

## Septic Shock: Update for the Anesthesiologist

### Discussion

Septic shock is a leading cause of morbidity and mortality in the United States and the most common cause of hospital death in non-coronary intensive care units. Septic patients are commonly encountered in the operating room and present a high-risk encounter for Anesthesiologists. Substantial data is available to help guide therapy for these patients and help Anesthesiologists improve patient care as part of the core perioperative team. In this presentation, we will discuss the current guidelines for care of these patients and the impact of recently published clinical trials.

### Learning Objectives

- 1) Discuss the epidemiology of sepsis and septic shock
- 2) Define terminology related to sepsis
- 3) Review the physiology of shock and the goals of resuscitation
- 4) Discuss changes to protocolized therapy based on the recent ProCESS and ARISE trials
- 5) Examine evidenced based guidelines for intraoperative therapy for septic shock

### Outline

#### I. Epidemiology (1995)

- a. Incidence of Severe Sepsis 750,000
- b. Mortality of Septic Shock 30%
- c. 9.3% of all deaths in the USA
- d. Cost \$17 billion annually

#### II. Definitions and Terminology

- a. SIRS – 2 or more of the following: Temp > 38/<36, HR > 90, RR > 20, WBC > 12k/< 4k
- b. Sepsis – SIRS + Confirmed or Suspected Infection
- c. Severe Sepsis – Sepsis + Organ Dysfunction
- d. Septic Shock – Sepsis + Shock (Hypotension s/p Fluid Bolus or Lactate < 4)

#### III. Shock Physiology

- a. Hypovolemic – dec CO, inc SVR, dec CVP
- b. Cardiogenic – dec CO, inc SVR, inc CVP
- c. Distributive/Vasodilatory
  - i. Pre-resuscitation - dec CO, dec SVR, dec CVP
  - ii. Post-resuscitation – inc CO, dec SVR, inc CVP

#### IV. Protocolized Therapy

- a. Since 2004, Surviving Sepsis guidelines based on specific protocols for resuscitation
- b. “ProCESS” and “ARISE” trials published in NEJM in 2014 demonstrate no change in outcomes as compared to usual (non-protocolized) bedside care
- c. Literature refutes uber-protocolized resuscitation policies, but does not disprove

importance of evidenced based bundles of care

#### V. Evidenced Based Treatment of Septic Shock

- a. Goal to restore effective circulatory flow and oxygen deliver
- b. Fluid Choice – Colloid versus Crystalloid
  - i. Colloid rationale – increases osmotic pressure and there decreases resuscitation volume and secondary complication of volume overload
  - ii. Albumin
    - a. Expensive, no apparent harmful effects except in head trauma
    - b. No clear benefit compared to crystalloids, but may have some value in treatment of extremely sick patients with septic shock
  - iii. Hydroxyethyl Starch (Hespan/Hextend/Voluven)
    - a. Expensive, concern for possible harm related to acute kidney injury, bleeding, anaphylactoid reactions, pruritis
- c. Fluid Choice – Crystalloids (Normal Saline vs Balance Solutions)
  - i. Normal Saline – leads to non-anion gap metabolic acidosis and possible worse outcomes
  - ii. Balanced Solutions (Normosol/Plasmalyte) – balanced and may improve outcomes as above
- d. Fluid Resuscitation Endpoints
  - i. No clearly defined easy to obtain endpoint
  - ii. CVP is not an accurate measurement of preload and volume status
  - iii. Pulse Pressure Variation helpful and can be obtained through “eyeball” analysis of arterial line tracing
  - iv. Consider using dynamic endpoints of therapy and trending physiologic and laboratory values (lactate, SvO<sub>2</sub>, HR, BP, UOP)
- e. Vasopressor Management
  - i. 1<sup>st</sup> Line – Norepinephrine, 2<sup>nd</sup> Line – Vasopressin
  - ii. Target MAP > 65 (must consider baseline BP)
- f. Antibiotics
  - i. Broad spectrum Gram Positive, Gram Negative, and ? Antifungal Coverage
  - ii. Must given as early as possible to improve outcomes
- g. Blood Transfusion
  - i. New evidence in “TRISS” trial for transfusion to maintain HGB > 7
  - ii. Lower transfusion threshold only leads to more blood product usage
- h. Sodium Bicarbonate
  - i. No evidence for use of bicarbonate therapy for pH > 7.15
  - ii. pH < 7.15 is not well studied
- i. Steroids
  - i. Consider steroids for vasopressor refractory shock (2 or more vasopressors)
  - ii. Dose is Hydrocortisone 50mg q6h