SURVIVING SEPSIS:
Early Management Saves Lives

Pat Posa RN, BSN, MSA
System Performance Improvement Leader
St. Joseph Mercy Health System
Ann Arbor, MI
Patricia.posa@stjoeshealth.org
Objectives

a. Understand the incidence of sepsis
b. Discuss the difference between sepsis, severe sepsis and septic shock
c. Define an early recognition process for severe sepsis
d. Discuss the evidence based interventions for severe sepsis
Severe Sepsis: A Significant Healthcare Challenge

- Sixth most common reason for hospitalization
- Most costly reason for hospitalization in 2009**
  - 15.4 billion in aggregate hospital cost
- 1 out of 23 patients in hospital had septicemia**
- Major cause of morbidity and mortality worldwide
  - Leading cause of death in noncoronary ICU (US)¹
  - 10th leading cause of death overall (US)²*
- In the US, more than 500 patients die of severe sepsis daily (1.6 million new cases per year)

* Based on data for septicemia
†Reflects hospital-wide cases of severe sepsis as defined by infection in the presence of organ dysfunction

** AHRQ Healthcare cost & Utilization Project October 2011
Polling Question

Do you send residents to the hospital for infections?
1. Yes
2. No
Time Sensitive Diseases
Changing the Paradigm of Practice

AMI

Stroke

Trauma

< 10%

< 10%

< 5%
Severe Sepsis: Defining a Disease Continuum

Infection

SIRS

Sepsis

Severe Sepsis

**Adult Criteria**
A clinical response arising from a nonspecific insult, including ≥ 2 of the following:

- **Temperature:** > 38°C or < 36°C
- **Heart Rate:** > 90 beats/min
- **Respirations:** > 20/min
- **WBC count:** > 12,000/mm³, or < 4,000/mm³, or > 10% immature neutrophils

**SIRS with a presumed or confirmed infectious process**

**Sepsis with ≥1 sign of organ dysfunction, hypoperfusion or hypotension.**

- Cardiovascular (refractory hypotension)
- Renal
- Respiratory
- Hepatic
- Hematologic
- CNS
- Unexplained metabolic acidosis

Shock
Identifying Acute Organ Dysfunction as a Marker of Severe Sepsis

**Respiratory**
- Increased O2 requirements
- SaO2 < 90%

**Cardiovascular**
- Tachycardia
- SBP < 90mmHg

**Metabolic**
- Unexplained metabolic acidosis
- pH ≤ 7.30 or Base deficit ≥ 5.0 mEq/l
- Lactate > 4

**Renal**
- UO < 0.5 ml/kg per hr (despite fluid)

**Neurological**
- Altered level of consciousness (unrelated to primary neuro pathology)
Except on few occasions, the patient appears to die from the body's response to infection rather than from it."

Sir William Osler – 1904
The Evolution of Modern Medicine
Homeostasis Is Unbalanced in Severe Sepsis

Coagulation

Inflammation

Fibrinolysis

Inflammation, Coagulation and Impaired Fibrinolysis In Severe Sepsis

Reprinted with permission from the National Initiative in Sepsis Education (NISE).
Microcirculation of Septic Patient: Orthogonal Polarization Spectral Imaging

- BP: 120/80 Hg
- SaO₂: 98%

Microcirculation of Septic Shock
Patient: Orthogonal Polarization Spectral Imaging

- Resuscitated with fluids and dopamine
  - HR: 82 BPM
  - BP: 90/35 mm Hg
  - SaO₂: 98%
  - CVP: 25 mm Hg

CORNERSTONES OF MULTIDISCIPLINARY MANAGEMENT OF SEVERE SEPSIS

• Prevention
  • Screening and Early Identification
  • Early Intervention: Source control, Blood cultures and broad spectrum antibiotics
• Initial Resuscitation Bundle
• Septic Shock Bundle
Prevention

• Handwashing
• Device related infections
  – CLABSI
  – CAUTI
• Pneumonia
CORNERSTONES OF MULTIDISCIPLINARY MANAGEMENT OF SEVERE SEPSIS

- Prevention
- Screening and Early Identification
- Early Intervention: Source control, Blood cultures and broad spectrum antibiotics
- Initial Resuscitation Bundle
- Septic Shock Bundle
Polling Question

Do you have a screening process to identify patients with severe sepsis?
1. Yes
2. No
3. Planning on putting one in place
# Patient Units Severe Sepsis Screening Tool

**Severe Sepsis = Infection + SIRS + Organ Dysfunction**

**Directions:** The screening tool is for use in identifying patients with severe sepsis upon admission, once per shift and PRN on each patient.

