E·QUAL | EMERGENCY QUALITY NETWORK

Sepsis Wave II

Fluid and Pressors Management
Challenging Cases and Exceptions

TCPi | Transforming Clinical Practices Initiative

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

E·QUAL | EMERGENCY QUALITY NETWORK

Presenters

Tiffany Osborn, MD, MPH, FACEP

Laurence Dubensky, MD

TCPi | Transforming Clinical Practices Initiative

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

SEPSIS RESUSCITATION: CHALLENGING CASES AND EXCEPTIONS

MAY, 2017

LAURENCE DUBENSKY, MD
ASSISTANT PROGRAM DIRECTOR
RESIDENCY IN EMERGENCY MEDICINE

Aventura Hospital and Medical Center

DISCLOSURES:

- None

DISCLAIMER UPDATES:

- Verdict on fluids still pending
- Expert opinion replaced with growing evidence base
- See attached references

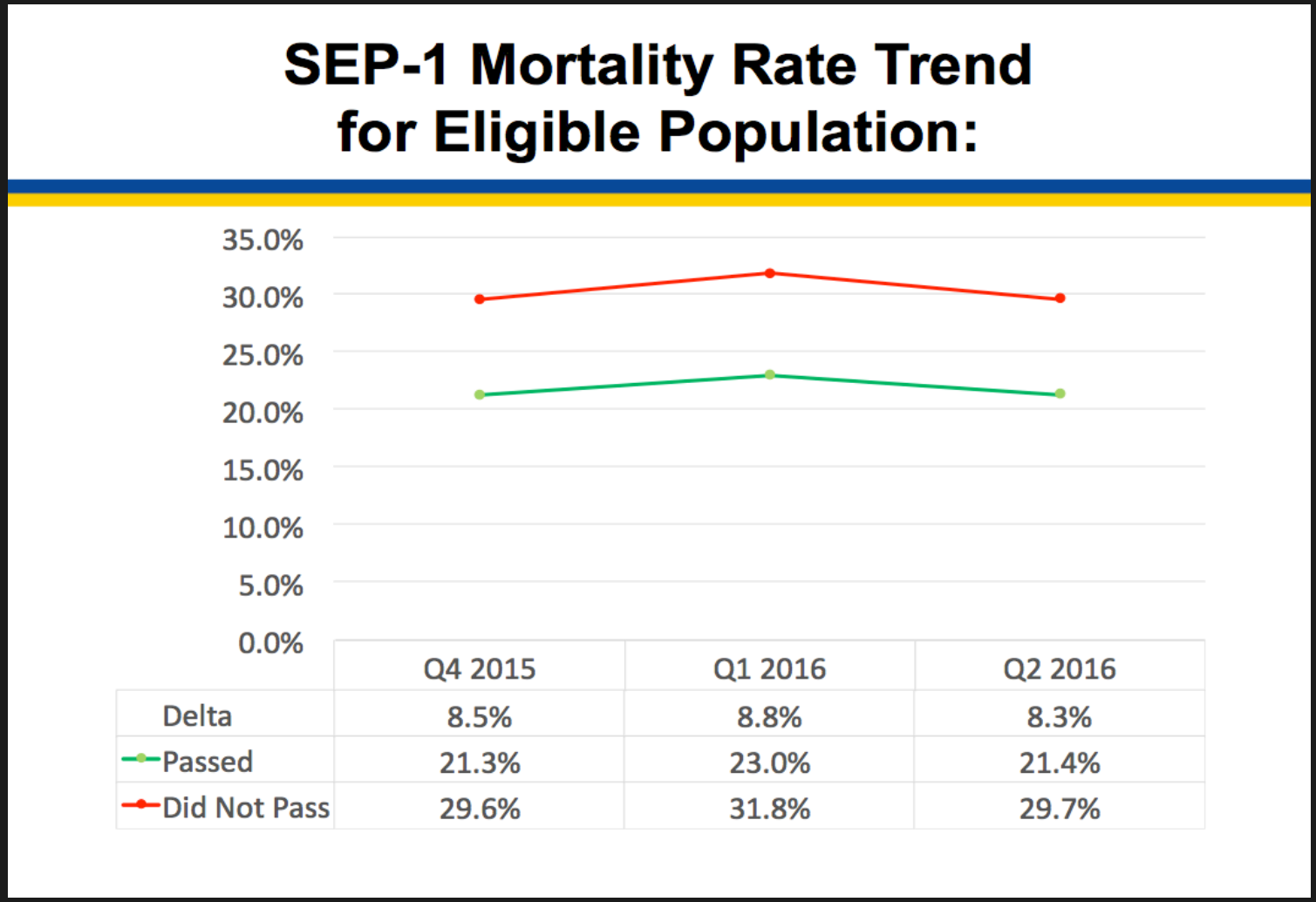
OBJECTIVES

- SEP-1 data review
  - Mortality and exclusions
- Surviving Sepsis Guidelines Update
- Evidence (or lack of) for liberal fluid use
- Thinking about precision medicine and patient centered care

- Attention to High Risk Populations
- Goals of Care

Chest. 2014 Jun;145(6):1407-18

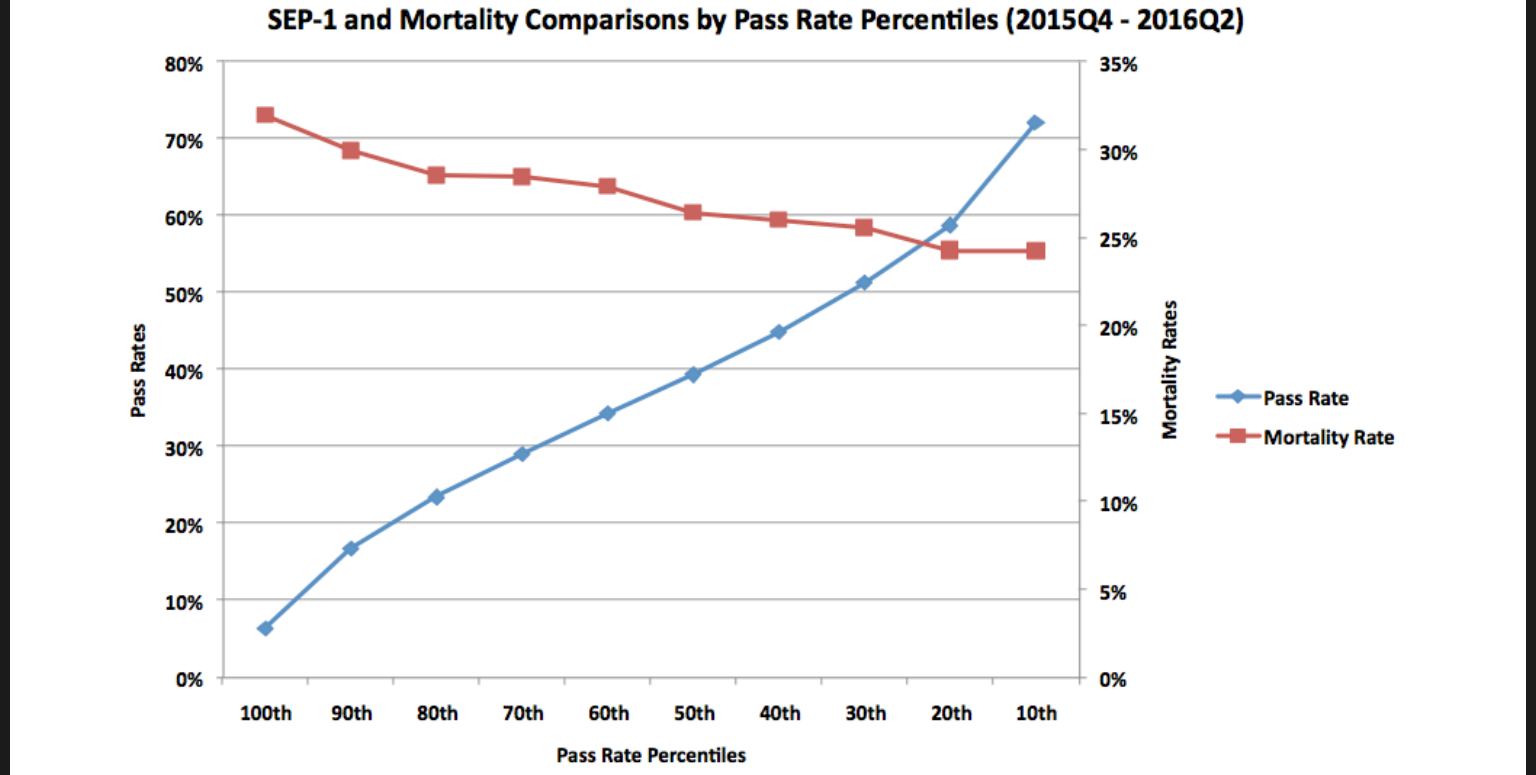
SEP-1 ACEP DATA



	Q4 2015	Q1 2016	Q2 2016
Delta	8.5%	8.8%	8.3%
Passed	21.3%	23.0%	21.4%
Did Not Pass	29.6%	31.8%	29.7%

SEP-1 ACEP DATA

SEP-1 and Mortality Comparisons by Pass Rate Percentiles (2015Q4 - 2016Q2)



Intensive Care Med (2017) 43:378–379
DOI 10.1007/s00134-017-4680-9

SPECIAL EDITORIAL

Practice guidelines as implementation science: the journal editors' perspective

Timothy G. Buchman[1*] and Elie Azoulay[2]

"As clinicians, we are bound to deviate from guidelines when such deviation is reasonably expected to improve an individual patient outcome. As clinical scientists, we are bound to evaluate the prevailing standard against emerging alternatives. These three imperatives are inseparable. We therefore caution against any quality metric or reimbursement policy that mandates slavish adherence to a particular recommendation."

