Sepsis in Fifteen Minutes

Summer School 2011

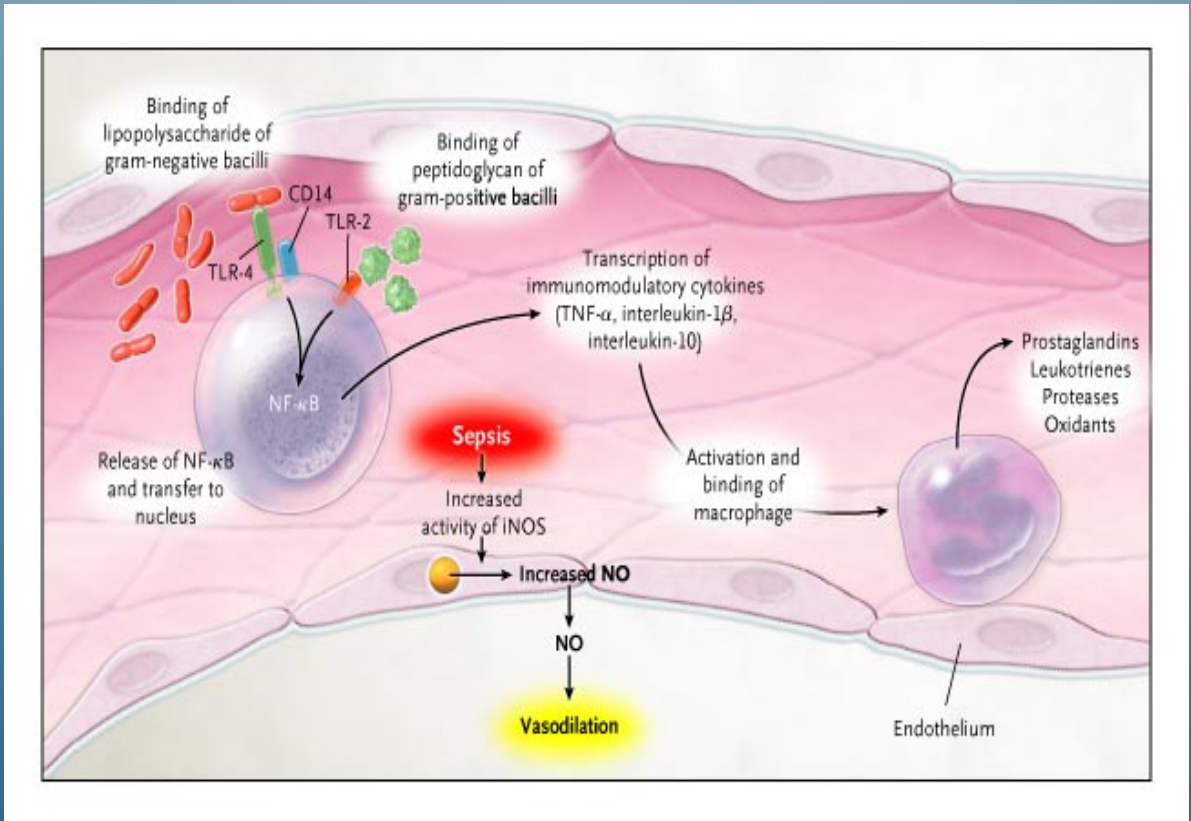
Carmelle Romain

PGY-3

What is Clinical Sepsis?

- A medical condition that is characterized by a whole body inflammatory state and the presence of a known or suspected infection
- In the United States, it is the 2nd leading cause of death among ICU patients
- It accounts for 2% of all hospitalizations and 25% of all ICU bed utilizations

Sepsis at the Molecular Level…



Case Presentation

- 55 y/o male s/p some bowel resection by some surgeon at some outside hospital some time ago
- Hospital course complicated by anastomotic leak requiring washout and diversion, ARF, pneumonia, UTI, and multiple line infections
- Transferred late one Saturday night as a direct admission to the SICU (EGS)
- Vitals: T: 102 HR: 120 BP: 90/50 RR: 31 O2sat: 91%

Critical Care

SIRS

- **Systemic Inflammatory Response Syndrome:**
  - An inflammatory state involving the whole body frequently in response to infection
  - Criteria:
    - Body temperature < 36^{o} C or > 38^{o} C
    - HR > 90
    - RR > 20 or pCO2 < 32
    - WBC < 4000 or > 12000 or the presence of > 10% bands
- SIRS can be diagnosed when two or more of the criteria are present

Fun Sepsis Equations

- **SIRS** + infection source = SEPSIS
- **Sepsis** + organ dysfunction = SEVERE SEPSIS
- **Sepsis** + refractory hypotension = SEPTIC SHOCK
- **Sepsis** + lack of a line + lack of fluids + 24 G PIV = MICU!!!

Why Do I Care about Fun Sepsis Equations?

