Do You Measure Up: Hardwiring Sepsis Processes to Meet Core Measures

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Overview

• Discuss the four tier process for program development:  I-Organizational Commitment  II-Screening  III-Sepsis Bundles Implementation  IV-Measurement
• Understand the milestones to achieve in each of the Tiers
• Identify common barriers to program implementation and discuss strategies to overcome common barrier
• Design a measurement process to evaluate program and the SEP-1 measures
Severe Sepsis: A Significant Healthcare Challenge

• Major cause of morbidity and mortality worldwide
  – Leading cause of death in noncoronary ICU (US)¹
  – 10th leading cause of death overall (US)²*
• More than 750,000 cases of severe sepsis in the US annually³
• Sepsis occurs in just 10% of U.S. hospital patients, but it contributes to as many as half of all hospital deaths
• Most expensive condition treated in hospitals in 2013, 23.7 billion or 6.2% aggregate cost⁴
• In the US, more than 500 patients die of severe sepsis daily³†

Based on data for septicemia
† Reflects hospital-wide cases of severe sepsis as defined by infection in the presence of organ dysfunction
Sepsis is #1 Cause of Inpatient Deaths

2014 Acute Care Discharges
11% of Pts Have Sepsis DX

2014 Acute Care Deaths
48% of Pts have Sepsis DX

- Simple Sepsis: 7,557 (5%)
- Severe Sepsis: 4,505 (3%)
- Septic Shock: 3,466 (3%)
- Acute Care Pat without Sepsis: 1,988 (52%)
- Acute Care Pat: 245,7 (13%)
- Acute Care Pat: 1,072 (28%)
Sepsis Impact on Mortality in Hospitals

1 out of 2-3 Deaths r/t Sepsis, Most POA

In KPNC 2012 subset, patient meeting criteria for EGDT comprised 32.6 percent of sepsis deaths & patients with sepsis, normal BP & lactate < 4 comprised 55.9% of sepsis deaths

Liu V, et al. JAMA, 2014: May 18th, online.
### Table 2. Ten conditions with the most all-cause, 30-day readmissions for Medicare patients (aged 65 years and older), listed by total number of readmissions in descending order, 2011

<table>
<thead>
<tr>
<th>Principal diagnosis for index hospital stay*</th>
<th>Number of readmissions</th>
<th>Readmissions as a percentage of total Medicare readmissions</th>
<th>Total cost of all-cause, 30-day readmissions (in millions), $</th>
<th>Readmission total cost as a percentage of total costs of Medicare readmissions</th>
<th>Readmission rate (per 100 admissions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congestive heart failure; nonhypertensive</td>
<td>134,500</td>
<td>7.3</td>
<td>1,747</td>
<td>7.3</td>
<td>24.5</td>
</tr>
<tr>
<td>Septicemia (except in labor)</td>
<td>92,900</td>
<td>5.1</td>
<td>1,410</td>
<td>5.9</td>
<td>21.3</td>
</tr>
<tr>
<td>Pneumonia (except that caused by tuberculosis or sexually transmitted disease)</td>
<td>88,800</td>
<td>4.8</td>
<td>1,148</td>
<td>4.8</td>
<td>17.9</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease and bronchiectasis</td>
<td>77,900</td>
<td>4.2</td>
<td>924</td>
<td>3.8</td>
<td>21.5</td>
</tr>
<tr>
<td>Cardiac dysrhythmias</td>
<td>69,400</td>
<td>3.8</td>
<td>835</td>
<td>3.5</td>
<td>16.2</td>
</tr>
<tr>
<td>Urinary tract infections</td>
<td>56,900</td>
<td>3.1</td>
<td>621</td>
<td>2.6</td>
<td>18.1</td>
</tr>
<tr>
<td>Acute and unspecified renal failure</td>
<td>53,500</td>
<td>2.9</td>
<td>683</td>
<td>2.8</td>
<td>21.8</td>
</tr>
<tr>
<td>Acute myocardial infarction</td>
<td>51,300</td>
<td>2.8</td>
<td>693</td>
<td>2.9</td>
<td>19.8</td>
</tr>
<tr>
<td>Complication of device; implant or graft</td>
<td>47,200</td>
<td>2.6</td>
<td>742</td>
<td>3.1</td>
<td>19.0</td>
</tr>
<tr>
<td>Acute cerebrovascular disease</td>
<td>45,800</td>
<td>2.5</td>
<td>568</td>
<td>2.4</td>
<td>14.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>718,100</strong></td>
<td><strong>39.1</strong></td>
<td><strong>9,371</strong></td>
<td><strong>39.0</strong></td>
<td><strong>19.6</strong></td>
</tr>
</tbody>
</table>

* Clinical Classifications Software (CCS) label

[HCUP (AHRQ) April 2014](https://www.hcup-us.ahrq.gov/reports/statbriefs/sb172-Conditions-Readmissions-Payer.pdf)
Sepsis Practice Collaborative Model
4 Tier Process for Program Implementation

- Organizational Consensus that Severe Sepsis Must be Managed Early and Aggressively
  - Early Screening with Tools and Triggers
  - Implementation of the Sepsis Bundles
  - Measuring Success CQI
  - Rapid Improvement

Infection Prevention

- Hand Washing
  - VAE (VAP) Bundle
  - CAUTI
  - BSI

Documentation Improvement ~ Accurate Coding

Adapted from: Sepsis Solutions International

1Continuous Quality Improvement
Tier I: Organizational Consensus and Support Milestones and Checklist

1. Define Sepsis Program Goal and aligned with organizational goals
2. Identify Executive sponsor
3. Collect Baseline Data—essential step
4. Develop sepsis team (do we have all the right people here?) and schedule monthly (minimum) meeting for at least 6 months
5. Identify nursing and physician champions in ED and ICU and ensure champions attend team meeting
   – Create a sepsis coordinator position to oversee program
6. Begin to define action plan and timeline for program development and implementation
# Building a Severe Sepsis Tool Kit: Project Team Charter

## Problem Statement:
Severe Sepsis is Common and Deadly

### Team Members
- ED, ICU, Patient Care Unit
- Representatives, Administration, Medical Staff, Nursing, Pharmacy, Performance Improvement, Case Management, Laboratory

### Business Case
In comparison to other ICU patients, severe sepsis patients have a higher mortality rate, increased LOS, and an increased need for a ventilator

### Benefits
Potential to improve outcomes

### Goals
Reduce severe sepsis mortality (make the goal specific and measurable)

### Scope
Severe sepsis patients in the ED, ICU, and patient care units

### Milestones
Implementation of Tiers 1, 2, 3, and 4
Tier I: Organizational Consensus and Support
Milestones and Checklist

1. Define Sepsis Program Goal and aligned with organizational goals
2. Identify Executive sponsor
3. Collect Baseline Data—essential step; understand your current process
4. Develop sepsis team (do we have all the right people here?) and schedule monthly (minimum) meeting for at least 6 months
5. Identify nursing and physician champions in ED and ICU and ensure champions attend team meeting
6. Begin to define action plan and timeline for program development and implementation
Baseline Data Collection Process

- Pick time period for medical record query
- Sample size: minimum of 20 pts per ICU
- Query strategies:
  - ICD 9 codes: 785.52 and 995.92 or DRG 870, 871, 872---now also look at ICD-10 R65.20 and R65.21
  - Patients in ICU on 1-2 antibiotics, vasopressor (review charts to see if meet criteria for severe sepsis with lactate > 4 or septic shock before including in outcome data or process data)
- Select Data Collection Elements
  - Outcome
  - Process
1. List the process steps below each box
2. For each process step include job title of persons performing the step
3. For each queue quantify the delay time (D/T)
4. Then total each to get L/T for the overall process

