Sepsis: Getting to ZERO Probable or Impossible?

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Shock Definition

“A Manifestation of the Rude Unhinging of the Machinery of Life.”
Gross, 1872

“A Momentary Pause in the Act of Death.”
John Collins Warren, 1895
History

1737
1743
Pre-World War I
1923
1934
1940
Korean War
Vietnam War
1973
1991
2001
2004/08/13
Septic Shock Definitions

1992 ACCP/SCCM

**Sepsis**: The Systemic Response to Infection, Manifested by Two or More of the Following Conditions as a Result of Infection.

- Temp $> 38^\circ$C or $< 36^\circ$C
- HR $> 90$
- RR $> 20$ or PaCO$_2$ $< 32$ mmHg
- WBC $> 12,000$ or $< 4000$ or $10\%$ bands
Septic Shock Definitions

2001 SCCM/ESICM/ACCP/ATS/SIS International Sepsis Definition Conference

✓ General Variables
✓ Inflammatory Variables
✓ Hemodynamic Variables
✓ Organ Dysfunction
✓ Tissue Perfusion Variables

Shift in Focus

Angus, D. et al
Epidemiology of Severe Sepsis in the US:
Analysis of Incidence, Outcome, and Associated Cost of Care.
Critical Care Med (2001)
Angus et al

Who was studied?

Discharge records of 6,621,559 patients from seven large states and 847 hospitals representing 25% of the US total population
Angus et al

What?
Review of hospital discharge records in 7 states for severe sepsis. Evaluation of these records for mortality, morbidity, cost.

Why?
To determine the national magnitude of severe sepsis
Angus et al

What Happened?

✓ 192,980 cases of severe sepsis
✓ National estimates of 751,000 annually
✓ 51.1% ICU & 17.3% required vent
✓ Overall mortality was 28.6%
✓ Mortality > 85yr 38.4%
✓ Avg cost/case $22,100
✓ Estimated annual national $16.7 billion
✓ Avg LOS 19.6 days
Angus et al

What Does it Mean?

Conclusion: “Severe Sepsis is a Common, Expensive, and Frequently Fatal Condition, with as Many Deaths Annually as Those From Acute Myocardial Infarction. It is Especially Common in the Elderly and is Likely to Increase Substantially as the US Population Ages.”
Angus Not Alone

✓ Martin et al (2000)
✓ Dombrovskiy et al (2007)
✓ Wang et al (2007)
✓ ICD 9 Codes
✓ CDC Definitions
✓ Big Numbers!
✓ Sepsis is #1 Cause of Death of hospitalized pts
✓ Maybe #2 Cause of Death Nationally

Control Group vs Goal Directed Tx In ED for Septic Shock Pts
Surviving Sepsis Campaign: International Guidelines for Management of Severe Sepsis and Septic Shock: 2004
Develop Evidence-Based Guidelines & Change Clinical Behavior Through Implementation of These Guidelines

Why?
SSC Guidelines

- 11 International Organizations
- Critical Care and Infectious Disease Experts
- Modified Delphi Method
Levels of Evidence

GRADE System

Grades of Recommendation, Assessment, Development and Evaluation

A. RCT Randomized Control Trial
B. Downgraded RCT or Upgraded Observations Studies
C. Well-Done Observational Studies
D. Case Series or Expert Opinion

Recommendation vs Suggestion

1. Strong Evidence Support – Recommend
2. Weaker Evidence Support - Suggest

R. Phillip Dellinger, MD; Mitchell M. Levy, MD; Andrew Rhodes, MB BS; Djillali Annane, MD; Herwig Gerlach, MD, PhD; Steven M. Opal, MD6; Jonathan E. Sevransky, MD7; Charles L. Sprung, MD; Ivor S. Douglas, MD; Roman Jaeschke, MD; Tiffany M. Osborn, MD, MPH; Mark E. Nunnally, MD; Sean R. Townsend, MD; Konrad Reinhart, MD; Ruth M. Kleinpell, PhD, RN-CS; Derek C. Angus, MD, MPH; Clifford S. Deutschman, MD, MS; Flavia R. Machado, MD, PhD; Gordon D. Rubenfeld, MD; Steven A. Webb, MB BS, PhD; Richard J. Beale, MB BS; Jean-Louis Vincent, MD, PhD; Rui Moreno, MD, PhD; and the Surviving Sepsis Campaign

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I. Initial Resuscitation and Infection Issues. **6 Recommendations**

II. Hemodynamic Support and Adjunct Therapy. **4 Recs**

II. Other Supportive Therapy of Severe Sepsis. **13 Recs**
I. Initial Resuscitation and Infection Issues

A. Initial Resuscitation
B. Screening for Sepsis & Performance Improvement
C. Diagnosis
D. Antimicrobial Therapy
E. Source Control
F. Infection Prevention
I. Initial Resuscitation and Infection Issues.

A. Initial Resuscitation

1. Protocolized, quantitative resuscitation of patients with sepsis-induced tissue hypoperfusion (defined in this document as hypotension persisting after initial fluid challenge or blood lactate concentration ≥ 4 mmol/L).

