Implementing a Hospital Wide Sepsis Program: Strategies and Challenges

Kathleen M. Vollman RN, MSN, CCNS, FCCM, FAAN
Clinical Nurse Specialist/Educator/Consultant
ADVANCING NURSING LLC
kvollman@comcast.net
Northville, Michigan
www.vollman.com

Pat Posa RN, BSN, MSA, FAAN
Quality Excellence Leader
St. Joseph Mercy Health System
Ann Arbor, MI
patposa@gmail.com
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 annually\(^3\)
- Sepsis occurs in just 10% of U.S. hospital patients, but it contributes to as many as half of all hospital deaths,
- 1 of every 2-3 deaths in hospital are the result of sepsis\(^4\)
- In the US, more than 500 patients die of severe sepsis daily\(^3\)†

Based on data for septicemia

† Reflects hospital-wide cases of severe sepsis as defined by infection in the presence of organ dysfunction
4. Liu V, et al. JAMA, 2014: May 18th, online
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 Pati without Sepsis: 1,988, 52%
- Other: 506, 13%
- Acute Care Pati without Sepsis: 1,072, 28%
Sepsis Impact on Mortality in Hospitals

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 all-cause, 30-day 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
Infection Prevention

VAE (VAP) Bundle

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

Hand Washing

4 Tier Process for Program Implementation

Sepsis Practice Collaborative Model

Continuous Quality Improvement

Adapted from: Sepsis Solutions International
# 4 E’s: Implementation Framework

<table>
<thead>
<tr>
<th>Engage (adaptive)</th>
<th>Frontline Staff</th>
<th>Sepsis Bundles</th>
</tr>
</thead>
</table>
| **Ask, how does this make the world a better place?** | - Help staff understand the preventable harm  
- Share stories about patients affected  
- Estimate number of patients harmed  
- Develop a business case | - Survivor story, Tragic deaths—Rorey Staton  
- Define evidence—Surviving Sepsis Campaign  
- Business case increased mortality, increased LOS, increased cost  
- Share clinical and business case with executive champion |

| Educate (technical) | What do I need to do? | - Convert evidence into behaviors;  
- Evaluate awareness and agreement | - \( \text{What are you going to do?} \) |
|---------------------|-----------------------|-----------------------------|--------------------------|

| Execute (adaptive) | How can I do it? | - Listen to resisters  
- Standardize, create independent checks  
- Make it easy to do the right thing  
- Learn from mistakes | - \( \text{What barriers/issues did you find on gap analysis/walk the process? Define strategies to overcome} \)  
- \( \text{Listen to resisters} \)  
- \( \text{Standardize—policies, algorithm, order sets} \)  
- \( \text{Easy to do the right thing—pocket cards, posters, web references} \)  
- \( \text{Independent checks—add to IDR} \) |

| Evaluate (technical) | How do I know we made a difference? | - Define measures  
- Regularly assess measures | - \( \text{Collect process measures} \)  
- \( \text{Review data at sepsis team meetings} \)  
- \( \text{Define compliance targets} \)  
- \( \text{Understand defects} \) |
Faces of Sepsis

http://www.sepsis.org/faces/
Infection Prevention

VAE (VAP) Bundle
BSI
CAUTI

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^1

Rapid Improvement

Sepsis Practice Collaborative Model
4 Tier Process for Program Implementation

Hand Washing

Infection Prevention

Documentation Improvement
~ Accurate Coding

^1Continuous Quality Improvement

Adapted from: Sepsis Solutions International
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
Economic Implications of an Evidence-based Sepsis Protocol: Can We Improve Outcomes and Lower Costs?

