Before-after implementation of the sniffer for the detection of failure to recognize and treat severe sepsis

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Background

In 2013, the US Agency for Healthcare Quality and Research ranked septicemia as the most expensive in-hospital condition in the US, based on 2011 data [1]. Despite increased understanding of this problem [2], previous sepsis detection and alert systems have failed to demonstrate improvement in clinically meaningful outcomes [3].

Objective

The objective of this study was to measure the impact of the automated, electronic sepsis sniffer on compliance with the 3-hour Surviving Sepsis Campaign (SSC) bundle elements.

Methods

We developed and validated a sniffer for the detection of failure to recognize and treat severe sepsis [4].

- Beginning January 14, 2015, the sepsis sniffer (suspicion of infection, Systemic Inflammatory Response Syndrome, and organ dysfunction components) was implemented in the medical ICU (MICU) at Mayo Clinic Rochester in AWARE—a patient-viewer and clinical decision support tool designed at Mayo Clinic to reduce risk of error and already in routine use in the MICU [5]—as well as in the Emergency Department (ED).

- Implementation occurred after focused provider training and presentations.

- Using METRIC Data Mart [6], a relational database and near-real time duplicate of the complete hospital EMR at Mayo Clinic, data on 3-hour SSC bundle element compliance for patients before implementation of the sepsis sniffer in the MICU (January through March 2013, N=98) was compared to MICU and ED data after implementation of the sepsis sniffer (January 14 through March 2015, N=60).

- As some ED visits result in no hospital admission or no admission to the MICU, these outcomes are not present for all patients in the "after" cohort.

- Average time to completion was calculated as: “Time of bundle element completion” minus “Time of sepsis detection”. Thus, negative results indicate compliance before detection.

Results

Overall percent completion of the 3-hour SSC bundle was increased after tool implementation. Overall average time to bundle completion was reduced for all 4 elements. Detailed results are in Figures 1 and 2.

Conclusion

Implementation of the sepsis sniffer improved overall 3-hour Surviving Sepsis Campaign (SSC) bundle compliance with respect to percent completion, as well as average time to completion for some elements.

Discussion

There are rate-limiting factors in interpretation of the percent completion of the 3-hour SSC bundle overall compliance. There was a clear improvement in percent completion of measurement of lactate levels and administration of antibiotics. However, a ceiling effect appears to be present in ability to obtain blood cultures. Interpretation of overall compliance as defined by average time to completion is also confounded by more than one factor. The rate-limiting factor here is administration of 30 mL/kg of fluids. Although average time to completion improved (with or without statistical significance), many of these interquartile ranges include negative values. This implies completion of the SSC bundle and/or its components prior to activation of the sepsis sniffer alert. In cases of improvement, it is unclear what impact the sepsis sniffer contributed to these improvements.

References


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http://www.mayo.edu/research/labs/clinicalinformatics_intensivecare