SURVIVING SEPSIS CAMPAIGN GUIDELINES

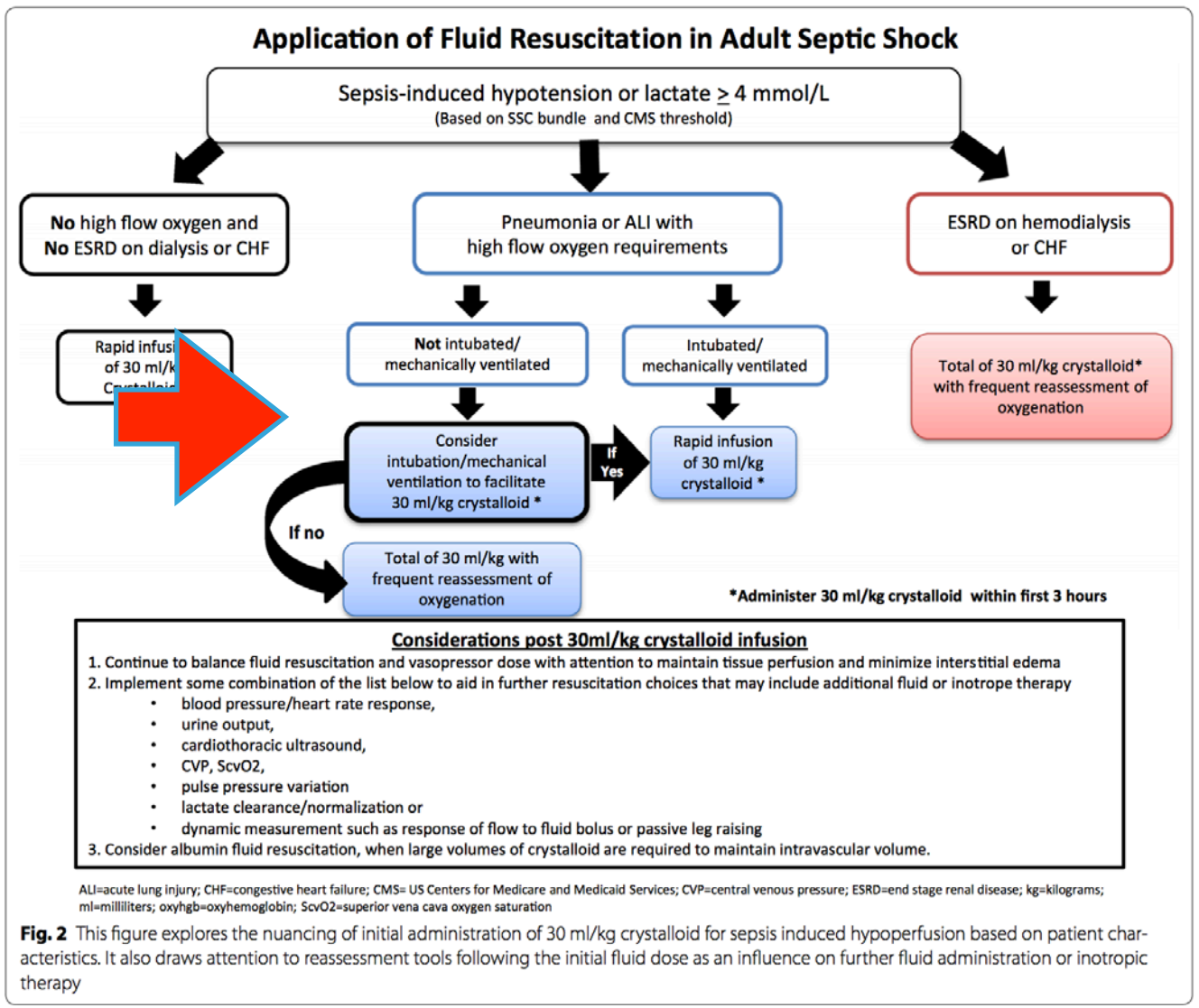


Fig. 2 This figure explores the nuancing of initial administration of 30 ml/kg crystalloid for sepsis induced hypoperfusion based on patient characteristics. It also draws attention to reassessment tools following the initial fluid dose as an influence on further fluid administration or inotropic therapy

Byrne and Van Haren *Ann. Intensive Care* (2017) 7:4
DOI 10.1186/s13613-016-0231-8

Annals of Intensive Care

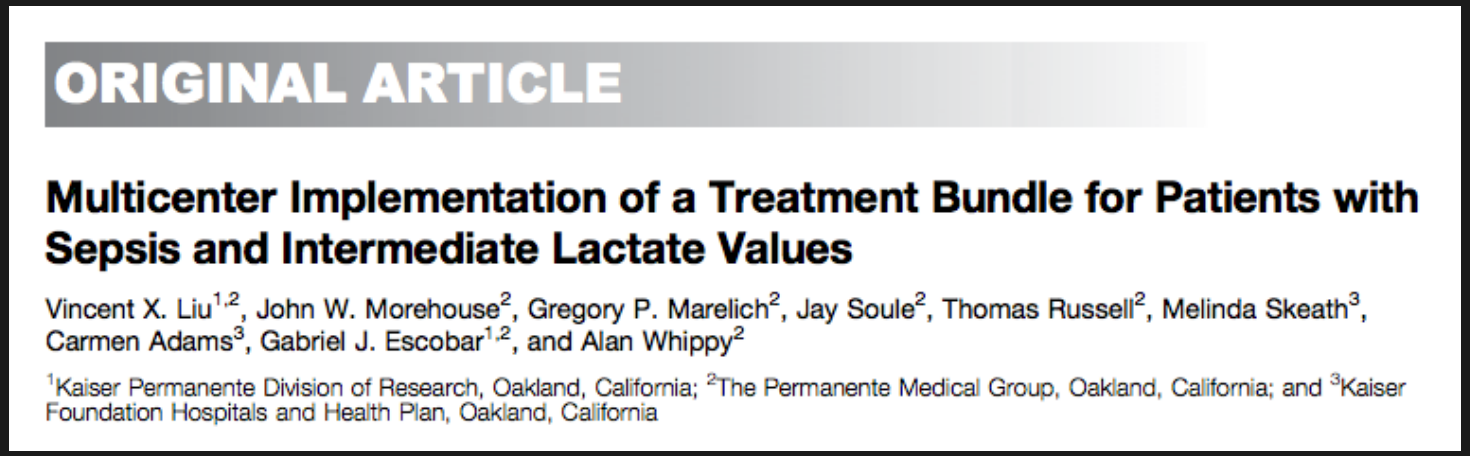
REVIEW Open Access

Fluid resuscitation in human sepsis: Time to rewrite history?

Liam Byrne[1,2*] and Frank Van Haren[1,2]

"Unfortunately, there is no agreed uniform definition of fluid resuscitation in the literature. Fluid administration is not necessarily the same as fluid resuscitation."

HEART FAILURE & ESRD



ORIGINAL ARTICLE

Multicenter Implementation of a Treatment Bundle for Patients with Sepsis and Intermediate Lactate Values

Vincent X. Liu[1,2], John W. Morehouse[2], Gregory P. Marelich[2], Jay Soule[2], Thomas Russell[2], Melinda Skeath[3], Carmen Adams[3], Gabriel J. Escobar[1,2], and Alan Whippy[2]

