Early Sepsis Identification: Harnessing the EHR
Disclaimer

The content of this presentation is not considered standard of care and is only intended to provide examples of EHR functionality but not represent a treatment suggestion or standard.

The content of this presentation is not intended to promote a specific EHR and the speaker has no relationship with the vendor of the EHR used as the example case.

The content is not intended to endorse the SEP-1 measure, it is only used for purposes of illustration.
Severe Sepsis Defined by Sep-1

All three of the following criteria must be met within 6 hours:

- Documentation of a known or suspected infection**

- 2 or more SIRS criteria:
  - Temp > 38.3 C or < 36.0 C
  - HR > 90 bpm
  - RR > 20/min
  - WBC > 12, < 4, or > 10% bands

- Organ dysfunction defined by 1 of the following:
  - SBP < 90, or MAP < 65, or a SBP decrease > 40 mmHg from the last previously recorded SBP considered normal for that specific patient
  - Creatinine > 2.0 or UOP < 0.5 mL/kg/hr x 2 hrs
  - Bilirubin > 2 mg/dL
  - Platelet count < 100,000
  - INR > 1.5 or aPTT > 60 sec
  - Lactate > 2 mmoL
Septic Shock Defined by SEP-1

- The criteria for Septic Shock are:

- Severe Sepsis

  \[ \text{AND} \]

- Tissue hypoperfusion persists in the hour after IVFs, evidenced by:
  - SBP < 90 mmHg \textit{OR}
  - MAP < 65 mmHg \textit{OR}
  - a decrease in SBP by > 40 mmHg from the last previously recorded SBP considered normal for the patient \textit{OR}
  - Lactate \( \geq \) mmoL

- \textit{OR} if criteria for septic shock are not met, but there is physician/APN/PA documentation of septic shock or suspected septic shock
SEP-1 Treatment Goals for Severe Sepsis

Received within 3 hours of presentation of Severe Sepsis:

- An initial lactate level measurement (between 6 hrs prior to and 3 hrs following the presentation of severe sepsis)
- If hypotensive or lactate elevated, 30 cc/kg IVF bolus
- Broad spectrum IV antibiotics (24 hrs prior to and 3 hours following the presentation of severe sepsis)
- Blood cultures prior to antibiotics (48 hrs prior to and 3 hrs following the presentation of severe sepsis)

AND received within 6 hours of presentation of Severe Sepsis:

- Repeat lactate level measurement only if initial lactate level is elevated (>2 mmoL)
Received within 3 hours of presentation of Septic Shock:

- 30 ml/kg IVF bolus

*AND ONLY IF* hypotension persists after fluid administration or initial lactate ≥ 4mmoL, received within 6 hours of presentation of Septic Shock:

- Repeat volume status and tissue perfusion assessment**
- Vasopressors
Hospital Baseline QI Data

- Based on ICD-10 diagnoses; Oct-Dec 2015
  - 100 / month eligible for audit
  - 20 sampled / month

- 60 charts screened, only 12 met eligibility
  - Reason for exclusion: Criteria not within 6 hours of each other

- 3/12 patients met 100% compliance with measure
Hospital QI data - Failures

- 9/12 failures

- Possible to have multiple failures; not addressed in this data
  - 6/9 due to antibiotics >3 hours after criteria
  - 2/9 due to no repeat lactate within 6 hours
Problem: Early recognition

- Definitions are “syndromic” or “academic”
  - Do not equate to clinical picture/phenotype
- Often not appreciated by clinicians
- Education helpful but of limited value
  - Clinician turnover
- Solution: Real time notification
Real Time Alerts

- Also called Best Practice Advisory (BPA)

- Pop up alert when certain criteria are met
  - “Troll” EHR data in background

- Need to “fire” or alert with reasonably high sensitivity and specificity
  - Alert fatigue
Sepsis BPA - Goals

- Enhance clinician awareness
  - Decrease time to sepsis recognition
- Help standardize care
  - Improve compliance with SEP-1
- Provide data for process improvement
BPAs - SIRS criteria

- 1 week in October
  - >200 alerts if SIRS criteria are used

- Has to be based on rational and logical inputs that are received relatively rapidly
BPAs - Tiered

- 3 tiered system
  - Tier 1: Hypotension (SBP <90)
  - Tier 2: Lactate >3 + (HR >110 or WBC <4 or >12 or Temperature)
  - Tier 3: Temperature + (HR >110 or SBP<110)

- Prioritized
BPAs - Specificity

- 1 week in October
  - 62 alerts (alerts decreased by >2/3)

- 23/62 (37%) with hospital DC diagnosis of sepsis
  - 5 septic shock, 2 severe sepsis, 18 sepsis
BPAs – Specificity

- 9/62 discharged from ED
  - 7/9 with infection

- False positives of current criteria
  - 9 trauma
  - 2-3 of each of the following:
    - GIB, cardiac arrest, cirrhosis, stroke, CHF, respiratory failure / COPD, DKA, altered mental status
BPAs - Sensitivity

- Same week in October: 26 patients potentially eligible for audit
- 21/26 presented to ED
  - 17 potentially eligible in ED
  - 12/17 (71%) had BPA fire
  - 5 missed patients
    - All severe sepsis, most with normal lactate
    - 4/5 had broad spectrum abx ordered by provider
BPA- Notice

- Customized alert when opening chart
- Provides vitals, lactate, WBC (if available)
- General diagnosis declaration
- Links to orders
This is a sepsis alert. EPIC has detected this patient is hypotensive and carries a high risk of severe sepsis.

