Severe Sepsis: Early Recognition and Management Saves Lives
Kathleen Vollman, Sepsis Solutions International LLC / Advanced Nursing LLC
A Webber Training Teleclass

Overview

• Why Sepsis? Why Now?
• Defining the continuum
• Brief overview of pathophysiologic derangements
• Process for development of a hospital wide sepsis program: The Power of the Pyramid
  – Organizational support
  – Early Recognition Screening/triggers
  – Implementation/protocols
  – Measurement
• Worldwide Sepsis Program Outcomes

Severe Sepsis: A Significant Healthcare Challenge

• Sixth most common reason for hospitalization
• Most costly reason for hospitalization in 2009**
  – 15.4 billion in aggregate hospital cost
• 1 out of 23 patients in hospital had sepsis**
• Major cause of morbidity and mortality worldwide
  – Leading cause of death in noncoronary ICU (US)†
  – 10th leading cause of death overall (US)†
• In the US, more than 700 patients die of severe sepsis daily (1.6 million new cases per year)

Sepsis: Defining a Disease Continuum

- SIRS
  - Adult criteria
  - Temp.: >38°C or <36°C
  - HR: >90 beats/min
  - Respirations: >20/min
  - WBC count: >12,000/mm³ or <4,000/mm³ or >10% immature neutrophils (bands)
  - SIRS with a presumed or confirmed infectious process
- Severe Sepsis
  - Sepsis with ≥1 sign of organ dysfunction, hypoperfusion or hypotension. Examples:
    - Cardiovascular (refractory hypotension)
    - Renal
    - Respiratory
    - Hepatic
    - Hematologic
    - CNS
    - Unexplained metabolic acidosis

How Does Severe Sepsis Compare to Your Current Care Priorities?

<table>
<thead>
<tr>
<th>Disease</th>
<th>U.S. Incidence</th>
<th># of Deaths</th>
<th>Mortality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMI†</td>
<td>895,000</td>
<td>171,000</td>
<td>19%</td>
</tr>
<tr>
<td>Stroke†</td>
<td>700,000</td>
<td>157,800</td>
<td>23%</td>
</tr>
<tr>
<td>Pneumonia‡</td>
<td>1,300,000</td>
<td>61,800</td>
<td>4.8%</td>
</tr>
<tr>
<td>Severe Sepsis§</td>
<td>751,000</td>
<td>215,000</td>
<td>29%</td>
</tr>
</tbody>
</table>

Why do you think that severe sepsis has not received the same focus as these other common disease states?


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Severe Sepsis: Defining a Disease Continuum

<table>
<thead>
<tr>
<th>Infection or Trauma</th>
<th>SIRS</th>
<th>Sepsis</th>
<th>Severe Sepsis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sepsis with ≥1 sign of organ dysfunction, hypoperfusion or hypotension</td>
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</tbody>
</table>

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

SIRS = Systemic Inflammatory Response Syndrome

Why Do You Need to Have a Screening Process?

- TIME IS TISSUE!!
  - The speed and appropriateness of therapy administered in the initial hours after severe sepsis develops are likely to influence outcomes.
- 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.


Make Screening for Severe Sepsis Process-Dependent

- Weave into fabric of current practice
- Assess for on a shift basis
- Identify strategies for initiation of therapy response once patient is identified

Incorporate Screening and Early Identification Throughout the Hospital

- Emergency Department
- ICUs
- Patient Care Units
- Rapid Response Team
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**What To Do Based on Where the Deposition of the Patient**

<table>
<thead>
<tr>
<th>Barriers: Time for nurses to do it (perception vs. reality)</th>
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<tbody>
<tr>
<td>Barriers: Screening is not sensitive only for severe sepsis</td>
</tr>
<tr>
<td>Barriers: Positive screen is not a diagnosis of severe sepsis</td>
</tr>
</tbody>
</table>

**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

**Screening: Clinical Scenario I: Early identification and intervention**

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

- Initial VS:
  - Temp: 101.6°F
  - RR: 31
  - HR: 109, atrial fib with occasional SVT
  - B/P: 79/51
  - 2L of O2, O2 sat of 96%
- Does this patient screen positive for severe sepsis?

