Sepsis: Overview and update. Focus on early intervention and improving outcomes.

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Poll Question

In the past 6 months, have you transferred a resident with signs and symptoms of sepsis to the hospital?
Sepsis Overview:

Definitions
Terminology
Diagnosis
Prognosis

AT LEAST 250,000 AMERICANS DIE FROM SEPSIS EACH YEAR.
Sepsis Overview:

Definition:

Sepsis is a clinical syndrome that has physiologic, biologic and biochemical abnormalities caused by dysregulated inflammatory response to infection. Previously described as Systemic Inflammatory Response Syndrome (SIRS):

- Heart Rate > 90 BPM
- Respiratory Rate > 20 per minute
- Temperature > 38 or < 36 Celsius
- White Blood Cell Count > 12,000 or < 4,000 or > 10% Bands

Known or suspected infection **PLUS**
Sepsis Overview:

The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)

Society of Critical Care Medicine (SCCM) and European Society of Intensive Care Medicine (ESICM).

New approach and definitions focus on the dysregulation of the inflammatory response AND the organ dysfunction that can accompany this dysregulated response to infection.
The New Sepsis Paradigm

Fig. 1 Schematic diagram showing the previous and new definitions of sepsis. Asterisk indicates a small fraction of infected patients develop organ dysfunction without fulfilling the established SIRS criteria. SIRS systemic inflammatory response syndrome.
<table>
<thead>
<tr>
<th>Target organ</th>
<th>Pathophysiology</th>
<th>Clinical features</th>
<th>SOFA score indices (other beneficial indices)</th>
<th>Available treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung (ARDS)</td>
<td>Vascular hyper-permeability, neutrophil accumulation</td>
<td>Impaired oxygenation</td>
<td>PaO₂/FIO₂ &lt;400 (bilateral infiltration on CXR)</td>
<td>Mechanical ventilation with low tidal volume and PEEP</td>
</tr>
<tr>
<td>Liver</td>
<td>Disturbed intracellular and extracellular bile salt transport</td>
<td>Jaundice, cholestasis</td>
<td>Serum bilirubin ≥1.2 mg/dl</td>
<td>Not established</td>
</tr>
<tr>
<td>Kidney (AKI)</td>
<td>Tubular epithelial cell injury, dysfunction or adaptive response of tubular epithelial cells</td>
<td>Reduced GFR, reduced urine volume</td>
<td>Serum creatinine ≥1.2</td>
<td>Hemodialysis</td>
</tr>
<tr>
<td>Cardiovascular system</td>
<td>Myocardial depression, impaired intracellular calcium homeostasis, disrupted high energy phosphate production</td>
<td>Ventricular dilatation, reduced ejection fraction, reduced contractility</td>
<td>Mean arterial pressure &lt;70 mmHg</td>
<td>Inotropic agents, beta-blocker</td>
</tr>
<tr>
<td>Gastrointestinal tract</td>
<td>Epithelial hyper-permeability, altered microbiome</td>
<td>Mucosal bleeding, paralytic ileus</td>
<td>Not included</td>
<td>Proton pump inhibitor, early enteral nutrition, probiotics, SDD</td>
</tr>
<tr>
<td>Central nervous system (SAE)</td>
<td>Direct cellular damage, mitochondrial and endothelial dysfunction, neurotransmission disturbances, calcium dyshomeostasis</td>
<td>Altered mental status</td>
<td>GCS &lt;15</td>
<td>Light sedation, early rehabilitation</td>
</tr>
<tr>
<td>Blood coagulation system (DIC)</td>
<td>Intravascular coagulation, microvascular damage, systemic thrombin generation, endothelial injury</td>
<td>Bleeding diathesis, microthrombi and tissue ischemia</td>
<td>Platelets &lt;150 × 10³/µl (prolonged prothrombin time, increased FDP)</td>
<td>Antithrombin, recombinant thrombomodulin, concentrated platelet preparation</td>
</tr>
</tbody>
</table>

SOFA sequential organ failure assessment, ARDS acute respiratory distress syndrome, CXR chest X-ray, PEEP positive end-expiratory pressure, AKI acute kidney injury, GFR glomerular filtration ratio, SDD selective digestive decontamination, SAE sepsis-associated encephalopathy, GCS Glasgow coma scale, DIC disseminated intravascular coagulation, FDP fibrin degradation product.
Sepsis Overview: Terminology

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

**Septic Shock**
subset of sepsis in which underlying circulatory and cellular/metabolic abnormalities are profound enough to substantially increase mortality. There is persisting hypotension requiring vasopressors to maintain an MAP of 65 mmHg and/or having a serum lactate level >2 mmol/L despite adequate volume resuscitation.