Objective
• To determine financial impact of a sepsis protocol designed for use in the ED of an Academic, tertiary care hospital in US

Design
• Analysis of results from recent prospective study comparing outcomes in patients with septic shock before and after initiation of sepsis protocol

Population
• Adults (n=120) who sequentially presented to ED with septic shock, specifically:
  – At least two systemic inflammatory response syndrome (SIRS) criteria
  –Known or suspected infection (based on radiologic imaging and clinical suspicion)
  – Shock requiring both fluid resuscitation and vasopressor administration

Subjects

• Adults (n=120) who sequentially presented to ED with septic shock, specifically:
  – At least two systemic inflammatory response syndrome (SIRS) criteria
  – Known or suspected infection (based on radiologic imaging and clinical suspicion)
  – Shock requiring both fluid resuscitation and vasopressor administration

• ED = Emergency Department

Overall LOS in Hospital

- Following protocol initiation there was a median reduction in overall hospital LOS of **5 days** (p=0.023)
- The likelihood of remaining hospitalized separated early between the two groups
  - Pre-protocol, 36.7% were hospitalized for >2 weeks vs. 13.3% post-protocol (p=0.003)
- A difference was seen in the frequency of extreme hospitalization:
  - Pre-protocol, 20% were hospitalized for ≥20 days vs. 8.3% post-protocol (p=0.071)

*LOS = length of stay*  
Summary of Results

• Post-protocol, savings of ~$6,000/patient observed
  – Translated into total cost difference of $573,000 between the two groups
• Post-protocol, ICU costs reduced by ~35% (p=0.026) and ward costs fell by 30% (p=0.033)
• Protocol resulted in a reduction in overall hospital LOS of 5 days (p=0.023)
• Pre-protocol, 28-day mortality rate was 48.3% vs. 30.0% following protocol initiation (p=0.040)

- ICU, intensive care unit; LOS, length of stay

Shorr AF et al. Crit Care Med. 2007;35:1257–1262
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
Role of Executive Sponsor

• Review project plans
• Review results from first team meeting
• Identify anticipated barriers that senior leader can help address
• Enlist support and help AND ASK for a sponsor to be assigned to the project
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
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
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
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

Rapid Improvement

Hand Washing

VAE (VAP) Bundle CAUTI BSI

Infection Prevention

Documentation Improvement ~ Accurate Coding

Adapted from: Sepsis Solutions International

1Continuous Quality Improvement
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

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
The New Definitions

- **Infection**: Invasion of a sterile host by a microorganism without organ dysfunction
- **Sepsis**: presence of infection (suspected or confirmed) with Sepsis-induced tissue hypoperfusion or organ dysfunction
- **Septic Shock**: Sepsis with hypotension that persists despite adequate fluid resuscitation
Sepsis 3:
Singer et al, JAMA 2016. PMID: 26903338

- 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

*Singert al, JAMA 2016. PMID: 26903338*

Keep doing what you are doing and consider measuring q-SOFA and SOFA scores in addition to current practice to assess high risk of death until CMS changes or large prospective studies are performed.

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

# Paper or Electronic….That is the Question

<table>
<thead>
<tr>
<th>Method</th>
<th>Pros</th>
<th>Limitations</th>
</tr>
</thead>
</table>
| Paper form                      | • Nurses critically think as they screen the patient  
• Easy and quick to develop  
• No cost | • Screening is intermittent  
• Paper can be misplaced  
• Static—no ability to automate an alert |
| EMR form                        | • Nurses critically thinks as they screen the patient  
• Can automate alerts for positive screens | • Screening is intermittent  
• Length of programming time  
• Cost |
| EMR—real time, continual screening | • 24 hour screening  
• Can automate alerts for positive screens | • Nurse does not screen patient—potential loss of screening knowledge and critical thinking  
• Computer not reliably able to identify patients who have infection  
• Computer not able to discern if SIRS is valid or organ dysfunction is new |
| EMR—real time and scheduled     | • Form fires and pre populates for nurse to screen upon admission and each shift—nurse critically thinks  
• 24 hour screening  
• Manual screen completed when EMR alert fires---nurse discerns/validates appropriateness/correctness of alert | • Screening form needs to be developed in EMR—programing time and costs |
**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. Screen each patient upon admission, once per shift and PRN with change in condition.

