Impact of Host Response Sepsis Test Implementation on Blood Culture and Antibiotic Utilization in the ED

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Background

Sepsis progresses rapidly and requires early diagnosis and timely, appropriate therapy to reduce morbidity and mortality.[1] Sepsis arises from a dysregulated host immune response to infection that causes life-threatening organ dysfunction,[2] and current guidelines stress rapid intervention.[3] In practice, Emergency Department (ED) clinicians must diagnose sepsis in undifferentiated patients before objective diagnostic or prognostic data are available, which can drive early broad-spectrum antibiotic use and blood culture orders even when risk is low. A novel FDA-cleared cellular Host-response Sepsis Diagnostic (HRSD) aims to close this gap.[4] In August 2023, Our Lady of the Lake Regional Medical Center (OLOLRMC) (Baton Rouge, Louisiana, USA) integrated the test (IntelliSep, Cytovale, San Francisco, CA, USA) into ED triage. This study evaluates whether this integration was associated with changes to antimicrobial stewardship targets, namely initiation of antibiotics, use of broad-spectrum antibiotics and blood cultures.

Methods

Setting and test: ED at OLOLRMC. We added the HRSD to triage workflow on 8/1/2023. One K2-EDTA whole-blood tube; ISI 0.1-10.0 in <10 min; Results delivered as Bands 1-3 (low→high) for adult ED patients with suspected infection.

Design: Retrospective pre-post observational study using EHR data from the ED encounter, comparing outcomes before and after HRSD implementation.

Cohort: *Pre*: Adults meeting local sepsis screen criteria presenting to the ED 5/30/2023-6/20/2023, HRSD tested but not reported. *Post*: Adults presenting to the ED 8/2/2023-6/5/2024 and 3/1/2025-5/31/2025 HRSD tested and reported, randomly sampled from within each collection period. *Exclusions*: Visits w/o medication or blood-culture data.

Protocol: Nurse-driven triage ordering (Fig. 1). Treatment pathways recommended based on HRSD result (Fig. 2).

Outcomes: *Primary*: Empiric broad-spectrum 3ab therapy (Fig 3) *Secondary*: 'Blood-culture use; routine site safety monitoring.

Analysis: Pre vs Post comparisons using descriptive/comparative statistics; absolute differences with CIs where available. Chi-square test used for hypothesis testing.

Fig. 1

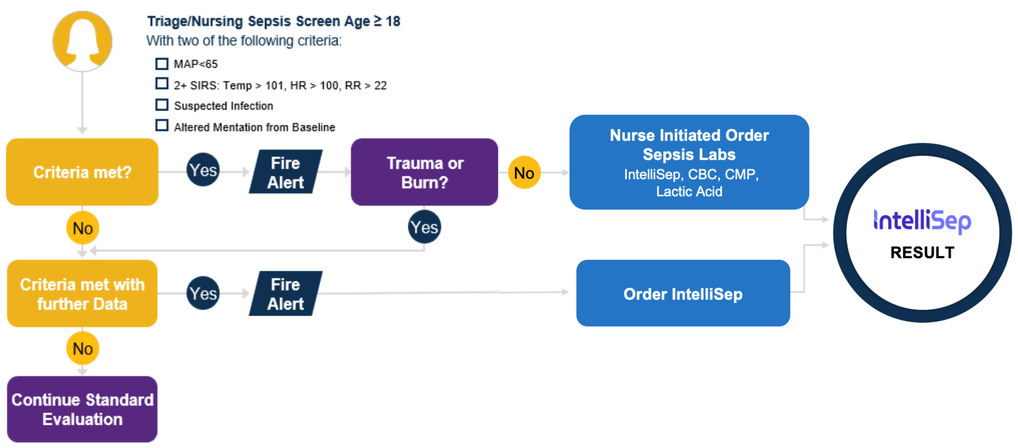

Fig. 2

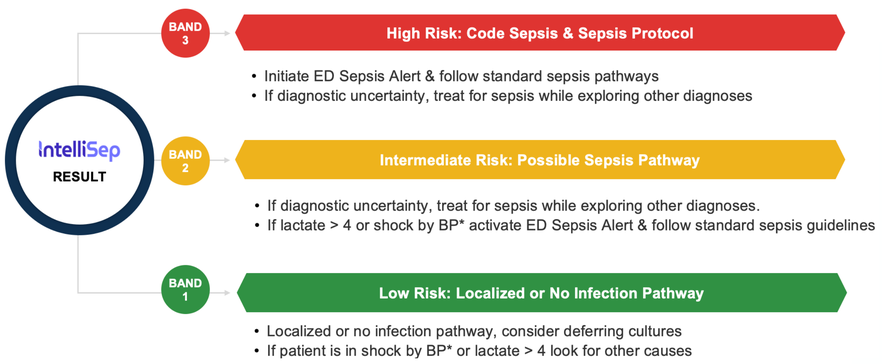

Fig. 3

Broad Spectrum 3ab Therapy defined as concurrent use of an anti-MRSA and anti-Pseudomonas antibiotics. Included antibiotics listed below

Anti-MRSA (a)
Vancomycin
Daptomycin
Linezolid
Anti-Pseudomonas (b)
Piperacillin/Tazobactam
Cefepime
Tobramycin
Gentamicin
Levofloxacin (IV or PO)
Ciprofloxacin (IV or PO)
Meropenem
Aztreonam

Results & Discussion

Cohorts and IntelliSep Bands:
- Pre: n=195; Post n=605.
- Pre: Band 1=78 (40%), Band 2=45 (23%), Band 3=72 (37%).
- Post: Band 1=316 (52%), Band 2=141 (23%), Band 3=149 (24%).

