SEPSIS TREATMENT AND BUNDLES
MANDATED PERFORMANCE: GOOD OR BAD?

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Potential Conflicts of Interest

• Hold leadership position in Surviving Sepsis Campaign
Objectives

Sepsis in the U.S.

Evolution of Sepsis Performance Improvement

New CMS Measures
State of Sepsis in the U.S.

Photo: http://www.npr.org/sections/health-shots/2015/07/28/426740179/happy-50th-birthday-medicare-your-patients-are-getting-healthier
Severe Sepsis in the U.S

- Strikes more than one million Americans annually\(^1\)
- 28-50% mortality\(^2\)
- Sepsis cases on the rise

Photo: [http://www.npr.org/sections/health-shots](http://www.npr.org/sections/health-shots)
In-hospital death 8X higher compared to other diagnoses
The Top Five Most Expensive Conditions Treated in U.S. Hospitals

Costs associated with inpatient stays constitute the largest single component of health care spending. Healthcare Cost and Utilization Project (HCUP) data show hospital costs by payer for the five most expensive inpatient conditions.

Total hospital costs in 2011 by condition and cost per payer (in billions):

- 62% Medicare $12.7b
- 13% Medicaid $2.7b
- 18% Private Insurance $3.7b
- 4% Uninsured <$1.0b

Sources: HCUP Statistical Brief #160 (http://www.hcup-us.ahrq.gov/reports/statbriefs/statbriefs.jsp) and HCUPnet (http://hcupnet.ahrq.gov/).
Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock

R. Phillip Dellinger, MD; Jean M. Carlet, MD; Henry Masur, MD; Henwig Gerlach, MD, PhD; Thierry Calandra, MD; Jonathan Cohen, MD; Juan Gea-Banacloche, MD, PhD; Didier Keh, MD; John C. Marshall, MD; Margaret M. Parker, MD; Graham Ramsay, MD; Janice L. Zimmerman, MD; Jean-Louis Vincent, MD, PhD; Mitchell M. Levy, MD; for the Surviving Sepsis Campaign Management Guidelines Committee

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Objectives In 2002, critical care and infectious disease experts representing a wide range of professional organizations throughout the world endorsed the adoption of the Surviving Sepsis Campaign, an international effort to increase awareness and improve outcomes in severe sepsis.

Design This process included a modified Delphi method, a consensus conference, several subsequent smaller meetings of subgroups and key individuals, brainstorming, and electronic-based discussion among subgroups and among the entire committee.

Methods We used a modified Delphi methodology for grading recommendations, built on a 2004 publication sponsored by the Surviving Sepsis Campaign. We undertook a systematic review of the literature using the levels to create recommendations. Grades A to D were given, with the highest grade indicating recommendations that were probably to definitely add and utilize management.

Results Key recommendations, labeled by category and not by hierarchy, included early goal-directed resuscitation of the septic patient during the first 6 hours of therapy, administration of adequate antibiotics, appropriate antibiotic therapy in non-gram-positive bacterial infections, and management of severe sepsis and septic shock. These recommendations were primarily intended to define clinical dilemma.

Conclusions The Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock have evolved to better reflect the current scientific evidence and clinical practice. These guidelines provide evidence-based recommendations for the care of patients with severe sepsis and septic shock.

Severe Sepsis Bundles:

**Sepsis Resuscitation Bundle**
(To be accomplished as soon as possible and scored over first 6 hours):

1. Send lactate measured.
2. Blood cultures obtained prior to antibiotic administration.
3. From the time of presentation, broad-spectrum antibiotics administered within 3 hours for E. coli and 4 hours for non-E. coli infections.
4. In the event of hypotension and/or lactate > 4 mmol/L (36 mg/dL):
   - a. Give an initial dose of 20 mcg/kg of epinephrine (or equivalent)
   - b. Apply vasopressors for hypotension not responding to initial fluid resuscitation to maintain mean arterial pressure (MAP) ≥ 65 mm Hg
5. In the event of persistent hypotension despite fluid resuscitation (solute shock) and/or lactate > 4 mmol/L (36 mg/dL):
   - a. Achieve central venous pressure (CVP) of 8–12 mm Hg
   - b. Achieve central venous oxygen saturation (ScvO2) of ≥ 70%

**Sepsis Management Bundle**
(To be accomplished as soon as possible and scored over first 24 hours):

1. Low-dose steroids* administered for septic shock in accordance with standardized ICU policy.
2. Intravenous aminoglycoside administered in accordance with a standardized ICU policy.
3. Glucose control maintained 85% of total time, < 180 mg/dL (10 mmol/L).
4. Inotropic/vasoactive pressures maintained > 30 mm Hg (or for mechanically ventilated patients)

*Use the individual chart measurement tool for the equivocality chart.

