Surviving Sepsis
An Update on the Surviving Sepsis Guidelines
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Objectives
During this presentation you will learn:
• The updated Surviving Sepsis guidelines for management of Sepsis and Septic Shock
• How to identify patients at highest risk for developing sepsis
• The long term effects of sepsis on survivors, and how this might impact their future care needs

No Disclosures
• No financial relationships to disclose
• No off label use of medications will be discussed
Why Should Everyone Care About Sepsis?

• Sepsis is a leading cause of death in U.S.
• The mortality rate from sepsis is 28-45%
• Treatment costs hospitals $20 billion / yr.
• Early sepsis often not recognized
• Delays in diagnosis & treatment ↓ survival
• Many sepsis survivors suffer long term consequences

Total Deaths From Sepsis Increasing

More susceptible people in the population
• Aging population
• Immunosuppression:
  – chemotherapy, transplants, treatment causing immunosuppression, serious co-morbidities
• More invasive medical treatments
• Evolving drug resistant organisms

Updated Definition of Sepsis

• Life threatening organ dysfunction caused by a dysregulated **host response** to infection
• Sepsis is a syndrome
  – A group of signs and symptoms that develop in a patient as a response to an infection
  – Leads to sepsis induced **organ dysfunction**
• 3rd International Consensus Definitions For Sepsis and Septic Shock (Sepsis-3) (Singer et al., 2016)
Sepsis Defined in Lay Persons Terms

• “Sepsis is a life-threatening condition that arises when the body’s response to an infection injures its own tissues and organs” (Singer et al., 2016, p. 805)

• Public awareness of sepsis is very low

Surviving Sepsis Campaign

• 2004: international collaborative effort to improve treatment of severe sepsis & improve high mortality rate

• A practice improvement program

• Developed evidenced based practice guidelines for management of severe sepsis and septic shock

• Updated in 2008, 2010, and 2015

Updated Guidelines

2 Classifications

• Sepsis
  – Life threatening organ dysfunction caused by a dysregulated host response to infection

• Septic Shock
  – Underlying circulatory and cellular / metabolic abnormalities are significant enough to substantially ↑ mortality

• Severe sepsis; not as big of a focus

• Organizations still using this terminology
Septic Shock

- Sepsis with:
  - **persistent hypotension** requiring vasopressors to maintain MAP ≥ 65mmHg
  - Serum lactate level > 2.0 mmol/L despite adequate volume resuscitation

★ Hospital mortality is > 40% in people who meet these criteria
   Early recognition and treatment improves survival!

Sepsis Declared a Medical Emergency

- 2016: Center for Disease Control (CDC) declared sepsis a medical emergency
  - similar to heart attack and stroke
- Need to increase awareness of sepsis:
  - Prevention
  - Screening
  - Early appropriate treatment

2016 Long Term Care National Patient Safety Goals

- Identify residents correctly
- Use medications safely
- **Prevent infection**
- Prevent residents from falling
- Prevent bed sores
Challenges Defining Sepsis

• Sepsis is a complex process
• Response to infection determined by pathogen factors and host factors
• Infection leads to activation of both pro and anti-inflammatory response mechanisms
• Many other metabolic pathways are activated in sepsis…still much we don’t know

Challenges Diagnosing Sepsis

• Sepsis is a clinical diagnosis
  – There is no one test to determine if a patient has sepsis
  – Many high risk patients already look very ill
• Unrecognized infection may be the cause of new onset organ dysfunction
  – Need high index of suspicion
  – Look for signs and symptoms of sepsis
  – Frequently reassess high risk patients

Systemic Inflammatory Response Syndrome

SIRS Criteria

• SIRS criteria useful to diagnosis infection
  – Does not diagnoses sepsis
• SIRS may represent a normal, adaptive host response to infection or injury
• Sepsis is the life threatening organ dysfunction in response to infection
Systemic Inflammatory Response Syndrome

**SIRS Criteria**
- Two or more of the following:
  - Temp > 38.0 or < 36.0
  - HR > 90 /min
  - Resp Rate > 20 min or PaCO2 < 32mmHg
  - WBC count > 12,000 or < 4,000
    - or > 10% immature bands
- *Can occur with other conditions, not just infection*

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**Early Presenting Signs & Symptoms of Sepsis**
- Tachypnea; RR > 20
- Systemic vasodilation
- Tachycardia
- Mild hypotension
- Altered mental status
- Decreased urine output
- Hyperthermia
- Hypothermia
- Hyperglycemia
- Ileus; or ↓ GI function

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**Tachypnea: RR > 20**
- Respiratory infection is most common cause of sepsis
- *Tachypnea almost always present but often overlooked*
- Often related to changes in acid base balance
- Hypoxia, anaerobic metabolism, production of lactate
- Patients medicated with narcotics or sedatives rarely become tachypneic
Systemic Vasodilation in Early Sepsis