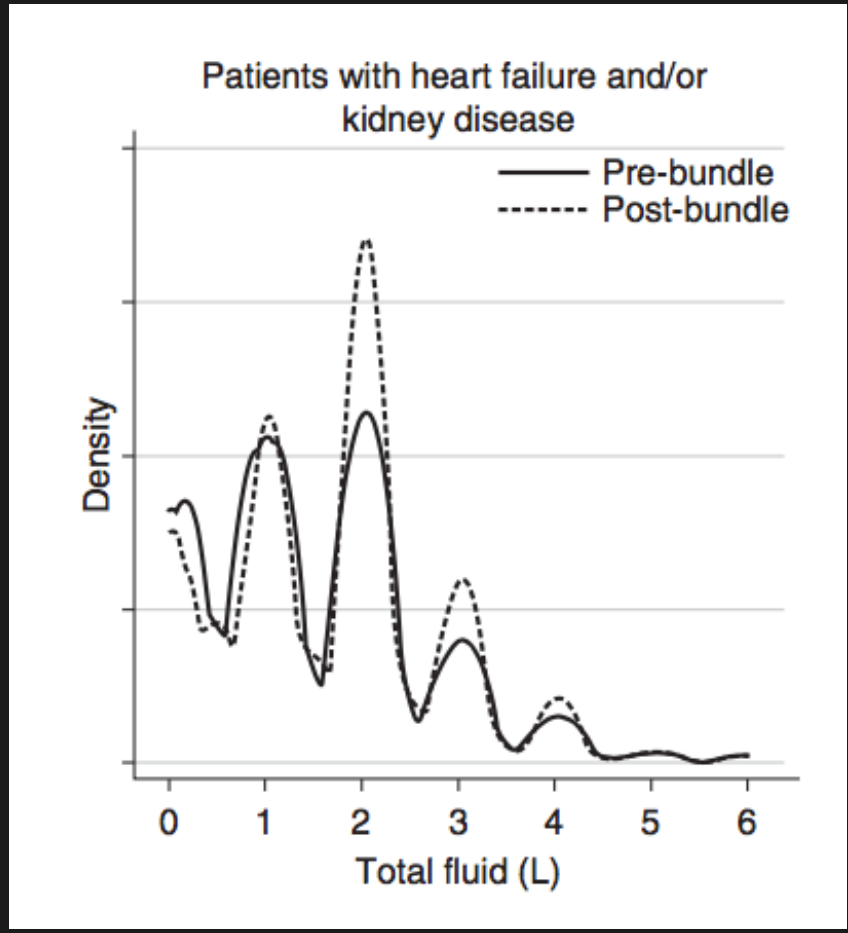
[1]Kaiser Permanente Division of Research, Oakland, California; [2]The Permanente Medical Group, Oakland, California; and [3]Kaiser Foundation Hospitals and Health Plan, Oakland, California

- 18,122 Patients with severe sepsis
- Evaluated bundle compliance effect on mortality
- Specific attention to “CHF” and “CKD”
- Article now cited as “supportive” of aggressive treatment

Am J Respir Crit Care Med Vol 193, Iss 11, pp 1264–1270, Jun 1, 2016

HEART FAILURE & ESRD

- Difference in fluid 0.3L
- Difference in mortality 3-4% (p<.01)
- Legitimate fluids in these patients?
- Misleading evidence given study population, definitions of CHF & CKD



Am J Respir Crit Care Med Vol 193, Iss 11, pp 1264–1270, Jun 1, 2016

EVIDENCE FOR FLUIDS?

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Time to Treatment and Mortality during Mandated Emergency Care for Sepsis

Christopher W. Seymour, M.D., Foster Gesten, M.D., Hallie C. Prescott, M.D., Marcus E. Friedrich, M.D., Theodore J. Iwashyna, M.D., Ph.D., Gary S. Phillips, M.A.S., Stanley Lemeshow, Ph.D., Tiffany Osborn, M.D., M.P.H., Kathleen M. Terry, Ph.D., and Mitchell M. Levy, M.D.

TIME TO TREAT:

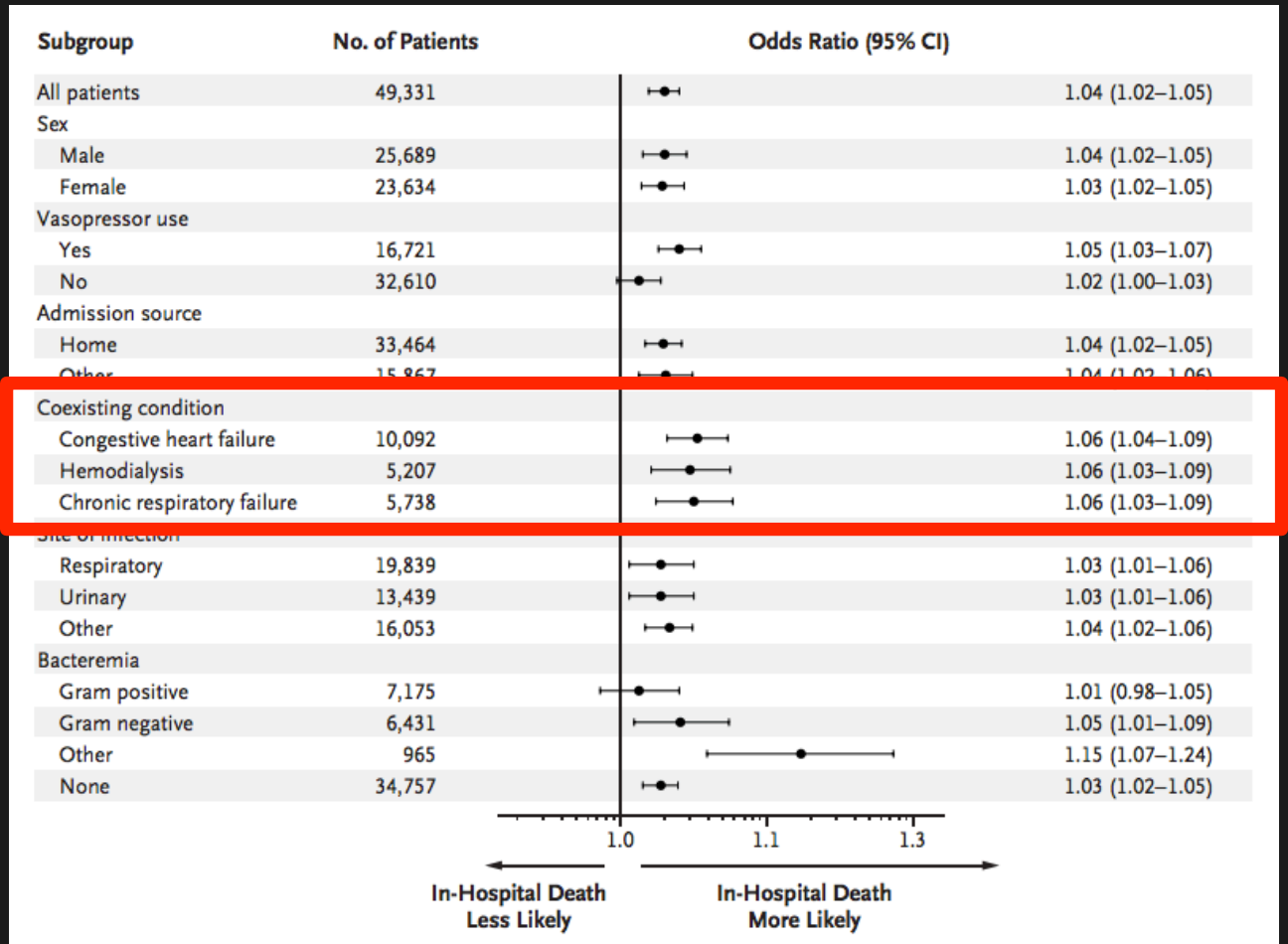
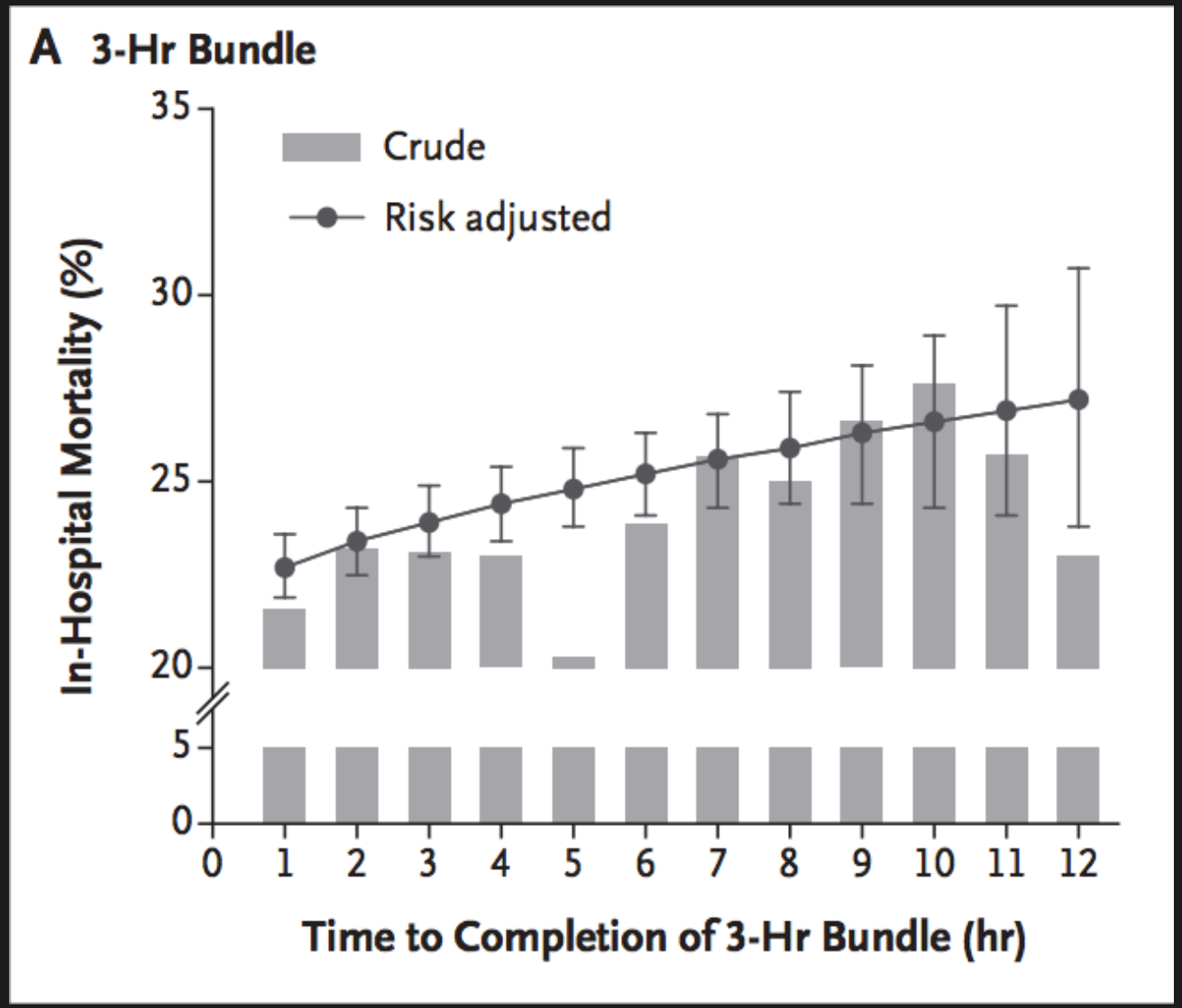
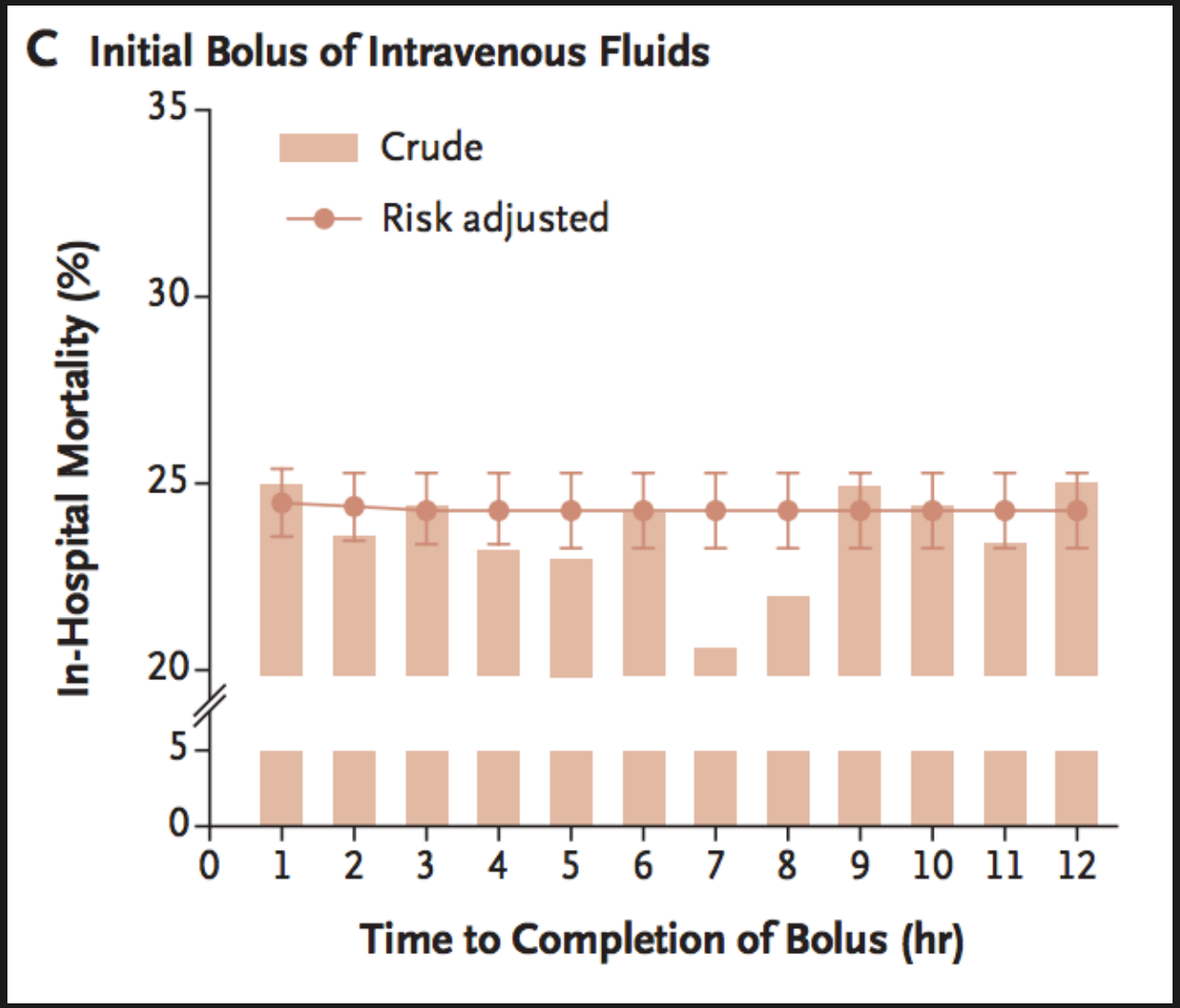