**Achieving a mixed venous oxygen saturation (ScvO2) of 65% as an acceptable alternative.
SCC Database and Implementation Guide
Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock: 2008

R. Phillip Dellinger, MD; Mitchell M. Levy, MD; Jean M. Carlet, MD; Julian Bion, MD; Margaret M. Parker, MD; Roman Jaeschke, MD; Konrad Reinhart, MD; Derek C. Angus, MD, MPH; Christian Brun-Buisson, MD; Richard Beale, MD; Thierry Calandra, MD, PhD; Jean-François Dhainaut, MD; Henwig Gerlach, MD; Maureen Harvey, RN; John J. Marini, MD; John Marshall, MD; Marco Ranieri, MD; Graham Ramsay, MD; Jonathan Sevransky, MD; B. Taylor Thompson, MD; Sean Townsend, MD; Jeffrey S. Vender, MD; Janice L. Zimmerman, MD; Jean-Louis Vincent, MD, PhD; for the International Surviving Sepsis Campaign Guidelines Committee

February 2013
New Database - 3 & 6 hour bundle
# Surviving Sepsis Campaign Bundles 2012

<table>
<thead>
<tr>
<th>To be accomplished as soon as possible and scored over first 3 hrs:</th>
<th>To be accomplished as soon as possible and scored over first 6 hrs:</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Serum lactate measured.</td>
<td>✓ Apply vasopressors for hypotension not responding to initial fluid resuscitation to maintain MAP ≥ 65 mm Hg.</td>
</tr>
<tr>
<td>✓ Blood cultures obtained prior to antibiotics administered.</td>
<td>✓ In the event of persistent arterial hypotension despite volume resuscitation (septic shock) or initial lactate &gt; 4 mmol/L (36 mg/dL):</td>
</tr>
<tr>
<td>✓ Administer broad-spectrum antibiotics.</td>
<td>✓ Measure CVP*</td>
</tr>
<tr>
<td>✓ For hypotension and/or lactate &gt; 4 mmol/L:</td>
<td>✓ Measure ScvO₂*</td>
</tr>
<tr>
<td>✓ Deliver an initial minimum of 30 ml/kg of crystalloid</td>
<td>✓ Remeasure lactate if initial lactate is elevated*</td>
</tr>
</tbody>
</table>

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2012 NQF: Sepsis 0500

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
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 arterial hypotension despite volume resuscitation (septic shock) or initial lactate ≥4 mmol/L (36mg/dl):
   - Measure central venous pressure (CVP)
   - Measure central venous oxygen saturation (ScvO2)*

7. Remeasure lactate if elevated.
A Randomized Trial of Protocol-Based Care for Early Septic Shock

The ProCESS Investigators*


Over 1500 Patients

Goal-Directed Resuscitation for Patients with Early Septic Shock

The ARISE Investigators and the ANZICS Clinical Trials Group*


1600 Patients
Measure 0500  
Public Comment-Member Voting-Decision

MEASURE #0500 is a composite measure consisting of the following elements:

A. Measure lactate level
B. Obtain blood cultures prior to antibiotics
C. Administer broad spectrum antibiotics
D. Administer 30 ml/kg crystalloid for hypotension or lactate >= 4 mmol/L
E. Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation to maintain a mean arterial pressure >= 60 mm Hg)
F. In the event of persistent aortic hypotension despite volume resuscitation (septic shock) or initial lactate >= 4 mmol/L (5x more measure central venous pressure and central venous oxygen saturation)

G. Remeasure lactate if initial lactate is elevated

FROM MEASURE TO ENDORSEMENT

1. NQF Committee Assignment
2. Call for Candidate Measures and Standards
3. Draft Report and Recommendations
4. Public and Member Comment
5. NQF Member Voting
6. NQF Consensus Standard Approval Committee Decision
7. NQF Board Ratification
8. Appeals Period Opens

April 20, 2014
NQF Revises Sepsis Measure

NQF has endorsed changes to an element of a sepsis measure, the Severe Sepsis and Septic Shock: Management Bundle (NQF measure #0500), that makes the use of a central venous catheter to monitor blood oxygen or pressure levels optional instead of required.

http://www.qualityforum.org/NQF_Revises_Sepsis_Measure.aspx

NQF Committee Recommends Revision for Sepsis Measure

NQF’s recently enhanced measure endorsement process is leaner, more efficient, and allows for evaluation of new evidence in real time. An NQF standing committee’s review of new research trial data related to a sepsis measure – the Severe Sepsis and Septic Shock: Management Bundle (NQF measure #0500) – is a case in point.