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<th>TIME:</th>
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## I. SIRS-Systemic Inflammatory Response Syndrome (two or more of the following):

- Temperature greater than or equal to 100.4°F or less than or equal to 96.8°F
- Heart Rate greater than 90 beats/minute
- Respiratory Rate greater than 20 breaths per minute
- WBC greater than or equal to 12,000/mm³ or less than or equal to 4,000/mm³ or greater than 0.5 K/uL bands
- Blood glucose greater than 140 mg/dL in non-diabetic patient
- Negative screen for severe sepsis (Please initial)

If check two of the above, move to II

## II. Infection (one or more of following):

- Suspected or documented infection
- Antibiotic Therapy (not prophylaxis)

If check none of above – Negative screen for severe sepsis (Please initial) – answer infection question NO in I-view

If check one of the above – answer infection question YES in I-view, call physician for serum lactate order and move to III

## III. Organ Dysfunction (change from baseline)

(One or more of the following within 3 days of new infection)

- Respiratory: SaO₂ less than 90% OR increasing O₂ requirements
- Cardiovascular: SBP less than 90mmHg OR 40mmHg less than baseline
- Renal: urine output less than 0.5ml/kg/hr; creatinine increase of greater than 0.5mg/dl from baseline
- CNS: altered consciousness (unrelated to primary neuro pathology)
- Glasgow Coma Score less than or equal to 12
- Hematologic: platelets less than 100,000, INR greater than 1.5
- Hepatic: Serum total bilirubin greater than or equal to 4mg/dl
- Metabolic: Serum lactate greater than or equal to 2mmol/L

Negative screen for severe sepsis (Please initial)

If check one in section III or a severe sepsis alert fires

Patient has screened positive for severe sepsis (Call rapid response team)

Implement urgent measures (on patients with a positive sepsis screen) Complete interventions in 0-1 Hours on back:

1. Contact physician, physician assistant or nurse practitioner
2. Obtain a venous blood gas (peripheral draw), serum lactate, CBC (if it has been greater than 12 hrs since last test), two sets of blood cultures (if greater than 24 hours since last set)
3. If patient is hypotensive: Start an IV and give a bolus of NS – 20ml per kg as fast as possible

**SBAR**

**Situation:**

Screened Positive for Severe Sepsis

**Background:**

1. Positive SIRS (describe areas positive)
2. Known or suspected infection
3. Organ dysfunction: share which organ system(s)

**Assessment:** Share complete V6 and SaO₂

**Recommendation:**

1. I need you to come and evaluate the patient to confirm if they have severe sepsis
2. I have obtained the following labs ____. Any other labs you would like me to obtain?
3. If patient is hypotensive: I began an IV and gave a bolus of NS – 20ml per kg?

**Outcome of patient assessment by physician:**

Physician diagnosis of severe sepsis: Time ___

No severe sepsis diagnosis by physician

**RN Signature, Initial Date & Time:**
Severe Sepsis Screening Tool

Directions: The screening tool is for use in identifying patients with severe sepsis. Screen each patient upon admission, once per shift and PRN with change in condition.

**DATE:**

**TIME:**

I. SIRS-Systemic Inflammatory Response Syndrome (two or more of the following) current values:

- Temperature greater than or equal to 101°F or less than or equal to 96.8°F
- Heart Rate greater than 90 beats/minute
- Respiratory Rate greater than 20 breaths per minute
- WBC greater than or equal to 12,000/mm3 or less than or equal to 4,000/mm3 or greater than 0.5 K/uL bands (in last 24 hours)
- Negative screen for severe sepsis (Please initial)

If check two of the above, move to II

II. Infection (one or more of following):

- Suspected or documented infection
- Antibiotic Therapy (not prophylaxis)

If check none of above – Negative screen for severe sepsis (Please Initial) – answer infection question NO in I-View

If check one of above – answer infection question YES in I-View, obtain serum lactate acid per protocol and move to III

III. Organ Dysfunction (change from baseline)

(one or more of the following within 3 days of new infection)