Figure 2. Risk-Adjusted Odds Ratios of In-Hospital Death in the Primary Model and Prespecified Subgroups.
Shown are odds ratios, with 95% confidence intervals, for in-hospital death for each hour that it took to complete the 3-hour bundle. Other site of infection includes gastrointestinal, skin, central nervous system, and unknown.

TIME TO TREAT:



TIME TO TREAT:



FLUID RESPONSIVENESS

REVIEW ARTICLE

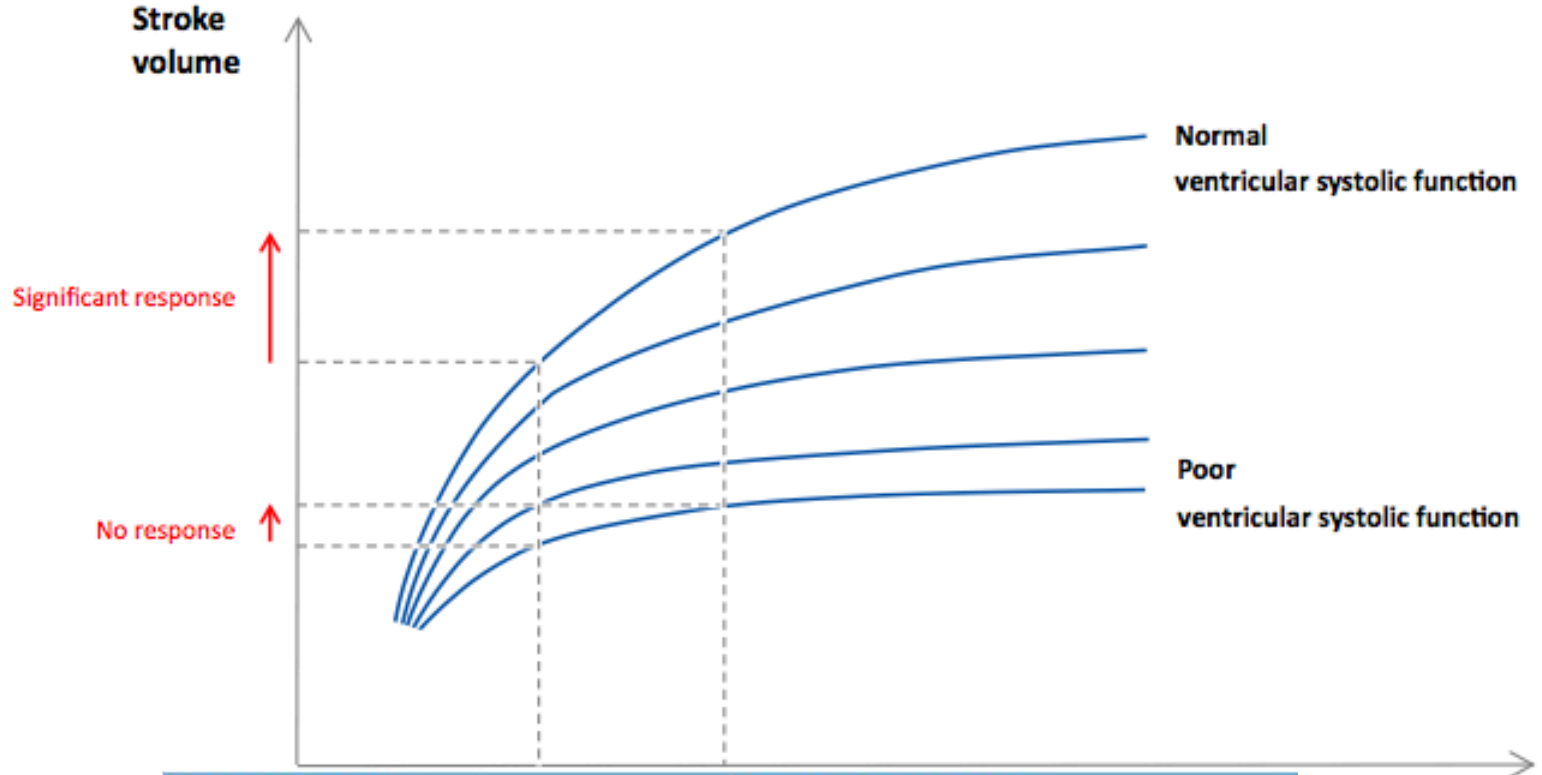
A rational approach to fluid therapy in sepsis

