The Role of the Nurse in Early Recognition And Management of Severe Sepsis in Neurological Patients

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Speaker Disclosures
• I have no relevant commercial relationships to disclose.

Overview
• Significance of the Problem
• Defining the continuum
• Early Recognition & Resuscitation
• Multidisciplinary approach to management
• Oct 2015 Core Measures
• Outcome studies

Severe Sepsis: A Significant Healthcare Challenge
• Hospitalizations have doubled 2000-2008**
• Most costly reason for hospitalization in 2009**
  – 15.4 billion in aggregate hospital cost
• 1 out of 23 patients in hospital had septicemia**
• Major cause of morbidity and mortality worldwide
  – Leading cause of death in noncoronary ICU (US)†
  – 10th leading cause of death overall (US)‡
• In the US, more than 700 patients die of severe sepsis daily

High Reliable Sepsis Care
• Recognizes trouble before it starts
• Follows standard operating procedures (SOP) for managing sepsis.
• Does not take little things for granted.
• Understands the consequences:
  • Immediate
  • Long term
• Holds everyone accountable
  • Takes personal responsibility for outcomes.

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

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

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

Liu V, et al. JAMA, 2014; May 18th, online.

How Does Severe Sepsis Compare to Your Current Care Priorities?

<table>
<thead>
<tr>
<th>Quality Projects</th>
<th>US 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?


Surviving Sepsis Campaign Implementation Results

29,470 patients
2005-2013

Surviving Sepsis Campaign Results (28,150 patients)
218 Hospitals

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


Surviving Sepsis Campaign
2005-2012-Resuscitation Bundle

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Low compliance</th>
<th>High Compliance (all elements - 29.8%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital Mortality</td>
<td>38.6</td>
<td>29%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hospital mortality if origin is ED,%</td>
<td>30.9</td>
<td>26.0</td>
<td>0.001</td>
</tr>
<tr>
<td>Hospital mortality if origin is Ward, %</td>
<td>45.3</td>
<td>36.7</td>
<td>0.001</td>
</tr>
<tr>
<td>Hospital mortality if origin is ICU, %</td>
<td>49.8</td>
<td>44.2</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Levy, M et al. Intensive Care Medicine; 2013;41:1523

Surviving Sepsis Campaign
Bundle Element
Mortality Odds Ratio 95% CI P value
Lactate < 2 0.80 0.73-0.89 <0.001
Lactate 2 to < 3 0.67 0.59-0.76 <0.001
Lactate ≥ 3 0.69 0.63-0.75 <0.001
Blood Cultures 0.82 0.77-0.87 <0.001
Antibiotics 0.85 0.81-0.90 <0.001
Fluid Administration 0.86 0.73-1.01 <0.07
CVP 0.84 0.78-0.91 <0.001
ScvO2 0.83 0.76-0.90 <0.001

Except on few occasions, the patient appears to die from the body's response to infection rather than from it."

Sir William Osler - 1904
The Evolution of Modern Medicine

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>Wearing 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
- Respiratory: >20/min
- WBC count: >12,000/mm³ or <4,000/mm³ or >10% immature neutrophils
- Glucose: >180
- Acute Mental Status Change

SIRS with a presumed or confirmed infectious process

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

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

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

Signs & Symptoms of Sepsis

- Chills
- Alteration in LOC
- Tachypnea
- Unexplained metabolic acidosis
- ♦️ Heart rate
- ♦️ Altered blood pressure
- ♦️ Platelets
- ♦️ Bands
- ♦️ Skin perfusion
- ♦️ Urine output
- ♦️ Skin mottling
- ♦️ Poor capillary refill
- ♦️ Hyperglycemia
- ♦️ Purpura/petechia

SSC Guidelines: Screening

- We recommend routine screening of potentially infected seriously ill patients for severe sepsis to increase the early identification of sepsis and allow implementation of early sepsis therapy (1C)
- Potential new screening process
- Performance improvement efforts in severe sepsis should be used to improve patient outcomes (UG)


Pts qualify for Severe Sepsis with:
1. Real or suspected infection
2. 2 SIRS criteria
3. One organ dysfunction

Early Recognition: The Screening Process

- TIME IS TISSUE!!
  - Similar to polytrauma, 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.

