Nursing Update: Recognition & Management of Sepsis in Patients with Cirrhosis

Cherie Navarro MSN, ACNP-BC
Objectives

1. Describe signs and symptoms of sepsis syndrome
2. Recognize signs of sepsis to respond quickly
3. Summarize management strategies
### Sepsis

Part of a disease spectrum ranging from infection to septic shock

Accounts for 1,000,000 cases in the United States with a mortality of 200,000 patients annually

Results from a dysregulated host response to infection causing life-threatening organ dysfunction

If not treated aggressively leads to multiple organ failure & death

Sepsis
Definition

A “life-threatening organ dysfunction caused by a dysregulated host response to infection.”

Singer et al., 2016
Based on administrative claims data, sepsis mortality was 15 to 140% higher than estimates using death certificate.

Serial markers for MI: troponins

HF: brain natriuretic peptide (BNP)
<table>
<thead>
<tr>
<th>Sepsis Background</th>
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<tbody>
<tr>
<td><strong>No validated diagnostic test to diagnose sepsis</strong></td>
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<tr>
<td><strong>Clinicians must suspect infection with early recognition to preventing organ dysfunction</strong></td>
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<tr>
<td><strong>Even small degrees of organ dysfunction cause increases in hospital mortality</strong></td>
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<tr>
<td>Risk Factors for Sepsis</td>
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<tr>
<td>------------------------</td>
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<tr>
<td>Compromised Immune Status</td>
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<tr>
<td>Neutropenia, <strong>Cirrhosis</strong>, AIDS &amp; Chronic Illness</td>
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<tr>
<td>Invasive procedures</td>
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<tr>
<td>Surgery or instrumentation</td>
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<tr>
<td>Extremes in age</td>
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<tr>
<td>Elderly-(more likely to have underlying disease)</td>
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</table>
### Risk Factors for Sepsis

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males &gt; 40, females 20-45</td>
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<tr>
<td>Antibiotic usage</td>
<td></td>
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<tr>
<td>Immunosuppressive drugs with broad-spectrum antibiotics</td>
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<tr>
<td>Miscellaneous</td>
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<tr>
<td>Trauma, Intestinal Ulceration, Childbirth, &amp; Septic Abortion</td>
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<tr>
<td>Sepsis Signs</td>
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<tr>
<td>Oliguria - UO &lt; 0.5 ml/kg/hr.), increase in BUN (7-18)/Creatinine(0.6-1.2)</td>
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<tr>
<td>Mental status changes</td>
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<tr>
<td>Increased O2 requirement- tachypnea, hypoxemia; Spo2 &lt; 90%</td>
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<tr>
<td>Hypotension: SBP &lt; 90, or a reduction of 40 mm Hg from baseline, MAP &lt;65</td>
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<tr>
<td>Nausea, vomiting, diarrhea</td>
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<tr>
<td>Sepsis Signs</td>
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<td>------------------------</td>
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<tr>
<td>Systemic Hypoperfusion seen with lactic acidosis</td>
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<tr>
<td>Lactate &gt; 2 mmol/L - a marker for tissue hypoperfusion</td>
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<tr>
<td>Bilirubin &gt; 2.0</td>
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<tr>
<td>Thrombocytopenia (Platelet &lt; 100,000)</td>
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<tr>
<td>Coagulopathy INR &gt; 1.5 PTT &gt; 60</td>
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</tbody>
</table>
Septic Signs

Altered Consciousness
Psychosis
Confusion

Tachypnea
RR >20
Sat < 90

Jaundice
Increased LFTs & PT/PTT
Decreased Albumin

Tachycardia
Hypotension
Altered CVP

Oliguria
Anuria
Increased Creatinine

Decreased Platelets,
Protein C
Increased D Dimer
Hypotension despite adequate fluid resuscitation

SBP < 90 mmHg - or a decrease of 40 mmHg from baseline- as in a normally HTN patient

Needing vasopressors to maintain a mean arterial pressure (MAP) of ≥65 mmHg

Change in mental status

Lactic acidosis (serum lactate level >2 mmol/L)