P. Marik[1,*] and R. Bellomo[2]

[1]Division of Pulmonary and Critical Care Medicine, Eastern Virginia Medical School, 825 Fairfax Av, Suite 410, Norfolk, VA 23507, USA, and [2]Intensive Care Unit, Austin Health, Heidelberg, Victoria, Australia

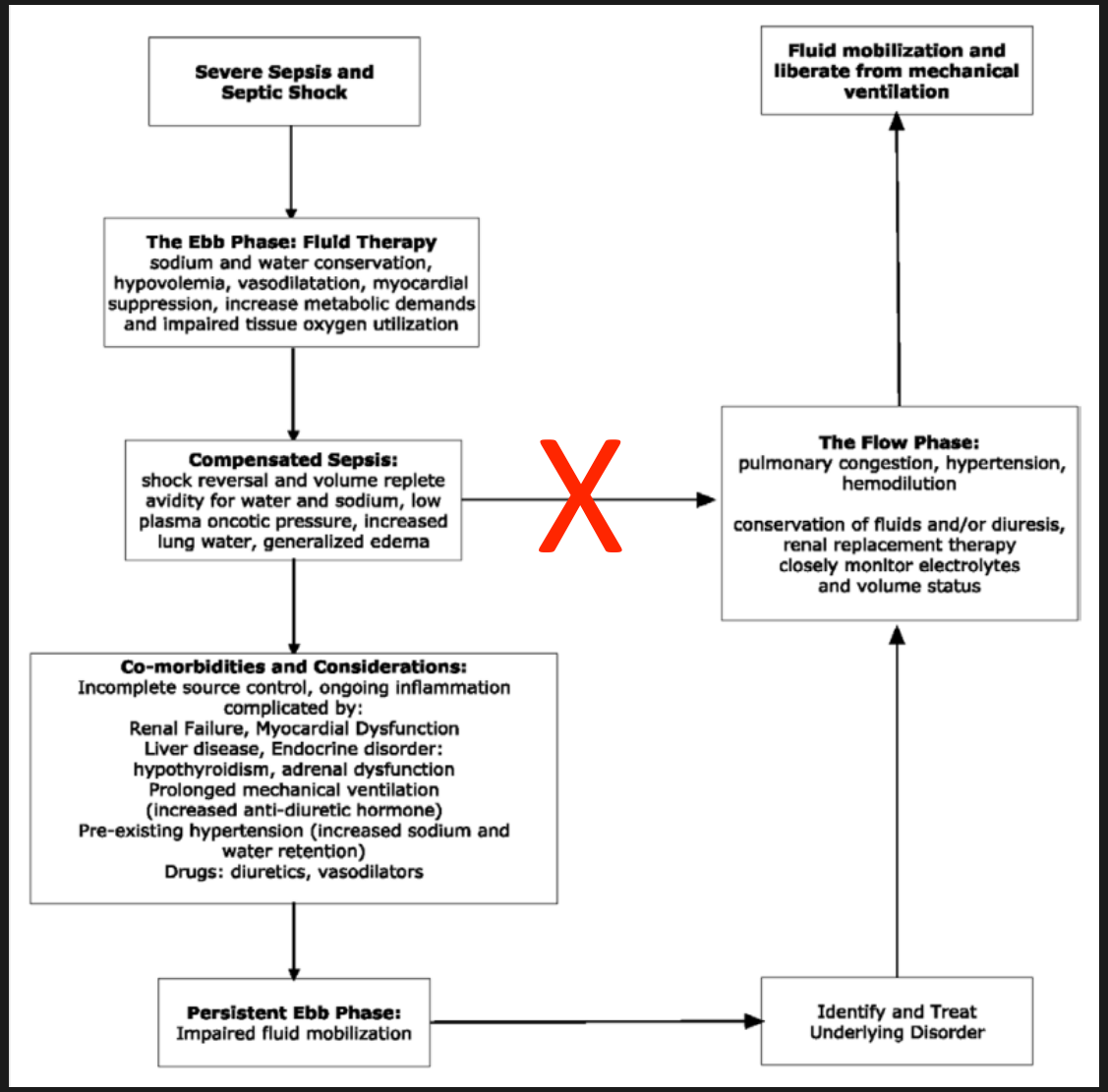
- Increase in SV by 10-15% in response to 250-500cc bolus
- Important to assess fluid tolerance and responsiveness before fluid loading
- Venous capacitance and myocardial dysfunction
- <40% of patients are fluid responders

FLUID



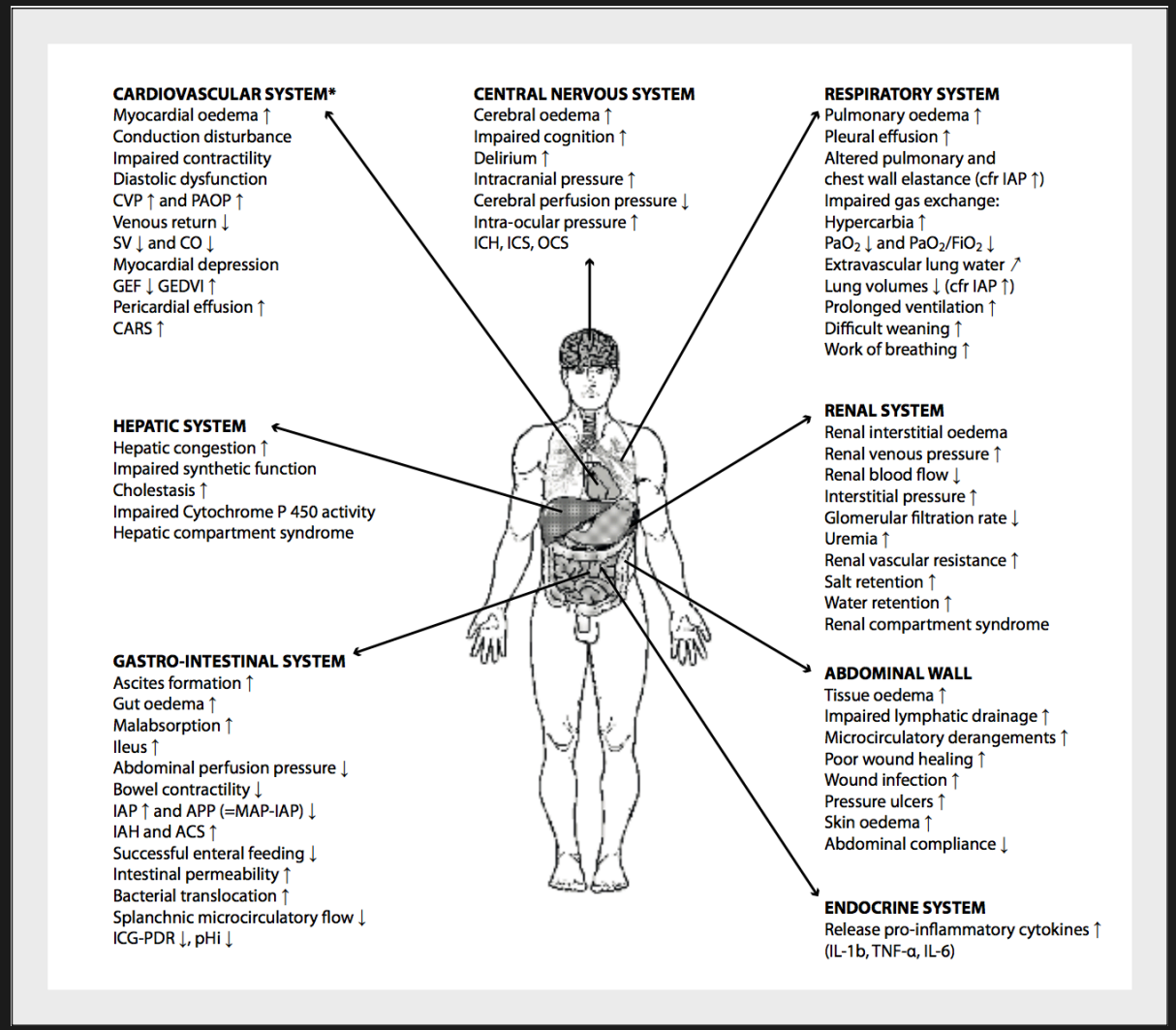
STATIC ASSESSMENT	DYNAMIC ASSESSMENT
Clinical endpoints (HR, Cap Refill, UO)	**Passive leg raise (PLR)**
CVP	**IVC / Lung POCUS**
CXR	**Pulse pressure variation**
Lactate / SvO2	**ECHO w/ VTI**

“THE EBB AND FLOW:” THOUGHTS ON DE-RESUSCITATION



Crit Care Med. 2016 Dec; 44(12): 2263–2269.

