

Assessing Disparities in SEP-1 Bundle Compliance at Corewell Health

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Introduction

Sepsis, a life-threatening condition resulting from a dysregulated immune response to infection, carries significant mortality. To improve sepsis management, the Centers for Medicare & Medicaid Services (CMS) introduced the SEP-1 bundle, outlining critical interventions within specified timelines. This study aimed to investigate disparities in SEP-1 bundle compliance, examining variations among septic patients based on sociodemographic factors like age, race, and area deprivation index (ADI), as well as clinical factors like chronic health conditions.

Aims and Objectives

1. Evaluate Disparities – Assess variations in SEP-1 bundle compliance based on sociodemographic factors such as age, race, and ADI.
2. Analyze Clinical Influences – Determine the association between chronic health conditions and SEP-1 compliance using multivariable logistic regression.
3. Identify Target Areas for Improvement – Highlight patient populations with lower compliance rates to inform targeted interventions in sepsis care.

Figure 1: SEP-1 Bundle Elements for Severe Sepsis

Definition: SEVERE SEPSIS
Severe Sepsis: Present when the following (3) three criteria are met within 6 hours of each other
1) Presence of infection/suspected infection
2) At least 2 SIRS criteria
• Temp >38.3 C (100.9 F) or < 36 C (96.8 F)
• HR > 90 beats per min
• RR > 20 per min
• WBC count > 12,000 or < 4,000 or > 10% bands
3) One or more signs of organ dysfunction*
• Lactic acid > 2 mmol/L
• Hypotension**
• Acute respiratory failure
• Creatinine > 2
• Urine output < 0.5 mL/kg/hr x 2 hours
• Bilirubin > 2 mg/dL
• Platelet count < 100,000
• INR > 1.5 or aPTT > 60 seconds
• Acute respiratory failure as evidenced by: requiring a new need for invasive or non-invasive mechanical ventilation (ETT, BiPAP)
Treatment Overview: 3 Hour Bundle
After identification of Severe Sepsis and/or Septic Shock, the patient is to receive ALL of the following:
Within 3 hours of presentation time
✓ Lactic acid: initial specimen collected
✓ Blood culture prior to antibiotics: specimen collected
✓ IV antibiotic(s) initiated: broad-spectrum according to suspected/identified source
✓ 30 mL/kg Crystalloid fluid bolus (0.9 NS or LR): if hypotension** present and/or initial lactic acid ≥ 4
Within 6 hours of presentation time
✓ Repeat lactic acid: if initial specimen is elevated > 2

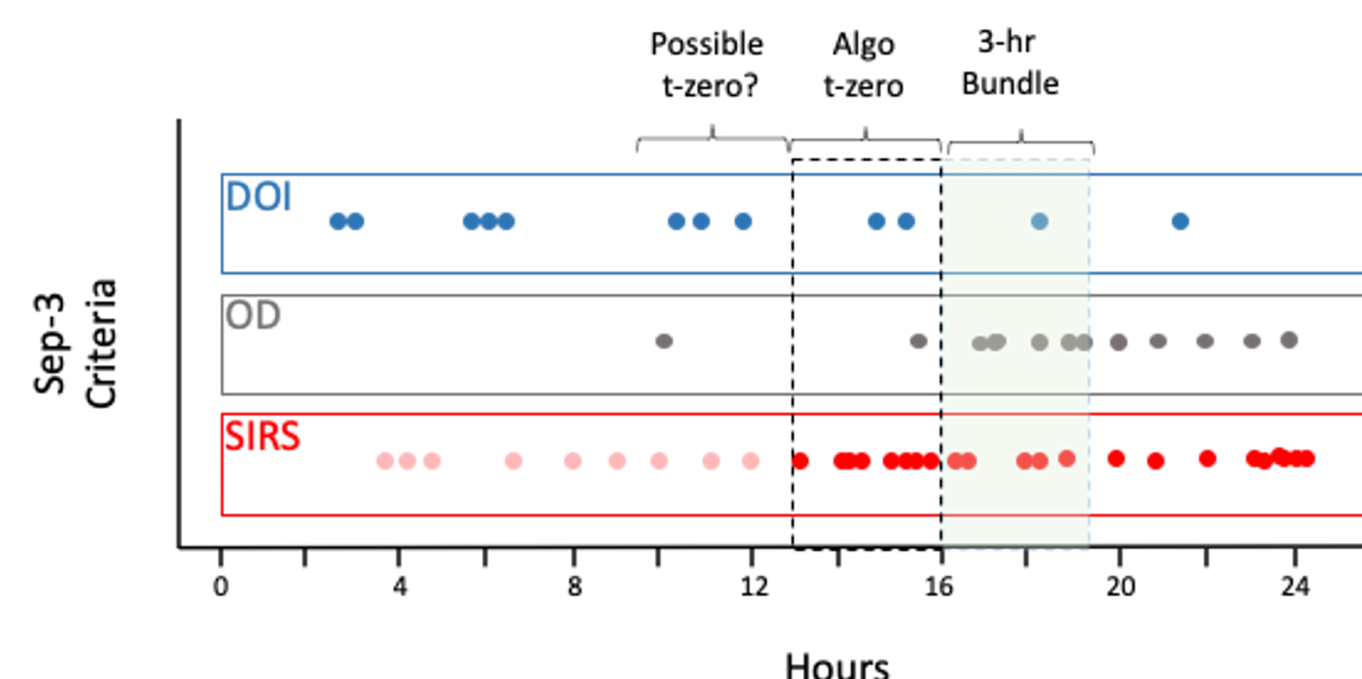
Legend: This figure outlines the diagnostic criteria of severe sepsis along with key components of the SEP-1 bundle within a three hour time window after onset.

