Early Sepsis Management: Evaluation of Sepsis Alert Screening Tools for the Emergency Department

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Purpose

- The purpose of this project is to determine how accurate sepsis alert screening tools in the Emergency Department (ED) are in identifying patients at risk for sepsis.

Significance

- Sepsis begins outside of the hospital for nearly 80% of patients.[2]
- Sepsis is deadly when it's not quickly recognized and treated.[2]
- Sepsis is a time critical disease.[3]
- 2/3 of septic patients enter the hospital through the ED, the responsibility for identification and initial management of this population falls largely on the emergency department staff.[4]

PICO Question

- Are ED patients identified at risk for sepsis by the screening tools more likely to have a subsequent sepsis diagnosis compared with ED patients that are not identified as being at risk for sepsis by the tools?

P	I	C	O
Population Patient Problem	Intervention or Exposure	Comparison	Outcome

Strategy and Implementation

- May 2014: Electronic Health Record (EHR) sepsis alert screening tools to help identify patients with SIRS, sepsis, and severe sepsis/ septic shock have been developed and implemented by the Mayo Clinic, Arizona ED nurses.
- 6/1/2014 – 6/1/2016: Data collected using a retrospective chart review to evaluate accuracy, sensitivity, and specificity of the tools.

ED Sepsis Alert Screening Tools

SIRS, Sepsis, & Septic Shock Alerts for ED FirstNet MCA

SIRS Alert – To trigger the SIRS Recognition order, 2 of the following must occur:
- Temp < 36.0 oral (36.5 core) ***OR*** Temp > 38.0 oral (38.5 core)
- RR > 24
- SBP < 90 ***OR*** MAP < 65
- HR or ECG HR > 90

SEPSIS Alert – To trigger the Sepsis Recognition order, patient must meet the following:
1. Lactate > 2.1 + any SIRS Alert
2. WBC < 4 + any SIRS Alert
3. WBC >12 + any SIRS Alert

SEPTIC Shock Alert – To trigger the Septic Shock Recognition order, patient must meet the following:
1. Lactate > 3.9
2. Two consecutive SBP <90 between a range of 3-15 minutes apart
3. Two consecutive MBP <65 between a range of 3-15 minutes apart

A trigger results in a corresponding hospital order and placement of one of the following icons on the Firstnet tracking board:

1. SIRS Recognition for a SIRS Alert
2. Sepsis Recognition for a Sepsis Alert
3. Septic Shock Recognition for a Septic Shock Alert

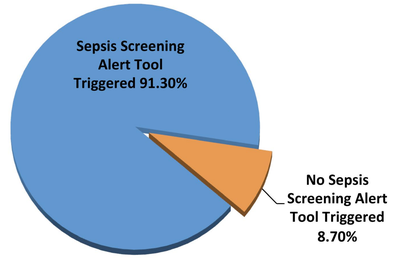
Firstnet Tracking Board Example:

Bed	Bed Sta	LOS	Name	Age	Alerts	Visit Reason	MD
ED W		95:18	*CERTPT, SIRSN*	94 y		TESTING FEVER, WEAK	

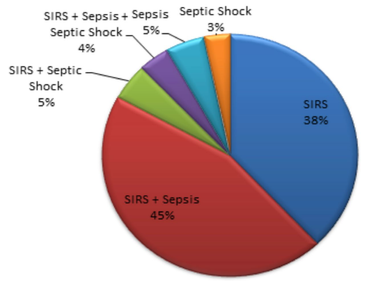
Evaluation

Patients Identified with an ED Sepsis Diagnosis

- 470 presented in the ED with Sepsis from June 1, 2014 – June 1, 2016
- 429 out of the 470 patients had a Sepsis Screening Alert Triggered (91.3%)



True Positive ED Patients with Sepsis Alert Screening Tool Triggered Breakdown (N=429)



Implications

- Sepsis is a life threatening diagnosis that can be missed.
- Use of the ED nurse-developed sepsis alert screening tools in the ED facilitates early identification of septic patients.
- ED Sepsis alerts are accurate and timely.

Evaluation

True Positive (TP) 429	False Positive (FP) 5210
False Negatives (FN) 41	True Negatives (TN) 56014

Accuracy: $\frac{TP+TN}{TP+TN+FP+FN}$ $\frac{56443}{61694}$ = 91.4%

Sensitivity: $\frac{TP}{TP+FN}$ $\frac{429}{429+41}$ = 91.2%

Specificity: $\frac{TN}{TN+FP}$ $\frac{56014}{56014+5210}$ = 91.4 %

Definitions:

True positive (TP) = septic patients with a triggered screening alert

False positive (FP) = non-septic patients with a triggered screening alert

True negative (TN) = non-septic patients with no screening alert

False negative (FN) = septic patients with no screening alert

Accuracy: Ability of test to differentiate septic from non-septic patients

Sensitivity: Fraction of septic patients who have a screening alert triggered

Specificity: Fraction of patients with no screening alert triggered who are not septic[1]

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