Using Heuristic Evaluation to Improve Sepsis Alert Usability

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KEYWORDS

• Sepsis • Clinical decision support • Alerts • Early recognition • Usability
• Heuristic evaluation • Nursing informatics

KEY POINTS

- Sepsis alerts systems have been developed to help clinicians recognize and treat sepsis early to improve patient outcomes.
- Unfortunately, some alerts have poor usability and cause frustration that can compromise patient safety.
- Heuristic evaluation is a simple, easy to learn, and inexpensive systematic usability inspection method that can be used to identify problems in the usability of alert systems.
- Results from the heuristic evaluation can be delivered to the organization's health information technology and informatics leaders, as well as vendors, to improve the sepsis alert systems.

INTRODUCTION

Sepsis is an alarmingly common and life-threatening organ dysfunction caused by a dysregulated host response to infection.[1] Recent worldwide hospital mortality rates were 17% for sepsis and 26% for severe sepsis, with even higher rates in the United States.[2] It is the most expensive reason for hospital care,[3] with US hospitals spending

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over $ 55.6 million on sepsis care every day, and over $20 billion annually.[4] This problem is especially dire in intensive care units (ICUs), which care for the sickest patients in the hospital, where sepsis is the leading cause of death of critically ill patients cared for in non-coronary care ICUs.[5]

Early recognition of patients with sepsis is key to morbidity reduction,[6–9] reduced length of stay (LOS), cost per ICU stay,[10] and preventing sepsis mortality.[6,11–13] To improve sepsis care and outcomes, evidence-based guidelines have been widely disseminated.[14] The Society of Critical Care Medicine's Surviving Sepsis Campaign in particular has made great strides in improving awareness of sepsis, improving diagnosis, and developing guidelines.[15] They have also developed treatment bundles for both 3 hours and 6 hours from time of sepsis presentation (the earliest chart annotation with all elements of severe sepsis or septic shock ascertained through chart review)[16] to simplify the complexity of sepsis treatment. Despite these advances, the bundles do not eliminate complexity. The bundles require memory aides (such as printed badges) for the multiple steps and do not aide in early recognition. For these and other reasons, including epidemiologic causes such as increasing gram-positive organisms,[17] sepsis continues to be a major public health problem.

Clinical decision support (CDS) may overcome weaknesses in paper-based sepsis guidelines. CDS has been defined as "providing clinicians (nurses) with computer-generated clinical knowledge and patient related information which is intelligently filtered and presented at appropriate times to enhance patient care."[18] One factor of CDS includes clinical alarm systems that are intended to enhance safety by alerting clinicians to deviations from a predetermined normal status or potential patient problems.[18] Used within the electronic health record (EHR), CDS targeting clinician providers who direct care (eg, physicians and advanced practitioners) has been associated with improved process of care, reduced risk of morbidity, fewer medical errors, and increased compliance with standards of care.[19,20] More recently CDS has also been shown to improve patient outcomes when targeting decision making of bedside nurses.[21]

To better help both providers and bedside care nurses recognize sepsis as early as possible, several sepsis alerts systems have been developed. These sepsis CDS alerts reduce the need for external memory aides, streamline treatment ordering, and provide prompts for essential documentation. Designs of these alerts vary by: vendor, alert threshold trigger, and response required from providers to the alerts.[22,23]

The trigger thresholds for the alert system in this study are similar to the other sepsis alert systems identified in the literature. All are triggered by systemic inflammatory response syndrome (SIRS) criteria and at least one of organ dysfunction criteria. The alert system in this study used a higher heart rate trigger (>110 beats/minute, vs others that used >100 beats/minute). Although the published SIRS criteria is >90 beats/minute, the trigger was raised to decrease false-positive alert. Kurczewski and colleagues (2015) have the only other sepsis alert system the authors identified in the published literature.

In the alert reviewed in this study, registered nurses and medical doctors are required to respond to the alert that pops up in their patient's profile when they log in into the electronic health record by clicking the "OK" button. In contrast, Kurczewski and colleagues'[24] system provides a role-specific alert and response for each provider including care assistant, registered nurse, medical doctor, physician assistant, and nurse practitioner. For example, a care assistant can respond, "Will contact RN" or "RN Notified," while a medical doctor/physician assistant/nurse practitioner should select "Already Treating" or "Will Assess." Results after sepsis alert implementation are promising in Kurczewski and other studies, with statistically significant improvements in improved escalation of antibiotics and oxygen therapy[25] and reduced time to initial antibiotics and fluid resuscitation[25,26] and any sepsis-related intervention.[24]