SEPSIS
Early Recognition and Treatment

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PGY-3 Resident Internal Medicine
ENA Conference Feb 2nd 2017

Disclosures

• No conflict of interest to disclose
• All sources referenced, unless royalty-free

What conflict of interest?!
AGENDA

• Introduction and Background
• Pathophysiology: Demystifying Sepsis
• The Sepsis Continuum: Current & Future Definitions
• Early Recognition: ED at the Front Line
• Diagnostic Criteria: One Size Does Not Fit All
• Life-Saving Interventions in the ED and Beyond
• Overview of Quality Measures and Initiatives
• The Future of Sepsis Care
• References and Useful Resources
• Applying Theory to Practice: Interactive Case

Worldwide Concern

• Sepsis accounts for 60-80% of lost lives per year in the developing world
• 10M deaths worldwide
• >6M newborns/children
• >100,000 women during pregnancy/birth
Introduction and Background

• Sepsis = Badness ☠
• In USA, >1.6M cases/year
• 5x higher risk of death than MI or stroke
• Sepsis mortality ≥10%
• Septic shock mortality ≥40%
• Cost: $20 billion in 2011
  – Rising by ~12% / year

USA Disease Mortality Rankings
Sepsis is at Our Doorstep

- >1000 patients/yr die from sepsis…
- in **WISCONSIN**
- **Think Katie First, Think Sepsis**

More Sepsis Admissions Than Ever

Hospital admissions for sepsis have overtaken those for stroke or myocardial infarction. Adapted from Seymour et al. Severe sepsis in pre-hospital emergency care: analysis of incidence, care, and outcome. Am J Respir Crit Care Med 2012; 186(10):1264-1271.
**Hospital Re-Admissions**

### Sepsis Readmission Rates

Sepsis is the No. 1 killer of hospital patients. It is a condition that arises when the body’s response to an infection injures its own tissues and organs. Nationally, hospital readmissions of patients who suffered sepsis far outpace the four medical conditions that the federal government tracks to gauge hospital performance.

#### Percentage of hospital readmissions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sepsis</td>
<td>32.2%</td>
</tr>
<tr>
<td>Heart Failure</td>
<td>6.7%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>5.0%</td>
</tr>
<tr>
<td>COPD</td>
<td>4.4%</td>
</tr>
<tr>
<td>Heart attack</td>
<td>1.3%</td>
</tr>
</tbody>
</table>

#### Estimated average cost per readmission

<table>
<thead>
<tr>
<th>Condition</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Sepsis</td>
<td>$17,676</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>$18,535</td>
</tr>
<tr>
<td>Heart attack</td>
<td>$18,434</td>
</tr>
<tr>
<td>Heart Failure</td>
<td>$19,091</td>
</tr>
<tr>
<td>COPD</td>
<td>$18,477</td>
</tr>
</tbody>
</table>

*10-day readmissions, 2013 National Readmissions Database
Source: Naeser et al., ETM, 2007

**Pathophysiology of Sepsis**

Infection: Bacteria, Virus, Fungi, Parasite

Severe sepsis

SIRS

Pancreatitis, Trauma, Burns, Other

Sepsis: Infection, Severe sepsis, SIRS
Pathophysiology of Sepsis

The Sepsis Continuum

SIRS
- ANY ≥2 of the following
  - Temp >100.9°F (38.3°C) or <96.8°F (36.0°C)
  - HR ≥90/minute
  - RR ≥22/minute
  - WBC >12,000 or <4,000 or >10% bands

SEPSIS
- Met ≥2 SIRS
- (+) suspected or confirmed source of infection (UTI, PNA, wound, etc.)

SEVERE SEPSIS
- SEPSIS (+) new organ dysfunction (see box below)
- OR provider documentation of severe sepsis

SEPTIC SHOCK
- SEVERE SEPSIS (+) ongoing SBP 90 mmHg, fluid bolus
- OR 1st lactate ≥4
- OR provider documentation of septic shock

Other Signs of SEVERE SEPSIS:
- CRP >10 mg/dL or WBC >15,000 or ≤4,000
- Lactate ≥4 mmol/L
- Acute Respiratory Failure
- Hypotension that required fluid bolus for >3 hrs
- New-onset coagulopathy (PT >1.5 or aPTT >1.5 x control)
- New dialysis
- New confusion (Glasgow Coma Scale ≤8)