Homeostasis Is Unbalanced in Severe Sepsis

Inflammation, Coagulation and Impaired Fibrinolysis In Severe Sepsis

OXYGEN SUPPLY/DEMAND DYNAMICS

Cornerstones of Multidisciplinary Management of Severe Sepsis/MODS

- Prevention
- Screening and Early Identification
- Early Intervention: Source control, Blood cultures and broad spectrum antibiotics
- Resuscitation Bundle
- Management Bundle

Third Tier: Implementation of Evidence-Based Sepsis Bundles

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Surviving Sepsis Campaign Bundles

TO BE COMPLETED WITHIN 3 HOURS:
1) Measure lactate level
2) Obtain blood cultures prior to administration of antibiotics
3) Administer broad spectrum antibiotics
4) Administer 30 ml/kg crystalloid for hypotension or lactate ≥4 mmol/L

TO BE COMPLETED WITHIN 6 HOURS:
5) Apply vasopressors (if hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥ 65 mm Hg
6) In the event of persistent arterial hypotension despite volume resuscitation (septic shock) or initial lactate ≥4 mmol/L (≥20 mg/dL):
   - Measure central venous pressure (CVP)
   - Measure central venous oxygen saturation (ScVO2)
7) Remasure lactate if initial lactate was elevated

*Targets for quantitative resuscitation included in the guidelines are CVP of ≥8 mm Hg, ScVO2 of ≥70%, and normalization of lactate.

Initial Sepsis Resuscitation Bundle

- Measure serum lactate
- Obtain blood cultures prior to administration of antibiotics (1C)
- Minimize time to administration of broad spectrum antibiotics (within 1 hr with shock (1B);
within 3 hrs without shock (1C))
- In the event of hypotension and/or lactate ≥4, deliver 30 ml/kg of crystalloid (1B) (3hrs)

New: if lactate 2.1-3.9: target resuscitation to normalize the lactate (2C)

No Management Bundle/Guidelines for Care of the Severe Sepsis/Septic Shock Patient

- Source control (1C) As rapid as possible <12hrs drain
- Continue to recommend the use of lung protective strategies for pts with ALI/ARDS (no change)
- Recommend—No steroids if can get MAP > 65 with fluids and vasopressors; if unable, then administer 200mg/day (2C)
- Start insulin gtt if get (2) consecutive BG > 180; target glucose < 180
- Also added nutritional recommendations to guidelines

Septic Shock Bundle

- Continue the challenge (1C)
  - CVP > 8 (suggest dynamic parameters of fluid responsiveness)
  - MAP > 65 (1C)
  - Levophed first line (1B) (epi second choice 2B)
  - Dopamine removed
  - ScVO2 > 70 (2C)
  - Use dobutamine with evidence of cardiac dysfunction (1C)

Early Management

Early Recognition & Source Control
Early Antibiotics
Prompt/Aggressive Resuscitation
ICU/Additional Evidence Based Therapies

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SSC Guidelines
Antibiotics

- We recommend that intravenous antibiotic therapy be started as early as possible and within the first hour of recognition of septic shock (1B) and severe sepsis without septic shock (1C).

Remark: Although the weight of evidence supports prompt administration of antibiotics following the recognition of severe sepsis or septic shock, the feasibility with which clinicians may achieve this ideal state has not been scientifically validated.

Mortality as a Function of Adequacy of Empiric Antimicrobial Therapy

<table>
<thead>
<tr>
<th>Hospital Mortality (%)</th>
<th>60</th>
<th>50</th>
<th>40</th>
<th>30</th>
<th>20</th>
<th>10</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>All causes</td>
<td>P=0.001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infection-related</td>
<td>P=0.001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


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%).

CCM 2006 Vol. 34 No.6

Initiation of Inappropriate Antimicrobial Therapy Result in a 5-Fold Reduction of Survival in Human Septic Shock

- Objective: determine the impact of the initiation of inappropriate antimicrobial therapy on survival to hospital discharge of patients with septic shock.
- Retrospective review of 5,715 patients from 22 different hospitals in Canada, US and Saudi Arabia.
- Data collected from 1996-2005.

Initiation of Inappropriate Antimicrobial Therapy Result in a 5-Fold Reduction of Survival in Human Septic Shock

- 5,715 patients in septic shock in three countries.
- 55% of cases were from community acquired infection.
- Decrease in survival with inappropriate initial antibiotics was fivefold.


EARLY MANAGEMENT

Early Recognition & Source Control
Early Antibiotics
Prompt/Aggressive Resuscitation
ICU/Additional Evidence Based Therapies

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Initial Resuscitation (1C)

- Protocolized resuscitation should begin as soon as sepsis induced tissue hypoperfusion is recognized or
- Elevated Serum lactate identifies tissue hypoperfusion in patients at risk who are not hypotensive
- Initial fluid challenges be started at ≥ 1000 mL or 300-500 mL of colloid over 30 minutes (1C)


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 > 90%, 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