**Severe Sepsis**
no longer utilized

*Does this new this new terminology present a problem for Long Term Care facilities?*
Ongoing Goals

- Recognize & Treat Early & Aggressively
- Decrease Cases Progressing to Severe Sepsis
- Decrease Morbidity & Mortality

Previous Paradigm

SIRS (Screen) → Sepsis (Treat) → Severe Sepsis (Transfer) → Septic Shock
Sepsis Overview:

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Sequential (Sepsis Related) Organ Failure Assessment Score (SOFA)
Requires access to laboratory values

Early Sepsis outside the ICU Quick SOFA (qSOFA)
No laboratory data included
# Sequential (Sepsis Related) Organ Failure Assessment Score (SOFA)

<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><strong>Respiration</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pao$<em>2$/Fi$</em>{O_2}$, mm Hg</td>
<td>0</td>
<td>≥400 (53.3)</td>
<td>&lt;400 (53.3)</td>
<td>&lt;300 (40)</td>
<td>&lt;200 (26.7) with respiratory support</td>
<td>&lt;100 (13.3) with respiratory support</td>
</tr>
<tr>
<td>(kPa)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Coagulation</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Platelets, x10$^3$/μL</td>
<td>0</td>
<td>≥150</td>
<td>&lt;150</td>
<td>&lt;100</td>
<td>&lt;50</td>
<td>&lt;20</td>
</tr>
<tr>
<td><strong>Liver</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bilirubin, mg/dL (μmol/L)</td>
<td>0</td>
<td>&lt;1.2 (20)</td>
<td>1.2-1.9 (20-32)</td>
<td>2.0-5.9 (33-101)</td>
<td>6.0-11.9 (102-204)</td>
<td>&gt;12.0 (204)</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Dopamine &lt;5 or dobutamine (any dose)$^b$</td>
<td>Dopamine &gt;5 or epinephrine ≤0.1 or norepinephrine ≤0.1$^b$</td>
</tr>
<tr>
<td>MAP ≥70 mm Hg</td>
<td>0</td>
<td>MAP &lt;70 mm Hg</td>
<td>Dopamine &lt;5 or dobutamine (any dose)$^b$</td>
<td>Dopamine &gt;5 or epinephrine ≤0.1 or norepinephrine ≤0.1$^b$</td>
<td>Dopamine &gt;15 or epinephrine &gt;0.1 or norepinephrine &gt;0.1$^b$</td>
<td></td>
</tr>
<tr>
<td><strong>Central nervous system</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glasgow Coma Scale score$^c$</td>
<td>0</td>
<td>15</td>
<td>13-14</td>
<td>10-12</td>
<td>6-9</td>
<td>&lt;6</td>
</tr>
<tr>
<td><strong>Renal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creatinine, mg/dL (μmol/L)</td>
<td>0</td>
<td>&lt;1.2 (110)</td>
<td>1.2-1.9 (110-170)</td>
<td>2.0-3.4 (171-299)</td>
<td>3.5-4.9 (300-440)</td>
<td>5.0 (440)</td>
</tr>
<tr>
<td>Urine output, mL/d</td>
<td>0</td>
<td>&lt;500</td>
<td>&lt;200</td>
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</tr>
</tbody>
</table>
In Hospital Mortality as a function of SOFA score on admission and Maximum during Hospitalization
<table>
<thead>
<tr>
<th>Score Trend (first 48 hrs)</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing</td>
<td>&gt; 50%</td>
</tr>
<tr>
<td>Unchanged</td>
<td>27 - 35%</td>
</tr>
<tr>
<td>Decreasing</td>
<td>&lt; 27%</td>
</tr>
</tbody>
</table>
Poll Question

Have you been asked by a local hospital on early recognition and intervention for the signs and symptoms of sepsis?
What is qSOFA?

The qSOFA score (also known as quickSOFA) is a bedside prompt that may identify patients with suspected infection who are at greater risk for a poor outcome outside the intensive care unit (ICU). It uses three criteria, assigning one point for low blood pressure (SBP ≤ 100 mmHg), high respiratory rate (≥ 22 breaths per min), or altered mentation (Glasgow coma scale < 15).
What is qSOFA?