If bundle is not used, describe these resuscitation components

% pt. screened: Total L/T to diagnosis:

% bundle use: Labs: Meds: IV’s: Monitoring: CVP: MAP: ScvO2: Total L/T to admit:
Sepsis Patient Flow Template: ICU

1. List the process steps below each box
2. For each process step include job title of persons performing the step
3. For each queue quantify the delay time (D/T)
4. Then total each to get L/T for the overall process

Supplier Inputs:

- ICU
- ER/Floor

Customer Requirements:

- Manage
- ICU Asses
- ICU Admit

Highlight the steps with the biggest issues

% bundle use:
- Labs:
- Meds:
- IV’s:
- Monitoring:
- CVP:
- MAP:
- ScvO2:

If bundle is not used, describe these resuscitation components

Total L/T to admit:
Tier I: Organizational Consensus and Support Milestones and Checklist

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   - Create a sepsis coordinator position to oversee program
6. Begin to define action plan and timeline for program development and implementation
The Team Is KEY! Can Be Major Barrier If Not Functioning Well

- **Must** have nurse and physician champions from ED and ICU (need at least one physician at all meetings)
- **Must** be linked in the organization’s quality or operational structure—**Are you linked?**
- **Must** meet at least 1-2 times per month
- Team members **must** be well educated on the evidence and armed with tools and knowledge to change behavior at the bedside—**Does the team need more education?**
- **MUST** have bedside nurses on team—provide reality check and best knowledge of barriers—**Do you?**

*Consider developing nurse champions on each patient care unit and shift*
Sepsis Practice Collaborative Model
4 Tier Process for Program Implementation

1. Organizational Consensus that Severe Sepsis Must be Managed Early and Aggressively
2. Early Screening with Tools and Triggers
3. Implementation of the Sepsis Bundles
4. Measuring Success
   - Continuous Quality Improvement (CQI)

- VAE (VAP) Bundle
- CAUTI
- BSI

Infection Prevention

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Adapted from: Sepsis Solutions International
Surviving Sepsis Campaign Guidelines: 2012

- Consensus committee of 68 international experts presenting 30 international organizations
- Used GRADE system to guide assessment of quality of evidence from high (A) to very low (D) and to determine the strength of recommendations as strong (1) or weak (2)
- Some recommendations were ungraded (UG)
- Guidelines included recommendations in 3 areas:
  1. Directly targeting severe sepsis
  2. Targeting general care of critically ill patient, considered high priority in severe sepsis
  3. Pediatric considerations

Old Definitions

- Sepsis is defined as the presence (probable or documented) of infection together with systemic manifestations of infection.
- Severe sepsis is defined as sepsis plus sepsis-induced organ dysfunction or tissue hypoperfusion; at least two SIRS criteria to be present in the setting of known or suspected infection.
- Septic shock is a state of acute circulatory failure; severe sepsis plus hypotension not reversed with fluid resuscitation.
New Definitions

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

• Septic shock is defined as a subset of sepsis in which underlying circulatory and cellular metabolism abnormalities are profound enough to substantially increase mortality.
• Sepsis is: ‘life-threatening organ dysfunction caused by a dysregulated host response to infection’

• Sepsis-3 does away with:
  – SIRS criteria (sepsis is pro- and anti-inflammatory)
  – Severe sepsis (sepsis = the old severe sepsis)
  – Antiquated concepts: sepsis syndrome; septicemia

• Sepsis-3 codifies the quantification of organ dysfunction through the SOFA score (Sequential Organ Failure Assessment)

• Septic shock: vasopressor-dependent hypotension + lactate >2

• Sepsis-3 includes clinical criteria to predict life-threatening disease
**Sepsis-3 Workflow**

*Singer et al, JAMA 2016. PMID: 26903338*

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

**B** 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

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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 $\text{MAP} \geq 65$ mm Hg
AND
2. serum lactate level >2 mmol/L?

Yes

Septic shock

No

Sepsis still suspected?

No

Monitor clinical condition; reevaluate for possible sepsis if clinically indicated

Yes

Monitor clinical condition; reevaluate for possible sepsis if clinically indicated

No
So, What Now

- There is no consensus among other professional organizations including ACEP and ACCP (CMS usually does not like to make changes unless all professional societies in agreement)
- CMS is reviewing these changes to determine what changes (if any) to make to the Sepsis measure
- The earliest changes can be incorporated would be for January 1, 2017 discharges – and even this date is highly unlikely

Keep Following Current CMS Definitions/Measurements
SSC Guidelines
Screening

• We recommend routine screening of potentially infected seriously ill patients for severe sepsis to increase the early identification of sepsis and allow implementation of early sepsis therapy (1C)

• Performance improvement efforts in severe sepsis should be used to improve patient outcomes (UG)

Finding the Patients

Redefining what a ‘septic shock’ patient looks like

<table>
<thead>
<tr>
<th>Before</th>
<th>NOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supine in bed</td>
<td>Sitting up in bed</td>
</tr>
<tr>
<td>Ventilator</td>
<td>Nasal cannula</td>
</tr>
<tr>
<td>Fluids wide open</td>
<td>IV boluses</td>
</tr>
<tr>
<td>Increasing vasopressors</td>
<td>Weaning vasopressors</td>
</tr>
<tr>
<td>Minimally responsive</td>
<td>Awake</td>
</tr>
</tbody>
</table>

“Don’t look sick enough to be in ICU or to have a central line”

Must correct this misperception
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
- **Respiration**: > 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.

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

Shock

SIRS = Systemic Inflammatory Response Syndrome
Tier II: Screening for Severe Sepsis Milestones and Checklist

- Develop screening process for ED, rapid response team, ICU and eventually housewide
- Develop audit process to evaluate compliance and effectiveness
- Ensure screening process has clear “next steps” defined for nursing staff
Why Do You Need to Have a Screening Process?

• TIME IS TISSUE!!
  - Similar to trauma, AMI, or stroke, the speed and appropriateness of therapy administered in the initial hours after severe sepsis develops are likely to influence outcomes.¹
• To screen effectively, it must be part of the nurses’ daily routines—i.e., part of admission and shift assessment
• Must define a process for what to do with the results of the screen

If you don’t screen you will miss patients that may have benefited from the interventions

<table>
<thead>
<tr>
<th>Method</th>
<th>Pros</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper form</td>
<td>• Nurses critically think as they screen the patient &lt;br&gt;• Easy and quick to develop &lt;br&gt;• No cost</td>
<td>• Screening is intermittent &lt;br&gt;• Paper can be misplaced &lt;br&gt;• Static—no ability to automate an alert</td>
</tr>
<tr>
<td>EMR form</td>
<td>• Nurses critically thinks as they screen the patient &lt;br&gt;• Can automate alerts for positive screens</td>
<td>• Screening is intermittent &lt;br&gt;• Length of programming time &lt;br&gt;• Cost</td>
</tr>
<tr>
<td>EMR—real time, continual screening</td>
<td>• 24 hour screening &lt;br&gt;• Can automate alerts for positive screens</td>
<td>• Nurse does not screen patient—potential loss of screening knowledge and critical thinking &lt;br&gt;• Computer not reliably able to identify patients who have infection &lt;br&gt;• Computer not able to discern if SIRS is valid or organ dysfunction is new</td>
</tr>
<tr>
<td>EMR—real time and scheduled</td>
<td>• Form fires and pre populates for nurse to screen upon admission and each shift—nurse critically thinks &lt;br&gt;• 24 hour screening &lt;br&gt;• Manual screen completed when EMR alert fires—nurse discerns/validates appropriateness/correctness of alert</td>
<td>• Screening form needs to be developed in EMR—programming time and costs</td>
</tr>
</tbody>
</table>
PATIENT CARE UNIT SEVERE SEPSIS SCREENING TOOL
**General Care Severe Sepsis Bundle**