<table>
<thead>
<tr>
<th></th>
<th>Standard Therapy</th>
<th>EGDT</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>133</td>
<td>130</td>
</tr>
<tr>
<td>28-day Mortality</td>
<td>49.2%</td>
<td>33.3%</td>
</tr>
<tr>
<td>NNT</td>
<td>7–8</td>
<td></td>
</tr>
</tbody>
</table>

*Key difference was in sudden CV collapse, not MODS


Evidence of Early Goal Directed Therapy

- First 6 hours of EGDT:
  - 1500cc more fluid
  - 64% received blood products vs. 18.5%
  - 13.7% received inotropes vs. 0.8%
  - No difference in vasopressor use or mechanical ventilation


SSC Guidelines

Resuscitation

Should be protocolized, quantitative resuscitation of patients with sepsis induced hypoperfusion (defined as hypotension persisting after initial fluid challenge or blood lactate ≥4mmol/L).

Recommend
insertion central venous catheter

Recommended Goals
- Central venous pressure: 8-12 mmHg
  - Higher with altered ventricular compliance or increased intrathoracic pressure
- ScvO2 saturation > 70% (1C)

SSC Guidelines

Fluid Therapy

1. We recommend crystalloids be used in the initial fluid resuscitation of severe sepsis (1B)
2. We suggest the use of albumin in the fluid resuscitation of severe sepsis and septic shock when patients require substantial amounts of crystalloids. (2C)
3. We recommend against the use of hydroxyethyl starches (HES) for fluid resuscitation of severe sepsis and septic shock patients (1B)

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SSC Guidelines

- Fluid challenge technique be applied wherein fluid administration is continued as long as there is hemodynamic improvement either based on dynamic (eg, change in pulse pressure, stroke volume variation) or static (eg, arterial pressure, heart rate) variables (UG).


Optimize Cardiac Performance

Fluid Bolus to define place on curve:
- Record CI and SV
- Give 250-500 NS bolus over 15 minutes
- Record CI and SV
- If see greater than a 10% increase in SV or CI—pt is on steep portion of curve and will still respond to fluid


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)

Mikkelsen, Mark et al CCM 2009 Vol 37 No 5

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

Multicenter Study of Central Venous Oxygen Saturation as a Predictor of Mortality in Patients With Sepsis

- Objective:
  - Primary: an abnormal (both low and high) ScvO2 is associated with increased mortality in emergency department (ED) patients with septic shock.
  - Secondary: determine whether the initial ScvO2 or the maximum ScvO2 achieved was associated with mortality.
- 619 patients from 4 hospitals; prospectively collected data

Pope; et al j.annemergmed.2009

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Central Venous Oxygen Saturation (ScvO2) as a Predictor of Mortality in Patients With Sepsis

Considering the maximum ScvO2 achieved in the ED, the presence of both hypoxia and hyperoxia was associated with a higher mortality rate compared with that of the normoxia group.

Pope; et al. J.annemergmed.2009

Peer Review Publications

Odds Ratio (95% CI)

Gan, 2004
Selvat, 2014
Kerhe. 2004
Shephed, 2004
Topnik, 2004
Kuc, 2004
Shuker, 2004
Qu, 2004
Nguyen, 2007
Carra, 2007
Owens, 2007
Barba, 2007

Before | 1104 | After | 1175

Recommendation Norepinephrine vs. Dopamine

<table>
<thead>
<tr>
<th>Study</th>
<th>Norepinephrine</th>
<th>Dopamine</th>
<th>RR (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matti et al.</td>
<td>7</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Mark et al.</td>
<td>5</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Rosskussen et al.</td>
<td>4</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Mathur et al.</td>
<td>14</td>
<td>25</td>
<td>19</td>
</tr>
<tr>
<td>De Backer et al.</td>
<td>349</td>
<td>652</td>
<td>291</td>
</tr>
<tr>
<td>Patel et al.</td>
<td>51</td>
<td>110</td>
<td>67</td>
</tr>
<tr>
<td>Overall</td>
<td>558</td>
<td>676</td>
<td>396</td>
</tr>
</tbody>
</table>


Vasopressors

- Vasopressor therapy initially to target a mean arterial pressure (MAP) of 65 mm Hg (grade 1C).
- Norepinephrine as the first choice vasopressor (grade 1B).
- Epinephrine (added to and potentially substituted for norepinephrine) (grade 2B).
- Vasopressin 0.03 units/minute can be added to norepinephrine (NE) with intent of either raising MAP or decreasing NE dosage (UG).
- Low dose vasopressin is not recommended as the single initial vasopressor (UG).
- Dopamine as an alternative vasopressor agent to norepinephrine only in highly selected patients (grade 2C).