- Toxins can circulate causing blood vessels to dilate
- SIRS can cause vasodilation
  - Warm flushed skin
  - Bounding pulses
  - Rapid capillary refill
- Late sign: patients are cold, clammy, cyanotic, and mottled

Mild Hypotension & Tachycardia in Early Sepsis

- As blood vessels dilate, BP ↓ slightly
- Initially body compensates by ↑ HR
- Body will increase diastolic pressure to maintain perfusion, look for this sign!
- Remember; patients on meds such as beta blockers, calcium channel blockers will not develop tachycardia
- Late sign: severe hypotension

Altered Mental Status

- Anxiety, restlessness, apathy are early signs of sepsis due to ↓ perfusion to brain
- Hypoxia can cause anxiety & restlessness
- Elevated PCO2 causes lethargy, ↓ RR
- Symptoms often blamed on meds!
  - Look for signs / symptoms of sepsis
- Late sign: patient becomes unresponsive
Decreased Urine Output
• The body will attempt to conserve fluids due impaired perfusion to organs
  – Kidneys retain sodium and water
• Important to look closely at urine output
• Urine output is an important indicator of fluid volume status in people with normal renal function
• Late sign: oliguria; renal failure

Will all Septic Patients Have a Fever?
• Hyperthermia: T > 101.0° F often present
  – May be intermittent
• Hypothermia: T < 96.8° F
  – Common in elderly population
• Immunosuppressed patients won’t mount a fever or elevated WBC
  – Transplant, oncology patients
  – Treatment with steroids

Hyperglycemia in Sepsis
• Pay attention to elevated glucose levels
  – May be sign of stress response from SIRS
  – May indicate presence of infection
• Look for trends in blood glucose levels and insulin needs
• Hypoglycemia is a bad prognostic sign!
Development of Ileus in Sepsis

- Blood is shunted away from the bowel to maintain perfusion to vital organs
  - Decreased bowel sounds often occurs
  - Look for high residuals from tube feedings
  - Look for signs of decreased appetite
- Vomiting and aspiration are common complications in hospitalized patients
- Dead gut can occur

Assessment of WBC Count in Sepsis

- In sepsis WBC can be high or low
- WBC > 12,000, or > 10 % bands
- WBC < 4,000
- Look for trends in WBC
  - Presence of bands can indicate prolonged or severe infection
- Patients on antibiotics can become septic

Sepsis Screening

- Should be routinely performed by nurses & providers at every level of care
  - Long term and residential care facilities
  - Outpatient screening: EMS
  - On admission: ED, ICU, inpatient bed
- At regular intervals
- With any change in condition
Tools for Sepsis Screening and Management

- Mandatory screening increases awareness of sepsis signs & symptoms
- Many tools used
- Improve early recognition of sepsis
- Provide direction for early diagnosis & evidence based rapid treatment of sepsis
  - Evidenced based, goal directed therapy saves lives

What is the Sequential Organ Failure Assessment (SOFA) score?

- Identifies clinical indicators of organ dysfunction due to infection to predict mortality from sepsis
  - ≥ 2 points from baseline = new organ dysfunction
- Measures of organ failure
  - Resp: RR and 02 needs
  - CV: MAP > 70, vasopressor use
  - Liver: ↑ bilirubin levels
  - Neuro: GCS
  - Renal: ↑ creatinine, ↓ U/O

Quick Sequential Organ Failure Assessment (qSOFA) score

- Simple sepsis screening tool
- Designed for quick assessment of organ dysfunction related to infection
- No lab testing required; good for settings with fewer resources
- RR > 22
- Altered mentation
- SBP < 100 mmHg
- Identifies adult patients with suspected infection who are likely to have poor outcomes
CMS Mandates Sepsis Screening & Treatment in Hospitals

- All patients must receive routine screening
- **Once Severe Sepsis identified**
  - confirmed/ suspected infection
  - plus signs of ≥ 2 SIRS criteria
- **Or if Septic Shock identified**
  - Severe sepsis plus ≥ 1 signs of new organ dysfunction, poor perfusion
- Clock starts; must deliver standard care
  - 3 and 6 hour bundles

Three and Six Hour Bundles

**Severe Sepsis**
- **Three Hour Bundle**
  - Lactate level, blood cultures x 2, broad spectrum antibiotics, IV fluids
- **Six Hour Bundle**
  - Re-measure lactate level if initial level > 2
  - Frequently assess response to treatment

**Septic Shock**
- Must meet all of 3 hour severe sepsis bundle
- **Six Hour Bundle**
- Additional elements:
  - Vasopressors to maintain MAP ≥ 65
  - Reassess fluid & organ perfusion
  - Targeted physical exam

The Benefits of Sepsis Screening in LTCFs

- “Sepsis begins outside the hospital in nearly 80% of cases”
- Rapid detection and early intervention saves lives

http://www.cdc.gov/vitalsigns/sepsis/index.html
Failure to Rescue

- Inability to save a patient’s life after the development of a complication that was not present on admission