For patients with 2 or more SIRS + known/suspected infection + initial lactic acid 2.2-2.9 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

**Intermediate Care Severe Sepsis Bundle**

For patients with 2 or more SIRS + known/suspected infection + initial lactic acid 3.0-3.9 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 1 hr x 2, then every 2 hr 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 maintain these parameters or if pt has additional organ dysfunction, call MD for possible transfer to IMC/ICU**

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

<table>
<thead>
<tr>
<th>Date/Time: ___________________________ to ___________________________</th>
</tr>
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<tbody>
<tr>
<td>If hypotensive, volume resuscitate: initial 30 mL/kg as fast as possible, then additional boluses as needed per order</td>
</tr>
<tr>
<td>Time 30 mL/kg fluid bolus infused</td>
</tr>
<tr>
<td>Broad spectrum antibiotic-start after obtaining blood culture</td>
</tr>
<tr>
<td>Time antibiotic hung</td>
</tr>
<tr>
<td>Initial Labs: serum lactate, additional labs as ordered by physician</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum lactic acid drawn</td>
<td></td>
</tr>
<tr>
<td>Blood Cultures x 2</td>
<td></td>
</tr>
</tbody>
</table>

| Time 1: ___________________________ | Time 2: ___________________________ |
| Other cultures: |
| Establish IV access (2 large bore IVs) |

| Signature: ___________________________ | Date/Time: ___________________________ |

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| Time 1: ___________________________ | Time 2: ___________________________ |
| Other cultures: |
| Establish IV access (2 large bore IVs) |

| Signature: ___________________________ | Date/Time: ___________________________ |
Screening Tool Examples

STOP Severe Sepsis SBAR
(Communication tool with MD when patient screens positive for sepsis)

Situation: has screened positive for sepsis at
(patient name) at (time)

Background:
1. has the following positive criteria for SIRS
   (patient name)
   (state only those that apply)
   a. Temperature > 100.6 (38°C) or < 96.8% (36)
   b. BP < 90 mmHg or > 40 mmHg from baseline
   c. HR > 90/min
   d. Respiratory rate > 20/min
   e. Change in mental status, ALOC

2. I suspect infection
   The most recent WBC is (Consider infection if WBC > 12,000 or < 4,000)

Assessment:
1. Vital signs are: Temp: _____ BP: _____ HR: _____ RR: _____
2. SAO2 is _____, compared to _____ (last reading)
3. Mental status is now ______
4. Urine output is _____ ml per hour or _____ over the last 8h
5. The most recent creatinine is _____: Creatinine on admission was _____

Recommendation:
1. I need you to evaluate the patient to confirm if they have severe sepsis
2. In addition to a stat Lactate, what other labs would you like me to order?
3. Should I start an IV and give a fluid bolus? (if patient hypotensive)
Make Screening for Severe Sepsis Process-Dependent

- Weave into fabric of current practice
- Bedside nurse should do the screening—every shift and prn with condition changes
- Define expectation to screen during shift assessment and PRN with changes in patient’s conditions
- Screen for severe sepsis with every rapid response or medical response team call
- Identify strategies for initiation of therapy once patient with positive screen for severe sepsis is identified
Strategies: Establish Trigger for Rapid Implementation of SSC Bundles

- Clearly define next steps for patients with positive screen for severe sepsis
  - Alert RRT/Med Team
  - Notify Physician
  - Begin 3 hour bundle: lactate, blood cultures, antibiotics, fluid

SBAR

<table>
<thead>
<tr>
<th>Situation:</th>
<th>Screened Positive for Severe Sepsis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background:</td>
<td>1. Positive Systemic Response to Infection</td>
</tr>
<tr>
<td></td>
<td>2. Known or suspected infection</td>
</tr>
<tr>
<td></td>
<td>3. Organ dysfunction: share which organs</td>
</tr>
<tr>
<td>Assessment:</td>
<td>Share any other clinical changes?</td>
</tr>
<tr>
<td>Recommendations:</td>
<td>1. I need you to come and evaluate the patient to confirm if they have severe sepsis</td>
</tr>
<tr>
<td></td>
<td>2. It is recommended that I get an ABG, lactate, blood cultures and a CBC (if &gt; 12 hrs since last one). Can I proceed and get these?</td>
</tr>
<tr>
<td></td>
<td>3. Any other labs you would like me to obtain? Do you want to order antibiotics?</td>
</tr>
<tr>
<td></td>
<td>4. If patient is hypotensive: Can I start an IV and give a bolus of NS—30ml/kg</td>
</tr>
<tr>
<td>Date/time of call:</td>
<td>________________</td>
</tr>
<tr>
<td>RRT called:</td>
<td>Yes   No</td>
</tr>
</tbody>
</table>
Audit Screening Process
What Do We Want to Learn?

- **Screening compliance** = all of the patients are being screened for severe sepsis
- **Screens are valid** = Are the screens being done correctly
- **Screens are reliable** = Screens are consistent from RN to RN

If patient screens positive for severe sepsis, were the appropriate interventions completed
Screening: Barriers/Strategies

• Barriers
  – Time for nurses to do it (perception vs. reality)
  – Screening is not specific only for severe sepsis
  – Positive screen is not a diagnosis of severe sepsis

• Strategies
  – Must assign responsibility and enforce accountability
  – Perform audits to measure compliance and identify problems
  – Round on unit and ask nurses how it is going and discuss issues
Infection Prevention

VAE (VAP) Bundle BSI

Organizational Consensus that Severe Sepsis Must be Managed Early and Aggressively

Early Screening with Tools and Triggers

Implementation of the Sepsis Bundles

Measuring Success CQI¹

Rapid Improvement

Hand Washing

VAE (VAP) Bundle CAUTI BSI

Infection Prevention

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¹Continuous Quality Improvement
**Early Goal Directed Therapy**

**Methodology:** 263 severe sepsis patients

- Early Goal-Directed Therapy (EGDT)
  - Continuous ScvO2 monitoring & tx with fluids, blood, inotropes &/or vasoactives to maintain:
    - ScvO2 $>70\%$, SaO2 $>93\%$, Hct $>30\%$, CI/VO2
    - CVP $>8-12$
    - MAP $>65$
    - UO $>0.5\text{ml/kg/hr}$

- Standard Therapy
  - CVP $\geq 8-12$
  - MAP $\geq 65$
  - UO $\geq 0.5\text{ml/kg/hr}$

Early Goal-Directed Therapy Results

28-day Mortality

- Standard Therapy: 49.2% (n=133)
- EGDT: 33.3% (n=130)

P = 0.01*

NNT = 7–8

*Key difference was in sudden CV collapse, not MODS

The Changing Paradigm of Septic Shock Management

- ProCESS trial-randomized, 31 centers, 1341 patients
- ARISE trial- randomized, 51 centers (mostly Australia and New Zealand), 1600 patients
- Promise—randomized, UK, 56 centers, 1260 patients
Results of 3 International Studies 2014-2015

• ARISE and Promise had two groups: EGDT and Usual care
• ProCess had three groups: EGDT, structured resuscitation and usual care
• Before randomization all patients received antibiotics and an average of **2500ml of NS (equal to 30ml/kg)**, had blood cultures and lactate drawn
• No statistically significant difference in mortality between groups
• Mortality rate 18% for ARISE & ProCess
• Mortality rate 30% for Promise

ProCESS Investigators, 2014; 370:1683-1693
TO BE COMPLETED WITHIN 3 HOURS OF TIME OF PRESENTATION †:

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

† “time of presentation” is defined as the time of earliest chart annotation consistent with all elements severe sepsis or septic shock ascertained through chart review.
5. Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥65mmHg

6. In the event of persistent hypotension after initial fluid administration (MAP < 65 mm Hg) or if initial lactate was ≥4 mmol/L, re-assess volume status and tissue perfusion and document findings according to table 1.