Abstracts and Publications

1 of every 6 Patients

Number Need To Treat

Before | 4125 | After | 3328

Clinical Investigations

The effect of a quantitative resuscitation strategy on mortality in patients with sepsis: A meta-analysis

Alan E. Jones, MD; Michael D. Brown, MD, MSc; Steven Troncoso, MD, MPH; Nathan L. Saphier, MD, MPH; John S. Garratt, MD; Alan C. Hermer, MD; Jeffrey A. Hine, MD; on behalf of the SIMCC/CITN investigators.

- This meta-analysis evaluates the treatment effect of using a quantitative resuscitation strategy in the treatment of patients with sepsis.
- Using pooled data from nine studies that randomized a total of 1001 subjects, we found the magnitude of the decrease in mortality (OR 0.50 with the upper limit 95% CI 0.69) was profound when the resuscitation strategy was implemented early.

CCM, October 2008
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Clinical Scenario II: Early Identification and Intervention

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

The Rest of the Story

Clinical Scenario II: Early Identification and Intervention-ER

- **Labs**:
  - WBC: 11.5
  - Hgb: 15.8
  - Hct: 47.4
  - BUN: 28 Creatinine:1.6
  - Glucose:158
  - BNP:78 (moderate CHF); troponin:0.03
  - Lactic acid: 4.6
  - U/A: positive for bacteria
  - ScvO2: 49.1%
  - Blood cultures X 2 drawn

Clinical Scenario II: Early Identification and Intervention-MICU

- **CXR**: RLL consolidation
- **Additional Interventions**:
  - Broad spectrum antibiotics given within 3 hours of presentation
  - Lactic acid >4mmol/L so CVP inserted
  - Fluid resuscitation continued
  - Foley inserted
  - Received total of **3 Liters of NS** during 3 hour ED stay
  - **ED diagnosis**: Septic Shock, Pneumonia, UTI, CHF
  - Transferred to MICU

Clinical Scenario II: Early Identification and Intervention

- **Day 2**:
  - CVP 18
  - Lasix to assist with fluid mobilization
  - Lactic acid: 3.0
- **Day 3**:
  - Lactic acid: 1.2
  - O2 sat 93% on room air
  - Central line discontinued
  - Transferred to intermediate care on Day 3
  - Discharged from hospital on day 7

Fourth Tier: Measuring Process & Outcome Changes

- Use of evidence-based approach
- Implementation of the Sepsis Bundle
- Early Screening with Tools and Triggers
- Organizational Consensus that Severe Sepsis Must be Managed Early and Aggressively

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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**
  - SSC database
  - Data elements that measure implementation of resuscitation and management bundle

Finding the Patients:
Prospective Patient Log

<table>
<thead>
<tr>
<th>Unit</th>
<th>Pt #</th>
<th>Point of Entry</th>
<th>Date of Septic Shock Dx</th>
<th>Time of Septic Shock Dx</th>
<th>Data Obtained</th>
<th>Data Complete</th>
<th>Comments / Follow-up</th>
</tr>
</thead>
<tbody>
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Sustaining and Improving:
Strategies

- **Independent checks**
  - Checklists, pathway
  - Multidisciplinary rounds
  - Part of handoffs
- **Real time feedback and on-going education**
  - Unit rounds
  - Unit champions
  - Staff meetings
  - Orientation—RN and residents
  - Quarterly with current staff

Sustaining and Improving:
Strategies

- Creating sense of urgency
  - ‘Code Sepsis’ or ‘Sepsis Alert’
  - Staffing ratio for initial 6 hours of ICU or ED care
  - Clock on the door
  - Electronic alerts

Impact of Implementing the Sepsis Bundles

A Prospective Multi-Center Collaborative Study
Before and After Implementation of an Early Sepsis Initiative

The Multi-Center Severe Sepsis & Septic Shock Collaborative Group

Presented by Emanuel Rivers at the World Federation of Critical care Medicine, Florence Italy 08/09

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**Multi-center Severe Sepsis & Septic Shock Collaborative**

- **Presented by Emanuel Rivers at the World Federation of Critical Care Medicine, Florence Italy 08/09**

In this intention-to-treat evaluation, all patients including DNR were examined.

