Variability in Emergency Physician Care for Severe Sepsis: How do we Measure up?

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No Conflict of Interest to Disclose
Outline

• Background
• Objective of the Study
• Methods
• Results
• Limitations
• Conclusions
Background
Severe Sepsis

SIRS
Temp. >38°C or <36°C, HR >90, RR >20 or PaCO₂ <32, WBCs >12,000 or <4,000 or >10% bands

Sepsis
SIRS + Infection

Severe Sepsis
Sepsis + End Organ Damage

Septic Shock
Severe Sepsis + Hypotension
“Administration of effective intravenous antimicrobials within the first hour of recognition of septic shock (grade 1B) and severe sepsis without septic shock (grade 1C) as the goal of therapy”
Mortality with delays

Predicted hospital mortality and 95% CI’s for time to first antibiotic administration in severe sepsis and septic shock

Ferrer et al Critical Care Med 2014 Aug;42(8)
Objectives
Objective

To explore emergency physician variation on key performance metrics in sepsis care using administrative data as a prelude to generating aggregate and individual physician-specific reports
Methods
Identification of Severe Sepsis

- All the patient visits included in the study cohort were selected based on the below criteria:
  1) Patient age >18yo
  2) Had a lactate ordered in the ED and the initial result was ≥ 2.0 mmol/L
  3) Had an infection-related primary admitting ICD-10 code
  4) Had antibiotics ordered while in the ED
Data Retrieval

Sources
• REDIS (Emergency Department Information System)
• SCM (Sunrise Clinical Manager)

Time Period
• 36 months total
• January 1 - December 31
  – 2011
  – 2012
  – 2013

Facilities Included
• FMC
• PLC
• RGH
• SHC (1-year data only)
Time Points

- Triage Time
- MD Assessment Time
- Initial Lactate Order Time
- Initial Lactate Result Time
- First Antibiotic Requested Time
- First Antibiotic Administration Time
Statistics

• Simple descriptive statistics
• Median times were used for all time points
  – Non-normally distributed data
  – Avoid the impact of outliers
• Interquartile range (IQR) was used to demonstrate statistical dispersion
Results

HONEY, WHAT'S A STANLEY CUP?

I DUNNO. WE'RE CANUCKS.
Aggregate Report

• 2197 severe sepsis patient visits
• Care provided by 146 different emergency physicians
Source of Sepsis

Description

A419  Sepsis, unspecified
J189  Pneumonia unspecified
N390  Urinary tract infection, unspecified
J440  COPD with acute lower respiratory infection
J690  Pneumonitis due to food or vomit
L0311 Cellulitis of lower limb
T814  Infection following a procedure
R509  Fever unspecified
Time From Triage to Ordering of Serum Lactate

- **Cohort median = 72 mins**
- **Cohort Lower Quartile = 38 mins**
- **Cohort Upper Quartile = 151 mins**

450 patients (20%) with delay >3hrs
Median Time from Meeting Criteria for Severe Sepsis to Antibiotic Administration

441 patients (20%) with delay >2hrs
Time from Meeting Criteria for Severe Sepsis to First Antibiotics Requested (discrete visits)
Limitations
Limitations

• Our definition of severe sepsis could be called into question
• Unable to differentiate patients with severe sepsis from those with septic shock
• No way of assessing appropriateness of antibiotic therapy
• Did not assess patient outcome or mortality
Conclusions
Conclusions

- ED Physicians demonstrate significant variation in practice of severe sepsis management in the ED
- This variation has the potential to affect patient care
- Time to antibiotics and other markers of quality sepsis care can be defined by administrative data and reported back to physicians
Questions?

Disneyland

Duck Hunt

FLAMES VS DUCKS
Extra Slides
### 8.1 Median MD Sign-Up Time to First Antibiotics Requested Time

<table>
<thead>
<tr>
<th></th>
<th>Median # of Visits</th>
<th>Median Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>You</strong></td>
<td>17</td>
<td>23.00 min</td>
</tr>
<tr>
<td><strong>Other 145 ED Physicians</strong></td>
<td>13</td>
<td>45.40 min</td>
</tr>
</tbody>
</table>

**Graph Legend**
- **You**
- "Other 145 ED Physicians"

The scatter plot indicates the median MD sign-up time to the first antibiotics requested time in minutes. The median sign-up time is 44.7 minutes for the given data set.
8.3.2 Time from Initial Lactate Result to First Antibiotics Requested by Discrete Visits

<table>
<thead>
<tr>
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<th>Median Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>You</td>
<td>17</td>
<td>-6.00 min</td>
</tr>
<tr>
<td>Other 145 ED Physicians</td>
<td>12</td>
<td>10.69 min</td>
</tr>
</tbody>
</table>

Graph Legend
- Red: Your Visits
- Grey: Visits by Other 145 ED Physicians

Each Dot Represents a Discrete Severe Sepsis Visit
Blood Cultures Ordered

Did not Order Blood Culture
14.54%

Ordered Blood Culture
85.46%
Serial Lactate Assessments

Only Includes Visits with Repeat Lactate Orders (n=1198)

- **18.4% of the Visits had Second Lactate Increased**
- **Purple Dots:** Second Lactate of the Same Visit Increased
- **Green Dots:** Second Lactate of the Same Visit Unchanged or Decreased
- **Black Dots:** Initial Lactate Results
Surviving Sepsis Campaign Update 2015

• To be completed within 3hrs of time of presentation
  – Measure serum lactate
  – Obtain blood cultures prior to antibiotics
  – Administer broad spectrum antibiotics
  – Administer 30ml/kg crystalloid for hypotension or lactate ≥4mmol/L

• To be completed within 6hrs of time of presentation
  – Vasopressors for persistent hypotension
  – Re-measure lactate if initial was elevated
Why Lactate?

SEVERE SEPSIS: SEPSIS-INDUCED TISSUE HYPOPERFUSION OR ORGAN DYSFUNCTION (ANY OF THE FOLLOWING THOUGHT TO BE DUE TO INFECTION)

Sepsis-induced hypotension

Lactate level above upper limits of laboratory normal levels

Urine output <0.5 mL/kg per hour for more than 2 h despite adequate fluid resuscitation

Acute lung injury with PaO₂/FiO₂ <250 in the absence of pneumonia as infection source

Acute lung injury with PaO₂/FiO₂ <200 in the presence of pneumonia as infection source

Creatinine level >2.0 mg/dL

Bilirubin level >2 mg/dL

Platelet count <100,000 µL

Coagulopathy (INR >1.5)
Serum lactate is associated with mortality in severe sepsis independent of organ failure and shock*

Mark E. Mikkelsen, MD, MS; Andrea N. Miltiades, BA; David F. Gaieski, MD; Munish Goyal, MD; Barry D. Fuchs, MD; Chirag V. Shah, MD, MS; Scarlett L. Bellamy, ScD; Jason D. Christie, MD, MS

- Single centre cohort study
- N = 830 adults with severe sepsis in the ED
- Tested for association between initial serum lactate level and mortality
  - Low (<2mmol/L)
  - Intermediate (2-4mmol/L)
  - High (>4mmol/L)