- Respiratory: SaO2 less than 90% OR increasing O2 requirements
- Cardiovascular: SBP less than 90mmHg OR 40mmHg less than baseline OR MAP less than 65mmHg
- Renal: urine output less than 0.5ml/kg/hr; creatinine increase of greater than 0.5mg/dl from baseline
- CNS: altered consciousness (unrelated to primary neuro pathology)
- Glasgow Coma Score less than or equal to 12
- Hematologic: platelets less than 100,000; INR greater than 1.5
- Hepatic: Serum total bilirubin greater than or equal to 4mg/dl
- Metabolic: Serum lactate acid greater than or equal to 2mEq/L

Negative screen for severe sepsis (Please initial)

If check one in section III or a severe sepsis alert fires, patient has screened positive for severe sepsis

1. Call rapid response team
2. Call physician, physician assistant or nurse practitioner and implement urgent measures protocol
3. Initiate or ensure IV access (2 large bore IV’s if no central access)
4. Obtain a venous blood gas (peripheral draw); serum lactate acid, CBC (if it has been greater than 12 hrs since last test), two sets of blood cultures (if greater than 24 hours since last set)
5. If patient is hypotensive: Give crystalloid (NS) fluid bolus – 30ml/kg over one hour or as fast as possible until hypotension resolved, unless known LF is less than 35% or active treatment for heart failure.

**SEPSIS INDUCED HYPOPERFUSION?**

(Clinical picture of severe sepsis plus one or both of the following criteria)

1. Hypotension AFTER initial fluid bolus (30 ml/kg)
2. Require vasopressor
3. Initial lactate acid greater than or equal to 4 mEq/L, with any BP

**YES**

- Activate CODE SEPSIS
- Initiate transfer to ICU
- Meanwhile, continue crystalloid resuscitation of 250-1000ml boluses if hypotensive after the initial bolus – per physician order

**NO**

For lactate acid 3-3.9 or initial hypotension that responded to the 30 ml/kg fluid bolus, initiate transfer to ICU

**NO**

For lactate acid 3-3.9 or initial hypotension that responded to the 30 ml/kg fluid bolus, initiate transfer to ICU

Initiate Intermediate Care Severe Sepsis Bundle on back and complete interventions.
General Care Severe Sepsis Bundle

For patients with 2 or more SIRS + known/suspected infection + initial lactic acid 2-2.9 w/o additional organ dysfunction

- Blood cultures x 2
- Antibiotics w/in 1 hr of screening positive for sepsis. Ensure antibiotic is ordered STAT (call Rx and notify of STAT order)
- Vital signs: every 1 hr x 4, then every 4 hr x 2, then once per shift
- Lactic acid every 4 hr x 24 hr
- I & O every 2 hr (if no void w/in 4 hr, bladder scan- if greater than 200 mL perform intermittent straight cath), call MD if less than 0.5 mL/kg/hr
- Maintain/monitor for:
  - SBP greater than 90 mmHg
  - Urine output greater than 0.5 mL/kg/hr
  - Decrease in lactic acid x 3 results or normalization x2 within 12 hours

**If unable to maintain these parameters or if pt has additional organ dysfunction, call MD for possible transfer to IMC/ICU

- Continue sepsis screen every shift and pm change in patient condition
- Complete 0 to 1 hour interventions, below

Intermediate Care Severe Sepsis Bundle

For patients with 2 or more SIRS + known/suspected infection + initial lactic acid 3-3.9 or had hypotension that responded to fluid bolus

- Blood cultures x 2
- Antibiotics w/in 1 hr of screening positive for sepsis. Ensure antibiotic is ordered STAT (call Rx and notify of STAT order)
- Vital signs: every 30 min x 4, then every 1hr x 2, then every 2hr x 4; then every 4 hr
- Lactic acid every 4 hr x 24 hr
- I & O every 2 hr (if no void w/in 4 hr, bladder scan- if greater than 200 mL perform intermittent straight cath), call MD if less than 0.5 mL/kg/hr
- Continue to administer fluid boluses per physician order to achieve/maintain the following goals:
  - SBP greater than 90 mmHg
  - Urine output greater than 0.5 mL/kg/hr
  - Decrease in lactic acid x 3 results or normalization x2 within 12 hours

**If unable to achieve these parameters or if pt has increase in lactic acid of 0.5 or more, increase in O2 requirements, mental status change, or additional organ dysfunction, call MD for possible transfer to ICU

