Sepsis – I Know It When I See It
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What is sepsis?

I shall not today attempt further to define the kinds of material...[b]ut I know it when I see it...

Justice Potter Stewart

RECOGNITION
Objectives

- Identify patients at risk for sepsis
- Identify common presentations of sepsis
- Understand the new definition of sepsis in context of previous sepsis work

Objectives

- What is Sepsis? (Sepsis 3.0 Definition)
- What is qSOFA?
- What is SEP-1? (CMS Bundle)
The new face of sepsis

- Nearly 1.5 million cases and 215k deaths each year
  
- 33-50% of all inpatient deaths are due to sepsis

Increasing incidence due to:

- Aging population
- Increased use of immunomodulating therapy
- Longer survival in cancer patients
  - RR sepsis with cancer 9.77 vs. non-cancer patient
- Increased transplantation
  - 29% of lung transplant patients die from sepsis

Case

- 65 yo man with a history of HTN, CAD, ischemic cardiomyopathy (EF 45%) admitted with atrial fibrillation from cardiology office
- Temp 98.6; HR 133; BP 98/44; RR 22; O2 sat 95% on 2L NC
- On exam he is somewhat anxious with a rapid, irregular heart rate

Is he septic?
What year is it?

- 1991 – Definitions for Sepsis and Organ Failure and Guidelines for the Use of Innovative Therapies in Sepsis
- 2016 – The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)

1991 - Sepsis 1 Definition

**SIRS (systemic inflammatory response)**

- Two of following:
  - Temp > 38 or < 36
  - HR > 90
  - RR > 20 or PaCO2 < 32
  - WBC > 12 or < 4 or bands > 10%
Case

- 65 yo man with atrial fibrillation
- Lab studies with WBC of 13,000
- Admits to some cough and sputum production

Is he septic?

Definitions for Sepsis and Organ Failure and Guidelines for the Use of Innovative Therapies in Sepsis

- 65 yo man with atrial fibrillation
- Lab studies with WBC of 13,000
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Is he septic?
Case

- Patient also notes he has new lower extremity edema
- Nursing notes decreased urine output
- Initial work-up reveals a creatinine of 2.0 (previously 0.9)

Now what does he have?

2001
2001 - Continuum of Sepsis

- Sepsis with ≥1 sign of organ failure
  - Cardiovascular (refractory hypotension)
  - Renal
  - Respiratory
  - Hepatic
  - Hematologic - coagulopathy
  - CNS - delirium
  - Metabolic acidosis


Our Patient

- Blood cultures grow gram-positive cocci
- His clinicians carefully exam and order labs to evaluate the 25+ possible clinical findings of the sepsis-2 definition
- They variously describe him as having:
  - “Pneumonia”
  - “SIRS”
  - “Sepsis”
  - “Severe Sepsis”
  - “Bacteremia”
- Patients family now demands to talk to doctor because they are utterly confused…

Sepsis is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection.
Out with Old (2.0), In with New (3.0)

Sepsis is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection.

How to Measure Organ Failure?
SOFA Increase > 2

### Table 1. Sequential (Sepsis-Related) Organ Failure Assessment Score

<table>
<thead>
<tr>
<th>System</th>
<th>Score</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory</td>
<td></td>
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</tr>
<tr>
<td>$\text{Pa}_2/\text{Fi}_2$, mm Hg (kPa)</td>
<td>$\leq 400$ (33.3)</td>
<td>$&gt;400$ (33.3)</td>
<td>$&gt;300$ (40)</td>
<td>$&gt;200$ (26.7) with respiratory support</td>
<td>$&gt;150$ (11.3) with respiratory support</td>
<td></td>
</tr>
<tr>
<td>Coagulation</td>
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<tr>
<td>Platelets, $10^9$/µL</td>
<td></td>
<td>$\leq 150$</td>
<td>$&gt;150$</td>
<td>$&gt;100$</td>
<td>$&gt;50$</td>
<td>$&gt;20$</td>
</tr>
<tr>
<td>Liver</td>
<td></td>
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<tr>
<td>Bilirubin, mg/dL (µmol/L)</td>
<td>$\leq 1.2$ (20)</td>
<td>$1.2-3.9$ (20-31)</td>
<td>$2.0-5.9$ (33-101)</td>
<td>$3.0-11.9$ (102-204)</td>
<td>$&gt;12.0$ (204)</td>
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<tr>
<td>Cardiovascular</td>
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<tr>
<td>MAP ≥ 70 mm Hg</td>
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<tr>
<td>MAP ≥ 70 mm Hg</td>
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<tr>
<td>Renal</td>
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<td></td>
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<tr>
<td>Glasgow Coma Scale score</td>
<td></td>
<td>15</td>
<td>13-14</td>
<td>10-12</td>
<td>6-9</td>
<td>&lt;6</td>
</tr>
<tr>
<td>Creatinine, mg/dL (µmol/L)</td>
<td>$\leq 1.2$ (11.0)</td>
<td>$1.2-3.9$ (11.0-17.0)</td>
<td>$2.0-3.4$ (17.1-29.9)</td>
<td>$3.5-4.9$ (30.0-44.0)</td>
<td>$&gt;5.0$ (44.0)</td>
<td></td>
</tr>
<tr>
<td>Urine output, mL/h</td>
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</tbody>
</table>
| Abbreviations: $\text{Fi}_2$, fraction of inspired oxygen; MAP: mean arterial pressure; $\text{Pa}_2$, partial pressure of oxygen.

