June 2nd Poster #4832

Impact of a novel automated clinical decision support solution on quality of care and outcomes by sepsis severity

East Jefferson General Hospital EJGH

John DePaula, MD, Infectious Disease Sepsis Champion, East Jefferson General Hospital
Courtney Merwin, BS, RRT, Quality Analyst, East Jefferson General Hospital
Raymond DeCorte, MD, Chief Medical Officer, East Jefferson General Hospital
Ya-Ting Chen, PhD, Executive Director, Healthcare Services & Solutions, Merck & Co., Inc.
Brandon Palermo, MD, MPH, Chief Medical Officer, ILÚM Health Solutions, Merck & Co., Inc.
Srinivasan Rajagopalan, PhD, Med Data Analytics, Inc.
Ami Mayo, MD, Chairman, Medical Department, medCPU
Jeanne Gorrondona, RN, BSN, Infection Control Supervisor, East Jefferson General Hospital
Donna Carbajal, RN, RRT, MBA, Senior Director of Quality, East Jefferson General Hospital

Contact Information
Brandon Palermo, MD
2000 Galloping Hill Road
Kenilworth, NJ 07033
brandon.palermo@merck.com

BACKGROUND

Sepsis is a major complication of infection that is associated with high mortality and healthcare utilization. To improve sepsis outcomes, international guidelines emphasize the importance of strategies and quality improvement initiatives that focus on: (1) early recognition of sepsis and severe sepsis and (2) adherence to evidence-based management bundles that include timely and optimal management with broad-spectrum antibiotics and intravenous fluids.

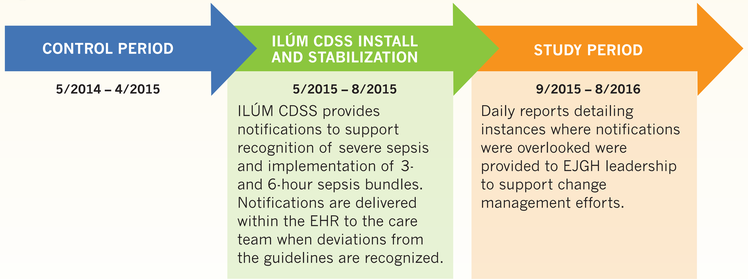
OBJECTIVE

This study assessed the impact of a novel automated clinical decision support solution (CDSS) on adherence to guideline-based sepsis care, mortality, and resource use in patients with sepsis, severe sepsis, and septic shock.

METHODS

The study was a quasi-experimental design at East Jefferson General Hospital (EJGH) (Figure 1). The CDSS provided notifications at the point of care to support early recognition of sepsis and severe sepsis and adherence to 3-hour and 6-hour bundles. Notifications were delivered within the electronic health record (EHR) to the care team when there were deviations from hospital guidelines.

Figure 1.

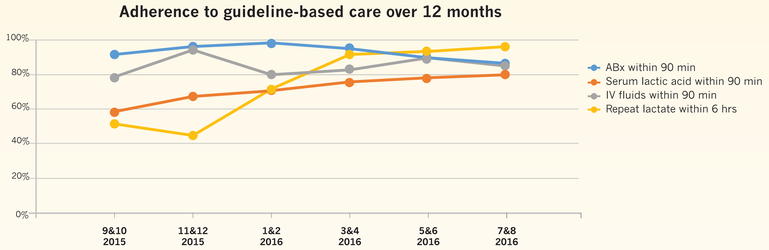


Data were obtained from EJGH's claims database using ICD-9 diagnostic codes for sepsis and classified into 3 subtypes: "sepsis, unspecified organism" (sepsis), "severe sepsis without septic shock" (severe sepsis), and "severe sepsis with septic shock" (septic shock).

RESULTS

Implementation of the CDSS resulted in consistently high adherence to guideline-based care, including antibiotic use, measurement of serum lactic acid, and administration of IV fluids in patients with hypotension or elevated serum lactic acid. Adherence to repeat lactic acid measurement performed within 6 hours of sepsis time zero was also high. By the end of the study period, the adherence to guideline-based care reached 80% or higher for all metrics measured (Figure 2).