- Complete 0 to 1 hour interventions, below
# SEVERE SEPSIS SCREENING TOOL

## I. INFECTION
- Suspected or documented infection
- Antibiotic therapy

Check blood glucose if any one above is checked AND proceed to STEP II: Blood sugar:

If no checks above = NEGATIVE screen for sepsis: Initial __________

No need to proceed to Step II, however continue to assess resident for changes: STOP and WATCH early warning tool OR Using your Senses to Identify Sepsis

## II. SIRS – Systemic Inflammatory Response Syndrome
- Temperature **greater than or equal to 101 or less than or equal to 96.8°F**
- HR greater than 90 beats/minute
- Respiratory rate **greater than 20 breaths/minute**
- Blood glucose **greater than 140 in non-diabetics**

If less than 2 checked = NEGATIVE screen for sepsis: Initial __________

No need to proceed to Step III, however continue to assess resident.

If 2 above are checked, PATIENT SCREENED POSITIVE FOR SEPSIS

Place resident on I & O. Monitor and record urine output every shift

Obtain order for LACTIC ACID and proceed to Section III

## III. ORGAN DYSFUNCTION
- Respiratory: SAO2 less than 90% OR increasing O2 requirements
- Cardiovascular: SBP less than 90mmHg OR 40mmHg less than baseline
- Renal: Urine output less than .5ml/kg over last 8 hours
- CNS: Mental status changes

**LABS:** (Do not use lab results older than 24 hours)
- Platelets less than 100,000
- INR greater than 1.5
- Bilirubin greater than or equal to 4mg/dl
- Serum lactic acid greater than or equal to 2mEq/l

If 1 above checked, PATIENT SCREENS POSITIVE FOR SEVERE SEPSIS.

CALL PHYSICIAN AND FOLLOW SBAR SCRIPT BELOW.

If no checks above = NEGATIVE screen for sepsis: Initial __________

Continue to assess. No further action at this time.

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**SITUATION:** Tell physician resident screened positive for Severe Sepsis

**BACKGROUND**
- Describe positive SIRS; Inform physician if resident is currently being treated for a known infection; share which organ system has dysfunction

**ASSESSMENT**
- Share VS and SaO2 (pulse ox)

**RECOMMENDATION:**
- Blood cultures; CBC; Lactic Acid (if not previously drawn) IV Antibiotic
- Decreased BP, fluid bolus 30ml/kg over 1 hour or faster until hypotension resolved. If resident does not respond to bolus, send to ER

**REQUEST ORDER FOR FOLLOWING**
USING YOUR SENSES TO IDENTIFY SEPSIS (HOME INSTEAD)

- Skin redness, swelling, discharge, decreased urination
- Complaints of pain, chills and/or breathing
- Warm wound, fast pulse, hot, cold or clammy skin
- Odor from wound, urine and/or breath
- Decreased appetite

STOP AND WATCH (INTERACT)

S – Seems different than usual
T – Talks or communicates less
O – Overall needs more help
P – Pain- new or worsening; Participated less in activities
a – Ate less
n – No bowel movement in 3 days; or diarrhea
d – Drank less
W – Weight change
A – Agitated or nervous more than usual
T – Tired, weak, confused, or drowsy
C – Change in skin color or condition
H – Help with walking, transferring, toileting more than usual

Link with current process
NQF/SSC Bundles

To be completed within 3 hours of time of presentation*

1. Measure lactate level
2. Obtain blood cultures prior to antibiotic administration
3. Administer broad spectrum antibiotics
4. Administer 30ml/kg crystalloid for hypotension or lactate ≥ 4 mmol/L

*time of presentation" is defined as the time of triage in the Emergency department or if presenting from another care venue, from the earliest chart annotation consistent with all elements of severe sepsis or septic shock ascertained through chart review
NQF/SSC Bundles

To be completed within 6 hours of time of presentation

5. Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) of > 65mmHg

6. In the event of persistent arterial hypotension despite volume resuscitation (septic shock) or initial lactate ≥4mmol/L (36mg/dL):
   - Measure central venous pressure (CVP)*
   - Measure central venous oxygen saturation (ScvO2)*

7. Remeasure lactate if elevated*

*Targets for quantitative resuscitation included in the guidelines are CVP of ≥8mm Hg, ScvO2 of ≥70% and lactate normalization
Clinical Scenario 1: Early identification and intervention