Methods

This is a retrospective study of 2,235 adult sepsis patients treated at Corewell Health William Beaumont University Hospital emergency department between January 1, 2023 and December 31, 2023. Sepsis cases were identified using CMS criteria and the Quire Sepsis Algorithm.

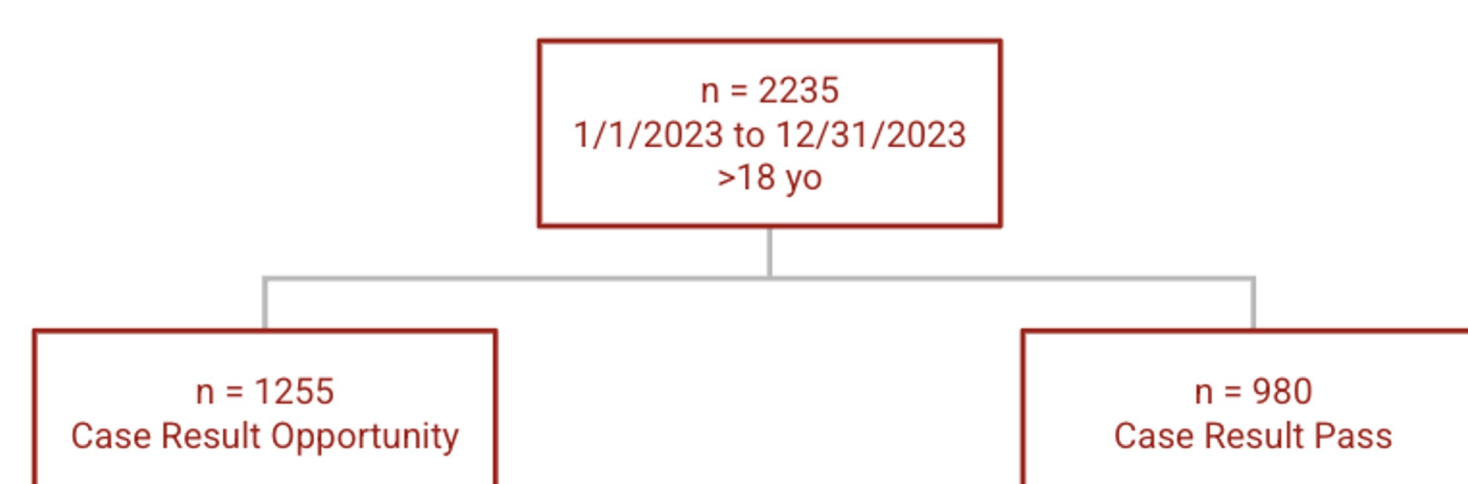
Multivariable logistic regression was used to determine the association between SEP-1 bundle compliance and patient characteristics, including age, race, gender, ADI, and 27 different pre-existing chronic conditions.

Figure 2: Timeline of SEP-1 Bundle Compliance and Sepsis Criteria Documentation



Legend: This figure illustrates the timeline of SEP-1 bundle compliance in relation to the documentation of sepsis criteria.

Figure 3: Consort Diagram for the Study



Legend: A total of 2,235 adult sepsis patients treated between January 1, 2023, and December 31, 2023, were included. Of these, 980 cases met SEP-1 compliance criteria, while 1,255 cases had at least one missed component of the SEP-1 bundle.