Figure 2.



A total of 2815 patients with sepsis (N=2119), severe sepsis (N=207), and septic shock (N=489) were included in the study. There were similar gender and age distributions between study and control groups within each subtype of sepsis (Table 1).

Table 1.

Variable	All patients	Control group	Study group	*P* value
Sepsis, unspecified organism	**2119**	**995**	**1124**	
Gender, female n (%)	1180 (55.69%)	553 (55.58%)	627 (55.78%)	0.9302
Age, mean (SD), years	70.93 (16.96)	72.37 (16.37)	69.67 (17.38)	0.0003
Severe sepsis	**207**	**56**	**151**	
Gender, female n (%)	90 (43.48%)	22 (39.29%)	68 (45.03%)	0.5288
Age, mean (SD), years	70.69 (16.49)	70.50 (15.67)	70.75 (16.84)	0.7381
Septic shock	**489**	**217**	**272**	
Gender, female n (%)	218 (44.58%)	103 (47.47%)	115 (42.28%)	0.2723
Age, mean (SD), years	71.13 (14.36)	71.89 (14.65)	70.52 (14.13)	0.2569

The impact of the CDSS on clinical outcomes and resource use varied by type of sepsis (Figures 3 and 4). Mortality decreased by 65% (23% vs 8%; *P*=0.007) in severe sepsis post-CDSS implementation, but the reduction was not observed in sepsis or septic shock (Figure 3). ICU/CCU admission was reduced for sepsis (23% vs 19%; *P*=0.02) and severe sepsis (57% vs 46%; *P*=0.16) patients (Figure 4). Length of hospital stay was significantly reduced by 0.7 days in sepsis patients (*P*=0.001), but not in severe sepsis or septic shock patients.

Figure 3.

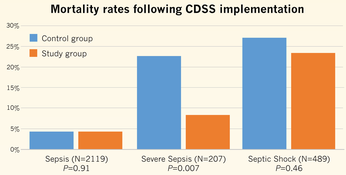
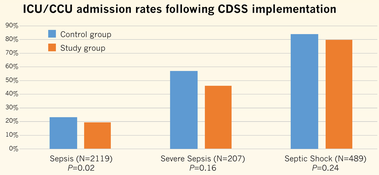


Figure 4.



DISCUSSION

Early recognition of sepsis and severe sepsis, and adherence to evidence-based management guidelines, may help avoid further deterioration in these patients and reduce risk for mortality and healthcare resource utilization. An automated CDSS for sepsis resulted in improved adherence to guideline-based care in all patients, regardless of sepsis type. A significant reduction in mortality was seen in patients with severe sepsis, and healthcare resource use, such as ICU/CCU admission and hospital length of stay, was reduced in patients with sepsis. That a reduction in length of stay in patients with severe sepsis was not seen could be due to the earlier recognition of more patients with severe sepsis and the application of more aggressive interventions that halted progression to shock and improved survival. Indeed, prior analyses demonstrated a reduced risk for progression to septic shock in this cohort.[1] Additionally, since these findings are based on billing data, the diagnoses of severe sepsis were likely underreported. In fact, the CDSS database identified many more severe sepsis patients (N=634) based on clinical information within the EHRs.

CONCLUSION

High adherence to guideline-based care was achieved with a novel automated CDSS in patients with all types of sepsis. In the period after implementation of a novel automated CDSS, a significant improvement in survival was observed in patients with severe sepsis and a reduction in resource utilization was seen in patients with sepsis. These observations warrant confirmation in a larger prospective study in different hospital settings.

Reference: 1. DePaula J, Merwin C, DeCorte R, et al. Sepsis care improvement through an automated decision support solution at East Jefferson General Hospital. Poster presented at: Institute for Healthcare Improvement 28th Annual National Forum on Quality Improvement in Health Care; December 4–7, 2016; Orlando, FL.

ilúm™ HEALTH SOLUTIONS
Powering Better Outcomes