<table>
<thead>
<tr>
<th>DATE:</th>
<th>TIME:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I. SIRS - Systemic Inflammatory Response Syndrome</th>
<th>(2 or more of the following):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature greater than or equal to 100.4°F or less than or equal to 96.8°F</td>
<td></td>
</tr>
<tr>
<td>Heart Rate greater than 90 beats/minute</td>
<td></td>
</tr>
<tr>
<td>Respiratory Rate greater than 20 breaths per minute</td>
<td></td>
</tr>
<tr>
<td>WBC greater than or equal to 12,000/mm^3 or less than or equal to 4,000/mm^3 or greater than 0.5 mmol/L</td>
<td></td>
</tr>
<tr>
<td>Blood glucose greater than 140 mmol/L, in non-diabetic patient</td>
<td></td>
</tr>
<tr>
<td>Negative screen for severe sepsis (Please initial)</td>
<td></td>
</tr>
</tbody>
</table>

If check two of the above, move to III.

<table>
<thead>
<tr>
<th>III. Infections (one or more of following):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspected or documented infection</td>
</tr>
<tr>
<td>Antibiotic Therapy (not prophylaxis)</td>
</tr>
</tbody>
</table>

If check none of above – Negative screen for severe sepsis (Please initial) – answer infection question NO in flow. If check one of the above – answer Infection question YES in flow, call physician for serum lactate level and move to III.

<table>
<thead>
<tr>
<th>III. Organ Dysfunction (change from baseline)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(one or more of the following within 3 days of new infection)</td>
</tr>
<tr>
<td>Respiratory: RR/CVD less than 60% or increasing CVD requirements</td>
</tr>
<tr>
<td>Cardiovascular: SBP less than 90 mmHg OR 40 mmHg less than baseline OR MAP less than 65 mmHg</td>
</tr>
<tr>
<td>Renal: urine output less than 0.5 ml/kg/hr, creatinine increase of greater than 0.5 mg/dl from baseline</td>
</tr>
<tr>
<td>CNS: altered consciousness (unrelated to primary neuro pathology)</td>
</tr>
<tr>
<td>Glucose: CCM less than or equal to 120</td>
</tr>
<tr>
<td>Hematologic: platelets less than 100,000; INR greater than 1.5</td>
</tr>
<tr>
<td>Hepatic: serum total bilirubin greater than or equal to 4 mg/dl</td>
</tr>
<tr>
<td>Metabolic: serum lactate acid greater than or equal to 2 mmol/L</td>
</tr>
</tbody>
</table>

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 or no central access)
4. Obtain a venous blood gas (peripheral vae), serum lactate, CVP (if it had 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 – 20 ml/kg over one hour or as fast as possible until hypotension resolved, unless known EF is less than 25% or adverse event for heart failure

**Sepsis Induced Hypoperfusion?**

- For Lactate acid 0.1
  - Hypotension (APTT)<90 initial fluid bolus (30 ml/kg)
  - 2. Lactate acid greater than or equal to 4 mmol/L, with any BP

**YES**

- Initiate General Care Severe Sepsis Bundle on back and complete interventions
- Activate CODE SEPSIS
- Initiate transfer to ICU
- Meanwhile, continue crystalloid resuscitation of 250-1000 mL boluses if hypotensive after the initial bolus – per physician order

**NO**

- For Lactate acid 3.5 OR initial hypotension that responded to the 30 ml/kg fluid bolus, initiate transfer to SICU

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

**RN Signature, Initial Date & Time:**

**Scan Code:**

**For Code:**

- Sepsis Induced Hypoperfusion?
- 1. Hypotension (APTT)<90 initial fluid bolus (30 ml/kg)
- 2. Lactate acid greater than or equal to 4 mmol/L, with any BP

**Initiate General Care Severe Sepsis Bundle on back and complete interventions**

**Initiate transfer to ICU**

**Meanwhile, continue crystalloid resuscitation of 250-1000 mL boluses if hypotensive after the initial bolus – per physician order**

**Initiate the Sepsis Shock Pathway 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 prn change in patient condition
- Complete 0 to 1 hour interventions, below

Date/Time: __________________ to __________________

_______ If hypotensive, volume resuscitate: initial 30 mL/kg as fast as possible, then additional boluses as needed per order
_______ Time 30 mL/kg fluid bolus infused
_______ Broad spectrum antibiotic-start after obtaining blood culture
_______ Time antibiotic hung
_______ Initial Labs: serum lactate, additional labs as ordered by physician

