

Epic Best Practice Alerts Increases SEP1 Orderset Usage

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Introduction

Sepsis is a massive, system-wide inflammatory response to an infection that can lead to multisystem organ failure.¹ Sepsis has a very high mortality rate of 20-50% in patients with severe sepsis and is the 10th leading cause of death in the United States.² One of the most significant ways of reducing mortality from sepsis is timely detection and initiation of treatment in septic patients.³

Electronic medical records such as Epic have implemented sepsis warning algorithms and alerts to facilitate quicker detection of sepsis and thus earlier initiation of treatment. The goal of this study is to determine if an Epic Best Practice Alert (BPA) of 5 is correlated with an increased likelihood of clinician's using the sepsis order set in the EMR to assist in effective treatment of sepsis.

Aims and Objectives

1. Evaluate the accuracy of the Epic Sepsis Algorithm in identifying the onset of sepsis (T0).
2. Determine whether an Epic Best Practice Alert (BPA) is associated with activation of the sepsis order set by physicians, leading to more timely and appropriate treatment of sepsis.

Methods

This project is a retrospective, observational study of 2235 patients (ages 18 and older) who had a sepsis diagnosis code and the sepsis onset (time zero) was within 24 hours of arrival to the Corewell Health University Hospital emergency room between January 1 to December 31, 2023.

The time sepsis onset (T0) was based on CMS Severe Sepsis criteria and identified by using a proprietary Quire Sepsis Algorithm.

Statistical analysis was performed using Chi-square test for categorical variables, Wilcoxon rank sum test for continuous variables and multivariable regression for determining the association between variables and outcomes. The outcomes were activation of the sepsis order set in the EMR or compliance with SEP-1 guidelines.



Figure 1: Consort diagram of final cohort of patients further broken down into whether or not sepsis order set was used.

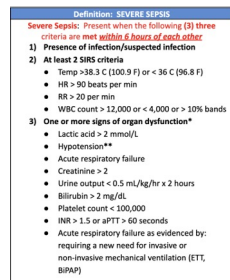


Figure 2: CMS clinical criteria for severe Sepsis and T0. Severe sepsis onset is defined by having: 1) Documentation of Infection, 2) Two or more SIRS, 3) One or more signs of organ dysfunction.

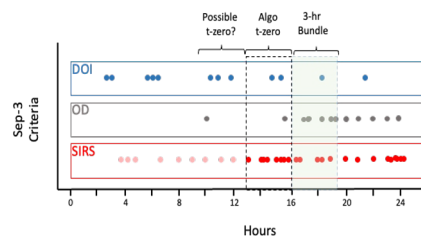
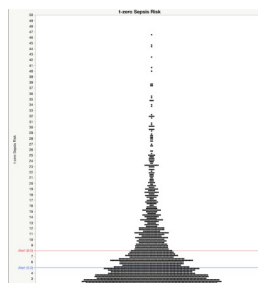


Figure 3: Example timeline for the Quire Sepsis Algorithm (QSA) detection of T0. Each dot represents specific data points for documentation of infection (DOI, blue), organ dysfunction (OD, grey), and systemic inflammatory response syndrome (SIRS, pink or red). Pink dots represent fulfillment of one SIRS criteria and red dots represent fulfillment of two SIRS criteria. T0 is defined when all three criteria are met within a 6 hour time window.

Results

Table 1: Summary table describing demographic and clinical characteristics of the patients, based on whether or not the sepsis order set was used.

Variable	Summary Table		
	All	No	Yes
Sample, n	2235	1162	1073
Age, median (IQR)	69 (57-78)	68 (56-68)	69 (58-79)
Female, n (%)	1033 (46.2)	471 (45.6)	483 (46.8)
Race, n (%)			
White/Caucasian	1464 (65.5)	774 (66.6)	690 (64.3)
Black/AA	587 (26.3)	297 (25.6)	290 (27.0)
Asian	50 (2.2)	21 (1.8)	29 (2.7)
Other	115 (5.1)	57 (4.9)	58 (5.4)
ND	19 (0.9)	13 (1.1)	6 (0.6)
Sepsis BPA>=5	1019 (45.6)	456 (39.2)	563 (52.5)
Parkinson's	35 (1.6)	10 (0.9)	25 (2.3)
Anemia	1725 (77.2)	860 (74.0)	865 (80.6)
Atrial Fibrillation	785 (35.1)	442 (38.0)	343 (32.0)
CKD	1037 (46.4)	557 (47.9)	480 (44.7)
Ischemic Heart disease	904 (40.4)	499 (42.9)	405 (37.7)
Mortality	625 (28.0)	380 (32.7)	245 (22.8)



- Among 2235 patients with Sepsis, 1216 (54.4%) were below BPA threshold of 5.
- Among 2235 patients with Sepsis, 1634 (73.1%) were below BPA threshold of 8.

Figure 4: Distribution of Epic Sepsis Scores at onset of sepsis (T0). Each dot represents a patient with confirmed sepsis plotted based on their sepsis risk score at T0. The blue line represents a BPA threshold of 5 while the red line represents a BPA threshold of 8.

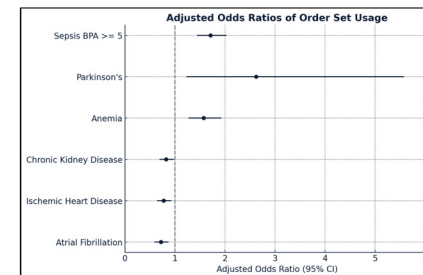


Figure 5: Forest plot showing adjusted odds ratios for order set usage. Regression model included age, race gender, and a variety of comorbid chronic conditions. OR >1 indicates a higher likelihood of order set usage.

Conclusions

- Although a score threshold of 5 for the sepsis BPA produced a large number of false negatives (54.4%), it was significantly associated with the likelihood of using the sepsis order set in the EMR. Using the order set has been shown to improve mortality outcomes in patients so there is value to implementing alerts for clinicians.
- Lowering the BPA threshold to reduce false negatives increases the false-positive rate. The question going forward will be how healthcare systems will balance the risks of false positives and negatives when alerts do lead to increased order set usage.
- Some chronic conditions (Parkinson's and Anemia) are associated with increased order set usage, while other with decreased order set usage. Further studies are needed to understand how these factors affect order set usage in practice.

References

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