*Adapted from Vincent et al. 1996

* Ganciclovir doses are given as µg/kg/min for at least 1 hour.

** Glasgow Coma Scale scores range from 3-15; higher score indicates better neurological function.
Sepsis New versus Old Definition

Old Version (1&2)  
(don’t memorize)
- Infection = Infection
- SIRS criteria + Infection = Sepsis
- Infection + Organ Failure = Severe Sepsis
- Infection + Shock = Septic Shock

New Version (Sepsis-3)  
(memorize)
- Infection = Infection
- SIRS criteria + Infection = Infection
- Infection + Organ Failure = Sepsis
- Infection + Shock = Septic Shock

Should we admit him? Where?
- qSOFA can identify patients at high risk for death or prolonged ICU stay
- qSOFA is NOT meant to be a screen for sepsis
What do we need to do for our patient?

Why is My Hospital So Interested in This?

<table>
<thead>
<tr>
<th>SIRS due to pneumonia (without documentation of sepsis)</th>
<th>Sepsis due to pneumonia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Example 1</strong></td>
<td><strong>Example 2</strong></td>
</tr>
<tr>
<td>PDX: J18.9 Pneumonia</td>
<td>PDX: A41.9 Sepsis</td>
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<tr>
<td>SDX</td>
<td>SDX: J18.9 Pneumonia (MCC)</td>
</tr>
<tr>
<td>DRG 195 Pneumonia W/O CC/MCC</td>
<td>DRG 871 Sepsis W MCC</td>
</tr>
<tr>
<td>RW: 0.71 GLOS 2.8</td>
<td>RW: 1.79 GLOS 5</td>
</tr>
<tr>
<td>$4,970*</td>
<td>$12,548*</td>
</tr>
</tbody>
</table>

*Base rate of $2000 used for illustrative purposes
PDX: Principal diagnosis
SDX: Secondary diagnosis
DRG: Diagnostic related group
MCC: Major complication or comorbidity
CC: Complication or comorbidity
GMLOS: Geometric mean length of stay
RW: Relative weight

Here’s what you should do now:

- Review the new SOFA/sOFA guidelines published in JAMA
- Meet with your CDI and Coding departments and include physician leaders to discuss if/how to implement the new sepsis definitions or to continue to use SIRS criteria
- Develop internal coding and query policies for the new guidelines
- Perform regular audits to ensure compliance with internal policies
Why is My Hospital So Interested in This?

In this world nothing can be said to be certain, except death and taxes.
(Benjamin Franklin)

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Why is My Hospital So Interested in This?

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Why is My Hospital So Interested in This?

**SEP-1 Definitions**

- **Severe Sepsis**
  - suspected source of infection
  - 2 SIRS criteria, and
  - evidence of end-organ dysfunction

- **Septic Shock**
  - initial lactate greater than or equal to 4 mmol/L
  - Evidence of hypotension in the first hour following completion of a 30 cc/kg IVF bolus

Our Patient

- ABG shows lactate 4.5 mmol/L
- SBP dips to 70’s
  - Norepinephrine started
- Antibiotics given
  - Ceftriaxone
  - Azithromycin

Now what do we do?
What do we need to do for our hospital / CMS?

- CMS Mandated Targets for Hospitals
  - Measure lactate
  - Obtain cultures prior to antibiotics
  - Administer antibiotics
  - Administer 30ml/kg fluid for hypotension or elevated lactate
  - Apply vasopressors
  - Assess volume status
  - Repeat lactate
Future

Clinicians need to be familiar with both new and old definitions of sepsis.

- Sepsis / Septic Shock (from 2016 definition)
- Severe Sepsis (from CMS / 2001 definition)

Recognition and identification remains the mainstay of improving outcomes and survival.

Clinicians need to be familiar with both the surviving sepsis guidelines and CMS bundle for sepsis care.

Thank You