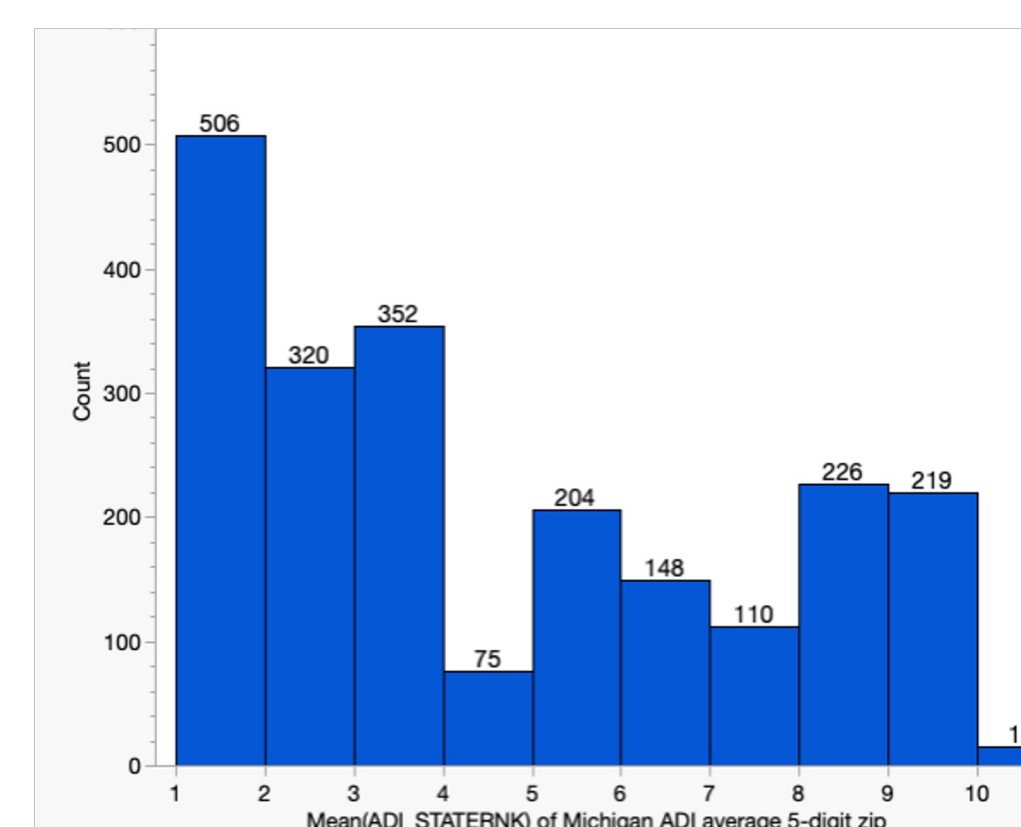
Table 1. Characteristics of Patients with Sepsis Case Result at Corewell Health Royal Oak Hospital			
Variable	All	Opportunity	Pass
Sample, n	2235	1073	980
Age, median (IQR)	69 (57-78)	68 (57-78)	69 (57.25-78)
Female, n (%)	1032 (46.17)	588 (46.85)	444 (45.31)
Race, n (%)			
Asian	50 (2.24)	26 (2.07)	24 (2.45)
Black/African Am.	587 (26.26)	317 (25.26)	270 (27.55)
ND	19 (0.85)	14 (1.12)	5 (0.51)
Other	115 (5.15)	63 (5.02)	52 (5.31)
White/Caucasian	1464 (65.50)	835 (66.53)	629 (64.18)
ADI Quintiles, n (%)			
1,2	465 (32.59)	241 (30.13)	224 (35.73)
3,4	278 (19.48)	163 (20.38)	115 (18.34)
5,6	271 (18.99)	158 (19.75)	113 (18.02)
7,8	239 (16.75)	140 (17.50)	99 (15.79)
9,10	174 (12.19)	98 (12.25)	76 (12.12)
30 d Mortality, n (%)			
No	1875 (83.89)	1019 (81.20)	856 (87.35)
Yes	360 (16.11)	236 (18.80)	124 (12.65)

Legend: This table provides an overview of the demographic and clinical features of the study population.