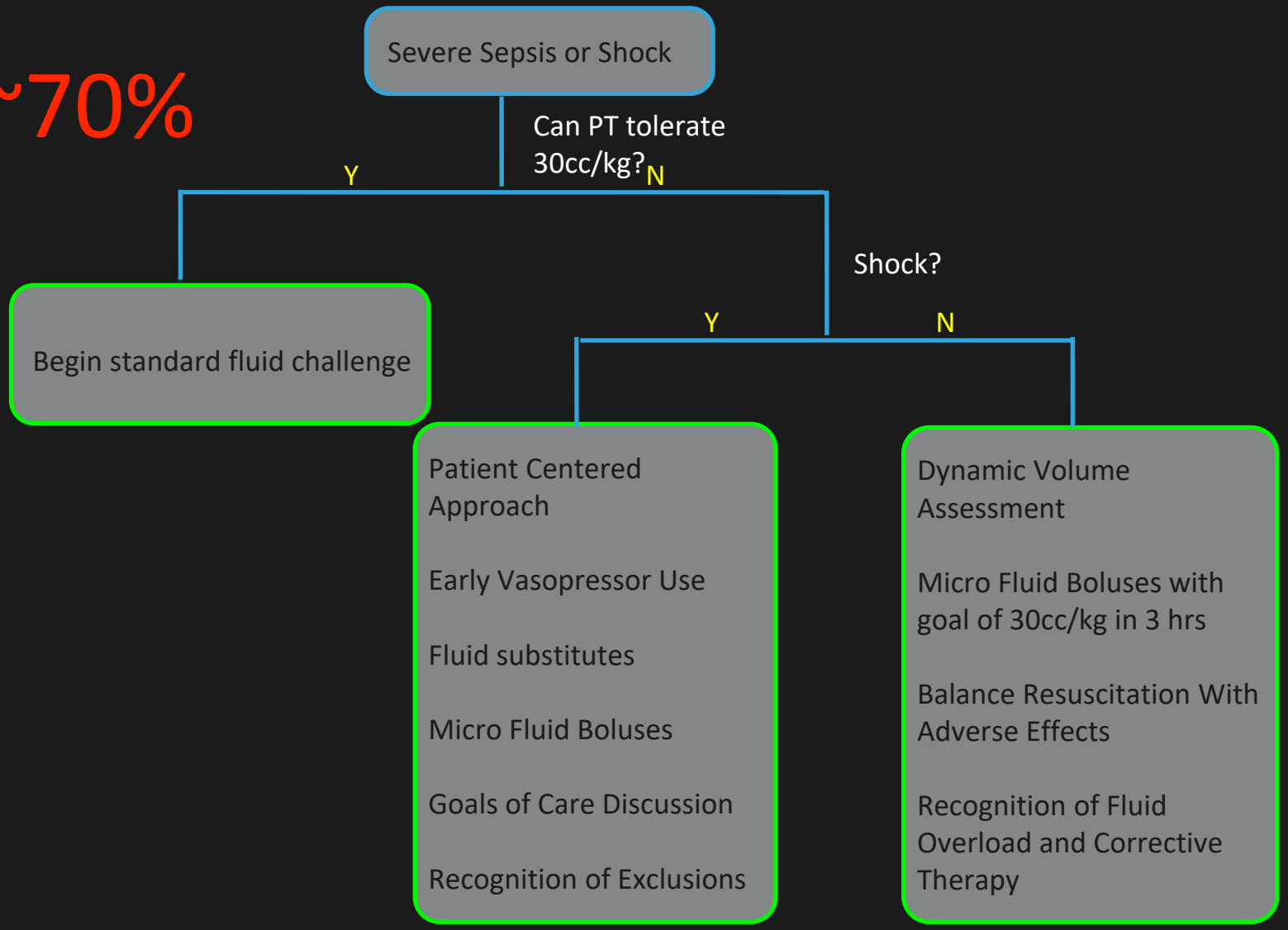
“SALT WATER DROWNING”



Anaesthesiol Intensive Ther 2014, vol. 46, no 5, 361–380

DECISIONS…

~70%



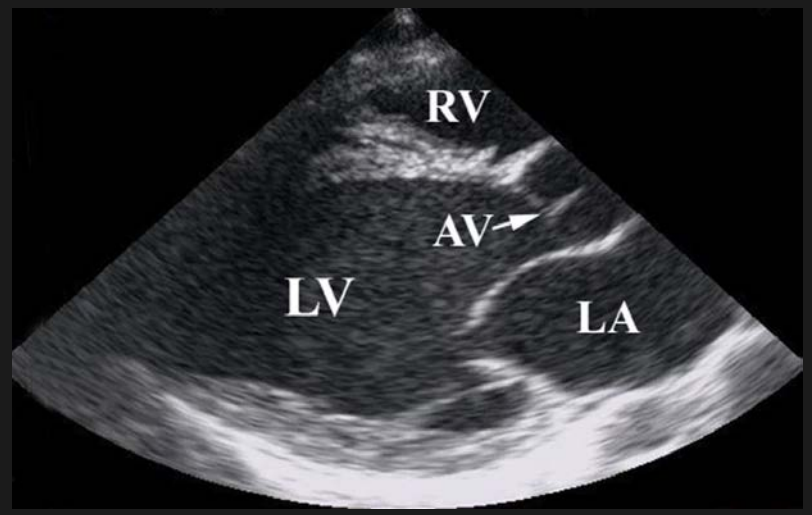
HEART FAILURE & PULMONARY HTN

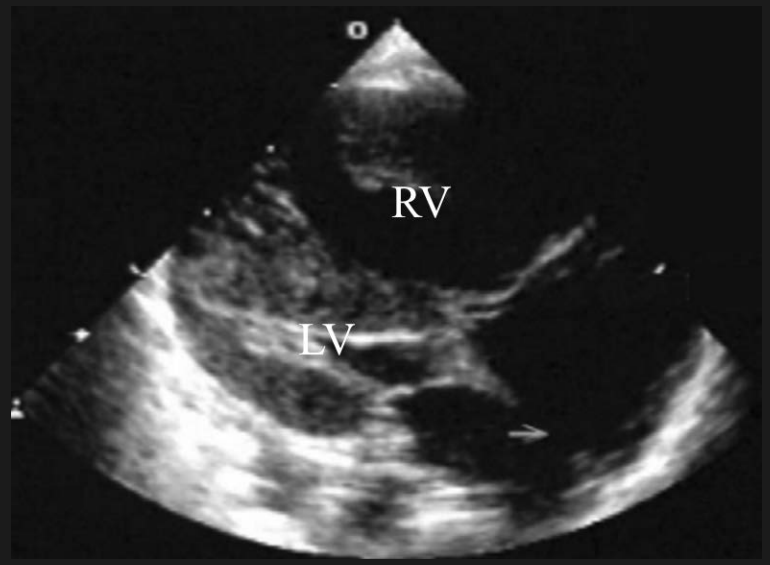
- Types of heart failure
  - Systolic vs diastolic
  - Left, right and biventricular
- Beside ECHO or recent ECHO is key
- Volume responsiveness
- Considerations in right heart failure and pulmonary HTN

Annals of the American Thoracic Society, Vol. 11, No. 5 (2014), pp. 811-822.

