Sepsis - Automate and Streamline the CMS Early Measure Bundle

A Conversation with Clinicians About Best Practices to Effectively Meet the Measure
Presenters

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Objectives

- Describe how to apply real-time intelligence technology for more effective, efficient Sepsis surveillance
- Learn the latest techniques to automated monitoring and reporting of the new bundle measures
- Identify operational efficiency best practices within your hospital, health system as well as from experts working as part of the VigiLanz community of more than 5,000 clinicians
Sepsis

Early Prevention
Early Intervention = Optimal Outcomes

Infection → Bacteremia → SIRS → Severe Sepsis → Septic Shock

Increased Mortality
Increased Cost
Increased LOS
Prospective Intervention Opportunities

Modern Real-time Intelligence is able to:
Provide intelligent, actionable alerts to any care provider/care team at any stage of care across the care continuum using modern testing methods without white noise.

- Infection Prevention
- Infection Identification
- Timely Treatment
- Device Removal
- Broad Spectrum Abx
- Targeted Diagnostics
- Invasive Procedures
- BP Support
- ICU
- Organ Support

- SIRS
- Bacteremia
- Timely Testing, alert only when guidance not met
- Evolve Care to Changing Needs, ie drug resistance
- Optimize therapy and address barriers to healing

Severe Sepsis
Septic Shock
Retrospective Analytics Feed Real-time Intervention

Modeling: Predict Risk

Live Data

Automated Real-Time Patient Assessment

Response Teams
EMR
Direct Providers
Visual Dashboards
Quality Specialists
Risk Managers

Targeted Alerts

Right elements for detection
Best location this patient
Trending condition
Severe Sepsis
Septic Shock

Bug/Drug Mismatch
Current risks removed?
Infection being treated?
Findings addressed?

Bacteremia
SIRS

Infection

Population at Risk
Infection Prevention

Infection being treated?
Current risks removed?
Findings addressed?
Bug/Drug Mismatch

Infection prevention
Population at Risk

Prevention
Risk

Infection

Infection being treated?
Current risks removed?
Findings addressed?
Bug/Drug Mismatch

Infection

Population at Risk
Infection Prevention

Prevention
Risk

Infection

Infection being treated?
Current risks removed?
Findings addressed?
Bug/Drug Mismatch
Sepsis Concurrent Review: Leverage Advanced Technology

- Automated Alerts directed to Care-givers. Intervene early, before the measure is failed.
- Include options for Prospective or Retrospective Review and Intervention
- Leverage auto-population of elements beyond demographics
- Guide clinicians to the proper element parameters
- Current with today’s guidelines and tomorrow’s science
- Deploy technology to find buried EMR data elements.
- Provide expert clinical support and report features
CMS Sepsis Core Measure

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CMS Sepsis Core Measure

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Disclosures

» No financial conflicts of interest
Hospitalization rates for septicemia or sepsis more than doubled from 2000 through 2008.

Figure 1. Hospitalizations for and with septicemia or sepsis

Rate per 10,000 population

NOTE: Significant linear trend from 2000 through 2008 for both categories.
Background

Figure 4: Average length of stay for those hospitalized for sepsis or septicemia compared with those hospitalized for other conditions, 2008

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Septicemia or sepsis hospitalizations</th>
<th>Other hospitalizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ages</td>
<td>8.4</td>
<td>4.8</td>
</tr>
<tr>
<td>Under 65 years</td>
<td>9.1</td>
<td>4.3</td>
</tr>
<tr>
<td>65 and over</td>
<td>8.0</td>
<td>5.6</td>
</tr>
</tbody>
</table>

*Difference is statistically significant at the 0.05 level.*

Background

Table. Hospitalizations for septicemia or sepsis compared with hospitalizations for other diagnoses, by discharge disposition, 2008

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Septicemia or sepsis</th>
<th>Other diagnoses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Routine</td>
<td>39</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td>Transfer to other short-term care facility</td>
<td>6</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Transfer to long-term care institution</td>
<td>30</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Died during the hospitalization</td>
<td>17</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Other or not stated</td>
<td>8</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

1Difference is statistically significant at the 0.05 level.

