Epidemiology and Identification of Sepsis

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Google Definition of Sepsis

• “A life-threatening complication of an infection.”
• It’s not really that simple…
  – What kind of complication?
  – How severe?
  – What is the source?
  – Who is the host?
  – Is the patient immunocompetent or immunocompromised?
  – What part of the world do they live in?
  – Have they travelled recently?

Most Common Principal Diagnoses
Among the Top 5% of Hospital Stays Based on Total Submitted Charges, 2008

<table>
<thead>
<tr>
<th>Rank</th>
<th>Diagnosis</th>
<th>No. (%) of Discharges</th>
<th>Mean LOS, d</th>
<th>Mean No. of Comorbidities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Septicemia</td>
<td>127,301 (6.5)</td>
<td>22.0</td>
<td>3.1</td>
</tr>
<tr>
<td>2</td>
<td>Coronary Atherosclerosis</td>
<td>111,534 (5.7)</td>
<td>9.3</td>
<td>2.5</td>
</tr>
<tr>
<td>3</td>
<td>Acute Myocardial Infarction</td>
<td>98,149 (5.0)</td>
<td>11.6</td>
<td>2.4</td>
</tr>
<tr>
<td>4</td>
<td>Complication of device, implant, or graft</td>
<td>87,287 (4.5)</td>
<td>16.2</td>
<td>2.6</td>
</tr>
<tr>
<td>5</td>
<td>Respiratory Failure</td>
<td>79,976 (4.1)</td>
<td>26.0</td>
<td>3.6</td>
</tr>
</tbody>
</table>

Increasing Number of Admissions for Sepsis

AHRQ 2016
Number and Percentage of Sepsis Cases
CDC MMWR 2016

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Adult Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male sex</td>
<td>52%</td>
</tr>
<tr>
<td>Age (median)</td>
<td>69</td>
</tr>
<tr>
<td>Hospital Stay [median]</td>
<td>9 days</td>
</tr>
<tr>
<td>Preadmission Location</td>
<td></td>
</tr>
<tr>
<td>— Private Residence</td>
<td>63%</td>
</tr>
<tr>
<td>— Nursing Home</td>
<td>18%</td>
</tr>
<tr>
<td>— Other Acute Care Hospital</td>
<td>10%</td>
</tr>
<tr>
<td>Discharge Disposition</td>
<td></td>
</tr>
<tr>
<td>— Private Residence</td>
<td>41%</td>
</tr>
<tr>
<td>— Nursing Home</td>
<td>25%</td>
</tr>
<tr>
<td>— Other Acute Care Hospital</td>
<td>&lt;1</td>
</tr>
<tr>
<td>— Died During Hospitalization</td>
<td>20%</td>
</tr>
</tbody>
</table>

Incidence & Mortality of Septic Shock at 27 Academic Medical Centers between 2005 and 2014

MORTALITY
55%-51%

INCIDENCE
12.8/1000 Admissions
To
18.6/1000 Admissions

Epidemiology of Sepsis in the US (1979-2000)

- U.S.: 750,000 cases/225,000 fatalities
- ↑ incidence with ↑ age
- Mortality rate 20-50%
- Septic shock mortality rates >50%
- Most common cause of death in medical and surgical intensive care units
- Most common causes for admission to the ICU

Factors that Determine the Incidence and Case-fatality Rate of Severe Sepsis

Outcomes: • Nosocomial > Community • Age • Host response: Fever, WBC • Underlying co-morbidities • Site of infection • Genetics

Epidemiology of Sepsis in the US (1979-2000)

- ↑ Gram +ve: 25% cases
- ↑ Fungal: 5-10%
- Gram -ve: 25%
- Mixed: 15%
- Multi-resistant organisms
- Respiratory > Intra-abdominal

Mortality Comparison to Other Major Diseases

Breast Cancer
Glob Cancer
Acute Myocardial Infarction
Severe Sepsis

Number of Deaths Annually


Martin et al. NEJM 2003; 348:1546-1554
Cost of Sepsis in the US

- Average Cost Per Case: $22,100
- Annual Total Costs: $16.7 billion
- Excess Patient Days: 2.3 million
- Avoidable Deaths: 43,000

Sepsis: Defining a Disease Continuum

- Sepsis - Known or suspected infection, plus - > 2 SIRS criteria
- Severe Sepsis - Sepsis, plus - > 1 organ dysfunction
- Septic Shock - Sepsis with - Hypotension despite fluid resuscitation, and - Perfusion abnormalities

SIRS Criteria

*Must meet 2/4 to be considered SIRS*

1) Temp >38°C OR <36°C
2) HR >90 bpm
3) RR >20 bpm OR pCO2<34
4) WBC >12.0, <4.0, OR >10% bands
Sepsis-3: New Definitions

- **Sepsis:**
  - Life-threatening organ dysfunction caused by a dysregulated host response to infection
  - Defined by qSOFA + SOFA scores
  - Emphasizes organ dysfunction
  - De-emphasizes nonspecific systemic inflammation
  - No more "severe sepsis"

Sepsis-3: qSOFA Score

- **Utility:**
  - IDs patients with suspected infection likely to have a prolonged ICU stay or to die in the hospital
  - No labs required + easy to calculate
  - qSOFA ≥ 2 considered "positive"

- **Caveats:**
  - "Altered mentation" = GCS < 15
  - SBP (not MAP) because most widely recorded in EHR data sets

> Use like SIRS: prompt to look for organ dysfunction, start tx, increase monitoring, etc.

Sepsis-3: Algorithm

- SIRS still has value—use it when clinically appropriate!!

Interprofessional Education Module to Learn, Teach, and Optimize the Treatment of Sepsis

- Jeffrey P. Gonzales, PharmD
- Nirav G. Shah, MD
- Renee Dixon, MD
- Joan M. Davenport, RN, PhD
- Mojdeh S. Heavner, PharmD
- Samuel A. Fisherman, MD
- Tracey Wilson, DNP
- Siu Yan Amy Yeung, PharmD
- Nimeet Kapoor, RN
- Peter P. Olivieri, MD
Thank you....Any questions?

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