   Goals during the first 6 hrs of resuscitation:
   a) CVP 8–12 mm Hg
   b) MAP ≥ 65 mm Hg
   c) UO ≥ 0.5 mL/kg/hr
   d) Central venous or SVO2 70% or 65%, respectively (grade 1C).

2. In pts w elevated lactate levels targeting resuscitation to normalize lactate (grade 2C).
B. Screening for Sepsis and Performance Improvement

1. Routine screening of potentially infected seriously ill pts for severe sepsis to allow earlier implementation of tx (grade 1C).

2. Hospital–based performance improvement efforts in severe sepsis (UG).
Surviving Sepsis Campaign

Updated Bundles in Response to New Evidence 04/2015
Surviving Sepsis Campaign
Updated Bundles

To Be Completed within 3 Hrs

✓ Measure Lactate Level
✓ Obtain Bld Cultures
✓ Admin Broad Spectrum ABX
✓ Admin 30ml/kg Crystalloid for Hypotension of Lactate > 4mmol/L
Surviving Sepsis Campaign
Updated Bundles

To Be Completed w 6 Hrs

✓ Vasopressors (if needed) \( \rightarrow \) MAP > 65mmHg

✓ If Persistent Hypotension \( \rightarrow \) Re-assess* Vol Status & Tissue Perfusion

✓ Re-Measure Lactate if Initial Lactate > 4
Surviving Sepsis Campaign
Updated Bundles

To Be Completed w 6 Hrs

✓ Re-assess* Vol Status & Tissue Perfusion
✓ Repeat Focused Exam
✓ VS, CV, Cap Refill, Pulse & Skin Findings

OR

✓ CVP, Scvo2, Bedside Ultrasound, Dynamic Fluid Response
Surviving Sepsis Campaign
Studies Since 2013

- ProCESS Trail: Protocolized Care for Early Septic Shock
- ARISE Study: Australasian Resuscitation in Sepsis Evaluation
- ProMISE Trail: Protocolised Management in Sepsis
Surviving Sepsis Campaign

Was Rivers Wrong?

- ProCESS Trail, ARISE Study, ProMISe Trail Results
- ‘Standard Care’ has improved
- Decreasing M&M of Sepsis
- **Goal:** Improve Outlines!
- By Implementing Guidelines
WEARENOWHERE
WE ARE NO WHERE

WE ARE NOW HERE
Hospitals Report Results of SSC Implementation

4 hosps in Detroit reported their **success** in implementing the **Surviving Sepsis Campaign** (SSC), demonstrating improved frequency of blood culture testing before antibiotic admin and significant improvement in the time to antibiotic tx — from a mean of approximately 182 mins to 92 mins. The 4 hosps participated in a study published in the *Journal for Healthcare Quality*. 
“While guidelines provide a roadmap for pt care, successful implementation relies on consistent patterns of clinician practice to achieve optimal outcomes,” “Educating staff is essential to the process of improving pt outcomes, and the results of our study showed the relationship between education and sampling of lactate and blood cultures, as well as timeliness of antibiotic admin.”

Lead author of the study Maria Teresa Palleschi, CCRN, DNP, ACNP, of Detroit Medical Center.
Where to Begin?
The Beginning!
I. Initial Resuscitation and Infection Issues.

B. Screening for Sepsis and Performance Improvement

1. Routine screening of potentially infected seriously ill pts for severe sepsis to allow earlier implementation of tx (grade 1C).

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Targeting Sepsis as a Performance Improvement Metric

Kleinpell & Schorr, April 2014

“Early recognition and targeted treatment can further improve sepsis care and pt outcomes.”

“The spotlight on quality and safety in health care is well recognized.”

“Performance improvement involves education, protocol development and implementation, data collection, measurement of indicators, and ongoing feedback to stakeholders and clinicians.”
Has it made a difference? Performance Metrics and Outcomes

Levy et al (2015) CCM.
7.5 yr follow up. 30,000 pts from 218 hospitals

“This analysis, over a pd of 7.5 yr, demonstrates that increased compliance w a global sepsis quality improvement initiative was associated with a 25% relative risk reduction in mortality.”
Performance Metrics and Outcomes

Levy et al (2015) CCM. 7.5 yr follow up. 30,000 pts from 218 hospitals

Conclusion

“Consistent w the literature, these results lend strength to the argument that performance metrics can be used to drive change in clinical behavior and, therefore, improve the quality of care and lead to decreased mortality in pts w severe sepsis and septic shock.” pg 11
Getting to Zero

✓ Best Practice Alerts on EHR
✓ Checklists: Rounding, Handoff
✓ Goal Sheets
✓ Protocols
✓ Pocket Cards
✓ Treatment Algorithms
✓ Templates
Getting to Zero

✓ Education
✓ Webcasts
✓ Journal Clubs
✓ Conferences Like This
✓ Networking and Collaborating
✓ Feedback ➔ Feedback ➔ Feedback
✓ Real Time Monitoring & Feedback
✓ Web sites: survivingsepsis.org
Septic Pts are Very Vulnerable!
We Should! We Must! We Will!
It’s Possible!


Web sites with great resources:

Surviving sepsis campaign: Survivingsepsis.org

Sepsis alliance: Sepsis.org
Sepsis: Getting to ZERO
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