7. Re-measure lactate if initial lactate elevated.
### TABLE 1

**DOCUMENT REASSESSMENT OF VOLUME STATUS AND TISSUE PERFUSION WITH:**

**Either**
- Repeat focused exam (after initial fluid resuscitation) by licensed independent practitioner including vital signs, cardiopulmonary, capillary refill, pulse and skin findings.

**Or two of the following:**
- Measure CVP
- Measure ScvO2
- Bedside cardiovascular ultrasound
- Dynamic assessment of fluid responsiveness with passive leg raise or fluid challenge
Components of TIER III
Milestones and checklist

• Understand current process for caring for septic shock patients
  • ‘Go and See’ work
  • Baseline data

• Order sets

• Common Barriers/Issues: identified Gaps from ‘Go and See’ work

• Educational plan

• Implementation plan
  • Unit champions
  • Prospective rounding
  • Independent checks
Which Components of the Bundle Did You Find Gaps in Performance During “Go and See” and From Baseline Data Collection?
Common Barriers/Issues

- Lactate
- Antibiotics
- Fluid boluses
- Reassessment for volume status and perfusion
- Consistency in bundle application
Lactate measurement

- Lab vs POC
- Venous vs arterial
- Turnaround time
- Repeat lactate if initial greater than 2
Antibiotics

- Appropriate initial antibiotics
  - Guide for providers recommending the appropriate antibiotic based on whether hospital or community acquired, source and your hospital’s antibiogram

- Turnaround time---from indication to hanging
  - ED vs ICU vs Floor

- Understand your current process and where the gaps are

- Make antibiotics rapidly available
## Mortality by Time to Antibiotics

**Severe Sepsis: SSC Database**

<table>
<thead>
<tr>
<th>Time to Abx HOURS</th>
<th>OR</th>
<th>CI</th>
<th>CI</th>
<th>P value</th>
<th>Prob of Death</th>
<th>CI</th>
<th>CI</th>
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<td>18.0</td>
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<td>2.31</td>
<td>&lt;0.001</td>
<td>21.9</td>
<td>18.8</td>
<td>25.3</td>
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</table>

**5% Increase in Mortality for Every Hour Delayed**
### Mortality by Time to Antibiotics Septic Shock: SSC Database

<table>
<thead>
<tr>
<th>Time to Abx HOURS</th>
<th>OR</th>
<th>CI</th>
<th>CI</th>
<th>P Value</th>
<th>Prob of Death</th>
<th>CI</th>
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<td>1.00</td>
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<td>1.12</td>
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<td>22.7</td>
<td>25.9</td>
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<td>1.00</td>
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<td>&lt;.046</td>
<td>25.4</td>
<td>23</td>
<td>27.9</td>
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</tbody>
</table>

5% Increase in Mortality for Every Hour Delayed
Fluid Boluses

- How fast should they be given?
- Gravity or pressure bag not by infusion pump
- What about dialysis patients?
- What about patients with CHF or low EF?

Fluid bolus is given rapidly, IV wide open, pressure bag if necessary; goal is 500ml every 15-30 minutes.
Impact of Early Fluid & Amount

- Prospective, observational cohort of all ED severe sepsis or septic shock patients during 13 months
- 90,000 average ER visits
- 1,866 subjects; 53.6% were men, 72.5% were white, mean age was 72 years (SD 16.6 years),
- Mean initial lactate level was 2.8 mmol/L.
- 86% received intravenous antibiotics within 180
- 64% had intravenous fluid initiated within 30 minutes

Impact of Early Fluid and Amount

• Results
  – ↓ Mortality in 30 minutes group (159 [13.3%] versus 123 [18.3%])
  – ↓ median hospital length of stay (6 days versus 7 days)
  – Adjustment for age, lactate, hypotension, acute organ dysfunction, and Emergency Severity Index score, intravenous fluid within 30 minutes was associated with lower mortality
  – ↑ mortality with later fluid administration
    • 13.3% (30 minutes) versus 16.0% (31 to 60 minutes) versus 16.9% (61 to 180 minutes) versus 19.7% (>180 minutes)

Reassessment for Volume Status and Perfusion

- Team decide how to support all options in table 1
  - Focused exam—templated notes? Specific form? Making sure it is done between after fluid bolus and before 6 hours
  - Do you have all the correct equipment and tools and training for:
    - CVP (IJ, Subclav or femoral)
    - ScvO2 (intermittent vs continuous)
    - Bedside cardiovascular ultrasound
    - Dynamic assessment of fluid responsiveness with passive leg raise or fluid challenge (must be able to monitor CI, SV—pulse contour technology, non-invasive or PA catheter,)

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Focused Examination

- **Vital Signs**
  - Temp, HR, BP, RR

- **Cardiopulmonary**
  - Rhythm, S1/2/3/4, presence of murmur and lung sounds

- **Peripheral Pulses**
  - 1+, 2+ or absent

- **Capillary Refill**
  - Brisk, <2 sec, >2 sec

- **Skin**
  - Mottled vs no mottling, to what level. Warm vs cold, etc
Sepsis Reassessment Note to assess volume status and tissue perfusion

Reassessment of Volume Status and Tissue Perfusion Note

Patient: HNAMTEST, AAFIVE  MRN: (aac)-037325766  FIN: 0166610384076
Age: 35 years  Sex: Female  DOB: 1/1/1980
Associated Diagnoses: None
Author: Anderson, Colby J

Reassessment of Volume Status and Tissue Perfusion

Comments

Time Septic Shock Criteria Met: Date: Time: 
Time 30ml/kg Fluid Bolus Given: Date: Time: 

Physical Examination

Vital Signs
Temperature: 98.6 (04/08 11:56)
Pulse: 76 (04/08 11:56)
Respiration: 16 (04/08 11:56)
BP: 130/84 (04/08 11:56)
Pulse Ox: 98 (04/08 11:56)
Oxygen Delivery: Room air (04/08 11:56)
Pain Score: Not Charted

Cardiopulmonary
Heart: regular rate and rhythm, S1, S2, S3, S4, no murmur, no lower extremity edema
Lungs clear to auscultation, breath sounds equal, no wheezing, no rhonchi, no crackles

Peripheral Pulses
Right
1+[ ] 2+[ ] 3+[ ] 4+[ ]

Left
1+[ ] 2+[ ] 3+[ ] 4+[ ]

Capillary Refill
[ ] Brisk  [ ] Greater than 2 seconds  [ ] Less than 2 seconds

Skin
[ ] No mottling present  [ ] Mottling present

OR two of the below values:

CVP: (From CVC in SVC vs Swan-Ganz)
Scvo2: (From CVC in SVC)
Bedside Cardiovascular Ultrasound: (Caviol index from TTE, TEE or IVC US)

[ ] Passive Leg Raise  or  [ ] 500-1000 mL fluid bolus
Findings: [ ] Fluid Responsive  [ ] Not Fluid Responsive

Passive Leg Raise: (With patient seated at 45 degrees, lower to horizontal and raise legs to 45 degrees. A 10% increase in SV on the cardiac output monitor or 10% increase in pulse pressure via the arterial line is a positive test at 30-90 seconds.)