Yes No Serum lactic acid drawn
Yes No Blood Cultures x 2
_______ Time 1: ______________ Time 2: ______________
_______ Other cultures:
_______ Establish IV access (2 large bore IVs)
Signature:______________________________ Date/Time: ______________

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 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 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

Date/Time: __________________ to __________________

_______ If hypotensive, volume resuscitate: initial 30 mL/kg as fast as possible, then additional boluses as needed per order
_______ Time 30 mL/kg fluid bolus infused
_______ Broad spectrum antibiotic-start after obtaining blood culture
_______ Time antibiotic hung
_______ Initial Labs: serum lactate, additional labs as ordered by physician

Yes No Serum lactic acid drawn
Yes No Blood Cultures x 2
_______ 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 screened positive for sepsis)

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

Background:
1. ___________ has the following positive criteria for SIRS
   (patient name) (state only those that apply)
   - Temperature > 100.6°F (38.0°C) or > 96.8°F (36°C)
   - BP < 90 mmHg or > 40 mmHg from baseline
   - HR > 90/min
   - Respiratory rate > 20/min
   - Change in mental status, ALOC

2. I suspect infection
   The most recent WBC is
   (Consider infection if WBC > 15,000 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 8
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>
</table>
| Background:         | 1. Positive Systemic Response to Infection  
                        2. Known or suspected infection  
                        3. Organ dysfunction: share which organs |
| Assessment:         | Share any other clinical changes? |
| Recommendations:    | 1. I need you to come and evaluate the patient to confirm if they have severe sepsis  
                        2. It is recommended that I get an ABG, lactate, blood cultures and a CBC (if > 12 hrs since last one). Can I proceed and get these?  
                        3. Any other labs you would like me to obtain? Do you want to order antibiotics?  
                        4. If patient is hypotensive: Can I start an IV and give a bolus of NS—30ml/kg |
| Date/time of call:  | ____________________________ |
| RRT called:        | Yes  No |
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 CQI

Hand Washing

VAE (VAP) Bundle CAUTI BSI

Infection Prevention

Documentation Improvement ~ Accurate Coding

Adapted from: Sepsis Solutions International

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 ≥ .5ml/kg/hr

- Standard Therapy
  - CVP ≥ 8-12
  - MAP ≥ 65
  - UO ≥ .5ml/kg/hr

Early Goal-Directed Therapy Results

28-day Mortality

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

NNT = 7–8

P = 0.01*

*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 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
SEP-1

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.
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) \( \geq 65 \text{mmHg} \)

6. In the event of persistent hypotension after initial fluid administration (MAP < 65 mm Hg) or if initial lactate was \( \geq 4 \text{ mmol/L} \), 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
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
Serum Lactate is associated with mortality in severe sepsis independent of organ failure and shock

Objective:
- Test whether the association between initial serum lactate level and mortality in patients presenting to the ED with severe sepsis is independent of organ dysfunction and shock

Design:
- Retrospective, single center cohort study
- Academic teaching hospital

Patients:
- 830 adults admitted with severe sepsis in the ED
- Stratified lactate into 3 groups: low (<2), intermediate (2-3.9) and high (> or equal to 4)
Serum Lactate is associated with mortality in severe sepsis independent of organ failure and shock

Results:

- Intermediate and high serum lactate significantly associated with mortality regardless of the presence of shock or other organ dysfunction

- A single serum lactate seems to risk-stratify patients independent of organ dysfunction or hemodynamic instability

Mikkelsen, Mark et al. CCM 2009 Vol 37 No 5
Antibiotics

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

- Timing
  - Turnaround time---from indication to hanging
    - ED vs ICU vs Floor
  - Understand your current process and where the gaps are
  - Make antibiotics rapidly available
Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock

*2,154 septic shock patients

*Effective antimicrobial administration within the 1st hour of documented hypotension was associated with increased survival in patients with septic shock.

