CODE SEPSIS:
Surviving Severe Sepsis and Septic Shock

David Shimabukuro, MDCM
Associate Professor
Medical Director, 13 ICU
Physician Lead, UCSF DSRIP Sepsis Project

Disclosures

• I have no disclosures

Agenda

• Identification
  – How do we know if a patient has sepsis, severe sepsis, or septic shock
• Treatment
  – The “Surviving Sepsis Campaign Bundles”
• The UCSF Experience

Agenda

• Identification
  – How do we know if a patient has sepsis, severe sepsis, or septic shock
• Treatment
  – The “Surviving Sepsis Campaign Bundles”
• The UCSF Experience
What is Sepsis??

- A variable condition that affects each of us differently and is initiated by an infectious insult.

Systemic Inflammation in Sepsis

Inflammation is Activated in Sepsis

Inflammatory Response

Coagulation Regulation

- Normal response to injury is a contained explosion of thrombin generation
- TNF and IL-1 activate coagulation pathway
- Endothelium acts like a fire extinguisher
  - Antithrombin
  - Thrombomodulin/Protein C
  - Act to neutralize thrombin and prevent conversion of fibrinogen to fibrin
Loss of Homeostasis in Sepsis

- Proinflammatory mediators
- Endothelial injury
- Tissue factor expression
- Thrombin production

Pathophysiology of Sepsis

- Coagulation
- Fibrinolysis
- Endothelial injury
- Inflammation

A Case...

- 56 year-old female, on the orthopedic floor, with tachypnea and tachycardia
  - POD#5 right femoral shaft prosthesis revision
  - Medical history of breast cancer (radiation, tamoxifen), severe osteoporosis, and chronic pain
  - No known cardiopulmonary disease, but is essentially wheelchair bound

A Case...

- 0830: Increase in FIO2 from 2LNC to 6LNC for O2SAT 93% and RR 32. With intervention, O2SAT increases to 98% and RR decreases to 24. Afebrile. Back to baseline. Ortho Team informed by RN. No further action taken.
- 1200 to 1600: Multiple desaturations on 6L NC with lowest O2SAT 82%. RR 24-44. HR 109-142. BP 129/87 to 109/54. Afebrile.
A Case...

- The Primary Team and RRT are called to see the patient
- The ICU fellow is also contacted
  - WBC: 17 (up from baseline of 12 over past 3 days)
  - ABG: 7.32/30/196/18/-5
  - Continued “weepy” and non-purulent drainage from the surgical wound
  - Positive 10L over the past 5 days
  - ECG: Sinus tachycardia
  - CXR:

What to do next:

A. Do nothing
B. Give furosemide
C. Get a chest CT with PE protocol
D. Send a lactate, draw blood cultures, and give broadspectrum antibiotics
E. Send a lactate, draw blood cultures, give broadspectrum antibiotics, and bolus with IV fluids
F. Do all of (E) plus transfer to the ICU, place central line, and monitor ScvO2.

Sepsis Definitions

- SIRS
- Sepsis
- Severe Sepsis
- Septic Shock
Septic Shock

SEVERE SEPSIS plus evidence of at least one alteration in organ perfusion

Sepsis
SEPSIS plus confirmed or suspected infection

SIRS
T > 38.3 C or < 36 C
HR > 90 beats/min
Tachypnea
WBC > 12K or < 4K

Sepsis: ACCP/SCCM Definitions

Crit Care Med February 2013 Volume 41 Number 2 pp. 580-637

SIRS
T > 38.3 C or < 36 C
HR > 90 beats/min
Tachypnea
WBC > 12K or < 4K

Sepsis
SIRS plus confirmed or suspected infection

Septic Shock
SEVERE SEPST plus hypoperfusion (systolic blood pressure < 90 or Mean Arterial Blood Pressure < 65) OR Lactate > 4

Sepsis Definition

Severe sepsis definition = sepsis-induced tissue hypoperfusion or organ dysfunction (any of the following thought to be due to the infection)

SIRS
Lactate above upper limits laboratory normal
Urine output < 0.5 mL/kg/h for more than 6 h despite adequate fluid resuscitation
Acute lung injury with PaO2/FiO2 < 300 in the absence of pulmonary or infection source
Acute kidney injury with PaO2/FiO2 < 300 in the presence of pneumonia as infection source
Coagulopathy international normalized ratio > 1.5
Platlet count < 100,000 µL