CMS Rationale

» Absolute reductions in mortality of 4-6% associated with sepsis bundle compliance rates of <30%
» Absolute reductions in mortality of 20% associated with sepsis bundle compliance rates of 52%
» Multicenter efforts to promote bundles of care for severe sepsis and septic shock were associated with improved guideline compliance and lower hospital mortality

» “[…] there is a direct association between bundle compliance and improved mortality. Without a continuous quality initiative (CQI), even these compliance rates will not improve and will decrease over time” (Ferrer, 2008)
Sepsis Definitions

**SIRS**
1. Temp > 38 C or < 36 C
2. HR > 90 BPM
3. RR > 20/min
4. Leukocyte count > 12,000/mm3, <4,000/mm3 or > 10% immature (band) cells

**SEPSIS**
2+ SIRS Criteria And Known or Suspected Infection

**SEVERE SEPSIS**
Sepsis And New or Acute Sepsis induced organ dysfunction

**SEPTIC SHOCK**
Severe Sepsis And Sepsis induced Hypoperfusion persisting Despite adequate fluid Resuscitation, or Lactate > 4mmol/L
CMS Core Measures

» The following pertains ONLY to adults aged 18 years or older

» Within 3 hours of severe sepsis presentation, patients shall receive ALL of the following
  ~ Initial lactate level measurement
  ~ Blood cultures prior to antibiotics
  ~ Broad spectrum or other antibiotics administered

» Within 6 hours of severe sepsis presentation, patients shall receive ALL of the following
  ~ Repeat lactate level measurement only if the initial lactate was elevated
CMS Core Measures

» Within 3 hours of presentation of septic shock, ALL patients shall receive the following
  ~ Severe sepsis interventions
    • Initial lactate level measurement
    • Blood cultures prior to antibiotics
    • Broad spectrum or other antibiotics administered
  ~ Resuscitation with 30mL/kg crystalloid fluids

» Within 6 hours ONLY IF hypotension persists after fluid administration,
  ~ Vasopressors are administered

» Within 6 hours ONLY IF hypotension persists after fluid administration or initial lactate ≥ 4 mmol/L:
  ~ Repeat lactate measurement
  ~ A focused exam (details on next slide) OR
  ~ Two of the following four interventions (detail on next slide)
CMS Core Measures

» Within 6 hours ONLY IF hypotension persists after fluid administration or initial lactate ≥ 4 mmol/L:
  ~ A focused exam
    • Vital signs AND
    • Cardiopulmonary exam AND
    • Capillary refill evaluation AND
    • Peripheral pulse evaluation AND
    • Skin examination
  ~ OR
  ~ Two of the following four interventions
    • Central venous pressure measurement
    • Central venous oxygen measurement
    • Bedside Cardiovascular ultrasound
    • Passive leg raise or fluid challenge
## Early Antibiotic Administration

<table>
<thead>
<tr>
<th>Time to ABX¹, hrs</th>
<th>OR²</th>
<th>95% CI</th>
<th>p-value</th>
<th>Probability of mortality³</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (ref)</td>
<td>1.00</td>
<td>---</td>
<td>---</td>
<td>18.7</td>
<td>17.5</td>
</tr>
<tr>
<td>1</td>
<td>1.05</td>
<td>1.02</td>
<td>1.07</td>
<td>&lt; 0.001</td>
<td>19.3</td>
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<tr>
<td>2</td>
<td>1.09</td>
<td>1.04</td>
<td>1.15</td>
<td>&lt; 0.001</td>
<td>20.0</td>
</tr>
<tr>
<td>3</td>
<td>1.14</td>
<td>1.06</td>
<td>1.23</td>
<td>&lt; 0.001</td>
<td>20.8</td>
</tr>
<tr>
<td>4</td>
<td>1.19</td>
<td>1.08</td>
<td>1.32</td>
<td>&lt; 0.001</td>
<td>21.5</td>
</tr>
<tr>
<td>5</td>
<td>1.25</td>
<td>1.11</td>
<td>1.41</td>
<td>&lt; 0.001</td>
<td>22.3</td>
</tr>
<tr>
<td>6</td>
<td>1.31</td>
<td>1.13</td>
<td>1.51</td>
<td>&lt; 0.001</td>
<td>23.1</td>
</tr>
</tbody>
</table>