Oliguria (UO < 0.5 ml/kg/hr), increase in BUN (7-18)/Creatinine(0.6-1.2)
From a Small Scrape to Sepsis

- Rory dived for a ball playing at recess & got a scrape on his arm
- By next morning had a high fever & was vomiting
- Thought was viral infection & was sent to the ED to treat dehydration
- In ED, fluids, labs including WBC, then sent home
- Worsening condition at home & returned to ED with direct admit to ICU in septic shock
- He died within 48 hours of streptococcal sepsis from a bacterial skin infection

http://www.sepsisalliance.org/faces/
Cirrhosis a condition in which the liver does not function properly due to long-term damage.

Replacement of normal liver tissue by scar tissue.
Cirrhosis

- Not only a risk factor for sepsis **BUT** an independent mortality risk factor in patients with septic shock

- May lead to acute liver dysfunction – identified as acute-on-chronic liver failure (ACLF) & results in jaundice & prolongation of prothrombin time (PTT)

- ICU mortality with patients having cirrhosis and septic shock is 65%
Symptoms of Cirrhosis

- Weakness
- Fatigue
- Pruritis
- Swelling
- Jaundice
- Ecchymosis
- Ascites - can become spontaneously infected
- Esophageal varices (bleeding from dilated veins in the esophagus or dilated stomach veins)
- Hepatic encephalopathy (confusion to unconsciousness)
Common physiological changes in patients with cirrhosis

- **Liver impairment** (worsening of liver function tests, including a rise in bilirubin, INR & thrombocytopenia from baseline tests)
- Baseline **tachycardia** (secondary to hyperdynamic circulation)
- **Tachypnea** (attributed to hepatic encephalopathy (HE))
- **Oliguria** (may indicate renal dysfunction)
- Serum **creatinine (falsely low)** \( r/t \) sarcopenia & malnourishment (creatinine comes from muscle)
- **High serum lactate levels** \( r/t \) Impaired hepatic lactate clearance
- Baseline **Hypotension**
- **Reduced white blood cell count** (attributed to hypersplenism)
# Patients with Cirrhosis

<table>
<thead>
<tr>
<th>Systemic Inflammatory Response Syndrome (SIRS)</th>
<th>Temperature</th>
<th>Heart Rate</th>
<th>Respiratory Rate</th>
<th>White Blood Count (WBC)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt;38°C or &lt;36°C</td>
<td>&gt;90 bpm</td>
<td>&gt;20/min or pCO2 &lt;32 mm Hg</td>
<td>&gt;12,000 cells/µL or &lt;4,000 cells/µL</td>
</tr>
</tbody>
</table>

**Baseline features in cirrhosis**

- Blunted temperature regulation
- Tachycardia (hyperdynamic state)
- Tachypnea r/t Hepatic Encephalopathy & ascites
- Leukopenia r/t hypersplenism
<table>
<thead>
<tr>
<th>Risk factors for Sepsis in Patients with Cirrhosis</th>
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<tbody>
<tr>
<td>Baseline hypotension</td>
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<tr>
<td>Poorly functioning white blood cells</td>
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<tr>
<td>Bacterial translocation from intestine</td>
</tr>
<tr>
<td>Third space fluid in abdomen (ascites) &amp; chest as reservoirs of infection</td>
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<tr>
<td>Poor functional state</td>
</tr>
<tr>
<td>Impaired cognition</td>
</tr>
<tr>
<td>Poor wound healing due to edema, sarcopenia</td>
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</tbody>
</table>
Recognizing Sepsis in Patients with Cirrhosis

- High Serum lactate levels r/t Impaired hepatic lactate clearance
- Serum creatinine (falsely low) r/t sarcopenia & malnourishment (creatinine comes from muscle)
- Low protein fluid in reservoirs - edema
- Ascites
Must determine if ascites is the source i.e spontaneous bacterial peritonitis (SBP)