Make it Process Dependent

- Weave into fabric of current practice
- Assess every shift and more frequently if needed
- Identify strategies for initiation of therapy response once patient is identified


Severe Sepsis Algorithm

Screened Positive for Severe Sepsis

<table>
<thead>
<tr>
<th>Symptom/Sign</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever and/or leucocytosis (defined as a white blood cell count of 12,000 or more)</td>
<td>Start empiric antimicrobial therapy (STEM)</td>
</tr>
<tr>
<td>Hypotension</td>
<td>Start fluid resuscitation</td>
</tr>
<tr>
<td>Respiratory distress</td>
<td>Administer nebulized epinephrine</td>
</tr>
<tr>
<td>Metabolic acidosis</td>
<td>Initiate renal support</td>
</tr>
</tbody>
</table>

1. If the patient meets one or more of these criteria, then start with empirical antimicrobial therapy. If the patient does not meet one or more of these criteria, then discontinue empirical antimicrobial therapy.
Screening: Barriers/Strategies

- **Barriers**
  - Time for nurses to do it (perception vs. reality)
  - Screening is not sensitive 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

**Lesson Learned:** Bedside nurse must do screening

**Education/Simulation/Education**
- Every 6 months
- Build into orientation
- Must be part of their documentation structure
- Practice-Practice-Practice

The END RESULT—anytime patient has 2 or more SIRS—will think that this patient might have sepsis and can screen at that time

Screening for Sepsis Milestones and Checklist

- Develop screening process for ED, rapid response team and ICU (eventually housewide)
- Ensure screening process has clear “next steps” defined for nursing staff
- Develop audit process to evaluate compliance and effectiveness

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)
Clinical Scenario II: 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?

Clinical Scenario 2: Early identification and Intervention

- 51 year old with past medical history of hepatitis C, ETOH abuse with cirrhosis, asthma/COPD and TIA's; 111kg (weight)
- She presents the emergency department for 5 days worsening generalized malaise, difficulty breathing, body aches diffusely and right-sided pleuritic chest pain. Reported fever of 103 yesterday
- VS in triage: 16:30; 82/54, HR 155, RR 22, T: 97.4
- Does she screen positive for severe sepsis?

Yes: HR 155, RR 22; suspected infection: body aches, pleuritic pain; Organ dysfunction: low BP

Clinical Scenario III

- On 3/20/07 at 10pm a 65 year old, 78 kg female with history of asthma, CAD and mental status changes admitted from ER to floor with SOB and rib pain. R/O pneumonia
- Hx: dementia, IDDM, PVD, arthritis and depression
- Admission VS include: BP- 88/60, HR-135, T-102, RR-30. pulse ox is 90% on 3 liters nasal cannula
- Does she screen positive for severe sepsis?

Homeostasis Is Unbalanced in Severe Sepsis


Inflammation, Coagulation and Impaired Fibrinolysis In Severe Sepsis

- Microcirculation: SUBLINGUAL BLOOD FLOW

Healthy Volunteer
- BP: 120/80 mm Hg
- SaO2: 98%

Septic Shock Patient
- Resuscitated with fluids and dopamine
  - HR: 82 BPM
  - BP: 90/35 mmHg
  - SaO2: 98%
  - CVP: 25 mmHg
Pathophysiologic Characteristics in Severe Sepsis

- Maldistribution of blood flow
- Imbalance of oxygen supply & demand
- Metabolic alterations & activation of the stress response

Maldistribution of Blood Flow

- Mechanical obstruction
  - Micro-emboli
  - Increased blood viscosity
  - Compression
- Systemic & local mediator & ion influence
  - Constriction vs. dilation
- Loss of regulatory activities/endothelial cell injury
  - Reactive hyperemia
  - Anticoagulation

Imbalance of Oxygen Supply & Demand

Occult Tissue Hypoxia

- Tissue hypoxia is often occult, reaches an advanced and lethal stage before its presence is known and resuscitation is attempted.
- Vital signs are inadequate for detecting global tissue hypoxia and not adequate as a resuscitation end point.
- Up to 50% of patients resuscitated from shock may have continued global tissue hypoxia (elevated lactate and decreased ScvO₂) despite normalized vital signs and central venous pressure.