**Results**

- There were 5467 total patients enrolled, 1446 pre- and 4021 post-implementation.
- The post-implementation group had higher baseline APACHE II scores with a 8.45% higher predicted mortality.
- In-hospital mortality was 39.12% before implementation and 28.97% after implementation ($P < 0.001$) for an absolute risk reduction of 10.15% and a relative risk reduction of 26.0%.
- Post-implementation secondary outcomes included improved organ dysfunction and lactate clearance; less vasopressor use and mechanical ventilation; shorter hospital length of stay (5 days)

**Surviving Sepsis Campaign Implementation Results**

Now close to 30,000 patients

Presented at SCCM, 2012

**Surviving Sepsis Campaign Results (28,150 patients)**

<table>
<thead>
<tr>
<th>Entry Point</th>
<th>Subjects</th>
<th>Mortality (hosp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED</td>
<td>54.3%</td>
<td>27.0</td>
</tr>
<tr>
<td>ICU</td>
<td>33.2%</td>
<td>40.5</td>
</tr>
<tr>
<td>Ward</td>
<td>12.5%</td>
<td>44.3</td>
</tr>
</tbody>
</table>

Presented at SCCM 2012

**Surviving Sepsis Campaign**

In campaign for 36 months

- Mortality: 42.5% to 31.9%  RRR: 25% $p<0.001$
- Compliance at sites
  - Lactate: 73.5%
  - Blood cultures: 83.4%
  - Antibiotics: 72.3%
  - Fluids: 75.7%
  - CVP: 29.9%
  - ScvO2: 22.3%
  - All Elements: 19.6%

Presented at SCCM Congress Jan. 2013

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Surviving Sepsis Campaign
In campaign for 36 months

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Low compliance</th>
<th>High Compliance (all elements-29.2%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>6,439 (34.3%)</td>
<td>12,306 (65.7%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hospital Mortality</td>
<td>31.3</td>
<td>26.8</td>
<td>0.385</td>
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<tr>
<td>Origin%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ED</td>
<td>64.4</td>
<td>65.4</td>
<td></td>
</tr>
<tr>
<td>Ward</td>
<td>25.8</td>
<td>25.2</td>
<td></td>
</tr>
<tr>
<td>ICU</td>
<td>9.8</td>
<td>9.4</td>
<td></td>
</tr>
<tr>
<td>Hospital mortality if origin is ED,%</td>
<td>27.3</td>
<td>23.2</td>
<td>0.001</td>
</tr>
<tr>
<td>Hospital mortality if origin is Ward,%</td>
<td>38.2</td>
<td>33.1</td>
<td>0.058</td>
</tr>
<tr>
<td>Hospital mortality if origin is ICU,%</td>
<td>38.7</td>
<td>34.7</td>
<td>0.008</td>
</tr>
</tbody>
</table>

Surviving Sepsis Campaign
Bundle Element | Mortality Odds Ratio | 95% CI | P value |
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Lactate</td>
<td>0.90</td>
<td>0.84-0.96</td>
<td>0.002</td>
</tr>
<tr>
<td>Blood Cultures</td>
<td>0.88</td>
<td>0.83-0.94</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>0.89</td>
<td>0.84-0.94</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Fluid Administration</td>
<td>0.68</td>
<td>0.63-0.74</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CVP</td>
<td>0.94</td>
<td>0.86-1.01</td>
<td>0.103</td>
</tr>
<tr>
<td>ScvO2</td>
<td>0.89</td>
<td>0.81-0.97</td>
<td>0.007</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
- Support from state-wide collaborative/surviving sepsis campaign

EDUCATION, DATA, PROCESS, EDUCATION, COMPLIANCE

WHAT WE DO AND HOW WELL WE DO IT MAKES A SIGNIFICANT DIFFERENCE IN MORTALITY!

Seize the Opportunity
The Power of The Pyramid Can Make a Difference in Your Hospital’s Severe Sepsis Outcomes

IMPROVING HAND HYGIENE BEHAVIOUR: THE EFFECTS OF SOCIAL INFLUENCE AND LEADERSHIP
Dr. Anita Haus, Radboud University, The Netherlands

DECONTAMINATION OF HIGH-TOUCH ENVIRONMENTAL SURFACES IN HEALTHCARE: A CRITICAL LOOK AT CURRENT PRACTICES AND NEWER APPROACHES
Speaker: Prof. Syed A. Sattar, Centre for Research on Environmental Microbiology, University of Ottawa

THE INFECTIOUS DISEASE FOLLOUT FOLLOWING NATURAL DISASTERS – THE HURRICANE SANDY STORY
Dr. Michael Tapper, Lenox Hill Hospital, New York

FROM LITTLE THINGS BIG THINGS GROW: THE IMPORTANCE OF LEADERSHIP SKILLS IN INFECTION PREVENTION

Hosted by Nicole Kenny, Virox Technologies Inc
www.webbertraining.com
Severe Sepsis: Early Recognition and Management Saves Lives
Kathleen Vollman, Sepsis Solutions International LLC / Advanced Nursing LLC
A Webber Training Teleclass

Hosted by Nicole Kenny, Virox Technologies Inc
www.webbertraining.com