Type: Progress Notes
Date: 03 November 2015 08:11 EST
Status: Auth (Verified)
Title: Reassessment of Volume Status and Tissue Perfusion Note
By: Anderson, Colby J on 03 November 2015 08:12 EST
Verified By: Anderson, Colby J on 03 November 2015 08:12 EST

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If Using CVP and ScvO2

- Provider confidence/competency in placing central lines
- Defined who will place central line when pt has lactate>4mMol/L or still hypotensive after initial fluid bolus
  - ED or ICU?
  - What happens on off shifts and weekends?
- Adequate equipment in ED/ICU to insert and monitor CVP
- Educate nurses in ED/ICU on hemodynamic monitoring and ScvO2
  - Is there sufficient nursing staff to handle the acuity and intensity of these patients in the ED?
- Why do I need a CVP?
  - Research shows that CVPs don’t accurately reflect volume status.
Tools to Assist with Consistent Application of the Evidence

- Identify tools to assist bedside staff to implement bundles
  - algorithm, pathway, checklist, pocket cards, green folder etc
- Create protocols
  - For positive screen: lactate, blood cultures and fluids
  - When patients need ICU level care
- Multidisciplinary Rounds
- Handoffs
- Real time review and feedback
## Sepsis Reassessment Note to Assess Volume Status and Tissue Perfusion

### Reassessment of Volume Status and Tissue Perfusion Note

**Patient:** HNMTEST, AAFIVE  
**MRN:** (aac)-037325766  
**FIN:** 016661038-4076  
**Age:** 35 years  
**Sex:** Female  
**DOB:** 1/1/1980  
**Associated Diagnoses:** None  
**Author:** Anderson, Colby J

### Comments

- **Time Septic Shock Criteria Met:**  
  - **Date:**  
  - **Time:**

- **Time 30ml/kg Fluid Bolus Given:**  
  - **Date:**  
  - **Time:**

### Physical Examination

#### Vital Signs

- **Temperature:** 98.6° (04/08 11:56)
- **Pulse:** 76 (04/08 11:56)
- **Respiration:** 16 (04/08 11:56)
- **BP:** 130/84 (04/08 11:56)
- **Pulse Ox:** 98 (04/08 11:56)
- **Oxygen Delivery:** Room air (04/08 11:56)
- **Pain Score:** Not charted

#### Cardiopulmonary

- Heart: regular rate and rhythm, S1, S2, S3, S4, no murmur, no lower extremity edema  
- Lungs clear to auscultation, breath sounds equal, no wheezing, no ronchi, no crackles

#### Peripheral Pulses

- **Right:**  
  - 1+ [-] 2+ [-] 3+ [-] 4+ [-]

- **Left:**  
  - 1+ [-] 2+ [-] 3+ [-] 4+ [-]

#### Capillary Refill

- [-] Brisk  
- [-] Greater than 2 seconds  
- [-] Less than 2 seconds

#### Skin

- [-] No mottling present  
- [-] Mottling present

**OR two of the below values:**

- **CVP:** (From CVC in SVC vs Swan-Ganz)
- **Scvo2:** (From CVC in SVC)

### Bedside Cardiovascular Ultrasound

**Cavial index from TTE, TEE or IVC US**

- [ ] Passive Leg Raise  
- [ ] 500-1000 mL fluid bolus

**Findings:**  
- [ ] Fluid Responsive  
- [ ] Not Fluid Responsive

---

**Passive Leg Raise:** With patient seated at 45 degrees, lower to horizontal and raise legs to 45 degrees. A 10% increase in SV on the cardiac output monitor or 10% increase in pulse pressure via the arterial line is a positive test at 30-60 seconds.

**Type:** Progress Notes  
**Date:** 03 November 2015 08:11 EST  
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**Title:** Reassessment of Volume Status and Tissue Perfusion Note  
**By:** Anderson, Colby J on 03 November 2015 08:12 EST  
**Verified By:** Anderson, Colby J on 03 November 2015 08:12 EST  
**Encounter info:** 016661038-4076, (AA) SIMH, Inpatient, 31/7/2014 - 4/28/2014
Tools to Assist with Consistent Application of the Evidence

- Identify tools to assist bedside staff to implement bundles
  - algorithm, pathway, checklist, pocket cards, green folder etc
- Create protocols
  - For positive screen: lactate, blood cultures and fluids
  - When patients need ICU level care
- Multidisciplinary Rounds
- Handoffs
- Real time review and feedback
**ADULT SEPSIS CRITERIA**

<table>
<thead>
<tr>
<th>Category</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SIRS</strong></td>
<td>- Temperature &gt; 100.9°F (38.3°C) or &lt; 96.8°F (36°C)</td>
</tr>
<tr>
<td></td>
<td>- HR &gt; 90</td>
</tr>
<tr>
<td></td>
<td>- RR &gt; 20</td>
</tr>
<tr>
<td></td>
<td>- WBC &gt; 12,000 or &lt; 4,000 or &gt; 10% bands</td>
</tr>
<tr>
<td><strong>Sepsis</strong></td>
<td>- Known or suspected infection</td>
</tr>
<tr>
<td></td>
<td>- PLUS 2 or more SIRS criteria</td>
</tr>
<tr>
<td><strong>Severe Sepsis</strong></td>
<td>Organ Failure Criteria:</td>
</tr>
<tr>
<td></td>
<td>1. Cardiopulmonary SBP &lt; 90 or &lt; 70% of baseline or MAP &lt; 60 [(2x DBP)]</td>
</tr>
<tr>
<td></td>
<td>2. Respiratory: SaO2 &lt; 90% or IF in O2 requirements</td>
</tr>
<tr>
<td></td>
<td>3. Renal: Urine output &lt; 0.8 mL/kg/min or creatinine &gt; 2 or</td>
</tr>
<tr>
<td></td>
<td>4. Electrolyte: Na &lt; 130 mmol/L or K &gt; 5 mmol/L</td>
</tr>
<tr>
<td></td>
<td>5. Metabolic: Lactic acid &gt; 2 mmol/L</td>
</tr>
<tr>
<td></td>
<td>6. New Organ Failure: Change in mental status (new) or</td>
</tr>
<tr>
<td></td>
<td>7. Platelets &lt; 100,000 or INR &gt; 1.8 (unrelated to anticoagulant</td>
</tr>
<tr>
<td></td>
<td>8. Hyperkalemia Serum total all-calin &gt; 2</td>
</tr>
<tr>
<td><strong>Septic Shock</strong></td>
<td>Severe sepsis PLUS hypotension</td>
</tr>
<tr>
<td></td>
<td>(SBP &lt; 90 or MAP &lt; 65) despite 30 mL/kg fluid bolus and/or</td>
</tr>
<tr>
<td></td>
<td>1. Lactate greater or equal to 4 mmol/L</td>
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</table>

**Sepsis Bundles**

TO BE COMPLETED WITHIN 3 HOURS

1. Measure lactate level
2. Obtain blood cultures prior to antibiotics
3. Administer broad-spectrum antibiotics
4. Administer 30 mL/kg crystalloid for hypotension or lactate > 4 mmol/L
5. "Time of presentation" is defined from earliest chart notation consistent with severe sepsis/shock

TO BE COMPLETED WITHIN 6 HOURS

1. Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain (MAP) ≥ 65 mmHg
2. In the event of persistent hypotension after initial fluid administration (MAP ≤ 65 mmHg) or if initial lactate was ≥ 4 mmol/L, reassess volume status and tissue perfusion.
3. Re-measure lactate if initial lactate > 2

**DOCUMENT REASSessment OF VOLUME STATUS AND TISSUE PERfusion BY LIP**:

**Exam**

- Repeat focused exam (after initial fluid resuscitation) by LIP including VS, cardiopulmonary, cap refill, pulse, and skin findings.
- Or two of the following:
  - Measure CVP
  - Measure ScvO2
  - Bedside cardiovascular ultrasound
  - Dynamic assessment of fluid responsiveness with passive leg raise or fluid challenge
### Severe Sepsis / Septic Shock Clinical Pathway

**Patient with severe sepsis—Implement interventions below within 1 hour:**
- Initial Labs: serum lactate acid, additional labs as ordered by physician
  - Serum lactate acid drawn
- Blood Cultures X 2
  - Time 1: ___________
  - Time 2: ___________
- Establish IV access
- Broad Spectrum Antibiotic-start after obtaining blood culture (see Infirmary Pharmacy Guide to Antimicrobial Therapy)
- Time antibiotic hung
- Source Control
  - If lactate acid greater than or equal to 4 Meq/L or SBP less than 90 to 40 mm Hg less than baseline or MAP less than 65 mm Hg administer: 30 mL/kg fluid bolus over 1 hour or as fast as possible, unless known E. Coli less than 35% or active treatment for heart failure if present, consult physician for speed of bolus
  - Time 30 mL/kg fluid bolus infused
- Proceed to decision grid.