Great….but when should we do it and how should it be done!!!!
Sepsis Screening

• Important to have one that works for the hospital
• Should probably do once a shift (no clear data)
• Screening works as a reminder for continued vigilance

Agenda

• Identification
  – How do we know if a patient has sepsis, severe sepsis, or septic shock
• Treatment
  – The “Surviving Sepsis Campaign Bundles”
• The UCSF Experience
Management of Severe Sepsis and Septic Shock

Blood cultures should not delay administration of antibiotics.

Antibiotics should be administered within 60 minutes from the time of recognition.
Management of Severe Sepsis and Septic Shock

- Normalization of lactate as a resuscitation goal is suggested
  - Use of rate of lactate clearance is mentioned, but not endorsed as a sole target
Management of Severe Sepsis and Septic Shock

• Fluid Therapy
  – Crystalloids are first choice for the overwhelming majority of patients
  – Albumin can be used to reduce volume from crystalloids
  – Hydroxyethyl starches should not be used

• Corticosteroids
  – For refractory hypotension despite fluids and vasopressors/inotropes
  – Do not perform ACTH stimulation test

• Glucose
  – Target level to less than 180 mg/dL

Management of Severe Sepsis and Septic Shock

• Blood Products
  – HGB level 7.0 – 9.0 g/dL after hypoperfusion has resolved
  – FFP not to be used unless bleeding is present or for planned invasive procedure
  – PLT to be given prophylactically when <10K in absence of bleeding
Management of Severe Sepsis and Septic Shock

• Recombinant Activated Protein C
  
  "While there were no new safety findings, the study failed to demonstrate that Xigris improved patient survival and thus calls into question the benefit-risk profile of Xigris and its continued use," Timothy Garnett, Lilly's chief medical officer, said in a statement on Tuesday.

Back to the case...

• Furosemide recommended with transfer to “step-down” unit for closer hemodynamic and pulmonary monitoring for fluid overload.
• Upon admission to “step-down” unit placed on 15L HFNC with FIO2 1.0 to maintain adequate oxygenation
• Moderate UOP response
• “stable” overnight per RRT notes

Back to the case...

• Medicine consulted the next day for worsening tachypnea, tachycardia, hypoxia, and hypotension.
  – 82/54  130  35  95% 20L HFNC FIO2 1.0
  – ABG: 7.22/30/96/12/-10
  – WBC: 24
  – ECG and CXR unchanged
• ICU consulted and transferred to ICU

Back to the case...

• Central line and arterial line placed
• Antibiotics and vasopressors started
• Worsening renal function
• DIC
• CRRT started
Back to the case...

• She expired 8 hours later.

Is it really a surgical issue??

Sepsis in General Surgery

The 2003-2007 National Surgical Quality Improvement Program Perspective

Laura J. Moore, MD; Frederick A. Moore, MD; S. Rob Todd, MD; Stephen L. Jones, MD; Krista L. Turner, MD; Barbara L. Bass, MD

ARCH SURG, vol 145 (no. 7) July 2010. 695-700
Operative Procedures for Sepsis and Septic Shock

**Sepsis**
- Partial removal of colon
- Removal of small intestines
- Arterial bypass graft
- Partial removal of pancreas
- Removal of colon

**Septic Shock**
- Partial removal of colon
- Removal of small intestines
- Arterial bypass graft
- Removal of colon
- Exploration of abdomen

Sepsis in General Surgery

**Sepsis**
- 3 major risk factors for development of sepsis/septic shock
  - Age older than 60 years
  - Emergency surgery
  - Presence of any comorbidity

**Septic Shock**
- Sepsis increased risk of 30-day mortality 4-fold
  - OR 3.9 (CI 3.5-4.3)

- Septic shock increased risk of 30-day mortality 33-fold
  - OR 32.9 (CI 30.9-35.1)
Summary

- A very heterogeneous disease that is difficult to diagnose in its early stages and difficult to treat in its later stages.
- Routine screening can allow for earlier identification.
- Early intervention can attenuate its course, but the mainstay of treatment is supportive care.