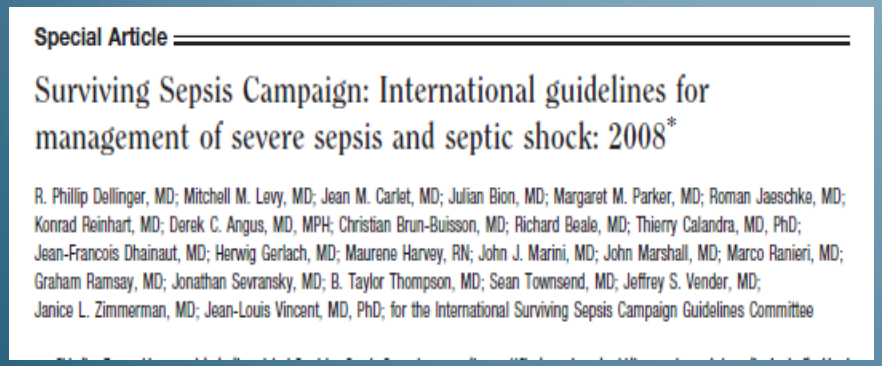
- More than 750,000 patients develop **severe sepsis** each year in North America
- 175,000 people die from sepsis each year
- People with **severe sepsis** are 35% more likely to die in the hospital than patients with uncomplicated sepsis
- Patients with **septic shock:** 50% hospital mortality rate
- Important to **recognize** these patients **early and treat** them appropriately

Early Identification and Source Control

- How to recognize the septic patient:
  - Changes in vital signs (i.e. SIRS criteria)
  - Mental status changes
  - Lab work abnormalities

- Sources of Infection:
  - Lungs
  - GI
  - Urinary Tract
  - Skin (i.e. central lines)
  - CNS
  - MSK

The Surviving Sepsis Campaign



Special Article

Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock: 2008*

R. Phillip Dellinger, MD; Mitchell M. Levy, MD; Jean M. Carlet, MD; Julian Bion, MD; Margaret M. Parker, MD; Roman Jaeschke, MD; Konrad Reinhart, MD; Derek C. Angus, MD, MPH; Christian Brun-Buisson, MD; Richard Beale, MD; Thierry Calandra, MD, PhD; Jean-Francois Dhainaut, MD; Herwig Gerlach, MD; Maurene Harvey, RN; John J. Marini, MD; John Marshall, MD; Marco Ranieri, MD; Graham Ramsay, MD; Jonathan Sevransky, MD; B. Taylor Thompson, MD; Sean Townsend, MD; Jeffrey S. Vender, MD; Janice L. Zimmerman, MD; Jean-Louis Vincent, MD, PhD; for the International Surviving Sepsis Campaign Guidelines Committee

- 55 international experts in sepsis meet in 2004 and publish recommendations as to the treatment of sepsis
- Recommendations were revised again in 2008

The Bundle Concept

- A “bundle” is a group of therapies for a given disease when implemented together may result in better outcomes than if implemented individually
- Goal of the campaign:
  - For hospitals to use the bundles to create customized protocols and pathways
  - Improve patient outcomes

The Resuscitation Bundle

- Eight goals that need to be accomplished within the **first six hours** of onset of severe sepsis or septic shock
  1. Measure serum lactate
  2. Obtain blood/urine cultures prior to abx*
  3. Broad spectrum antibiotics (within the first hour)
  4. Treatment of hypotension or ↑ lactate with fluids
  5. Vasopressor use to keep MAP ≥ 65
  6. Maintain CVP 8 - 12
  7. SvO2 > 70
  8. Urine output 0.5 cc/kg/hr

The Sepsis Management Bundle

- Other adjuncts that need to be considered after the onset of severe sepsis or septic shock:
  - Steroids
  - Xigris
  - Blood product administration

Vasopressors

- First line agent
  - Norepinephrine (levophed)*
    - Vasopressin may be added as an additional agent
  - Dopamine

- Second line agents
  - Epinephrine (alpha & beta agonist)
    - ↓ splanchnic circulation and tachycardia
  - Phenylephrine (pure alpha)
    - ↑ afterload (decreases stroke volume)

Corticosteroids

- Refractory hypotension (i.e fluid resuscitation and vasopressors)
- Consider performing cort stim test
  - Cortiol level difference of ≤ 9 is diagnostic of relative adrenal insufficiency and patients should be placed on IV steroid therapy
- Hydrocortisone is the preferred choice

Recombinant Human Activated Protein C (Xigris)

- Serine protease
- Anti-thrombotic (by inhibiting Va and VIIIa factors), anti-inflammatory, and pro-fibrinolytic properties
- Should be considered for septic shock, APACHE score ≥ 25 and no contraindications exist
  - PROWESS: RCT that examined 1690 patients with septic shock and demonstrated 6.1 % absolute reduction in mortality

Blood Product Administration

- Transfuse for hemoglobin ≤ 7.0
- Red cell transfusion in septic patients does increase tissue oxygen delivery but does not usually increase oxygen consumption
- Fresh frozen plasma should not be given unless the patient shows clinical signs of bleeding or clotting disorder

Vent Management

- Targets for sepsis induced ALI/ARDS
  - Tidal volume of 6 ml/kg
  - Inspiratory plateau pressures ≤ 30
  - Set PEEP to avoid alveolar collapse, usually ≥ 5
- No single vent mode has been shown to be more advantageous than the others

Invasive Monitoring

- Vascular access
  - Central venous catheters (TLC or MAC)
    - Advantages (CVP, Drugs, Labs)
    - Disadvantages (Complications, Infection)
- Arterial lines
  - Titrate vasopressor therapy to goal MAP
- Pulmonary Arterial Catheters (“swan”)
  - Cardiac output/index, EDV, SVO2
    - SVRI
  - www.pacep.org
- Foley catheter

Don’t Forget the Small Stuff…

- Bicarbonate therapy only should be used in patients with pH < 7.15
- DVT prophylaxis = YES!
- Glucose levels should be targeted for < 150 and ideally 100-150
- Stress ulcer prophylaxis = YES!

Take Home Points

- Sepsis kills….
- Early identification & source control
  - Key to survival
- Access and monitoring
- Rescusitation Bundle
  - Accomplished in the first 6 hours
  - Intravenous fluids ± vasopressors
  - Broad spectrum antibiotics (within 1st hour)
  - Endpoints (CVP, MAP, UOP, SVO2)
- Severe sepsis/Septic shock
  - Steroids, Xigris, blood (i.e. phone a friend time)