O₂ Supply Debt

Metabolic Alterations & The Stress Response

Initiation of the Stress Response

- Sympathetic Nervous System Activation
- Hypothalamus Activation
Metabolic Alterations & The Stress Response

- SNS Activation
  - Gut hypothesis
  - ↑ BMR
  - Inhibition of insulin secretion
  - Inhibition of glucose uptake by the tissues

- Hypothalamus Activation
  - Adrenal cortex stimulation
  - Changes in carbohydrate, protein & fat metabolism resulting in ↑ glucose concentration

Cornerstones of Multidisciplinary Management of Severe Sepsis/Septic Shock

- Prevention
- Screening and Early Identification
- Early Intervention: Source control, Blood cultures and broad spectrum antibiotics
- 3 hour Bundle: Initial resuscitation
- 6 hour Bundle: Septic Shock

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

October 15th CMS Core Measure Included & Excluded Populations

Included Populations:
- Discharges age 18 and over with an ICD-10-CM Principal or Other Diagnosis Code of Sepsis, Severe Sepsis, or Septic Shock

Excluded Populations:
- Directive for Comfort Care within 3 hours of presentation of severe sepsis
- Directive for Comfort Care within 6 hours of presentation of septic shock
- Administrative contraindication to care
- Length of Stay >120 days
- Transfer in from another acute care facility
- Patients with severe sepsis who expire within 3 hours of presentation
- Patients with septic shock who expire within 6 hours of presentation

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 ≥4 mmol/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.

Fluid bolus is given rapidly, IV wide open, pressure bag if necessary; goal is 500ml every 15-30 minutes

SEP-1

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

**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 SvcO2
- Bedside cardiovascular ultrasound
- Dynamic assessment of fluid responsiveness with passive leg raise or fluid challenge

**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)

**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

**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

**SSC Guidelines**

**Resuscitation-Lactate Clearance**

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

In patients with elevated lactate levels as a marker of tissue hypoperfusion, we suggest targeting resuscitation to normalize lactate as rapidly as possible (2C)

**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%)

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

Dellinger RP et al, Crit Care Med. 2013;41580-637

Dellinger RP et al, Crit Care Med. 2013;41580-637

Dellinger RP et al, Crit Care Med. 2013;41580-637

Dellinger RP et al, Crit Care Med. 2013;41580-637
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 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>
</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>
</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>
</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>
</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>
</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>18.8</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>
</tr>
</tbody>
</table>

5% Increase in Mortality for Every Hour Delayed

Mortality as a Function of Adequacy of Empiric Antimicrobial Therapy


Initiation of Inappropriate Antimicrobial Therapy Results in a Fiv 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

Kumar A. et al. Chest, 2009; 136; 1237-1248

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

Kumar A. et al. Chest, 2009; 136; 1237-1248

PROMPT AGGRESSIVE RESUSCITATION

“Early Goal Directed Therapy”
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:
    - $\text{ScvO2} > 70\%$
    - $\text{SaO2} > 93\%$
    - $\text{Hct} > 30\%$
    - $\text{CI/VO2}$
    - $\text{CVP} > 8-12$
    - $\text{MAP} > 65$
    - $\text{UO} > .5 \text{ml/kg/hr}$

- Standard Therapy
  - $\text{CVP} > 8-12$
  - $\text{MAP} > 65$
  - $\text{UO} > .5 \text{ml/kg/hr}$


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 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)


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) when an additional agent is needed to maintain adequate blood pressure (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 for treatment of sepsis-induced hypotension and vasopressin doses higher than 0.03-0.04 units/minute should be reserved for salvage therapy (failure to achieve adequate MAP with other vasopressor agents) (UG).
- Dopamine as an alternative vasopressor agent to norepinephrine only in highly selected patients (eg, patients with low risk of tachyarrhythmias and absolute or relative bradycardia) (grade 2C).