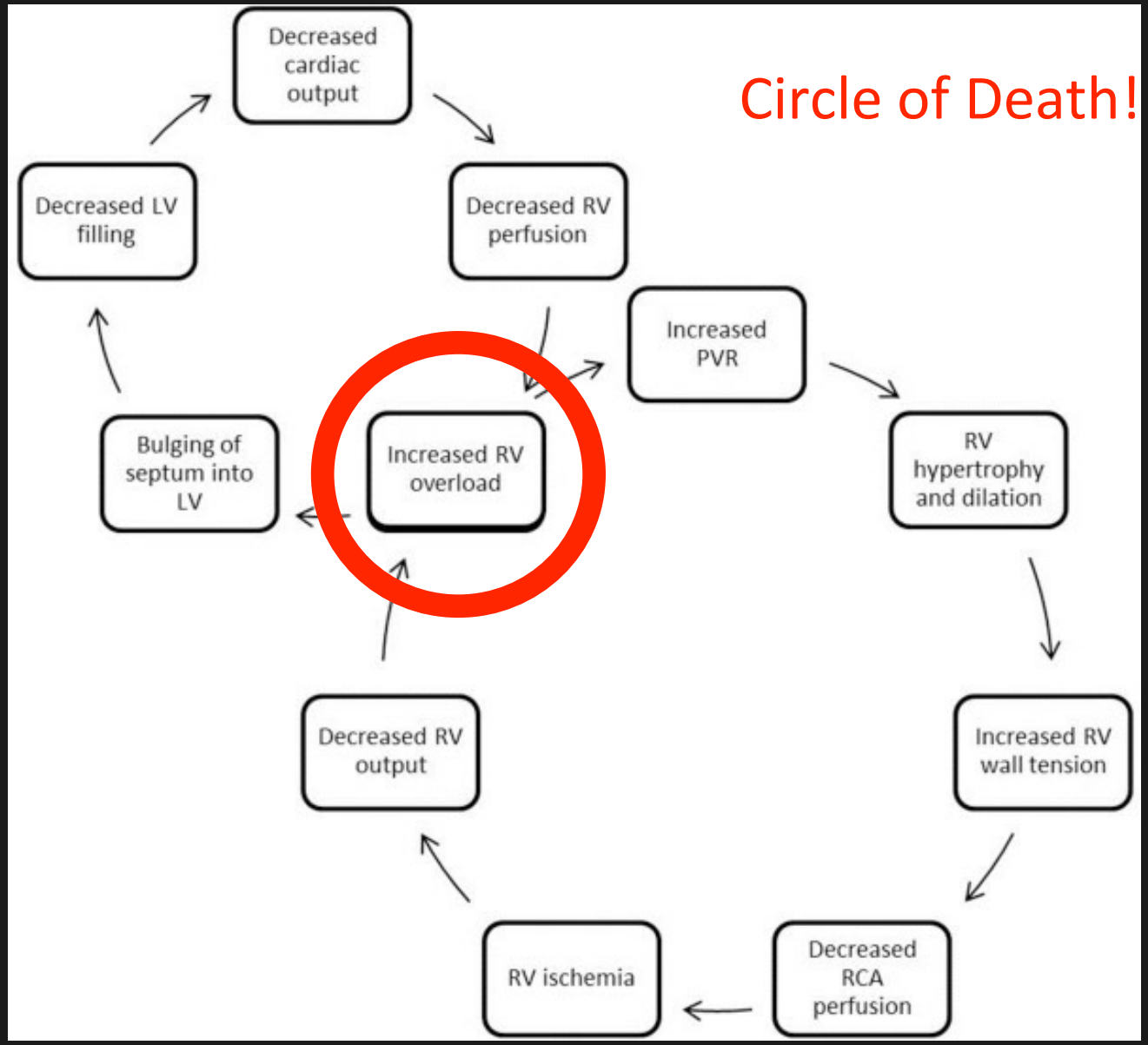
RIGHT HEART FAILURE & PHYSIOLOGY

- ECHO guided resuscitation
- LV only pumps what it receives
- Isolated right heart failure will not show “CHF” on CXR
- Does not respond well to aggressive fluid resuscitation
- Intubation is associated with increased mortality





Annals of Emergency Medicine , Volume 66 , Issue 6 , 619 - 628


Circle of Death!
Decreased cardiac output
Decreased RV perfusion
Increased PVR
RV hypertrophy and dilation
Increased RV wall tension
Decreased RCA perfusion
RV ischemia
Decreased RV output
Bulging of septum into LV
Decreased LV filling
Increased RV overload

RHF / PAH & SEPSIS

- Early vasopressors
  - Norepinephrine / Epinephrine
  - Vasopressin (pulmonary vasodilator)
    - Decrease RV afterload
- Dobutamine in isolation should be avoided (beneficial as combo therapy)
- Avoid phenylephrine
- May add iNO (even non ventilated patients), PDEi

RHF / PAH & INTUBATION

- Avoid at all costs
- Profound hemodynamic effects
  - Loss of sympathetic tone
  - Increased thoracic pressure
  - RSI medications
- Risks weighed against hypoxia & hypercarbia
- ARDS type management but low PEEP
- NIV is the better choice

RHF / PAH: SUMMARY

- Fluids are high risk
- Early pressors / inotropes / change HR on PPM
- Avoid hypoxia, acidosis, hypothermia
- Avoid intubation
- Pulmonary vasodilators
- ECMO / RVAD
- Goals of Care Discussions

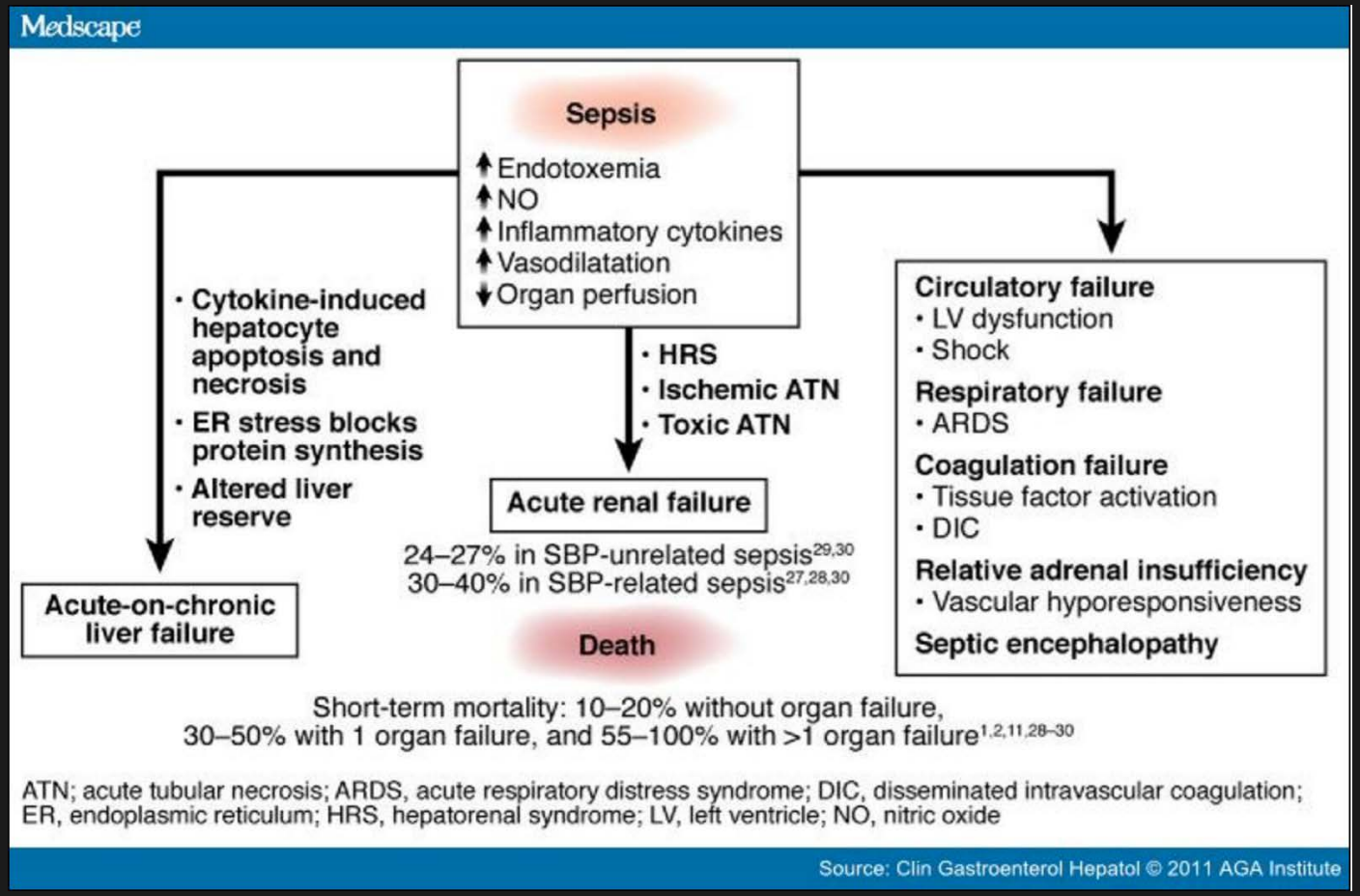
FLUIDS & END STAGE RENAL DISEASE

- Fluid limited / restricted
- Volume assessment / Intravascularly volume depleted
  - fragile volume status
- Choice of crystalloid (NS, LR, balanced)
  - Plasmalyte / Normsol
  - Avoid large volume NS

END STAGE RENAL DISEASE: SUMMARY

- Very sick population, high mortality
- Source control
- Fluid responsiveness essential
- Early vasopressors / Dobutamine
- NIV, High Flow O2 > ETT
- Consider: Avoiding NS as crystalloid (acidemia)

