SEPSIS: FROM SIRS TO SEPTIC SHOCK

Patrick C. Cullinan, DO, FACOI
Director, Intensivist Program
Metropolitan Methodist Hospital
San Antonio, TX
OBJECTIVES

• Define sepsis syndrome
• Review the physiology of the SIRS spectrum
• Evaluation of the adult with suspected sepsis
  – History
  – Physical exam
  – Differential
  – Labs and diagnostics
• Special considerations
CASE STUDY

- 69 yo male admitted to the hospital for SOB
- PMHx: DM, HTN, CAD, COPD
- Meds: Metformin 500 mg BID, lisinopril 40 mg daily, atorvostatin 40 mg daily, ASA 81 mg daily, Tiotropium 2 puffs daily, Advair 1 puff twice daily
- FHx: mother with type 2 diabetes, younger brother with asthma.
- SHx: Tobacco use 1/2 ppd x 40 years. No recent travel
SEPSIS SYNDROME

SIRS – vasodilation, leukocytosis, microvascular permeability
- temperature
- heart rate
- respiration
- WBC

Sepsis – SIRS plus infection

Severe Sepsis – SIRS plus infection plus tissue hypo perfusion

Septic Shock – SIRS plus infection plus hypotension refractory to fluid challenge
SEPSIS SYNDROME

• Severe Sepsis – SIRS plus infection plus tissue hypo perfusion
  - Organ Dysfunction
    • AMS
    • Hypoxia
    • Oliguria
    • Creatine elevation
    • Coagulopathy
    • Ileus
    • Thrombocytopenia
    • Hyperbilirubinemia
    • Hyperlactatemia
    • Mottling
PATHOPHYSIOLOGY

• Host Response with innate immune cells
  – Macrophages
    • Toll-like receptors
    • Pattern recognition receptors
    • Adhesion molecules
  – Proinflammatory mediators
    • TNFa
    • IL-1, IL-2, IL-6, IL-8, IL-10
  – Antiinflammatory mediators
PATHOPHYSIOLOGY

Genetic Susceptibility
- Single nucleotide polymorphism (SNP)
  - increased poor outcomes through cytokine, cell surface receptors …
- Tissue ischemia
- Cytopathic injury
- Mitochondrial dysfunction
- Apoptosis delay
- Lymphocyte apoptosis
HISTORY AND PHYSICAL

- PMHx that may contribute
  - ESRD/Lung Dz/CAD/CA/Medications
- Recent antibiotic use (past 90 days)
- Recent hospitalization or NH resident
- VS (fever/tachypnea/tachycardia/hypotension)
- AMS
- Hypoxia
- Knee mottling
DIFFERENTIAL

- Inflammatory Colitis
- Hypovolemic
- Medication toxicity
- Adrenal insufficiency
- AMI
- PE
- Pancreatitis

- SBO
- Anemia
- GI bleed
- CHF
- Anaphylaxis
- SLE
- DKA
RED FLAGS

• Decreased mental status
• Labored respiratory effort
• Cyanosis
• Tachycardia
• Hypotension
• Knee mottling
• Hypothermia
Mottling score

Skin area analysis
by Laser Doppler Imager
DIAGNOSTICS

- Pulse oximetry
- VS
- POC Lactate
- ABG
- Labs
- BNP
- D-dimer
- Cardiac Enzymes
- Cx
- Chest Xray
- EKG
- Foley
SPECIAL CONSIDERATIONS

- Shock Index
- Lactate Clearance
- Procalcitonin
- BNP
- ScvO2
- CVP
- “First, Do No Harm”
SPECIAL CONSIDERATIONS

• Shock Index
  – Heart rate/SBP
  – Predicts lactate > 4 (severe sepsis)
  – NPV of SI > 0.7 – 95%
    • Most sensitive
  – SI > 1
    • Most specific

SPECIAL CONSIDERATIONS

• Lactate Clearance
  – 10% clearance in first 6 hrs of resuscitation
  – Predicted 28 day mortality
  – Equivalent to ScvO2

Annals of Intensive Care 2013, 3:3
SPECIAL CONSIDERATIONS

• Procalcitonin
  – Extrathyroidal tissue
  – Pre-formed
  – All or nothing release
  – Ranges
    • < 0.5 – 97% Sn/NPV 99%
    • 0.5-2 – gray area – consider abx and recheck 24 hrs
    • > 2 – 93-99% specificity
SPECIAL CONSIDERATIONS

• BNP
  – Independent predictor of high left ventricular end diastolic pressure
  – Correlates with NYHA classification
  – Inverse relationship with EF
  – < 100 – 98% negative predictive value
  – > 500 – 87% CHF
SPECIAL CONSIDERATIONS

- ScvO2/CVP
  - Questions about validity of Rivers trial
  - Invasive
  - Static vs dynamic measurements
  - Inaccurate data
    - high/normal
    - Ventilator impact on CVP
PEARLS

• Baseline activity level before the illness serves as a useful point of comparison for the current functional level
• Physical exam has greater negative predictive value than positive predictive value
• Early identification
• Early aggressive management
PITFALLS

• Failure to recognize red flags and secure the airway prior to respiratory failure
• Failure to recognize abnormal vital signs
• Failure to expand your differential diagnosis
SEVERE SEPSIS/SEPTIC SHOCK GUIDELINES 2012

- Early resuscitation < 6 hr
- Blood cx before abx
- Appropriate imaging
- Broad-spectrum abx < 1 hr
- De-escalation of abx
- Source control < 12 hrs
- Crystalloid – initial fluid
- Albumin with failed fluid
- Avoid Hetastarch
- Initial volume 30ml/kg

- Norepi – 1st line choice
- Vasopressin – add on
- Dopamine is NOT recommended
- Dobutamine has a role
- Hg 7-9 is appropriate
  - Acceptions …GI bleed/coronary ischemia
- Low tidal volume
- Higher PEEP
- Prone positioning
- Fluid restriction - ARDS
SEVERE SEPSIS/SEPTIC SHOCK GUIDELINES 2012

• Glucose management
  – < 180

• Ulcer prophylaxis

• Enteral nutrition < 48 hrs

• End-of-life planning
  – < 72 hrs

QUESTION #1

When evaluating a patient for the potential of severe sepsis clinical findings that should be considered red flags include all of the below except:

1) Decreased mental status
2) Cyanosis
3) Diaphoresis
4) Tachypnea