Diagnosed with paracentesis at the bedside

SBP confirmed with more than 250 polymorphonuclear leukocytes, or a positive culture

IV antibiotics & albumin
Sequential Organ Failure Assessment (SOFA score)

- A morbidity severity score & mortality estimation tool
- Used in ICU to determine the extent of organ dysfunction
- Based on 6 different scores one for each of the following systems
  - Respiratory
  - Cardiovascular
  - Hepatic
  - Coagulation
  - Renal
  - Neurological systems
Each organ system is assigned a point value

- 0 (normal)
- 4 (high degree of dysfunction/failure)

Score ranges from 0 to 24

The higher the score the higher the organ dysfunction involvement
Organ Dysfunction is Represented by an Increase in the SOFA Score of 2 Points or More
<table>
<thead>
<tr>
<th>SOFA SCORING</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory (PaO2/FiO2)</td>
<td>&lt;400</td>
<td>&lt;300</td>
<td>&lt;200</td>
<td>&lt;100</td>
</tr>
<tr>
<td>Coagulation (Platelets x 10 to 3/μL)</td>
<td>&lt;150</td>
<td>&lt;100</td>
<td>&lt;50</td>
<td>&lt;20</td>
</tr>
<tr>
<td>Liver Bilirubin (mg/dL)</td>
<td>1.2-1.9</td>
<td>2.0-5.9</td>
<td>6.0-11.9</td>
<td>&gt;12</td>
</tr>
<tr>
<td>Cardiovascular hypotension or vasoactive agents (μg/kg/min)</td>
<td>MAP &lt; 70 mm Hg</td>
<td>Dopamine ≤5 or dobutamine (any dose) (Any dose)</td>
<td>Dopamine &gt;5, epinephrine ≤0.1 or norepinephrine ≤0.1 (Agents administered for at least 1 hour)</td>
<td>Dopamine &gt;15, epinephrine &gt;0.1, or norepinephrine &gt;0.1 (Agents administered for at least 1 hour)</td>
</tr>
<tr>
<td>Central nervous system Glasgow Coma Scale</td>
<td>13-14</td>
<td>10-12</td>
<td>6-9</td>
<td>&lt; 6</td>
</tr>
<tr>
<td>Renal creatinine (mg/dL) or urine output (mL/day)</td>
<td>1.2-1.9</td>
<td>2.0-3.4</td>
<td>3.5-4.9 or &lt; 500</td>
<td>&gt;5.0 or &lt; 200</td>
</tr>
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</table>
Sepsis Management

Think Sepsis for Fever, Hypotension, Leukocytosis

Within the first 6 hours:

Blood Cultures

Lactic Acid measures (goal < 2 mmol/L)

CBC with Diff

Antibiotics - within 1 hours of presentation

Broad-spectrum initially

Fluid Administration 30 mg/kg

Hypotension (SBP < 90, MAP < 65) or a reduction of 40 mm Hg from baseline)

IN cirrhosis MAP of ≥ 60 mm Hg,

Vaspressors Hypotension not responding to fluid resuscitation
Each hour delay in antimicrobial therapy increases mortality by 1.86 times.

Intravenous albumin infusion reduced mortality in:

- Spontaneous bacterial peritonitis
- Hepatorenal syndrome
- Improve outcomes following large-volume paracentesis
Fluid Resuscitation

Goal approach to Fluid Resuscitation

Urine output > 0.5 mL/kg/hr

CVP 8-12 mmHg

MAP 65 to 90 mmHg

Central venous oxygen concentration saturation (ScvO2) > 70%

Lactic acid < 2 moles/L
Hypotension not responding to fluid resuscitation

Titrate to MAP > 65 mm Hg; Map may be too low in a patient with uncontrolled hypertension

Norepinephrine first choice

Vasopressin (up to 0.03 U/min); Not recommended as single initial agent. High doses associated with cardiac, digital & splanchnic ischemia
Sepsis can lead to death within hours

A high index of suspicion for sepsis, early recognition & treatment are critical to mitigate organ failure & death
References