http://www.qualityforum.org/revision_for_sepsis_measure.aspx

Statement from NQF on Review of Sepsis Measure
SEPSIS BUNDLE PROJECT (SEP)
NATIONAL HOSPITAL INPATIENT QUALITY MEASURES

SEP-1 EARLY MANAGEMENT BUNDLE, SEVERE SEPSIS/SEPTIC SHOCK

Discharges 10-01-2015 (4Q15) through 06-30-16 (2Q16)
Measure Set Description

Focus on adults ≥18 years with a diagnosis of severe sepsis or septic shock. Consistent with the Surviving Sepsis Campaign Guidelines, the measure set assesses:

1. Measurement of lactate,
2. Obtaining blood cultures,
3. Administering broad spectrum antibiotics,
4. Fluid resuscitation,
5. Vasopressor administration,
6. Reassessment of volume status and tissue perfusion and
7. Repeat lactate measurement.
Severe Sepsis Criteria “a” & “b”

- In order to establish the presence of severe sepsis, there are three criteria, all three of which must be met within 6 hours of each other.

  a. **Documentation of a suspected source of clinical infection.** There may be reference to “possible infection from xx”, “suspect infection from xx”, or similar reference in progress notes, consult notes, or similar physician/APN/PA documentation.

  b. **Two or more manifestations of systemic infection according to the Systemic Inflammatory Response Syndrome (SIRS) criteria, which are:**
     i. Temperature > 38.3°C or < 36.0°C
     ii. Heart rate (pulse) > 90
     iii. Respiration > 20 per minute
     iv. White blood cell count > 12,000 or < 4,000 or > 10% bands

All three criteria refers to a, b, and c.
Criteria “c” - Organ Dysfunction

c. Organ dysfunction, evidenced by any one of the following:
   i. Systolic blood pressure < 90, or mean arterial pressure < 65, or a systolic blood pressure decrease of more than 40 points
   ii. Creatinine > 2.0, or urine output < 0.5 mL/kg/hour for 2 hours
   iii. Bilirubin > 2 mg/dL (34.2 mmol/L)
   iv. Platelet count < 100,000
   v. INR > 1.5 or aPTT > 60 sec
   vi. Lactate > 2 mmol/L (18.0 mg/dL)
Septic Shock Definition

Notes for Abstraction:

- The criteria for determining that Septic Shock is present are as follows:
  
  a. There must be documentation of severe sepsis present. AND
  
  b. Tissue hypoperfusion persists after crystalloid fluid administration, evidenced by either
     - systolic blood pressure < 90, or
     - mean arterial pressure < 65 or
     - a decrease in systolic blood pressure by > 40 points OR
     - Lactate level is > 4 mmol/L
SEP-1  Two Clocks

3 hour

6 hour
SEP-1: Early Management Bundle, Severe Sepsis/Septic Shock

Numerator Statement: Patients who received ALL of the following:
Received within three hours of presentation of severe sepsis:
- Initial lactate level measurement
- Broad spectrum or other antibiotics administered
- Blood cultures drawn prior to antibiotics
AND received within six hours of presentation of severe sepsis:
- Repeat lactate level measurement only if initial lactate level is elevated

Set Measure ID # SEP-1-8; Early Management Bundle, Severe Sepsis/Septic Shock
Septic Shock ONLY Measures

AND ONLY if Septic Shock present:
Received within three hours of presentation of septic shock:
  • Resuscitation with 30 ml/kg crystalloid fluids
AND ONLY IF hypotension persists after fluid administration, received within six hours of presentation of septic shock:
  • Vasopressors
  • Repeat volume status and tissue perfusion assessment consisting of either:
    • A focused exam including:
      • Vital signs, AND
      • Cardiopulmonary exam, AND
      • Capillary refill evaluation, AND
      • Peripheral pulse evaluation, AND
      • Skin examination
        OR
    • Any two of the following four:
      • Central venous pressure measurement
      • Central venous oxygen measurement
      • Bedside cardiovascular ultrasound
      • Passive leg raise or fluid challenge
POTENTIAL MEASURE MODIFICATIONS ON THE HORIZON
Missing Organ Dysfunction Criteria?

