



Sepsis Learning Collaborative:  
Harnessing the EHR in Sepsis Identification  
Human Elements in Screening and Initiation of Treatment of Sepsis

# Presenters



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## 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

*AND*

- Tissue hypoperfusion persists in the hour after IVFs, evidenced by:
  - SBP < 90 mmHg *OR*
  - MAP < 65 mmHg *OR*
  - a decrease in SBP by > 40 mmHg from the last previously recorded SBP considered normal for the patient *OR*
  - Lactate  $4 \geq$  mmol
- *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/L)

# + SEP-1 Treatment Goals for Septic Shock

**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  $\geq$  4mmol/L, 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
  - 283 alerts if SIRS criteria are used
    - 1022 combinations
- 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 80%)
- 17/62 (27%) 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
  
- 45 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 false negatives
    - All severe sepsis, with normal lactate, no shock
    - 4/5 had broad spectrum abx ordered by provider





## Tiered vs SIRS

- SIRS: Sensitivity: 71%, Specificity: 6%  
Tiered: Sensitivity: 71%, Specificity: 27%
- Eliminated between 220 and 1000 unnecessary individual alerts over 1 week



# + BPA- Notice

- Customized alert when opening chart
- Provides vitals, lactate, WBC (if available)
- General diagnosis declaration
- Links to orders





This is a hypotension alert.

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	
	01/05/16 1603
BP:	70/70
Pulse:	88
Temp:	103 °F (39.4 °C)
Resp:	60

01/05/16		
LACTATE		
Collection Time		
01/05/16 3:18 PM		
Result	Value	Ref Range
Lactate (Lactic Acid)	4.0 (*)	0.7-2.1 mmol/L
CBC		
Collection Time		
01/05/16 3:18 PM		
Result	Value	Ref Range
White Blood Cell Count	3.0 (*)	4.0-10.0 TH/cmm

# + 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)

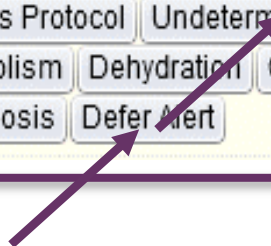
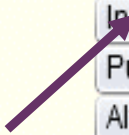




If you suspect severe sepsis, please utilize the ED sepsis protocol. If not, please provide an alternative diagnosis.

Acknowledge reason:





## 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 hypotension alert.

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 hyperlactatemia and fever alert.

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 fever and tachycardia alert.

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.

Acknowledge reason:

- 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)

Accept

Cancel

# + 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





ED Track Board (UH Emergency) - Last

Refresh | Arrival | Review Visits

My Patients | Waiting | Consults | To Be Admitted | All Patients (144)

Bed	Sepsis	Patient	Stat	Dispo	Transp...	Reg	Unsigned ...	Err Arrival
06 TX RM6		deGruiter, two (M)				X		
02 TRAU...		deGruiter, one (R)	2/2			X		
01 TRAU		Admit Service (M)	3/31	Admit - Admittin*		X		

Double click thermometer icon

**CI ALERT REVIEW for deGruiter, two** X

This is a fever and tachycardia alert.  
 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.

**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.

Date	User	Actions Taken	Triggers	Comment
01/06/16 0843		Acknowledge: Defer Alert [81] Lockout: 0 hour(s) For: All users, current encounter only	Open Patient Chart • Temp: 103 °F (39.4 °C) • Pulse: 105 • BP: 120 mmHg • BP: 120 mmHg • Rule: UMC ED SEPSIS ADULT TEMPERATURE HEART RATE [228470] • Result Component: LACTATE (LACTIC ACID)	[Add]

**Triage documentation must be completed.** Inactive

Date	User	Actions Taken	Triggers	Comment
01/06/16 0841		None	File Doc Flowsheets • Rule: UMC ED TRIAGE COMPLETION [16017118]	[Add]



# + Acknowledgement

- Michael Puskarich, MD
- Sarah Sterling, MD
- Gil Trest



Sepsis Initiative Webinar:

Wednesday July 20

12:00pm-1:00pm EST

E-QUAL Network Resources and More Information:

[www.acep.org/equal](http://www.acep.org/equal)

Contact Nalani Tarrant (Project Manager):

[ntarrant@acep.org](mailto:ntarrant@acep.org)