Effect of the mEWS Alert System on Sepsis Treatment
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Abstract
Sepsis is a suspected infection accompanied by a systemic inflammatory response. A systemic inflammatory response includes at least two of the following: an elevated heart rate, elevated temperature, elevated respiratory rate, or change in blood leukocyte count. Severe sepsis, in addition to the sepsis criteria, also includes organ failure. Septic shock is sepsis with hypotension that is not responsive to IV fluid resuscitation. The Surviving Sepsis Guidelines state that sepsis needs to be treated within three hours with a bundle of interventions: blood cultures, then broad spectrum antibiotics, serum lactic acid, and 30 ml/kg of IV fluids if appropriate.

Sepsis, severe sepsis, and septic shock are the primary cause of death from infection and is the third leading cause of death in the United States. It is also the most expensive in-hospital condition in the United States. Early detection and timely treatment is vital to reducing patient mortality rates, the length of patient stay, and in-hospital costs.

Methods
Two sets of sepsis data were analyzed by manual chart review. The control (pre-) group was 200 patients admitted to the University of Utah between July and December 2014; and the post-intervention group was admitted to the University between March and April 2016. Patients with a mEWS score greater than 5 in the University Hospital and greater than 4 in the Huntsman Cancer Institute were taken into account.

Chart review analysis included the following:
• Admission date and time
• mEWS time (prior to mEWS Alert System)
• mEWS retrospectively applied to pre-group
• mEWS score (after mEWS Alert System)
• Time to antibiotics from SIRS and mEWS, respectively

Mortality rates
• Other information, including labs taken, lab results, and age were also recorded but not considered in this study.

The mean and standard deviation for the length of stay and time to antibiotics were found for both prior and post mEWS Alert System data groups. The number of deaths was also found. Groups were compared using a student’s t-test for significance.

Results
The average time from SIRS to antibiotics dropped from 7.3 hours to 3.2 hours from the time of mEWS with the implementation of the alert system and system wide education (p-value = 0.03). Applying mEWS to antibiotics to the pre-implementation group did not show a significant difference, though the standard deviation is more narrow. The mortality rate changed from 7.8% to 8.7% (p>0.05). While there was an increase in the mortality rate, there is insufficient data to determine if the implementation of the mEWS Alert System was the cause of this increase. Additional data collection, analysis, and time is needed to determine the effects of the mEWS Alert System. Analysis based on unit would also provide insight into mortality rates. Length of stay of inpatients was not significantly different between the groups.

Discussion
The p-value associated with the time to antibiotics (0.034) suggests that the mEWS alert system and system wide sepsis education are associated with an improvement in this key component of sepsis therapy. While there is no significant difference in length of stay or mortality, it may be that the number of patients considered in this study is not large enough to detect a difference.

Additional data collection, analysis, and time is needed to determine the effects of the mEWS Alert System. Analysis based on unit would also provide insight into mortality rates.

References
1. The Value of Modified Early Warning Score (MEWS) in Surgical In-Patients: A Prospective Observational Study, Annals of The Royal College of Surgeons of England
3. The effect of age on the development and outcome of adult sepsis, Critical Care Medicine

Introduction
University of Utah Healthcare uses the modified Early Warning Score (mEWS) to determine the severity of a patient’s current condition. The mEWS score assigns an increasing number of points for each vital sign abnormality based on its severity (Table 1). In the Utah mEWS, the vital signs used include temperature, respiratory rate, pulse, and systolic blood pressure.

In the acute care units at the University of Utah, the mEWS Alert System alerts the charge nurse via page from Epic if a mEWS score is greater than 4 at HCH and 5 at the U. If the mEWS score is greater than 7 at HCH or 8 at the U, Epic pages the unit charge nurse and the hospital Rapid Response Team. On both tiers, the charge nurse then notifies the primary team, and the bedside nurse obtains blood cultures, a urine sample and a serum lactic acid on the patient. Providers are asked to see a patient within 30 minutes. This system has been used since October 2015; with a graduated roll out across the health system (Figure 1).

We hypothesized that the mEWS Alert System has not changed sepsis treatment in the University of Utah Hospital acute care units.

Table 1. Utah modified Early Warning Score (mEWS)

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<th>Pre-B</th>
<th>Post-A</th>
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Figure 1. Timeline of mEWS rollout across University & Huntsman Cancer Hospitals

Figure 2. Effect of mEWS on Time to Antibiotics

Figure 3. Effect of mEWS on Length of Stay