Bad to Worse

Mortality (%)
Mimics of Sepsis

Noninfectious mimics of sepsis

- Acute myocardial infarction
- Acute pulmonary embolus
- Acute pancreatitis
- Fat emboli syndrome
- Acute adrenal insufficiency
- Acute gastrointestinal hemorrhage
- Overzealous diuresis
- Transfusion reactions
- Adverse drug reactions
- Procedure-related transient bacteremia
- Amniotic fluid embolism

Adapted from Cuhna, BA, Crit Care Clin 1996; 14:1

Septic Shock

- Profound derangements in:
  - Circulation (hemodynamic compromise)
  - Cellular function (tissue injury)
  - Metabolic equilibria (acidosis)
MODS

Multiorgan Dysfunction Syndrome

The beginning of the end

Pathophysiology of MODS

MODS: Central Nervous System

- Altered mental status
- Encephalopathy
- Peripheral neuropathy
- Pathogenesis?
  - Unclear
  - ? Cerebral hypoperfusion
  - ? Direct interference of toxic substances

MODS: Circulatory Compromise

- ↑ Vasodilation+permeability
- ↓ Secretion of vasopressin
- Myocardial depression
- MMDS
  - Microcirculatory & Mitochondrial Distress Syndrome
Frank-Starling Concept

MODS: Pulmonary Dysfunction

- ↑Vasodilation + permeability
- Pulmonary edema
- Neutrophil entrapment
- Hyperventilation
  - Medullary stimulation by endotoxins
  - ↑RR = Resp alkalosis
- ALI
- ARDS
MODS: Intestinal Mayhem

- ↑ Vasodilation + permeability
- Translocation of:
  - Bacteria
  - Toxins
  - Digestive proteases
- Nitric Oxide leads to paralytic ileus
- Narcotics should be avoided⚠️

MODS: Liver Dysfunction

- Major player in host defenses
- RES failure = ↑ bacteria
- Liver failure = ↑ toxins
- Abnormal coagulation

2/2/2017
MODS: Kidney Dysfunction
- AKI complex & multifactorial
- ↓ effective circulating volume
- Renal vasoconstriction
- Cell injury mediated by:
  - Cytokines
  - Neutrophils
  - Endotoxins & other peptides

MODS: Diss Intravascular Coagulation
- ↑ INR | ↑ aPTT | ↓ Fibrinogen

Bleeding  Thrombosis
Risk Factors

Comorbidities

- >50% septic pts have ≥1 comorbidities
- Comorbidities independently increase ☠
- Most common:
  - T2DM, CHF, COPD
  - Cancer, immune suppression
  - Alcoholism
- Pay close attention to:
  - “Frequent flyers”
  - IVDU
Age

- The very young and very old
- 12% of population are >65 (rising)
  - Represent 65% of sepsis cases

Gender

- Males are at higher risk (54%-66%)
- Male hormones may hinder immunity and cardiovascular responses
- May explain the “Man Flu” phenomenon!

MY HUSBAND HAS A MAN COLD

Extending my deepest sympathies, as your family continues to battle your husband’s man cold.
Race

• Sepsis risk doubles in African Americans
• Also has worse outcomes
• Socioeconomic hindrances
• Healthcare disparities
• Substance use
• ?Genetic factors

Compromised Immunity

• Cancer / Chemotherapy
• Diabetes
• Splenectomy, sickle cell disease
• Steroids, chronic immune suppression
• Compromised skin 🔴
Recent Intervention

• Invasive procedure in past 6 weeks
• Indwelling lines
  – Ports, Foley catheters, dialysis

During & After Pregnancy

• Miscarriage in past 6 weeks
• Recent delivery
• Gestational diabetes
• Prolonged rupture of membranes
Season

- Colder seasons are associated with higher frequency of sepsis from respiratory infections

Common infections can lead to sepsis

Among adults with sepsis:

- 35% had a lung infection (e.g., pneumonia)
- 25% had a urinary tract infection (e.g., kidney infection)
- 11% had a type of gut infection
- 11% had a skin infection

History

- Sx dependent on continuum stage
- Fever, sweats, chills, malaise, anxiety
- Pain, may be a clue to infection site

Know the signs and symptoms of sepsis.