### Decision Grid

| Patient with severe sepsis criteria met: | Time: ___________
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Time septic shock criteria met: (Time Zero): Date: ___________</td>
<td>Time: ___________</td>
</tr>
</tbody>
</table>

1. Severe sepsis criteria: known or suspected infection plus 2 or more SIRS plus new organ dysfunction (see screening tool for organ dysfunction criteria)
2. Septic shock criteria: severe sepsis plus SBP less than 90 mm Hg or 40 mm Hg decrease from baseline after initial fluid bolus or requires vasopressors or initial lactic acid is greater than or equal to 4 Meq/L

### 0-6 Hours

#### Septic Shock Bundle
- Apply vasoressors immediately for hypotension after fluid bolus
- Re-measure lactic acid if initial lactic acid is greater than 2 Meq/L within 4 hours of meeting severe sepsis criteria
- At ______ (next planned draw time)
  - In the event of persistent hypotension after initial fluid administration (MAP less than 65 mm Hg) or initial lactic acid greater than or equal to 4 Meq/L, reassess volume status and tissue perfusion and document findings according to below.
  - Between hours 3-6 (at a minimum)
  - Repeat focused exam-including vital signs, cardipulmonary, capillary refill, pulse and skin findings by physician or APP
  - On two of the following:
    - Measure CVP
    - Measure ScvO2
    - Bedside cardiovascular ultrasound
    - Stroke volume optimization with passive leg raise or fluid challenge (500 mL over 15 min)
    - Volume repeat
    - Needs more volume

### 6-24 Hours

- Reassess for volume status/tissue perfusion at least every 4 hours
- Consider additional vasoressors as necessary
- Repeat lactic acid every 4 hours until normalized (less than or equal to 2 Meq/L)
- Ensure adequate source control
- No
- Assess for risk factors for abdominal compartment syndrome (fluid resuscitation greater than 5 L in 24 hours or less)

### In patients with ARDS (P/F ratio less than 200):

- Yes
  - Patient on mechanical ventilation
- Yes
  - Is the tidal volume 6 mL/kg of ideal body weight in the first 24 hours
- Yes
  - Are the static or plateau inspiratory pressures less than 30 cmH2O in the first 24 hours

#### 24-72 Hours

- Re-assess need for broad spectrum antibiotics based on culture reports
- Re-evaluate need for invasive lines and tubes
- Resume screening after 72 hours

### Nurse

<table>
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<tr>
<th>Signature, Date &amp; Time</th>
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</table>

<table>
<thead>
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</table>

<table>
<thead>
<tr>
<th>Signature, Date &amp; Time</th>
</tr>
</thead>
</table>
Develop a Protocol Based on the SSC Guidelines

- Obtain lactate when have 2 SIRS and suspected infection
- When screen positive for severe sepsis:
  - Nurse protocol to draw labs and give fluid bolus
  - Protocol done by RRT/Medical Response Team or all nurses
- Get medical staff approval
Severe Sepsis Algorithm

Screened Positive for Severe Sepsis

For lactic acid less than 2.9

NO

Initiate General Care Severe Sepsis Bundle on back and complete interventions

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)
   OR
2. Require vasopressor
   OR
3. Initial lactic acid greater than or equal to 4 mEq/L with any BP

YES

Activate CODE SEPSIS

Initiate transfer to ICU

NO

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

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

Meanwhile, continue crystalloid resuscitation of 250-1000ml boluses if hypotensive after the initial bolus — per physician order
CODE SEPSIS: WHAT IS IT?

- Notify through paging the ICUs about septic shock patient
- RRT come to the bedside (for floor code sepsis)
- Urgently assess a patient with severe sepsis
- Assist the primary physician in achieving the goals of care
  - fluid resuscitation
  - expediting antibiotic delivery
  - movement to a higher level of care as indicated
Excluded from Code Sepsis

- Comfort Care only
- Patient who doesn’t wish to have care escalated
- No evidence of suspected or actual infection
Role of ICU team in a Code Sepsis

- After each team member has received report from ED or Floor—implement a Code Sepsis Pre-admission Huddle (bedside nurse, resident, attending and charge nurse if possible)

- Purpose of huddle:
  - Ensure all team members have same knowledge of the patient
  - Know what treatment has been already provided
  - Establish and agree on time zero for severe sepsis and septic shock
  - Identify the priority interventions to be provided when patient arrives (these should be written on the white board)
Interdisciplinary Rounds - ABCDEF Bundle & Nursing Objectives

1. **Assess Pain:** What is the current score? What is the pain goal and current scale?
2. **Breathing:** Both SAT and SBT
   - Were they coordinated? Pass or Fail?
3. **Choice of Sedation:** Name of medication, route and dosage
4. **Delirium:** What is the CAM-ICU result?
   - If +, possible causes & interventions?
5. **Exercise:** Mobility Level?
   - What level is pt progressing to?
   - PT/OT consult?
6. **Family:** Patient/Family questions? Goals for the day?
   - Who will update pt/family? When? 
   (Continued on back)
7. **Severe Sepsis** screen result? + or –
   - On the bundle? What goals have not been met?
8. **Vasoactive Infusions**
9. **Skin:** Pressure Ulcer? POA?
   - Current description of PU
10. **Foley:** Can it be removed?
    - Renew Order
11. **Lines / Tubes:**
    - Other Tubes?
    - Vascular Access?
12. **Patient Diet / Tube Feeding / Bowel Regimen:** Nutrition concerns?
13. **Restraints:** Type? Time of Order Expiration?
14. Time of scheduled procedures today? Expected labs / tests
15. **Other:** Nursing concerns
**SICU Huddle Board**

**Quality/Safety**

**SEPSIS**
- Resuscitation goals met ≤ 4 hours
- # of pts resus ≤ 4°
- GOAL 80%

<table>
<thead>
<tr>
<th>2</th>
<th>% of septics</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>66%</td>
</tr>
</tbody>
</table>

**Improve Pain Reassessment**
- Reassessment after pain meds
- # of episodes reassessed 1 after med (PRN)
- # of episodes audited
- Goal 100%

<table>
<thead>
<tr>
<th>11</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>78%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Decrease Length of Stay in SICU**
- Early recognition of delirium using CAM-ICU
- # of pts ≤ 2 completed CAM-ICU for last 24h
- # of patients
- Goal 100%

<table>
<thead>
<tr>
<th>20</th>
<th>38</th>
</tr>
</thead>
<tbody>
<tr>
<td>52%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Daily Critical Communications**
- Please document CAM-ICU & RASS as a comment for all patients

**Skin**
- # of days since last pressure ulcer developed in SICU
- Unit Incidence Rates
- Jan: 13.3%
- Dec: 0%
- Nov: 0%

**Ideas in Motion**
1. Re-education for staff → PreSep cath
2. Education for families about delirium prevention
3. Use RN objective cards during RN-RN meetings
Tier III: Develop and Implement the Education Plan