*Each hour of delay over the next 6 hours was associated with an average decrease in survival of 7.6% (range 3.6-9.9%)
### 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>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>13.7</td>
<td>13.3</td>
<td>15.3</td>
</tr>
<tr>
<td>1</td>
<td>1.10</td>
<td>1.05</td>
<td>1.15</td>
<td>&lt;0.001</td>
<td>14.9</td>
<td>13.7</td>
<td>16.1</td>
</tr>
<tr>
<td>2</td>
<td>1.21</td>
<td>1.10</td>
<td>1.32</td>
<td>&lt;0.001</td>
<td>16.1</td>
<td>15.1</td>
<td>17.2</td>
</tr>
<tr>
<td>3</td>
<td>1.33</td>
<td>1.15</td>
<td>1.52</td>
<td>&lt;0.001</td>
<td>17.4</td>
<td>16.2</td>
<td>18.7</td>
</tr>
<tr>
<td>4</td>
<td>1.46</td>
<td>1.22</td>
<td>1.75</td>
<td>&lt;0.001</td>
<td>18.8</td>
<td>17.1</td>
<td>20.6</td>
</tr>
<tr>
<td>5</td>
<td>1.60</td>
<td>1.20</td>
<td>2.01</td>
<td>&lt;0.001</td>
<td>20.3</td>
<td>18.0</td>
<td>22.8</td>
</tr>
<tr>
<td>6</td>
<td>1.76</td>
<td>1.34</td>
<td>2.31</td>
<td>&lt;0.001</td>
<td>21.9</td>
<td>18.8</td>
<td>25.3</td>
</tr>
</tbody>
</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>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>22.2</td>
<td>20.7</td>
<td>23.8</td>
</tr>
<tr>
<td>1</td>
<td>1.03</td>
<td>1.00</td>
<td>1.06</td>
<td>&lt;.046</td>
<td>22.7</td>
<td>21.4</td>
<td>24.5</td>
</tr>
<tr>
<td>2</td>
<td>1.06</td>
<td>1.00</td>
<td>1.12</td>
<td>&lt;.046</td>
<td>23.2</td>
<td>22.0</td>
<td>24.5</td>
</tr>
<tr>
<td>3</td>
<td>1.09</td>
<td>1.00</td>
<td>1.19</td>
<td>&lt;.046</td>
<td>23.7</td>
<td>22.5</td>
<td>25.1</td>
</tr>
<tr>
<td>4</td>
<td>1.12</td>
<td>1.00</td>
<td>1.26</td>
<td>&lt;.046</td>
<td>24.3</td>
<td>22.7</td>
<td>25.9</td>
</tr>
<tr>
<td>5</td>
<td>1.16</td>
<td>1.00</td>
<td>1.33</td>
<td>&lt;.046</td>
<td>24.8</td>
<td>22.9</td>
<td>26.9</td>
</tr>
<tr>
<td>6</td>
<td>1.19</td>
<td>1.00</td>
<td>1.41</td>
<td>&lt;.046</td>
<td>25.4</td>
<td>23</td>
<td>27.9</td>
</tr>
</tbody>
</table>

5% Increase in Mortality for Every Hour Delayed
Antibiotics

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

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

- Understand your current process and where the gaps are
- Make antibiotics rapidly available
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.
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,)
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: (aad)-037325766    FIN: 016661038-4076
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: 78 (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: 0 (1/1/1980)

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: (Cavial 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

©2014 Trinity Health - Livonia, MI 65
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
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 hour 3-6
  - 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,)
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: 016661038-4076
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: 78 (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)
Scv02: (From CVC in SVC)
Bedside Cardiovascular Ultrasound: (Cavial 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 SV1 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
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
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
### Badge or Pocket Card

### Adult Sepsis Criteria

<table>
<thead>
<tr>
<th>SIRS</th>
<th>Severe Sepsis</th>
<th>Sepsis PLUS New Organ Failure</th>
<th>Septic Shock</th>
</tr>
</thead>
</table>
| * Fever > 100.3°F (38.3°C) or < 96.8°F (36°C)  
  * HR > 90  
  * RR > 20  
  * WBC > 12,000 or < 4,000 or >10% bands | * Organ Failure Criteria:  
  * Cardiovascular: SBP < 90 or 40  
  from baseline or MAP < 65 [(2 x  
  diastolic + systolic)/3] or a  
  * Respiratory: SaO₂ < 90% or 75  
  from baseline requirements  
  * Renal (URine output < 0.5 ml/kg/ 
  hour) or (Creatinine > 2 or  
  0.3 mg/dl from baseline)  
  * Metabolic: Lactic Acid > 2 m/mL  
  > 2 mmol/L | * Severe sepsis PLUS hypotension  
  (SBP < 90 or MAP less than 65)  
  despite 30 ml/kg/24 hours fluid bolus 
  and/or  
  * Lactate greater than or equal to 4mmol/L | * Sepsis Bundles |