- Shivering, fever, or very cold
- Extreme pain or discomfort
- Clammy or sweaty skin
- Confusion or disorientation
- Short of breath
- High heart rate

Exam

- Vitals
- Airway
- Breathing
- Circulation
- Disability (mentation)
- Exposure (possible infection source)

Early Recognition

- Relies on recognizing signs of physiologic derangements
- What scoring system do we use?
- What should we use?
## Early Recognition

**Components of SIRS, qSOFA, MEWS, and NEWS**

<table>
<thead>
<tr>
<th></th>
<th>SIRS</th>
<th>qSOFA</th>
<th>MEWS</th>
<th>NEWS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Heart rate</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Oxygen saturation</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Use of supplemental oxygen</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Mental status</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leukocyte count</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urine Output</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

## Diagnostic Criteria

### Crosswalk from current CMS definitions to SCCM definitions

<table>
<thead>
<tr>
<th>CMS current definitions</th>
<th>SCCM definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sepsis:</strong> Based on codes for sepsis. The core measure only focuses on patients with Severe Sepsis or Septic Shock.</td>
<td><strong>Sepsis:</strong> For any patient with suspected infection:</td>
</tr>
<tr>
<td><strong>Severe Sepsis:</strong> All 3 criteria below must be met within 6 hrs of each other. Presentation time is the date &amp; time which the pt met the last criterion or physician documentation of &quot;Severe Sepsis.&quot;</td>
<td>- Perform qSOFA assessment:</td>
</tr>
<tr>
<td>o Suspected infection or sepsis</td>
<td>o Alteration in mental status</td>
</tr>
<tr>
<td>o 2 or more SIRS criteria (T&gt;103.9 HR &gt;90, RR&gt;20, WBC&gt;12,000 or &lt;4,000 or &gt;10% bands)</td>
<td>o SBP of less than 100 mm Hg</td>
</tr>
<tr>
<td>o New Organ dysfunction (only one of the below criteria):</td>
<td>o A respiratory rate &gt; 22 breaths/min</td>
</tr>
<tr>
<td>- SBP &lt;90, or MAP &lt;65</td>
<td></td>
</tr>
<tr>
<td>- Acute resp failure</td>
<td></td>
</tr>
<tr>
<td>- Creatinine &gt;2 or urine output &lt;0.5 mL/kg/hr X2 hrs</td>
<td></td>
</tr>
<tr>
<td>- Bilirubin &gt;2</td>
<td></td>
</tr>
<tr>
<td>- Pt&lt;100,000</td>
<td></td>
</tr>
<tr>
<td>- INR=1.5 or aPTT &gt;60 sec</td>
<td></td>
</tr>
<tr>
<td>- Lactate &gt;2.0</td>
<td></td>
</tr>
</tbody>
</table>

CMS is recommending crystalloid fluid bolus at 30mL/kg for any new hypotension (SBP <90) or lactate 4 or higher to be started ASAP.

If patient has 2 or 3 of qSOFA criteria, then do the full SOFA assessment to determine organ dysfunction, scoring each of the following variables (see table1):  
- PiCO2/FIO2 ratio  
- Glasgow Coma Scale score  
- Mean arterial pressure  
- Administration of vasopressors w/ type & dose rate of infusion  
- Serum creatinine or urine output  
- Bilirubin  
- Platelet count  

If SOFA score is 2 or greater, the patient has **SEPSIS**

**Severe Sepsis:** This term deleted. They consider any identified sepsis as "severe"!

SCCM is recommending crystalloid fluid bolus at 30mL/kg after sepsis identified ASAP!!
**Septic Shock (CMOS):**
- Blood cultures prior to antibiotics.
- Broad spectrum antibiotics.
- Lactate level and repeat if >2.0.
- For patients identified with sepsis, despite adequate fluid resuscitation, the following are present, then patient has severe sepsis:
  - Vasopressors required to maintain MAP > 65 mmHg 
  - Lactate > 2.0.

**Septic Shock (SCCM):**
- For patients identified with sepsis, despite adequate fluid resuscitation, if the following are present, then patient has septic shock:
  - Vasopressors required to maintain MAP > 65 mmHg
  - Lactate > 2.0.

**Recommended care for severe sepsis:**
- Blood cultures prior to antibiotics.
- Broad spectrum antibiotics.
- Lactate level and repeat if >2.0.

**Recommended care for septic shock:**
- Initiate vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥ 65 mmHg.
- If hypotension persists after initial fluid administration (MAP > 65 mmHg) or if initial lactate was > 4.0 mmol/L, re-assess volume status and tissue perfusion and document findings & assessment of all 5 below:
  - Vital signs.
  - Capillary refill.
  - Pulse.
  - Skin color.
  - OR: TWO OF THE FOLLOWING FOUR:
    - Measure CVP.
    - Measure Svo2.
    - Biologic cardiovascular ultrasound.
    - Dynamic assessment of fluid responsiveness with passive leg raise.