Antibiotic initiation: 22% Relative Reduction (RR) overall (82% Pre -> 64.0% Post, p< 0.001) (Fig. 3A).
- Band 1: 33% RR (67% -> 44%, p<0.01).
- Band 2: 24% RR (98% -> 74%, p<0.001).
- Band 3: 9% Relative Increase (RI) (89% -> 97%, p=ns).

Broad-spectrum regimens (3ab = anti-MRSA + anti-Pseudomonas): *Overall unchanged among those given antibiotics (Fig. 3B).*
- Band 1: 55% RR (62% -> 28%, p<0.001).
- Band 2: 12% RR (50% -> 44% p=ns).
- Band 3: 33% RI (55% -> 73%, p<0.05).

Blood cultures: 33% Relative Reduction (RR) overall (81% Pre -> 54% Post, p< 0.001) (Fig. 3C).
- Band 1: 60% RR (73% -> 29%, p< 0.001).
- Band 2: 26% RR (87% -> 64%, p<0.05).
- Band 3: 13% Relative Increase (RI) (85% -> 96%, p<0.05).

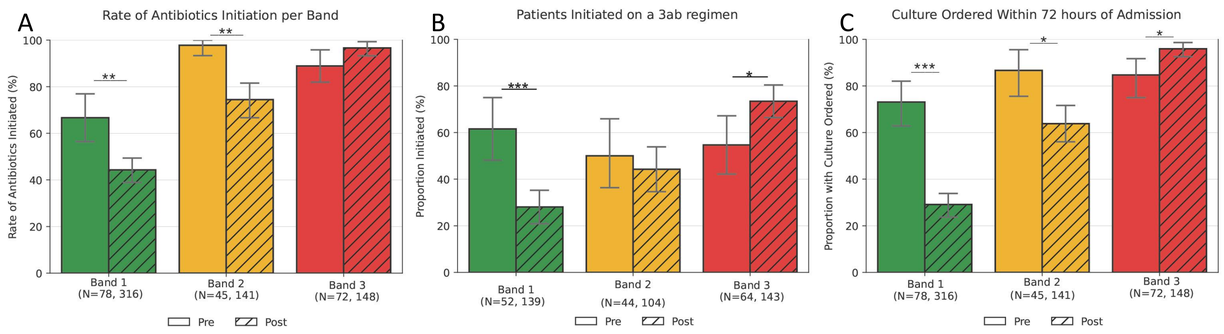

Fig. 3. (A) Rate of antibiotic initiation per band, (B) proportion of patients initiated on 3ab antibiotics, and (C) proportion of patients with blood cultures ordered within 72h of ED admission (*, **, and *** indicate p < 0.05, 0.01, 0.001 respectively).

Discussion

Implementation of a rapid host-response sepsis diagnostic shifted ED resource use toward risk-aligned care. Because the HRSD is available rapidly, clinicians can make early antibiotic and blood-culture decisions with measured risk, reducing use in lower-risk patients and maintaining or increasing use when sepsis risk is higher (see Fig. 3).

Broad-spectrum antibiotic initiation decreased overall, driven by a marked reduction in the larger cohort of Band 1 patients, despite increased use in Band 3 patients. Among treated patients, concurrent anti-MRSA plus anti-Pseudomonas therapy declined in Band 1 and increased in Band 3.

Blood culture ordering decreased significantly overall, led by Band 1, despite a small increase in Band 3 culture draws.

Study limitations include single site, retrospective pre-post design and short baseline period. In addition, differences in physician ordering in the pre vs post populations may lead to slight differences in acuity. Multicenter evaluation is warranted.

Conclusions

Integrating a host-response sepsis test into the ED workflow reduced antibiotic use and blood culture orders in patients less likely to have sepsis and increased their use in higher-risk patients. These findings suggest host-response diagnostics may guide more targeted, risk-aligned ED care.

Acknowledgements

We would like to thank the providers and nursing staff of the Our Lady of the Lake Regional Medical Center Emergency Department for their tireless efforts in adopting new process and technology to improve the care of our patients who present with signs or suspicion of infection. We also thank Jim Teague, the director of the Our Lady of the Lake Regional Medical Center clinical laboratory, and the clinical laboratory staff who have worked with us over the last several years to develop and implement this test. Finally, we thank the Our Lady of the Lake Regional Medical Center Quality and Safety team that works to ensure we are providing the best possible care to our patients.

References

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