Sepsis Squashing Squadron: Can Automated EHR Risk Scores combined with Clinical Teams Improve Sepsis Identification and Treatment in an Urban, Academic, Tertiary Care Hospital

Mark Liotta[1], MD, Alan Kubey[1], MD, Sara Groome[1], PharmD, Christopher Haines[1], MD, Lily Ackerman[1], MD, Kimberly Berenbaum[1], MSN, CRNP, Joy Burke[1], CRNP, Nisreen Jahshan[1], PA-C, James Lee[1], MD, Adam Ostrovsky[1], Chantel Venkataraman[1], MD, Alyssa Yeager[1], MD

[1]Thomas Jefferson University Hospital

Background

- Sepsis is the leading cause of death in hospitals in the United States with 1 in 3 deaths being from septic shock[1]
- Early recognition and administration of antibiotics are the best predictors of improved mortality[1]
- Sepsis response teams (SRT) is one method to improve sepsis identification, treatment compliance to guidelines, and reduce hospital mortality[2]
- After our hospital system implemented a "best-practice alert" based on Epic's proprietary "sepsis score" (SS) to improve ED and ICU sepsis care, our group focused on improving sepsis care for patients on the general floors
- After a multidisciplinary, multifaceted root-cause-analysis that identified multiple opportunities for improvement, the team piloted a "sepsis squashing squadron" (SSS) – a combination of SRT and automated scoring tools and summary displays in the EHR to improve efficiency, sensitivity, and specificity of workload

Methods

- Through morning chart review, a SSS team member screened hospital medicine patients on a single unit
- For patients with a likely and/or definitive infection and a SOFA score ≥ 2 and/or SIRS ≥2, adherence to Severe Sepsis/Septic Shock Early Management Bundle (SEP-1) components were assessed
- If additional interventions were clinically appropriate, the reviewer contacted the primary team, primary nurse, and charge nurse with specific recommendations and the offer of an additional SSS team member's support to complete tasks
- Automated scores available in Epic were also recorded for performance characterization: qSOFA, an institutional modification of the Modified Early Warning score (jMEWS), SS and Epic's proprietary "deterioration index" (DI)

Results

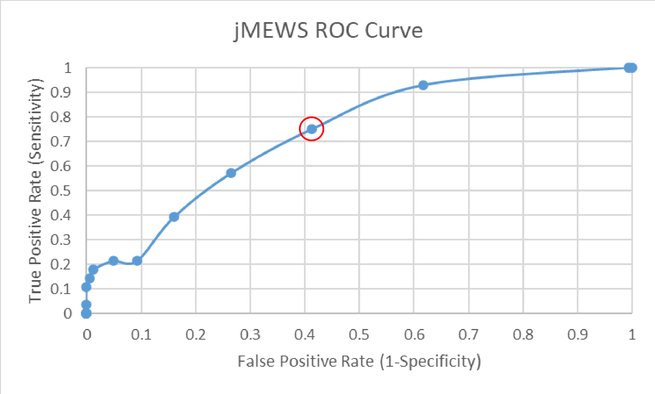

Figure 1: jMEWS Receiver Operating Characteristic Curve

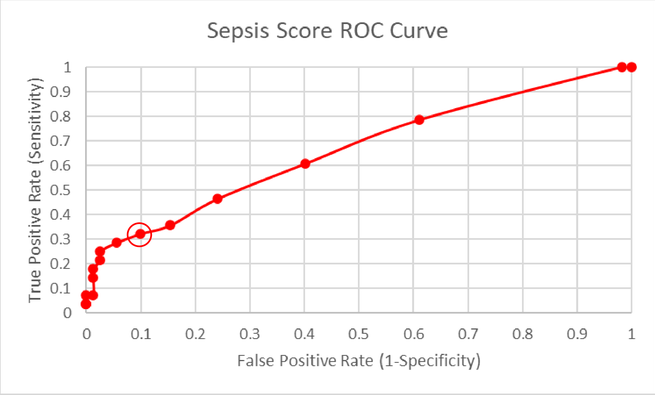

Figure 2: Sepsis Score Receiver Operating Characteristic Curve

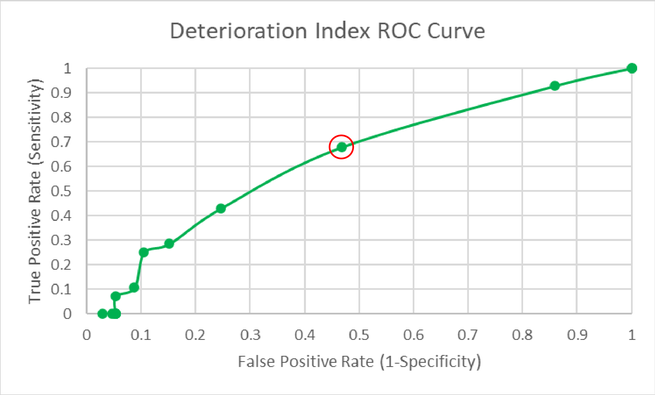

Figure 3: Deterioration Index Receiver Operating Characteristic Curve

- From 5/16/22-6/2/22, 190 patients were screened; 97 had a known or probable infection
- Three patients' care did not meet SEP-1 and a message was sent
- The average review time per patient was 2 minutes (range 1-19 minutes)
- Sepsis prevalence and SEP-1 adherence varied based on sepsis definition:
  - SOFA ≥ 2: 24% prevalence, 93% adherence
  - SIRS ≥ 2: 16% prevalence, 86% adherence
  - qSOFA ≥ 2: 5% prevalence, 100% adherence.
- When compared to SIRS-defined septic patients, automated Epic scores at optimal thresholds demonstrated (circled in red in corresponding figures):
  - jMEWS ≥ 2: 75% sensitivity, 59% specificity (Fig 1)
  - SS ≥ 6: 32% sensitivity, 90% specificity (Fig 2)
  - DI ≥ 30: 68% sensitivity, 53% specificity (Fig 3)
- A combined threshold of jMEWS ≥ 2 and DI ≥ 30 and/or SOFA ≥ 2 offers a sensitivity/specificity of >93%/>50% and might offer a more efficient pre-screen prior to manual review

Conclusion

- While SEP-1 adherence was high in this study, time to adherence was not measured so it is possible that speed to recognition and adherence improvement opportunity remains
- Single automated risk scores in Epic provided wanting performance but a combined threshold of scores married with a team focused on sepsis recognition and treatment may improve early sepsis recognition, treatment and downstream patient outcomes

References

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2. Bloos, Frank. "The Importance of a Hospital-Dedicated Sepsis Response Team." *Expert Review of Anti-Infective Therapy*, vol. 18, no. 12, 2020, pp. 1235–1243., https://doi.org/10.1080/14787210.2020.1794813.