---

**Table 1: Sequential [Sepsis-Related] Organ Failure Assessment Score**

<table>
<thead>
<tr>
<th>Organ 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>
<td>≤400 (31.3)</td>
<td>&lt;400 (31.3)</td>
<td>&lt;400 (40)</td>
<td>&lt;400 (200) with respiratory support</td>
<td>&lt;400 (13.5) with respiratory support</td>
</tr>
<tr>
<td>Cerebral perfusion</td>
<td></td>
<td>≤150</td>
<td>&lt;150</td>
<td>&lt;100</td>
<td>&lt;50</td>
<td>&lt;20</td>
</tr>
<tr>
<td>Liver</td>
<td></td>
<td>≤1.2 (24)</td>
<td>≤1.2-2.0 (31-12)</td>
<td>≤2.0-5.0 (33-103)</td>
<td>≤6.0-11.9 (102-234)</td>
<td>≤13.0 (204)</td>
</tr>
<tr>
<td>Cardiopulmonary</td>
<td></td>
<td>≤0.5 mm Hg</td>
<td>≤2.0 mm Hg</td>
<td>≤5.0 mm Hg</td>
<td>≤10.0 mm Hg</td>
<td>≤20.0 mm Hg</td>
</tr>
<tr>
<td>Central nervous system</td>
<td></td>
<td>≤0.6 (1)</td>
<td>≤1.2-1.5 (110-170)</td>
<td>≤2.0-3.4 (171-290)</td>
<td>≤3.5-4.9 (300-440)</td>
<td>≤5.0 (440)</td>
</tr>
<tr>
<td>Glasgow Coma Scale</td>
<td></td>
<td>≤5</td>
<td>6-9</td>
<td>10-12</td>
<td>13-14</td>
<td>≤15</td>
</tr>
<tr>
<td>Renal</td>
<td></td>
<td>≤1.2 (110)</td>
<td>≤1.2-1.5 (110-170)</td>
<td>≤2.0-3.4 (171-290)</td>
<td>≤3.5-4.9 (300-440)</td>
<td>≤5.0 (440)</td>
</tr>
<tr>
<td>Urine output, mL/h</td>
<td></td>
<td>≤500</td>
<td>≤500</td>
<td>≤300</td>
<td>≤200</td>
<td>≤100</td>
</tr>
</tbody>
</table>

**Abbreviations:**
- FO2: Fraction of inspired oxygen
- MAP: Mean arterial pressure
- PaO2: Partial pressure of oxygen

*Adapted from Vincent et al. 27*

Catecholamine doses are given as µg/kg/min for at least 1 hour.
NEWS: National Early Warning Score

<table>
<thead>
<tr>
<th>PHYSIOLOGICAL PARAMETERS</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiration Rate ≤8</td>
<td>9 - 11</td>
<td>12 - 20</td>
<td>21 - 24</td>
<td>≥25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxygen Saturations ≤91</td>
<td>92 - 93</td>
<td>94 - 95</td>
<td>≥96</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any Supplemental Oxygen</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature ≤36.0</td>
<td>36.1 - 36.0</td>
<td>36.1 - 38.0</td>
<td>38.1 - 39.0</td>
<td>≥39.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic BP ≤90</td>
<td>91 - 100</td>
<td>101 - 110</td>
<td>111 - 219</td>
<td>≥220</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart Rate ≤40</td>
<td>41 - 50</td>
<td>51 - 90</td>
<td>91 - 110</td>
<td>111 - 130</td>
<td>≥131</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of Consciousness</td>
<td>A</td>
<td>V, P, or U</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The NEWS initiative flowed from the Royal College of Physicians’ NEWSDEC, and was jointly developed and funded in collaboration with the Royal College of Physicians, Royal College of Nursing, National Outreach Forum and NHS Training for Innovation.

Early Recognition

qSOFa = simplified NEWS score?

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<th>2</th>
<th>1</th>
<th>0</th>
<th>1</th>
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<td>Any Supplemental Oxygen</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature ≤35.0</td>
<td>35.1 - 36.0</td>
<td>36.1 - 38.0</td>
<td>38.1 - 40.0</td>
<td>≥40.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic BP ≤90</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart Rate ≤40</td>
<td>41 - 50</td>
<td>51 - 90</td>
<td>91 - 110</td>
<td>111 - 150</td>
<td>≥151</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of Consciousness</td>
<td>A</td>
<td>V, P, or U</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

qSOFa score:
- Altered mental status
- Respiratory rate ≥ 22
- Systolic blood pressure ≤ 100

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Rule of 100’s

100s

- Is the patient's temperature above 100?
- Is the patient's heart rate above 100?
- Is the patient's blood pressure below 100?