#### Sepsis Bundles

**TO BE COMPLETED WITHIN 3 HOURS OF TIME OF PRESENTATION:**

1. Measure lactate level
2. Obtain blood cultures prior to antibiotics
3. Administer broad spectrum antibiotics
4. Administer 30 ml/kg crystalloid fluids for hypotension or lactate > 6mmol/L

**TO BE COMPLETED WITHIN 6 HOURS**

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

**DOCUMENT REASSESSMENT OF VOLUME STATUS AND TISSUE PERFUSION BY LIP:**

* Either
  - Repeat focused exam (after initial fluid resuscitation) by LIP including VS, cardiovascular, 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

Please complete the following:

- **Time severe sepsis criteria met**: Date: ____________ Time: ____________
- **Time septic shock criteria met**: (Time Zero); Date: ____________ Time: ____________

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.

<table>
<thead>
<tr>
<th>Decision Grid</th>
<th>Date _________ to _________ 0-6 Hours</th>
<th>Date _________ to _________ 6-24 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient with severe sepsis—implement interventions below within 1 hour:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
</tr>
<tr>
<td>Initial Labs: Serum lactic acid, additional labs as ordered by physician</td>
<td>Serum lactic acid drawn</td>
<td>Serum lactic acid drawn</td>
</tr>
<tr>
<td>Blood Cultures X 2</td>
<td>Blood Cultures X 2</td>
<td>Blood Cultures X 2</td>
</tr>
<tr>
<td>Time 1:</td>
<td>Time 2:</td>
<td>Time 1:</td>
</tr>
<tr>
<td>Establish IV access</td>
<td>Establish IV access</td>
<td>Establish IV access</td>
</tr>
<tr>
<td>Broad Spectrum Antibiotic-start after obtain broad culture (see Infirmerut Pharmacy Guide to Antimicrobial Therapy)</td>
<td>Broad Spectrum Antibiotic-start after obtain broad culture (see Infirmerut Pharmacy Guide to Antimicrobial Therapy)</td>
<td>Broad Spectrum Antibiotic-start after obtain broad culture (see Infirmerut Pharmacy Guide to Antimicrobial Therapy)</td>
</tr>
<tr>
<td>Time antibiotic hung</td>
<td>Time antibiotic hung</td>
<td>Time antibiotic hung</td>
</tr>
<tr>
<td><strong>Source Control</strong></td>
<td><strong>Source Control</strong></td>
<td><strong>Source Control</strong></td>
</tr>
<tr>
<td>If lactic acid greater than or equal to 4 mEq/L or SBP less than 90 mm Hg or 40 mm Hg less than baseline or MAP less than 65 mm Hg administer:</td>
<td>If lactic acid greater than or equal to 4 mEq/L or SBP less than 90 mm Hg or 40 mm Hg less than baseline or MAP less than 65 mm Hg administer:</td>
<td>If lactic acid greater than or equal to 4 mEq/L or SBP less than 90 mm Hg or 40 mm Hg less than baseline or MAP less than 65 mm Hg administer:</td>
</tr>
<tr>
<td>30 ml/kg fluid bolus over 1 hour or as fast as possible, unless know E/F is less than 35% or active treatment for heart failure (if present, consult physician for speed of bolus)</td>
<td>30 ml/kg fluid bolus over 1 hour or as fast as possible, unless know E/F is less than 35% or active treatment for heart failure (if present, consult physician for speed of bolus)</td>
<td>30 ml/kg fluid bolus over 1 hour or as fast as possible, unless know E/F is less than 35% or active treatment for heart failure (if present, consult physician for speed of bolus)</td>
</tr>
<tr>
<td>Time 30 ml/kg fluid bolus infused</td>
<td>Time 30 ml/kg fluid bolus infused</td>
<td>Time 30 ml/kg fluid bolus infused</td>
</tr>
</tbody>
</table>