c. Organ dysfunction, evidenced by any one of the following:
   i. Systolic blood pressure < 90, or mean arterial pressure < 65, or a systolic blood pressure decrease of more than 40 points
   ii. Creatinine > 2.0, or urine output < 0.5 mL/kg/hour for 2 hours
   iii. Bilirubin > 2 mg/dL (34.2 mmol/L)
   iv. Platelet count < 100,000
   v. INR > 1.5 or aPTT > 60 sec
   vi. Lactate > 2 mmol/L (18.0 mg/dL)
Antibiotic Stewardship
Repeat Volume Assessment & Tissue Perfusion

Documentation consisting of either:

A focused exam including documentation of all 5 of the elements

- Vital signs AND
- Cardiopulmonary exam AND
- Capillary refill examination, AND
- Peripheral pulse evaluation AND
- Skin examination

OR

Any two of the following four:

- Central venous pressure measurement
- Central venous oxygen measurement
- Bedside cardiovascular ultrasound
- Passive leg raise or fluid challenge
We believe that almost any reasonable plan is better than no plan at all.
CMS Measures (Sep-1)

**Within 3 hours**
A. Measure lactate level
B. Obtain blood cultures prior to antibiotics
C. Administer broad spectrum antibiotics
D. Administer 30 ml/kg crystalloid for hypotension or lactate ≥ 4 mmol/L

**Within 6 hours**
E. Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation to maintain a mean arterial pressure ≥ 65)
F. 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.

*To meet the requirements, a focused exam† by a licensed independent practitioner (LIP) to include vital signs, cardiopulmonary, capillary refill, pulse and skin findings, or any 2 other items below are required:
- Measure CVP
- Measure ScvO2
- Bedside cardiovascular ultrasound
- Dynamic assessment of fluid responsiveness with passive leg raise or fluid challenge

G. Re-measure lactate if initial lactate is elevated
Mottling score predicts survival in septic shock

Patients (n) 60
Age, years, [mean (SD)] 66 (16)
Primary site of infection [n, (%)]
   Lung 27 (45)
   Abdomen 19 (32)
SOFA at H6 [mean (SD)] 11.5 (8.5–14.5)
SAPS II [mean (SD)] 59 (5–71)
Norepinephrine n (%) 50 (83)
Capillary refill time exploration during septic shock

Conclusion: CRT is a clinical reproducible parameter when measured on the index finger tip or the knee area. After initial resuscitation of septic shock, CRT is a strong predictive factor of 14-day mortality.
CMS Measures (Sep-1)

**Within 3 hours**
A. Measure lactate level
B. Obtain blood cultures prior to antibiotics
C. Administer broad spectrum antibiotics
D. Administer 30 ml/kg crystalloid for hypotension or lactate $\geq 4$ mmol/L

**Within 6 hours**
E. Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation to maintain a mean arterial pressure $\geq 65$)
F. In the event of persistent hypotension after initial fluid administration (MAP $< 65$ mm Hg) or if initial lactate was $\geq 4$ mmol/L, re-assess volume status and tissue perfusion and document findings.

*To meet the requirements, a focused exam$^\dagger$ by a licenses independent practitioner (LIP) to include vital signs, cardiopulmonary, capillary refill, pulse and skin findings, or any 2 other items below are required:

- Measure CVP
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G. Re-measure lactate if initial lactate is elevated
A. Measure lactate level
B. Obtain blood cultures prior to antibiotics
C. Administer broad spectrum antibiotics
D. Administer 30 ml/kg crystalloid for hypotension or lactate $\geq 4$ mmol/L
E. Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation to maintain a mean arterial pressure $\geq 65$)
F. In the event of persistent hypotension after initial fluid administration (MAP < 65 mm Hg) or if initial lactate was $\geq 4$ mmol/L, re-assess volume status and tissue perfusion and document findings.

*To meet the requirements, a focused exam† by a licensed practitioner (LIP) to include vital signs, cardiopulmonary, capillary refill, pulse and skin findings, or any 2 other items below are required:

- Measure CVP
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A Randomized Trial of Protocol-Based Care for Early Septic Shock

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1600 Patients
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<th>ProCESS</th>
<th>ARISE</th>
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<tbody>
<tr>
<td>Enrollment</td>
<td>&lt;2 hours from detection of shock</td>
<td>2.8 hours (median) from presentation to ED</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>75% received prior to enrollment</td>
<td>70 minutes (median) from presentation to ED</td>
</tr>
<tr>
<td>Fluids</td>
<td>&gt;2 liters prior to enrollment</td>
<td>2515ml (mean) prior to enrollment</td>
</tr>
</tbody>
</table>
TO SAVE LIVES.....

Early identification

Early antibiotics

Early fluid resuscitation
Good or Bad?

Importance of reassessment
Thank You