¹Time to ABX is based on 15,948 observations that are greater than or equal to zero
²Hospital mortality odds ratio referent group is 0 hours for the time to ABX and is adjusted by the number of baseline organ failures, infection type (community vs. nosocomial), and geographic region (Europe, North America, and South America)
Sepsis Clock Start Times

» Time Zero
  ~ Occurs when all elements of the diagnosis (severe sepsis or septic shock) are present
    • If all elements are in place at time of ER triage, clock starts at time of triage
    • Elements include anything that has a time stamp (vital signs, lab results, physician documentation, nursing documentation, etc.)
  ~ Potential for two clocks to run simultaneously
    • Severe sepsis that progresses to septic shock
Challenges

» May over-diagnose severe sepsis
» No mention of other infectious workup
  ~ Urinalysis / Urine Cultures?
  ~ CSF examination?
  ~ Sputum cultures?
» Lab workflow
» Pharmacy Workflow
» Antibiotic stewardship
Loma Linda University Medical Center’s Response

» When any elements of SIRS criteria are noted in the chart, the following occurs
  ~ Best Practice Alert notifies bedside nurse of possible sepsis
  ~ Standing order for lactate and blood cultures
  ~ Lactate drawn
  ~ Physician immediately paged to assess patient. If no response in 30 minutes:
    • Standing order for antibiotics

» Problems with our initial response
  ~ 1500+ activations in the first month
  ~ Currently, the above plan is being refined to improve the specificity
Implementing a Sepsis Initiative

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Chief Surgical Quality Officer
Orlando Regional Medical Center
Quality Improvement at Orlando Health

• Corporate-wide structure for quality improvement
  – Institute for Healthcare Improvement
  – www.IHI.org

• Focus on effective quality improvement processes
  – LEAN
  – Six Sigma

• Team member engagement is essential!
Improvement Requires Change

“If you cannot describe what you are doing as a process, you do not know what you are doing” - William Demming

- We all want to improve sepsis care
- Simply telling physicians, nurses, and others to watch for sepsis is not enough
- We need a process and structure for implementing a sepsis initiative
The “Plan-Do-Study-Act” Cycle

• Also known as “small tests of change”
  – Make a plan
  – Try it for a week or two
  – Study the outcome
  – Modify the plan
  – Test it again
    – What worked?
    – What didn’t work?
    – What should be done differently?
Sepsis Committees

- Corporate Sepsis Committee defines strategy
- Hospital Sepsis Committees implement processes
  - CNO, CQO, physicians and nurses
- Units provide patient care
- Bi-weekly sepsis rounds
The Unit Triad Concept

- Each unit has a quality Triad
- Triads meet weekly to review unit metrics
- Weekly meetings at the GEMBA board inform staff of the unit’s progress
- Sepsis initiative will be monitored by the Triad
Driver Diagram

Global Aim

To reduce mortality from sepsis

Specific Aim
To document implementation of the "Big Four" (lactate, fluids, antibiotics, and cultures) within THREE hours

Primary Drivers
What needs to be done to meet your aim?

- Educate physicians and nurses on sepsis
- Track documentation compliance electronically
- Make successful Big Four implementation EASY!

Secondary Drivers
How are you going to do it?

- Sepsis CME / CEUs
- Sepsis Grand Rounds
- Create sepsis documentation in EHR
- Sepsis alert for Lab and Pharmacy
- Sepsis orderset in EHR
“If you fail to plan, you plan to fail”
- Benjamin Franklin

• Structure your sepsis implementation to ensure success

• Start small and build your processes from there
  – Don’t be afraid to fail
  – Just get started!
Questions?