**Septic Shock Bundle**

- Apply vasopressor 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 if 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
    - Repeat focused exam—including vital signs, cardiopulmonary, capillary refill, pulse and skin findings by physician or APP
    - Repeat the fluid bolus, monitor for response, and document findings
  - Continue screening

**Other 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 replace
- Needs more volume

---

**In patients with ARDS (P/F ratio less than 300):**

- **No** | No | No |
| Patient on mechanical ventilator | Patient on mechanical ventilator | Patient on mechanical ventilator |
| Is the tidal volume 6 ml/kg of ideal body weight in the first 24 hours | Is the tidal volume 6 ml/kg of ideal body weight in the first 24 hours | Is the tidal volume 6 ml/kg of ideal body weight in the first 24 hours |
| Are the static or plateau inspiratory pressures less than 30 cmH2O in the first 24 hours | Are the static or plateau inspiratory pressures less than 30 cmH2O in the first 24 hours | 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**

**Physician**

**Signature, Date & Time**
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

- 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

NO

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%
- # of pts 3
- 66%
- 2

Daily Critical Communications

- Please complete Safety attitude questionnaire
- See Nurse Coordinators

SICU Huddle Board

Patient Satisfaction

- Improve Pain Reassessement
  - # of episodes reassessed after pain meds: 24
  - # of episodes audited: 78%
  - Goal 100%
  - Goal 100%
  - 52%

Skincare

- # of days since last pressure ulcer developed in SICU
- Unit Incidence Rates
  - Jan: 13.3%
  - Dec: 0.7
  - Nov: 0.7

- Re-education for staff: use RN objective cards during RN-RN nights
- Education for families about delirium prevention
- Use RN objective cards during RN-RN nights
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 CQI¹

Rapid Improvement

Hand Washing

VAE (VAP) Bundle CAUTI BSI

Infection Prevention

Documentation Improvement ~ Accurate Coding

¹Continuous Quality Improvement

Adapted from: Sepsis Solutions International
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
CORE MEASURE

• Sepsis management will be a core measure that is reported to CMS starting October 1st 2015
• Compliance is All or None—so all measure on the 3 and 6 hour bundles need to be met in the appropriate timeframe to be compliant
SEP-1

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.
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) ≥65 mmHg

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
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
  - Medical 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 resuscitation 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.

**Patient Initials:**

**Abstracter Name & Date:**

---

<table>
<thead>
<tr>
<th>Patient Name:</th>
<th>FIN:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED Arrival Date &amp; Time:</td>
<td>ED RN:</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; Time:</td>
<td></td>
</tr>
<tr>
<td>Attending:</td>
<td>Resident:</td>
</tr>
<tr>
<td>RN:</td>
<td>PRISM Scores</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 Page(s):</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></td>
</tr>
<tr>
<td>Blood Cultures before Antibiotics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broad-Spectrum Antibiotics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30mL/kg Fluid Bolus</td>
<td>Weight in kg:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central Line Placed, If Required Vasopressors</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<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>6 Hour Measures</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vasopressor Started for SBP &lt; 90 or MAP &lt; 65mmHg After Fluid Bolus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMS Requirement: Vasopressor Started for SBP &lt; 90 or MAP &lt; 65mmHg After Fluid Bolus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeat Focused Exam by MD/AP (VT, chest pain, c. ap., LMR, pulse, AHR, skin findings) CR, I/IV Lines (CVP, f. CO), Babinski Cerebral Status, Urine output, IV Optimization, with Fluid Challenge (see the Leg Exam)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeat Lactic Acid</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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
Sepsis Patient Flow Template: Ambulance

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

Highlight the steps with the biggest issues

Customer Requirements:

Total L/T to admit:

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

If bundle is not used, describe these resuscitation components
**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

Highlight the steps with the biggest issues.