<table>
<thead>
<tr>
<th>qSOFA (Quick SOFA) Criteria</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory rate $\geq 22$/min</td>
<td>1</td>
</tr>
<tr>
<td>Change in mental status</td>
<td>1</td>
</tr>
<tr>
<td>Systolic blood pressure $\leq 100$ mmHg</td>
<td>1</td>
</tr>
</tbody>
</table>
Clinical Criteria Identifying Patients with Sepsis and Septic Shock

1. **Patient with suspected infection**
   - **qSOFA ≥2?** (see A)
     - Yes
       - Assess for evidence of organ dysfunction
         - **SOFA ≥2?** (see B)
           - Yes
             - Sepsis
               - Despite adequate fluid resuscitation, 1. vasopressors required to maintain MAP ≥65 mm Hg AND 2. serum lactate level >2 mmol/L?
                 - Yes
                   - Septic shock
                 - No
                   - Monitor clinical condition; reevaluate for possible sepsis if clinically indicated
           - No
             - Monitor clinical condition; reevaluate for possible sepsis if clinically indicated
     - No
   - Sepsis still suspected?
     - Yes
       - Monitor clinical condition; reevaluate for possible sepsis if clinically indicated
     - No
       - Monitor clinical condition; reevaluate for possible sepsis if clinically indicated

**qSOFA Variables**
- Respiratory rate
- Mental status
- Systolic blood pressure

**SOFA Variables**
- $\text{PaO}_2/\text{FiO}_2$ ratio
- Glasgow Coma Scale score
- Mean arterial pressure
- Administration of vasopressors with type and dose rate of infusion
- Serum creatinine or urine output
- Bilirubin
- Platelet count
Lactic Acid or Lactate Measurement has become an important part of the equation

<table>
<thead>
<tr>
<th>Other Chemistry Tests</th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lipase Lvl</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BHBT</td>
<td>H 1.9</td>
<td>0.1 [2][H]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactic Acid Lvl</td>
<td>* H 2.4</td>
<td>* 1.9 [4][H]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ven Lactate POC Istat</td>
<td>* H 3.4 [3][C]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hgb A1c</td>
<td>* C 6.1 [2][C]</td>
<td>H 3.95</td>
<td></td>
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<td></td>
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</tbody>
</table>
Code Sepsis
Rapid Response Team

- Respiratory Pattern Changed from baseline or labored
- SpO2 is less than 90% or new requirement for > 50% FiO2
- Respiratory Rate is less than 8 or greater than 25 per minute
- SBP < 90 or > 180 mmHg
- Chest pain of new onset or unrelieved
- Heart Rate < 50 or > 150 BPM
- Change in peripheral pulses from baseline
- Seizures of new onset, repeated or prolonged
- Decrease in level of consciousness
- Limb weakness and/or speech difficulty
- Sensory changes, progressive weakness, acute bowel or bladder dysfunction
- Clinician or Family (legally authorized person) is concerned about patient’s condition
- Drug Reaction Suspected
- Decreased Urine Output
- Any significant bleeding
Rapid Response Team

• Respond and Triage to request from Clinicians and Families

• Contact Physician or Clinicians as needed
• Communicate with Nurses and Families
• Coordinate interventions to stabilize clinical status
• Educate and support those involved in patient’s care
• Communicate with clinicians and support transfer to higher level of care if needed
Rapid Response

- Ensure or Obtain IV Access
- IVF (Lactated Ringers now preferred over saline)
- Obtain relevant labs (CBC with differential, CMP, Serum Lactate)
- Blood Cultures
- CXR

- Initiate Antibiotics
- Determine if to be transferred or serially assessed for improvement

  - Vancomycin 20-25 mg/kg or Linezolid (600 mg)

  Plus

  - Beta-Lactam Cefepime (2 g), Piperacillin/Tazobactam (4.5g), Meropenem (1-2g), Aztreonam (2g)
At your facility, which of the following approaches are being utilized in an effort to improve early recognition and intervention for signs and symptoms of sepsis?

- Education for nurses, CNAs, other staff, etc.
- Sepsis Screening tools
- Protocol for patients with suspected early sepsis
Thank You for your attention.
Comments?
Discussion?
Questions?
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