SEP-1

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 >24 mmol/L, re-assess volume status and tissue perfusion and document findings according to table 1.
7. Re-measure lactate if initial lactate elevated.
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Or two of the following:
- Measure CVP
- Measure ScvO2
- Bedside cardiovascular ultrasound
- Dynamic assessment of fluid responsiveness with passive leg raise or fluid challenge

**ProCESS Trial**

- RCT of septic shock patients to protocol based EGDT (439), protocol based standard (446) or usual care (456)
- 31 Academic Tertiary ER’s
- Average time to randomization from arrival to ED 3.3 hrs & from meeting entry criteria 60 minutes
- Significant difference in use of therapy
- No difference in 90 day or 1 year mortality

Authors state it was not a replication of the EGDT Trial

ProCESS Investigators, NEJM, March 18, 2014

**Current Controversy: Results of ProCESS Trial**

- Mortality in usual care arm 18% (larger population of UTI sepsis than pneumonia sepsis)
- 1351 pts in 31 centers over 5yrs, roughly 8 patients per center
- All groups in the study received on average >2L of fluid prior to randomization & 75% received antibiotics prior to randomization (Both part of the 3hr bundle)
- Protocol changed to include patients receiving only 1 liter of fluid/define as septic shock
- 70% of hospitals in the trial had some form of a sepsis protocol
- Average time to randomization from arrival to ED 3.3 hrs & from meeting entry criteria 60 minutes
- 50% of patients by 6 hrs has central line. Dobutamine use 50%
- Did no report whether protocol arms reach their goals

**ARISE Trial**

- 51 centers (Australia or New Zealand)
- Randomized in ED with early septic shock to receive either EGDT or usual care.
- 1600 enrolled patients, 796 were assigned to the EGDT group and 804 to the usual-care group.
- Results-90 day mortality

<table>
<thead>
<tr>
<th></th>
<th>EGDT</th>
<th>Usual Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluids</td>
<td>1964 ± 1415</td>
<td>1713 ± 1401</td>
</tr>
<tr>
<td>Vasopressor</td>
<td>66.6%</td>
<td>57.8%</td>
</tr>
<tr>
<td>infusion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>red-cell</td>
<td>13.6%</td>
<td>7.0%</td>
</tr>
<tr>
<td>transfusions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dobutamine</td>
<td>15.4% vs.</td>
<td>2.6%</td>
</tr>
<tr>
<td>Mortality</td>
<td>18.8%</td>
<td>18.8%</td>
</tr>
</tbody>
</table>


**National Process & Outcome Measures**

SSC: Change in Compliance Over Time

**SSC: Change in Mortality Over Time**

- Hospital Mortality (%)
- Site Quarter

**Intermountain Health**

- Sepsis Bundle System

**Intermountain Health: SS and Shock**

- Northern Kaiser Combine Sepsis Mortality Rate 13%
Clinical Scenario 1: Early Identification and Intervention

- **88 year old**, 51.6kg, white, female presented to ED at 1345 from 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)

**Vital Signs**: 0900
- BP: 100/50
- HR: 100
- RR: 20
- O2 sat: 92

**Labs** (resulted at 10am)
- 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
- UA: positive for bacteria
- Blood cultures X 2 drawn

**CXR**: RLL consolidation

**What is the next step?**
- Fluid optimization: 500ml bolus until CVP > 8
- Gave 4L in next 3 hours

**1500**
- BP: 98/55
- HR: 90
- RR: 20
- O2 sat: 95%

**What are your next steps?**
- More data: CVP: 6
- ScvO2: 65%
- LA: 3.2

**WHAT ARE YOUR NEXT STEPS??**
Clinical Scenario 1:

- **HOURS 6-24**
- **Labs:**
  - Lactic acid: 4 hours after time zero: 6.7
  - 8 hours after ICU admission: 2.3
- **VS:**
  - Continue monitoring VS, CVP, ScvO2, every 2 hrs for first 24 hours to ensure goals of resuscitation are maintained
  - Monitor urine output every 1-2 hrs for 24 hrs

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

The Nurses Role

- Early recognition of patients with signs of sepsis
- Early initiation of evidence based practice therapies appropriate for your area of practice (antibiotics, fluids/blood & pressors)
- Swift disposition to care areas where the rest of the bundle can be started.

**THANK YOU!!**

QUESTIONS???