- **Content:** (present to physicians, nurses and RTs)
  - Significance of problem
  - Sepsis continuum
  - Pathophysiology of severe sepsis
  - Prevention and management (share the evidence)
  - Case studies for staff to practice with bedside tools

- **Methods:**
  - Self learning modules
  - Classroom and/or small groups of staff on unit
  - Web-based: IE: clinicaledonline.com

- **Ongoing:**
  - build into orientation,
  - monthly for residents,
  - every 6 months for all staff,
  - one-on-one during rounds
TIER III: Develop Implementation Plan

• Identify who will oversee the implementation and the expectations of that person (sepsis nurse or program coordinator)
• Define ICU/ED resources for staff that they can call at any time for questions and assistance
• Create rounding schedule and process
  – Should begin as daily in the ICU and ED
  – Keep master list of all patients who go on the bundles (and those who should have but didn’t if possible)
  – Do real time interventions to ensure patients get the evidence based practices
  – Define follow up process for review and evaluate missed opportunities
Infection Prevention

VAE (VAP) Bundle BSI

Organizational Consensus that Severe Sepsis Must be Managed Early and Aggressively

Early Screening with Tools and Triggers

Implementation of the Sepsis Bundles

Measuring Success CQI

Sepsis Practice Collaborative Model
4 Tier Process for Program Implementation

Hand Washing

VAE (VAP) Bundle CAUTI BSI

Infection Prevention

Documentation Improvement ~ Accurate Coding

Adapted from: Sepsis Solutions International

1Continuous Quality Improvement
Tier IV: Measurement Milestones and Checklist

- Define outcome and process data elements that will be collected
- Develop and implement a data collection process
- Revise and update goals and action plan as needed
- Execute implementation plan
- Continuous improvement
Data Collection

• Patient Log
  – Define how will find all patients that receive the bundles
  – Real time data collection is optimal—then used as checklist to ensure patient receives all appropriate interventions

• Outcome
  – Mortality (ICU and Hosp)
  – Hosp LOS
  – Cost per case (total and direct)

• Process
  – Core Measures
  – Data elements that measure implementation of 3 hour and 6 hour bundle
Common Challenge: Insufficient Feedback, Data and Accountability

Strategies:

Sepsis Team (core group)

• Monthly multidisciplinary sepsis team meeting with consistent attendance
  • nursing and physician champions
  • lab, pharmacy, and radiology as needed
• Accountable executive understands the role, holds team accountable and assists with problem-solving and removing barriers
• Timely feedback (data) to the team providing care to the sepsis patients
Common Challenge: Insufficient Feedback, Data and Accountability

Strategies:

• Set goals/expectations for sepsis program
• Use examples of hospital patients in case studies for education of staff (good outcomes and bad)
• Review data at:
  • Sepsis team meeting
  • Quality meeting
  • Patient safety meeting
  • Unit based meetings
  • Medial staff/department meetings
  • Board meeting
• Provider specific data on compliance with bundle elements and patient outcomes, compared to the goal
• Individual case feedback based on case reviews
Feedback to Individual Providers

Severe Sepsis/Septic Shock Feedback Report - MICU

The purpose of this report is to give feedback on the below listed patient recently treated for Severe Sepsis/Septic Shock, and to emphasize the current quality improvement initiative related to Sepsis. We welcome your input and clinical expertise on opportunities that might help us improve on any of these measures.

Performing all the elements within the 3 sepsis bundles listed below in a timely manner can significantly reduce mortality of our Severe Sepsis and Septic Shock patients. Thank you for your dedication and care for these patients. If you have any questions, please contact Dr. ___________, MICU Sepsis Champion.

<table>
<thead>
<tr>
<th>Patient Name</th>
<th>FIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED Arrival Date &amp; Time</td>
<td>ED RNs</td>
</tr>
<tr>
<td>ED Physician</td>
<td>ED Resident</td>
</tr>
<tr>
<td>Floor Arrival Date, Time, &amp; Unit</td>
<td>Pt Transferred From</td>
</tr>
<tr>
<td>ICU Arrival Date &amp; Times</td>
<td></td>
</tr>
<tr>
<td>Attending</td>
<td>Resident</td>
</tr>
<tr>
<td>RN</td>
<td>PRISM Score</td>
</tr>
<tr>
<td>Severe Sepsis</td>
<td>Septic Shock Time (Time Zero):</td>
</tr>
<tr>
<td>Severe Sepsis/Septic Shock Clinical Pathway</td>
<td>Code Sepsis Protocol</td>
</tr>
<tr>
<td>Date/Time Criteria Infection</td>
<td>Date/Time Criteria SIRS</td>
</tr>
<tr>
<td>Date/Time Criteria Organ Dysf</td>
<td></td>
</tr>
</tbody>
</table>

**Sepsis Quality Indicators**

<table>
<thead>
<tr>
<th>Date &amp; Time</th>
<th>Result</th>
<th>Goal Met (Y/N)</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3 Hour Measures</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactic Acid</td>
<td></td>
<td></td>
<td>Drawn within 3h of Severe Sepsis (Look 48 hrs Prior)</td>
</tr>
<tr>
<td>Blood Cultures before Antibiotics</td>
<td></td>
<td></td>
<td>Drawn before ABX (Look 48 hrs Prior)</td>
</tr>
<tr>
<td>Broad Spectrum Antibiotics</td>
<td></td>
<td></td>
<td>Hang within 3h of Severe Sepsis (Look 24 hrs Prior)</td>
</tr>
<tr>
<td>Start IV Fluid Bolus</td>
<td></td>
<td></td>
<td>As Fast As Possible. Infused within 3h of Severe Sepsis</td>
</tr>
<tr>
<td>Weight in kg</td>
<td></td>
<td></td>
<td>Placed within 4h of Vasopressor Start</td>
</tr>
<tr>
<td>Central Line Placed, If Requires Vasopressors</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **6 Hour Measures** | | | |
| Vasopressor Started for SBP <90 on MAP, & 60 mmHg After Fluid Bolus | | | Started 1h of Persistent Hypotension After Initial Fluid Bolus |
| CMS Requirement - Vasopressor Started for SBP <90 on MAP, & 60 mmHg After Fluid Bolus | | |CMS Requirement-Started within 6h of Septic Shock |
| Repeat Focused Exam by MD/AP (VS, CVP, Hgb, Hct, SVO2, PCWP, Fluid Challenges) | | | Documented within 6h of Time Zero |
| Repeat Lactic Acid | | | Repeat within 6h of Time Zero >2 |

**Comments:**
I HAVE ALL THIS DATA, WHAT’S NEXT ??
Role of Data

• Outcome data
  – Share with staff and administration to keep momentum going
  – Helps convince/move skeptics

• Process data
  – Celebrate small successes
  – Helps identify where opportunities for improvement still exist
Identify Gaps in Application of Evidence

• Set performance targets
  – IE: 90% compliance with obtaining lactates in 3 hours
• Prioritize area to work on first
  – Focus on screening and the 3 hour bundle first then move to the 6 hour bundle
• Understand the ‘why’ there are gaps
  – “go and see”—walk the process, talk with front line staff
  – Cause and effect—Fishbone
• Define action plan—
  – Can use IHI Model for Improvement
  – PDCA—tests of change
Determining the Gaps: Understanding Why

• Success relies on a complex set of tasks being completed in a limited amount of time
• Requires data collection and analysis to determine the bottleneck(s)
• Must analyze the workflow for patients arriving in the ED as well as those who become septic after hospitalization
• QI/PI teams are a great resource when available
• Multiple tools have proven successful
• Some examples of diagnostic tools used for analysis, and the “therapeutic” tools developed out of the analysis
Cause and Effect Diagram