Results

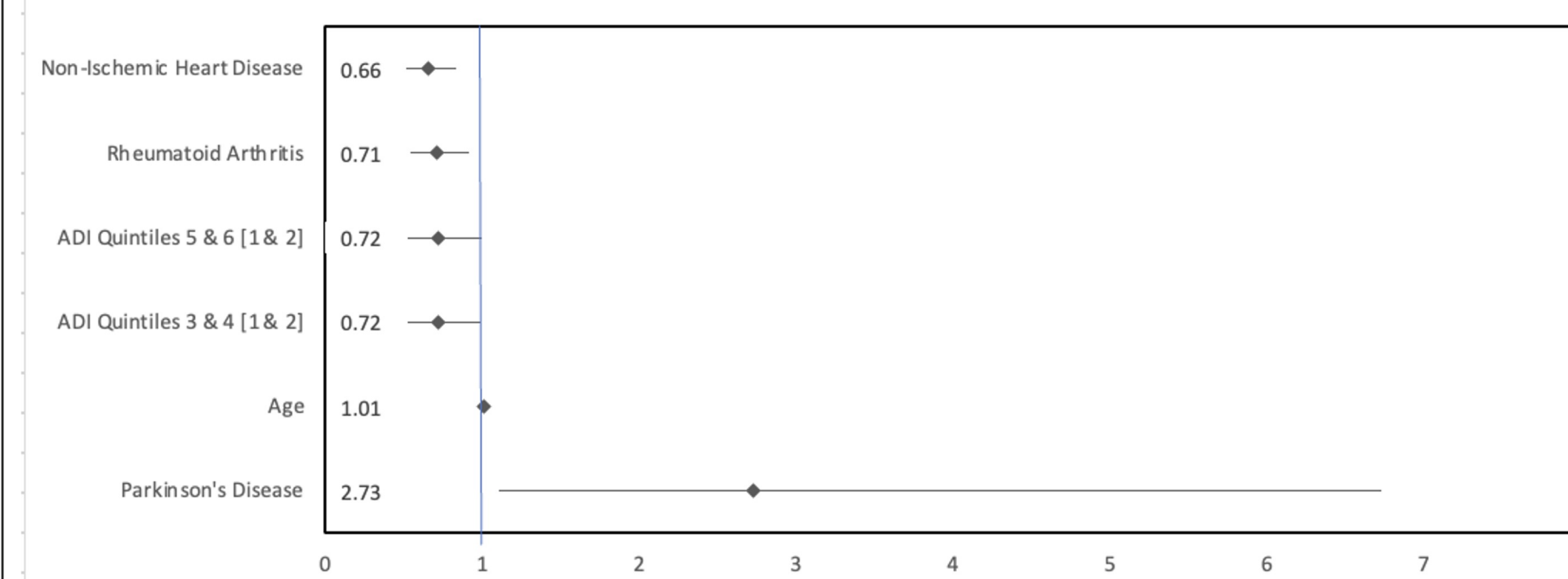
Using multivariable logistic regression, SEP-1 compliance was associated with age (aOR 1.01/year, 95% CI 1.00-1.02) and Parkinson's disease (aOR 2.73, 95% CI 1.11-6.72), but negatively associated with non-ischemic heart disease (aOR 0.66, 95% CI 0.52-0.83) and rheumatoid arthritis (aOR 0.71, 95% CI 0.55-0.90). While race and gender showed no significant associations, patients in affluent areas (ADI quintiles 1 & 2) were more likely to meet SEP-1 compliance (aOR 1.39, 95% CI 1.02-1.90).

Figure 4: Distribution of Patients by Area Deprivation Index (ADI) Decile



Legend: This figure displays the distribution of patients included in the study across Area Deprivation Index (ADI) Deciles. ADI Deciles range from 1 (most affluent) to 10 (most deprived), with lower numbers indicating less deprivation. The distribution of patients across ADI Deciles is uneven, with the highest concentration of septic patients residing in the most affluent regions (Decile 1).

Figure 5: Forest Plot of SEP-1 Compliance Predictors



Legend: Predictors with aOR < 1 indicate lower compliance, while aOR > 1 indicates higher likelihood of compliance. Non-ischemic heart disease (aOR 0.66) and rheumatoid arthritis (aOR 0.71) were associated with lower compliance, whereas age (aOR 1.01 per year) and Parkinson's disease (aOR 2.73) were associated with increased compliance. Patients from more affluent areas (ADI quintiles 1 & 2) had higher compliance compared to those in more deprived areas. Age and Parkinson's disease were positive predictors of SEP-1 compliance, while non-ischemic heart disease, rheumatoid arthritis, and higher ADI quintiles were associated with lower compliance.

Conclusions

- SEP-1 compliance is influenced by multiple factors
- Compliance was positively associated with age and Parkinson's disease
- Compliance was negatively associated with non-ischemic heart disease and rheumatoid arthritis
- No significant association was found between SEP-1 compliance and race or gender
- Patients from affluent areas were more likely to meet SEP-1 compliance
- Targeted interventions are needed for better sepsis care

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Acknowledgements

We are grateful for the support provided by Oakland University William Beaumont School of Medicine, Corewell Health Research Institute, and Quire Inc. (Memphis, TN).