- **88 year old**, 51.6kg, white, female admit from ED; resided in ECF
- **History**: CAD, COPD, dementia, Alzheimer disease, depression, SVT
- **Chief Complaint**: rib pain, chest congestion and SOB
- Awake, alert and oriented, slight combative (history of combative behavior)
Clinical Scenario 1: Early identification and intervention

- **Initial VS:**
  - Temp: 101.6 F
  - RR: 31
  - HR: 109, atrial fib with occasional SVT
  - B/P: 79/51
  - 2L of O2, O2 sat of 96%

- Does this patient screen positive for severe sepsis?

  - **Positive Screen for severe sepsis:**
    - **SIRS:** HR >90; RR> 20; Temp > 38
    - **Organ dysfunction:** SBP<90mmHg

  - **WHAT ARE THE NEXT STEPS?**
    - **Call physician**—follow SBAR
    - **Expected orders:**
      - Give fluid bolus of 20ml/kg bolus
      - Labs drawn(lactate, CBC, ABG)
# SEVERE SEPSIS SCREENING TOOL

## I. INFECTION
- Suspected or documented infection
- Antibiotic therapy

Check blood glucose if any one above is checked AND proceed to STEP II: Blood sugar:

If no checks above = NEGATIVE screen for sepsis: Initial _________

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## II. SIRS – Systemic Inflammatory Response Syndrome
- Temperature greater than or equal to 101 or less than or equal to 96.8°F
- HR greater than 90 beats/minute
- Respiratory rate greater than 20 breaths/minute
- Blood glucose greater than 140 in non-diabetics

If less than 2 checked = NEGATIVE screen for sepsis: Initial _________

No need to proceed to Step III, however continue to assess resident.

If 2 above are checked, PATIENT SCREENED POSITIVE FOR SEPSIS

Place resident on I & O. Monitor and record urine output every shift

Obtain order for LACTIC ACID and proceed to Section III

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## III. ORGAN DYSFUNCTION
- Respiratory: SAO2 less than 90% OR increasing O2 requirements
- Cardiovascular: SBP less than 90mmHg OR 40mmHg less than baseline
- Renal: Urine output less than .5ml/kg over last 8 hours
- CNS: Mental status changes

LABS: (Do not use lab results older than 24 hours)
- Platelets less than 100,000
- INR greater than 1.5
- Bilirubin greater than or equal to 4mg/dl
- Serum lactic acid greater than or equal to 2mEq/l

If 1 above checked, PATIENT SCREENS POSTIVE FOR SEVERE SEPSIS.
CALL PHYSICIAN AND FOLLOW SBAR SCRIPT BELOW.

If no checks above = NEGATIVE screen for sepsis: Initial _________

Continue to assess. No further action at this time.

---

### SITUATION:
Tell physician resident screened positive for Severe Sepsis

### BACKGROUND
Describe positive SIRS; Inform physician if resident is currently being treated for a known infection; share which organ system has dysfunction

### ASSESSMENT
Share VS and SaO2 (pulse ox)

### RECOMMENDATION:
Blood cultures; CBC; Lactic Acid (if not previously drawn) IV Antibiotic

### REQUEST ORDER FOR FOLLOWING
Decreased BP, fluid bolus 30ml/kg over 1 hour or faster until hypotension resolved. If resident does not respond to bolus, send to ER
Next Steps for Early Recognition of sepsis at your ECF

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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<tbody>
<tr>
<td>Is your staff knowledgeable about the importance of early recognition</td>
<td></td>
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<tr>
<td>and management of sepsis?</td>
<td></td>
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<tr>
<td>Do you have a sepsis screening process?</td>
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<tr>
<td>Is the screening process done on a regular basis or linked with another</td>
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<tr>
<td>process—IE: linked with the InterACT Early Warning Tool</td>
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<tr>
<td>Step</td>
<td>Who? When?</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>1. Get team together to create early identification process</td>
<td></td>
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<tr>
<td>2. Develop screening tool/process</td>
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<td>3. Get medical staff support for screening and early intervention</td>
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<tr>
<td>4. Develop and implement educational plan for sepsis and screening</td>
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<tr>
<td>5. Evaluate screening: define outcome and process metrics</td>
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</tbody>
</table>
QUESTIONS???