Circumstances Surrounding Failure to Rescue

- **Failure to Recognize**: deterioration in vital signs over time with no response from caregivers
- **Failure to Communicate**: Delay in physician response to call for assistance; inadequate communication between caregivers
- **Failure to Plan**: deterioration if a patient while awaiting treatment

Need to Empower Caregivers to Respond to Sepsis

- Early recognition of signs and symptoms
- Quickly calling for help
  - Able to articulate patient’s change in condition
- Providing appropriate early treatment
- Close monitoring for response to treatment
- Prompt transfer to higher level of care if needed
People Most at Risk For Sepsis

- Recent surgery or invasive procedure
- Long Term Care Facility (LTCF) residents
- People with significant co-morbidities
  - Diabetes, cardiac, lung, and liver disease
- Elderly (> 65 years old)
- Chronic renal failure
- Drug or ETOH abuse
- Persons undergoing treatment for cancer
- Transplant patients

Most Common Sites of Infections Causing Sepsis

- Respiratory tract or lungs
  - pneumonia
- Urinary tract
  - Many high risk patients have resistant organisms
- Skin
  - Pressure ulcers
- Gut or Gastrointestinal tract

Nursing Home-Acquired Pneumonia (NHAP)

- One of the most common infections in long term care residents
- Often due to multi-drug resistant organisms
- Common cause of sepsis
  - can progress to septic shock
- Those infected often have multiple co-morbidities leading to higher risk of mortality
- Requires prompt treatment to improve survival
Patients With Devices in Place

Biofilm develops on surface of devices:
* invasive lines  
* tubes  
* drains  
* catheters  
* prosthetics: heart valves, joints, etc.

• Biofilm: complex extracellular matrix composed of gram −, or gram+ bacteria, or yeast.
• Biofilm is difficult to penetrate  
  – Can lead to antibiotic resistance

Biofilm Attached to Graft

WBC Attached to Biofilm
Biofilm-Based Infections in Long Term Care Populations

- Becoming more common with more complex patients in long term care facilities
- Often involve multiple organisms, and or drug resistant organisms
- Growth of biofilm determined by host factors, and device factors

Catheter Associated Urinary Tract Infection in LTCFs

- Many CAUTIs in LTCFs due to insertion or maintenance of urinary catheters
  - Contamination during insertion
  - Ongoing contamination from indwelling catheter
- Biofilm begins to develop on inner and outer catheter surface in 2-3 days
  - Can shed biofilm when catheters exchanged

Catheter Related Blood Stream Infections in LTCFs

- Biofilm begins to develop on intravenous catheters within 2-3 days
- Skin colonization at insertion site occurs, leading to biofilm growth
- Biofilm growth and development can lead to continual release of organisms into bloodstream
  - Very difficult to treat
  - Can lead to repeated episodes of blood stream infections
Infections Associated with Pressure Ulcers in LTCFs

- Many stage III and stage IV pressure ulcers contaminated with drug resistant organisms
  - Aerobic and anaerobic bacteria
  - Leads to soft tissue injury
- Biofilm can also form on pressure ulcers
  - Can impede healing of pressure ulcers
  - Ongoing source of infection

Sepsis Survivors Suffer Many Long Term Effects

- Sepsis survivors at increased risk for mortality for up to 2 years
  - Risk \( \uparrow \) for those who are older, co-morbidities
- Many sepsis survivors have \( \downarrow \) quality of life
  - Many report \( \downarrow \) in cognitive and physical functioning
  - Can limit their ability to live independently
  - Older age increases risk
  - Effects can last \( \geq 8 \) years

Important Prevention Methods

- Hand washing
- Vaccination
  - Influenza, pneumonia, others
- Increasing awareness of sepsis
  - Sepsis Screening; Use the word sepsis
  - Ask “could this be sepsis?”
  - “This patient is at risk for sepsis”
  - “This patient has sepsis” in hand off report
Free Sepsis Related Resources Available to You

- Surviving Sepsis Guidelines
  [http://www.survivingsepsis.org/Pages/default.aspx](http://www.survivingsepsis.org/Pages/default.aspx)
- CDC
  [http://www.cdc.gov/sepsis/](http://www.cdc.gov/sepsis/)
- National Nursing Home Quality Campaign
  [https://www.nhqualitycampaign.org/](https://www.nhqualitycampaign.org/)

Posters for your work place to increase awareness

Available free of charge on CDC website

Increase public awareness of sepsis

Available free of charge on CDC website

**WHAT CAN YOU DO TO PREVENT SEPSIS?**

1. Get vaccinated against the flu, pneumococcal, and any other infections that could lead to sepsis. Talk to your doctor for more information.
2. Prevent infections that can lead to sepsis by:
   - Cleansing wounds and sores
   - Practicing good hygiene (e.g., hand washing)
3. Know that time matters. If you have a severe infection, look for signs like: shivering, fever, or very cold; extreme pain or discomfort; chills or nausea, skin change or discoloration, short of breath, rapid breathing, and high heart rate.
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References