And does the patient just not look right? Screen for sepsis and notify the physician immediately.

Life-Saving Interventions

- Oxygen
- Blood cultures
- Antibiotics
- Fluid challenge
- Lactate output
Life-Saving Interventions

• Antibiotics (ideally after blood cultures)
  – Broad spectrum, IV

• Fluid Resuscitation
  – At least 30mL/Kg

• Vasopressors
  – Norepinephrine until MAP>65
  – Can add Vasopressin

• Source Control

• Disposition
  – IMCU vs MICU
qSOFA is not Superior

Quality Measures and Initiatives

- CMS Sepsis-1 Core Measure
- Began October 2015
- All or nothing
- Recently changed
  - Fluid challenge to within 10% of body weight
Quality Measures and Initiatives

The Future of Sepsis Care

- Every hospital should have a QI team
- Physician and nurse champions
- Education
- Compliance with bundles
- Audit and feedback

High bundle compliance led to 25% relative risk reduction in sepsis mortality

(Surviving Sepsis Campaign: Association Between Performance Metrics and Outcomes in a 7.5-Year Study, 2014)
The Future of Sepsis Care

Source: Wisconsin Hospital Association

Useful Websites

- https://www.cdc.gov/sepsis/
- http://www.survivingsepsis.org/
- http://world-sepsis-day.org/
Useful Apps – SCCM

Society of Critical Care Medicine
By PDM Verticals Corporation

Open iTunes to buy and download apps.

Description
All of SCCM’s resources are in one central location within the SCCM App. SCCM App users are able to access the Critical Care Congress App 2016 and the Surviving Sepsis Campaign App. It features all Critical Care paradigms. It researches SCCM Member Directory 31 more and download SCCM guidelines to our News and Career Central updates. These other features also are included.

Society of Critical Care Medicine Support

What’s New in Version 2.1
- Added Critical Care Quiz component.

Screenshots

Available on iPhone and iPad.

Useful Apps – Sepsis 2016

SmartIntern: Sepsis 2016

This app is designed for both iPhone and iPad.

Rating: 5.0

© JonasHealthcare Park, MD

Available on iPhone and iPad.

Rating: 5.0
Case 1

A 28-year-old Caucasian woman presented to the emergency department with a two-day history of fevers, conjunctival hyperemia, abdominal cramps, myalgias, diffuse erythroderma prominent on her upper thorax, and inner thighs. She had a history of Hashimoto’s thyroiditis and chronic menorrhagia.
Case 1

- On initial examination, she looked unwell and had an oral temperature of 98.9°F (37.2°C), blood pressure of 98/65 mmHg and a heart rate of 132 beats/min. No other obvious source of sepsis was found during physical examination.

<table>
<thead>
<tr>
<th>Parameter (normal range)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC (4.0–10.0×10⁹/L)</td>
<td>21.2×10⁹/L</td>
</tr>
<tr>
<td>Hemoglobin</td>
<td>WNL</td>
</tr>
<tr>
<td>Platelets 1(50–400×10⁹/L)</td>
<td>WNL</td>
</tr>
<tr>
<td>INR (0.9–1.1)</td>
<td>1.8</td>
</tr>
<tr>
<td>Fibrinogen (2.0–4.0 g/L)</td>
<td>4.79 g/L</td>
</tr>
<tr>
<td>Creatinine (mg/L)</td>
<td>WNL</td>
</tr>
<tr>
<td>Creatine kinase (&lt;167 U/L)</td>
<td>346 U/L</td>
</tr>
<tr>
<td>BUN</td>
<td>WNL</td>
</tr>
<tr>
<td>ALT(&lt;33 U/L)</td>
<td>52 U/L</td>
</tr>
<tr>
<td>AST(&lt;32 U/L)</td>
<td>72 U/L</td>
</tr>
<tr>
<td>Total bilirubin (3.4–17.1 µmol/L)</td>
<td>61.3 µmol/L</td>
</tr>
<tr>
<td>Blood cultures</td>
<td>Negative x2</td>
</tr>
<tr>
<td>Urine culture</td>
<td>Negative</td>
</tr>
</tbody>
</table>
Case 1 Diagnosis

- Toxic Shock Syndrome (TSS)
- Secondary to retained tampon
- Successfully treated with IV abx
- Discharged 3 days later

Take Home Points

- Early recognition & treatment is key
  - Antibiotics within 1 hour, fluids for $\downarrow$BP
- Improving sepsis care requires multidisciplinary efforts to improve education and system processes
REFERENCES