Severe sepsis is defined as a suspected infection, 2 or more SIRS criteria, and any sign of acute organ dysfunction.

### Vitals

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>BP</th>
<th>Pulse</th>
<th>Temp</th>
<th>Resp</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/05/16</td>
<td>1603</td>
<td>70/70</td>
<td>88</td>
<td>103 °F (39.4 °C)</td>
<td>60</td>
</tr>
</tbody>
</table>

### LACTATE

<table>
<thead>
<tr>
<th>Collection Time</th>
<th>Result</th>
<th>Value</th>
<th>Ref Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/05/16 3:18 PM</td>
<td>Lactate (Lactic Acid)</td>
<td>4.0 (*)</td>
<td>0.7-2.1 mmol/L</td>
</tr>
</tbody>
</table>

### CBC

<table>
<thead>
<tr>
<th>Collection Time</th>
<th>Result</th>
<th>Value</th>
<th>Ref Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/05/16 3:18 PM</td>
<td>White Blood Cell Count</td>
<td>3.0 (*)</td>
<td>4.0-10.0 TH/cmm</td>
</tr>
</tbody>
</table>
BPA – Acknowledgement

- Must declare a suspected diagnosis (cannot cancel, but can defer)
  - Severe sepsis
  - Variety of alternatives (hemorrhage, dehydration, infection without sepsis, etc)
  - Unclear at this time (closes alert for 60 mins)
  - Defer – Fires the next time you open the chart

- No impact on clinical impression, not filed in chart (QI purposes only)
If you suspect severe sepsis, please utilize the ED sepsis protocol. If not, please provide an alternative diagnosis.
BPA – Tiers

- If alert declined, but new data arrives:
  - Example: Tier 3 alert declined, but patient becomes hypotensive; alert will “refire” with new data
  - Example: Tier 1 alert declined, no further alerts will fire

- These data can be QI’ed to see why cases are missed
This is a **sepsis alert**. EPIC has detected this patient is **hypotensive** and carries a **high risk** of severe sepsis.

Severe sepsis is defined as a suspected infection, 2 or more SIRS criteria, and any sign of acute organ dysfunction.

This is a **sepsis alert**. EPIC has detected this patient has an **elevated lactate** and signs of **inflammation**, and carries a **moderate risk** of severe sepsis.

Severe sepsis is defined as a suspected infection, 2 or more SIRS criteria, and any sign of acute organ dysfunction.

This is a **sepsis alert**. EPIC has detected this patient has a **fever** and either **tachycardia** or **borderline hypotension**, and is **at risk** of severe sepsis.

Severe sepsis is defined as a suspected infection, 2 or more SIRS criteria, and any sign of acute organ dysfunction.
BPA – Functionality

- If severe sepsis chosen as diagnosis:
  - Link to take you directly to sepsis order set
  - Must check the box

- If diagnosis is unclear:
  - Single click order for a POC lactate

- Repeat lactate functionality automatic
If you suspect severe sepsis, please utilize the ED sepsis protocol. If not, please provide an alternative diagnosis.

- Initiate ED Sepsis Protocol
- Undetermined at this point
- Hemorrhage
- Cardiogenic Shock
- Pulmonary Embolism
- Dehydration
- Cardiac Arrest
- Infection without End-organ Damage
- Alternative Diagnosis
- Defer Alert

☐ Open Order Set: Adult Emergency Department Severe Sepsis preview

☐ Add to unsigned orders: POCT LACTIC ACID (LACTATE)
BPA – Residents and APPs

- Alerts can only fire if chart is opened
- If residents diagnose no sepsis, attending may never see alert
- Introduced “thermometer” on ED manager
Sepsis Alert System

This is a fever and tachycardia alert. EPIC has detected this patient has a fever and either tachycardia or borderline hypotension, and is at risk of severe sepsis.

Severe sepsis is defined as a suspected infection, 2 or more SIRS criteria, and any sign of acute organ dysfunction.

Vitals
01/06/16 0835
BP: 120/85
Pulse: 105
Temp: 103 °F (39.4 °C)
Resp: 105

No results found for this visit on 01/06/16.

If you suspect severe sepsis, please utilize the ED sepsis protocol. If not, please provide an alternative diagnosis. If the patient has an infection but severity is unclear, consider evaluating for acute organ injury including lactate measurement.

Triage documentation must be completed.

01/06/16 0841
None
File Doc Flowsheets
• Rule: UMC ED TRIAGE COMPLETION [16017118]
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