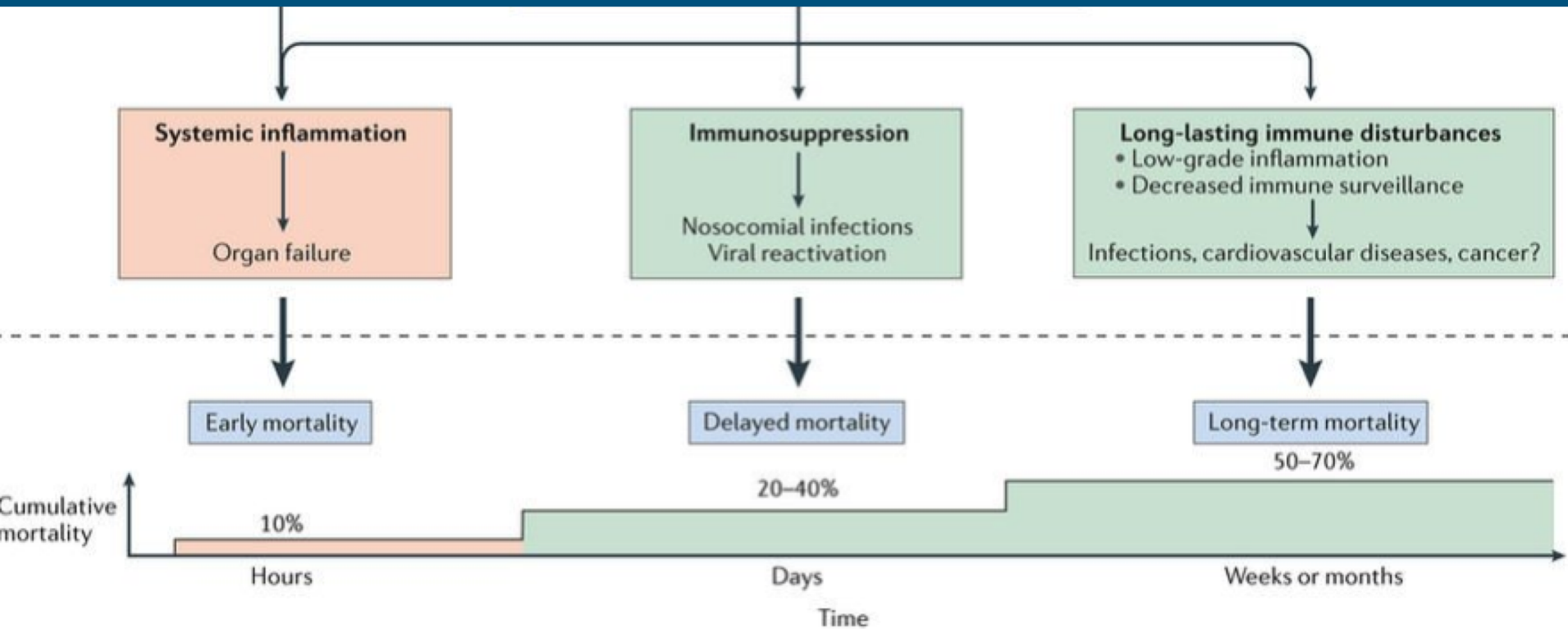
Sepsis Mimics

2019 Updates in Management of Sepsis

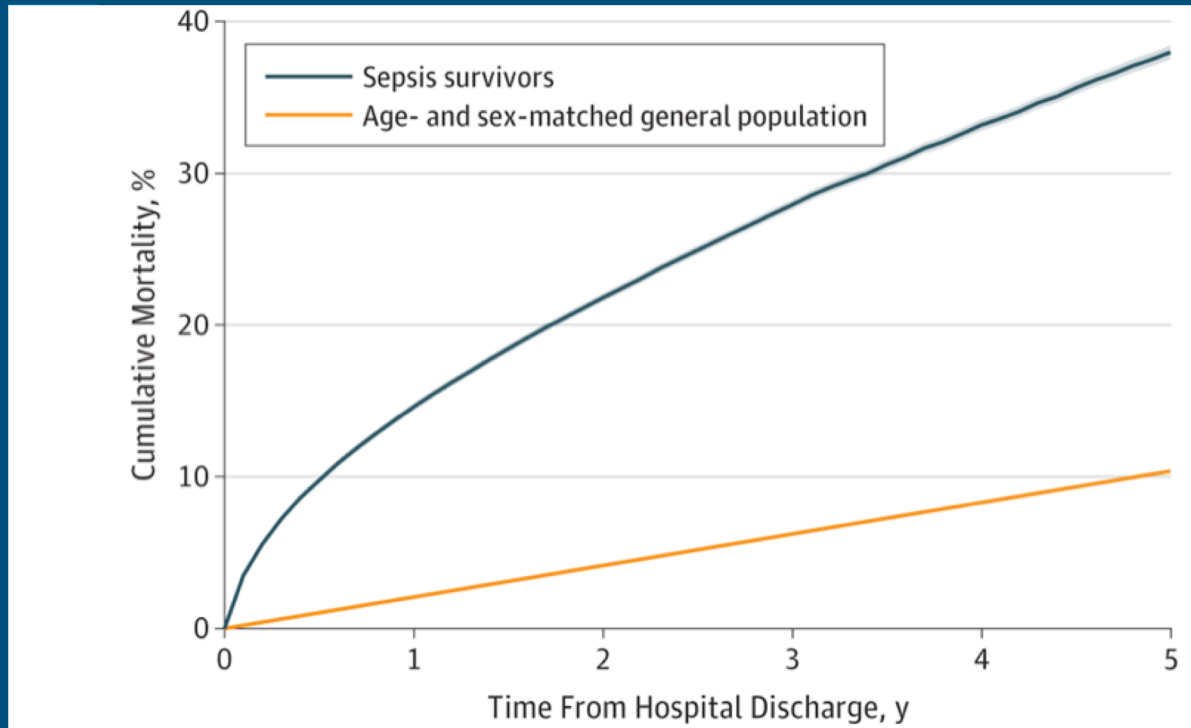
Non-Septic Shock Management Pearls

Post-Sepsis Care

Pathophysiology of Sepsis Mortality

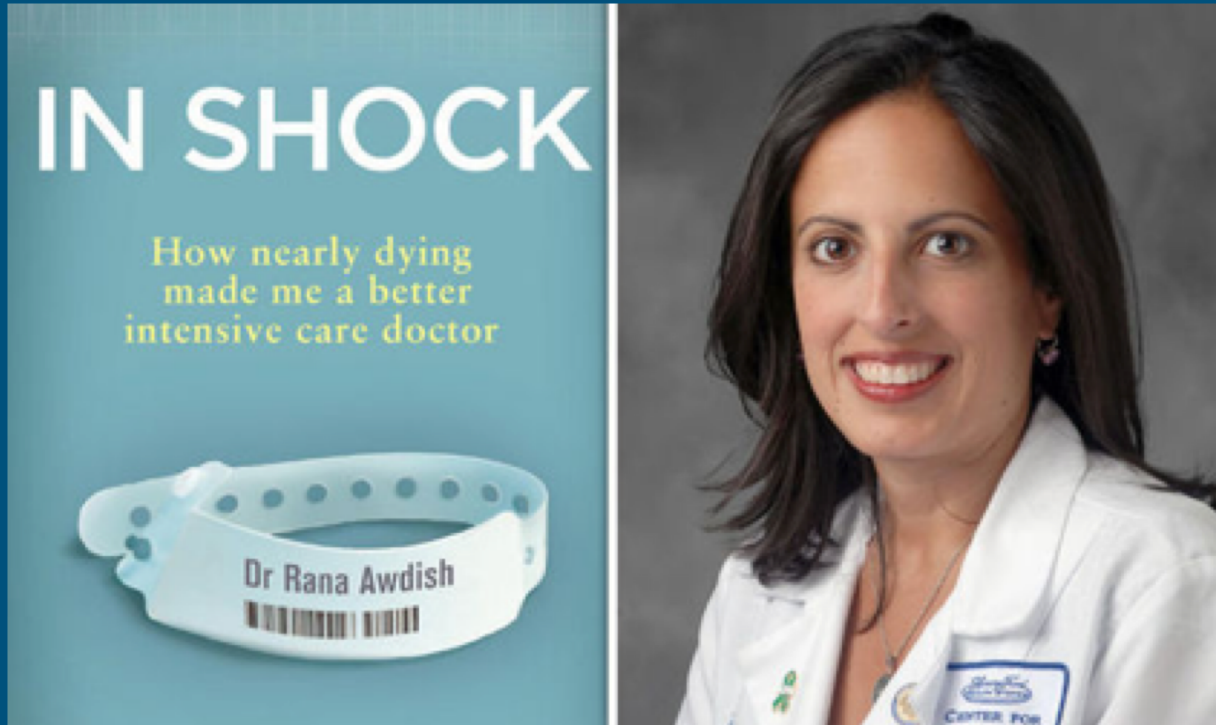


What about ACTUALLY “Surviving Sepsis?”



1 yr post-D/C,
15% of sepsis
survivors died
& **6-8%**
die/year over
the next 5 yrs.

The Most Practice-Changing Read on Shock



Take Home Point

[Video]

Take Home Points

- Diagnosis of sepsis remains challenging w/ nonspecific criteria – sticking with SIRS, sepsis, severe sepsis, septic shock for now
- Don't forget sepsis mimics, both common & uncommon
- 1-hour bundle is recommended but may be unrealistic
- May need to escalate to vasopressors earlier, titrate to physiology
- Long-term effects after surviving sepsis: post-ICU syndrome

Thank You!
Questions?

Lekshmi.Santhosh@ucsf.edu

@LekshmiMD