- **ICU**
  - Admit to ICU
  - ICU Assess
  - Resuscitate

- **ER/Floor**
  - Supplier Inputs:
  - Total L/T to admit:

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

If bundle is not used, describe these resuscitation components.
# Current State Issues

<table>
<thead>
<tr>
<th>Process Box &amp; Issue</th>
<th>Top 2 reasons why</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1a</td>
</tr>
<tr>
<td></td>
<td>1b</td>
</tr>
<tr>
<td>2</td>
<td>2a</td>
</tr>
<tr>
<td></td>
<td>2b</td>
</tr>
<tr>
<td>3</td>
<td>3a</td>
</tr>
<tr>
<td></td>
<td>3b</td>
</tr>
<tr>
<td>4</td>
<td>4a</td>
</tr>
<tr>
<td></td>
<td>4b</td>
</tr>
<tr>
<td>What are we trying to accomplish?</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td></td>
</tr>
<tr>
<td>How will we know that a change is an improvement?</td>
<td></td>
</tr>
<tr>
<td>What change can we make that will result in improvement?</td>
<td></td>
</tr>
</tbody>
</table>

Model for Improvement

- **Act**
- **Plan**
- **Check**
- **Do**

Nolan
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 accept it
- Communication breakdown RN-RN shift report
- Not sure what they received on another unit
- Taker too long for physician to come and see the patient

Policy
- Appropriate labs not drawn/ordered
- Appears cardiogenic not septic
- "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 pursued
- Blame hypotension on other conditions or source (i.e., sedation)
- Physician pushback
- Nurse/doctor hesitant because being diurezeded
- Patient who hover or have unclear presentation

Environment/EMR
- Staff busy with more than 1 patient
- Getting orders in and charting in MAR (should treat like a code and chart late)
- Physical support especially on off-shift
- Lack of documentation when fluid actually given

Material
- Lack of IV access

Process/critical thinking
- 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
- New interns
- Staff not aware of sepsis protocol—doesn't require physician order
- Unassertive RN staff—at advanced beginner stage
- Not proper 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

People/knowledge
- Not trusting high lactate and continue to recheck
- Patient not symptomatic with low BP
- RN not sure where pt 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 amount of fluid
- Staff knowledge deficit
- Nurse like exact orders in EMR before starting interventions—causes delays
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:
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
Learn From a Defect

• What happened?

• Why did it happen (system lenses)?

• What could you do to reduce risk?

• How do you know risk was reduced?
  – Create policy / process / procedure
  – Ensure staff know policy
  – Evaluate if policy is used correctly

• Who will I share the learnings with?
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
<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>( p )-value&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Died</td>
<td>Percent</td>
<td>Total</td>
</tr>
<tr>
<td>Overall</td>
<td>11,609</td>
<td>4,475</td>
<td>38.6</td>
<td>17,861</td>
</tr>
<tr>
<td>Location of severe sepsis identification</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ED</td>
<td>5,984</td>
<td>1,850</td>
<td>30.9</td>
<td>10,465</td>
</tr>
<tr>
<td>Ward</td>
<td>3,970</td>
<td>1,800</td>
<td>45.3</td>
<td>5,532</td>
</tr>
<tr>
<td>ICU</td>
<td>1,655</td>
<td>825</td>
<td>49.8</td>
<td>1,864</td>
</tr>
<tr>
<td>Site duration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 2 years</td>
<td>4,960</td>
<td>1,896</td>
<td>38.2</td>
<td>3,352</td>
</tr>
<tr>
<td>2 to &lt; 3 years</td>
<td>1,611</td>
<td>600</td>
<td>37.2</td>
<td>6,557</td>
</tr>
<tr>
<td>( \geq ) 3 years</td>
<td>5,038</td>
<td>1,979</td>
<td>39.3</td>
<td>7,952</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

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
Sepsis Practice Collaborative Model
4 Tier Process for Program Implementation

Organizational Consensus that Severe Sepsis Must be Managed Early and Aggressively

Implementation of the Sepsis Bundles

Early Screening with Tools and Triggers

Measuring Success CQI

Hand Washing

VAE (VAP) Bundle
CAUTI
BSI

Infection Prevention

Documentation Improvement ~ Accurate Coding

Rapid Improvement

Adapted from: Sepsis Solutions International

1Continuous Quality Improvement
# Sepsis Program Action Plan

<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>
<td></td>
</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>
<td></td>
<td></td>
<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?