Why is the initial 30ml/kg fluid bolus not being given

**Communication**
- Poor between residents and nursing staff
- Responses from physicians: Physician aware and don’t respond and RN just accepts it

**Policy**
- Staff busy with more than one patient
- Getting orders in and charting in MAR (should treat like a code and chart later)
- Physical support especially on off shift
- Lack of documentation when fluid actually given

**Environment/EMR**
- New interns
- Staff not aware of sepsis protocol—doesn’t require physician order
- Unassertive RN staff—at advanced beginner stage
- Not properly using screening tool
- Fear of fluid overload of renal or CHF patients (RN’s and doctors)
- Lack of education on appropriate fluid needed
- Physician not familiar with protocol and not consulting with senior
- Give fluid over long period of time or just increase IV rate

**Lack of IV access**
- Appropriate labs not drawn/ordered
- Appears cardiogenic not septic
- "his BP has been low before" accept low BP as normal
- Unsure of baseline BP
- Delay in identifying change in condition
- Infection not suspected—other causes persisted
- Diastolic hypotension on other conditions or source (i.e. sedation)
- Physician pushback
- Nurse/doctor hesitant because being disarmed
- Patient whoفوز or have unclear presentation

**Material**
- Need to elicit support of CNL and charge nurse/nurse coordinators

**Themes:**
1. Knowledge and comfort in using protocol
2. Accepting when physician doesn’t want to do protocol without going up chain of command
3. Fear of fluid in elderly, ESRD and CHF
4. Blame hypotension on other conditions
5. Unassertive RN staff

**Initial Fluid bolus (30ml/kg) not given in 3 hrs**
- Not trusting high lactate and continue to recheck
- Patient not symptomatic with low BP
- RN not sure where pts is on pathway
- SBP > 90 but MAP < 65—Rn doesn’t know pt might be in shock
- New RN afraid of starting fluids on someone where no fluids are running
- Doctors order small amt of fluid
- Staff knowledge deficit
- Nurse like exact orders in EMR before starting interventions—causes delays

**Process/critical thinking**
Sepsis Patient Flow Template: Emergency Department

1. List the process steps below each box
2. For each process step include job title of persons performing the step
3. For each queue quantify the delay time (D/T)
4. Then total each to get L/T for the overall process

If bundle is not used, describe these resuscitation components

Customer Requirements:

Total L/T to admit:

---

Supplier Inputs:

---
Errors Provide Useful Information

• We can learn more from our failures than from success
• Our processes can be improved when studied

“Give me a fruitful error anytime, full of seeds, bursting with its own corrections. You can keep your sterile truth to yourself.” Vilfred Pareto
Severe Sepsis Bundle Implementation Results
Surviving Sepsis Campaign
Results (28,150 patients)
218 Hospitals

<table>
<thead>
<tr>
<th>Entry Point</th>
<th>Subjects</th>
<th>Mortality (hosp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED</td>
<td>55.8%</td>
<td>26.0</td>
</tr>
<tr>
<td>ICU</td>
<td>32.2%</td>
<td>40.3</td>
</tr>
<tr>
<td>Ward</td>
<td>11.9%</td>
<td>44.2</td>
</tr>
</tbody>
</table>

Mortality over 7 year period
36.7% to 27.5% ARR: 7% RRR: 25% p= 0.005
ICU & Hos LOS 4% for every 10% ↑ in compliance

Levy, M et al. Intensive Care Medicine;2014;40;1623
# Surviving Sepsis Campaign

<table>
<thead>
<tr>
<th>Bundle Element</th>
<th>Mortality Odds Ratio</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lactate &lt;2</td>
<td>0.80</td>
<td>0.73-0.89</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Lactate 2 to &lt;3</td>
<td>0.67</td>
<td>0.59-0.76</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Lactate ≥ 3</td>
<td>0.69</td>
<td>0.63-0.75</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Blood Cultures</td>
<td>0.82</td>
<td>0.77-0.87</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>0.85</td>
<td>0.81-0.90</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Fluid Administration</td>
<td>0.86</td>
<td>0.73-1.01</td>
<td>&lt;0.07</td>
</tr>
<tr>
<td>CVP</td>
<td>0.84</td>
<td>0.78-0.91</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>ScvO2</td>
<td>0.83</td>
<td>0.76-0.90</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Levy, M et al. Intensive Care Medicine;2014;40;1623
## Dose Effect: High vs. Low Compliance

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Low resuscitation compliance</th>
<th>High resuscitation compliance</th>
<th>Total</th>
<th>Total</th>
<th>Died</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>11,609  4,475 (38.6%)</td>
<td>17,861  5,185 (29.0%)</td>
<td>29,470  9,660 (32.8%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location of severe sepsis identification</td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ED</td>
<td>5,984  1,850 (30.9%)</td>
<td>10,465  2,421 (23.1%)</td>
<td>16,449  4,271 (26.0%)</td>
<td>&lt; 0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ward</td>
<td>3,970  1,800 (45.3%)</td>
<td>5,532  2,032 (36.7%)</td>
<td>9,502  3,832 (40.3%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICU</td>
<td>1,655  825 (49.8%)</td>
<td>1,864  732 (39.3%)</td>
<td>3,519  1,557 (44.2%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site duration</td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 2 years</td>
<td>4,960  1,896 (38.2%)</td>
<td>3,352  992 (29.6%)</td>
<td>8,312  2,888 (34.7%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 to &lt; 3 years</td>
<td>1,611  600 (37.2%)</td>
<td>6,557  1,895 (28.9%)</td>
<td>8,168  2,495 (30.5%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 3 years</td>
<td>5,038  1,979 (39.3%)</td>
<td>7,952  2,298 (28.9%)</td>
<td>12,990  4,277 (32.9%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Levy, et al CCM, 2015, 43:3-12
Intermountain Health: SS and Shock

Miller, Dong, Nelson, et al.: Sepsis Bundle and Mortality
Am J Respir Crit Care Med Vol 188, Iss. 1, pp 77–82, Jul 1, 2013
Intermountain Health: Shock

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Sepsis Practice Collaborative Model
4 Tier Process for Program Implementation

1. Hand Washing
   - VAE (VAP) Bundle
   - CAUTI
   - BSI

2. Organizational Consensus that Severe Sepsis Must be Managed Early and Aggressively

3. Early Screening with Tools and Triggers

4. Implementation of the Sepsis Bundles

Measuring Success

CQI

Rapid Improvement

Adapted from: Sepsis Solutions International
<table>
<thead>
<tr>
<th>Item</th>
<th>Responsibility</th>
<th>Due Date</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Assemble team</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Identify executive sponsor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Educate team on evidence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Project Charter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Baseline data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Define screening tool and process—for ED, ICU, Floor, RRT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Define screening audit process</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>8. Develop triggers/processes to alert staff when time to move from first 3 hrs to shock bundle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Develop &amp; implement an educational plan for all staff:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Develop an implementation plan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Data measurement &amp; feedback</td>
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<td></td>
</tr>
</tbody>
</table>
Keys to Success

- Team in place with key stakeholders overseeing implementation
- Project coordinator with lead clinical staff on each unit
- Sepsis resource/coordinator rounds frequently on units
- Strong physician leadership on team
- Reminders to staff through use of bedside sepsis tools/checklist
- Empowerment of nursing staff to prevent errors
- Administrative support to help manage barriers
- Review data monthly to identify opportunities for improvement-real time follow up whenever possible
- Provider specific feedback or report cards related to performance
- Support from a collaborative
- EDUCATION, DATA, COACHING, EDUCATION…….
Questions?