CIRRHOSIS / ACLD



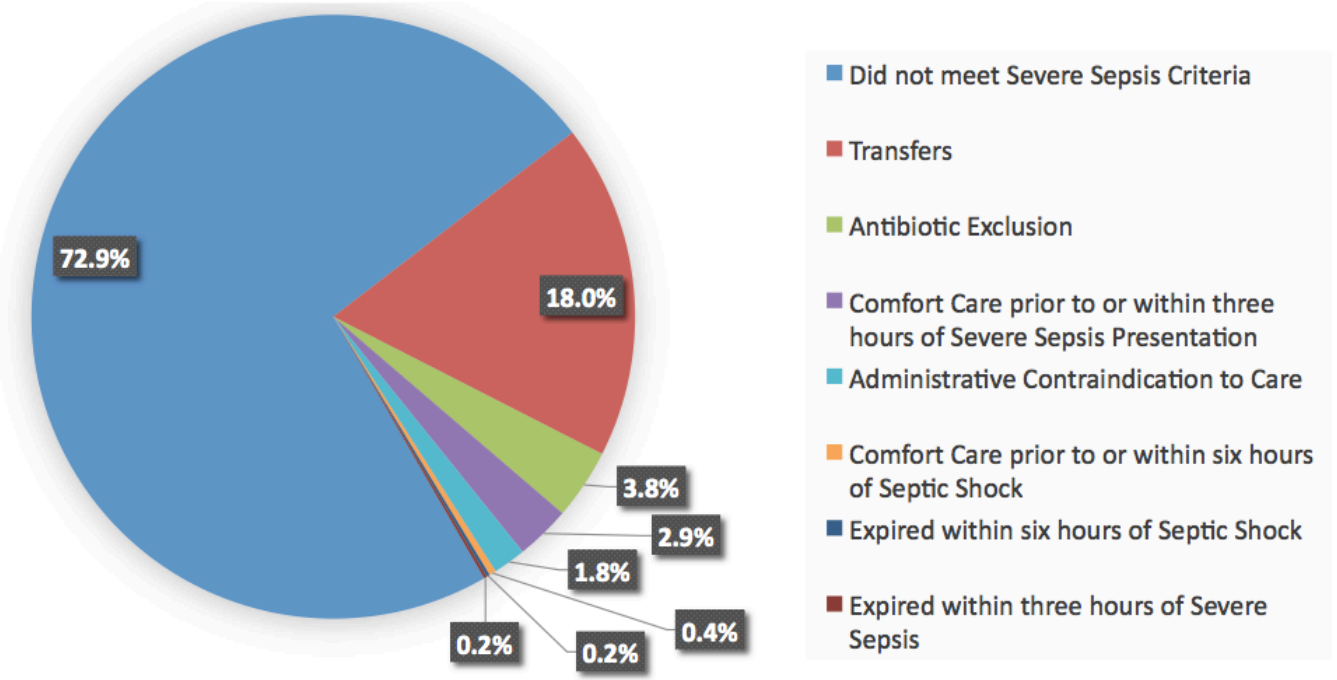
Clin Gastroenterol Hepatol. 2011;9(9):727-738

CIRRHOSIS : SUMMARY

- Very sick population, high mortality
- Fluid responsiveness essential
- Consider colloids (improve mortality, decrease AKI/RRT)
- Consider corticosteroids
- Early vasopressors / Vasopressin (hyporesponsive)
- Consider: Variceal bleeding & Abdominal Compartment Syndrome

GOALS OF CARE : HIGH RISK POPULATIONS

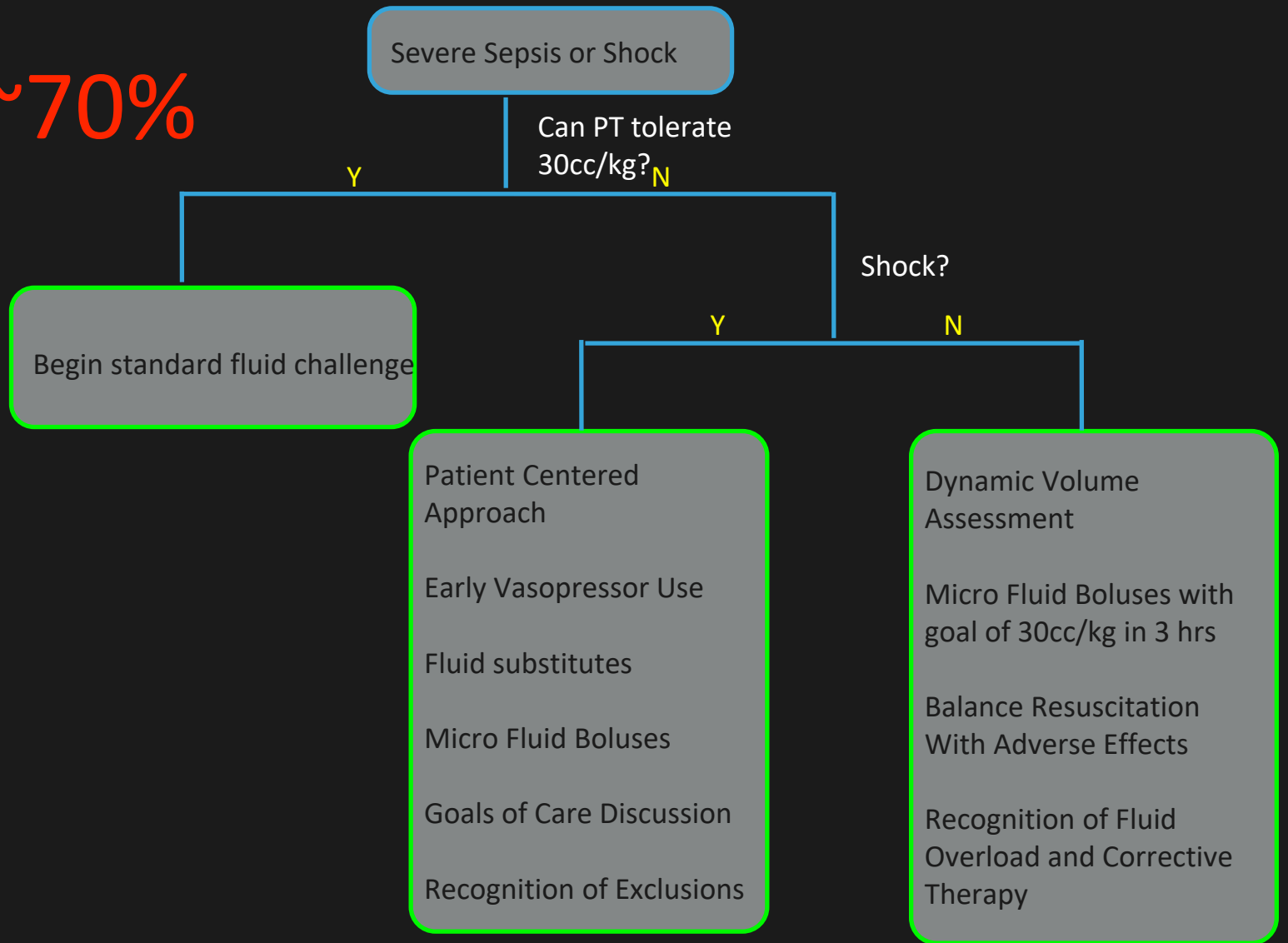
Breakdown of SEP-1 Exclusion Population:



Note: Cumulative data from October 2015 – March 2016

CLOSING STATEMENTS

~70%



FINAL THOUGHTS…

- Fluids are medications
- Become familiar with volume assessment
- Early pressors / inotropes
- Precision, patient specific management
- Avoid intubation / Use NIV
- Goals of Care Discussions

REFERENCES:

- 1. Effects of fluid resuscitation with colloids vs crystalloids on mortality in critically ill patients presenting with hypovolemic shock: the CRISTAL randomized trial. Annane D, Siami S, Jaber S, et al.JAMA. 2013;310:1809–1817.
- 2. The role of albumin as a resuscitation fluid for patients with sepsis: a systematic review and meta-analysis. Delaney AP, Dan A, McCaffrey J, Finfer S. Crit Care Med. 2011;39:386–391.
- 3. Association between initial fluid choice and subsequent in-hospital mortality during the resuscitation of adults with septic shock. Raghunathan K, Bonavia A, Nathanson BH, et al.Anesthesiology. 2015;123:1385–1393.
- 4. Avila, A. A., Kinberg, E. C., Sherwin, N. K., & Taylor, R. D. (2016). The Use of Fluids in Sepsis. *Cureus*, *8*(3), e528
- 5. Boyd JH, Forbes J, Nakada TA, Walley KR, Russell JA. Fluid resuscitation in septic shock: a positive fluid balance and elevated central venous pressure are associated with increased mortality. Crit Care Med. 2011;39(2):259–65.
- 6. Samoni S, Vigo V, Resendiz LI, Villa G, De Rosa S, Nalesso F, et al. Impact of hyperhydration on the mortality risk in critically ill patients admitted in intensive care units: comparison between bioelectrical impedance vector analysis and cumulative fluid balance recording. Crit Care. 2016;20:95.
- 7. Sadaka F, Juarez M, Naydenov S, O'Brien J. Fluid resuscitation in septic shock the effect of increasing fluid balance on mortality. J Intensive Care Med. 2013:0885066613478899.
- 8. Kelm, Diana J. et al. "Fluid Overload in Patients with Severe Sepsis and Septic Shock Treated with Early-Goal Directed Therapy Is Associated with Increased Acute Need for Fluid-Related Medical Interventions and Hospital Death." *Shock (Augusta, Ga.)* 43.1 (2015): 68–73. *PMC*. Web. 18 May 2017.
- 9. Malbrain, ML et al. "Fluid overload, de-resuscitation, and outcomes in critically ill or injured patients: a systematic review with suggestions for clinical practice. 9. Anaethesiol Intensive Ther. 2014 Nov-Dec;46(5):361-80.

E·QUAL | EMERGENCY QUALITY NETWORK

TCPi | Transforming Clinical Practices Initiative

American College of Emergency Physicians®

ADVANCING EMERGENCY CARE

E·QUAL | EMERGENCY QUALITY NETWORK

What's Next?

- Complete Sepsis Portal Activities
- Register for the June Webinar
  www.acep.org/equal
- Questions? Contact the E-QUAL team at equal@acep.org

TCPi | Transforming Clinical Practices Initiative

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE