Impact of eLink Virtual Surveillance on Sepsis Outcomes

Alva, R., Cassidy, B., Evans, B., Feinstein, D., Moore, A., Nanavati, A., Paula, E., Schmidt, M., Smith, P., Wyatt, T., Thomas, J.
Cone Health

Introduction

Sepsis is the leading cause of death in U.S. hospitals(1). Mortality rises as much as 8% for every hour treatment is delayed with up to 80% of sepsis deaths being preventable with timely treatment (2). Timely treatment is a challenge in a busy emergency department.

In 2016, sepsis bundle compliance was low and in need of quality improvement (Figure 1). In an effort to identify how to improve compliance to the 3 and 6 hour sepsis bundles for Code Sepsis patients using A3 thinking and LEAN principles, the multidisciplinary sepsis team started routine GEMBA walks to fine actionable process improvements. Our team found adherence to the bundle was hindered by time management for the bundle measures.

Our multidisciplinary team included physician sepsis champions, sepsis coordinator, quality nurses for the system and virtual surveillance leaders and nurses.

Measurement & Outcomes

**Methods:** We used a case-control study design where cases (n=2,572) were identified as patients arriving to the emergency department and code sepsis + eLink was initiated versus controls (n=1,453) where code sepsis was called but eLink was not engaged.

Unadjusted analyses were performed using t-tests for continuous variables and Chi-square for binary and categorical variables.

Adjusted analyses were performed using Poisson models with Huber-White robust standard errors were used analyses for mortality, readmissions and shock outcomes. An Ordinary Least Squares (OLS) model was used for the cost of care continuous outcome with a logged cost outcome per case.

All models adjusted for: payer, prior IP/ED visits, LOS, days since last ED visit, observation bed, age, gender, race, comorbidities, time to antibiotic, class of antibiotic given, time to fluid delivery and acuity score at admission.

Results: Figure 2 shows unadjusted analyses where bundle compliance improvement is clearly shown in cases vs. controls. We also saw a statistically significant difference in mortality between cases and controls when septic shock was present (33.8% vs. 46.3%). Selected unadjusted results are shown in Table 1.

Discussion

Patient outcomes are better when eLink surveillance is used in sepsis cases arriving to our emergency departments. Bundle compliance did improve in abstracted cases (not shown) with eLink engagement. However, the important endpoints are patient outcomes and cost of care. We have demonstrated that eLink surveillance of bundle compliance is associated with reduced mortality, 30-day readmissions and progression to septic shock.

Prevention from sepsis to septic shock is a huge opportunity in terms of mortality, readmission and cost of care reductions. Timely care as suggested in the SEP-1 bundles can prevent progression to shock. Shock cases have longer ICU stays, higher rates of mortality and readmissions. Cost of care is significantly greater for shock.

The return on investment when using eLink to monitor care was most impactful in prevention of shock. By averting 40 cases over 2.5 years, the ROI was significant (126%).

Telemedicine is growing in healthcare. Using eLink to remind providers to complete timely care is only one potential area where this resource has proven cost-effective. Cone Health plans to evaluate eLink monitoring across other processes as this technology grows and proves its utility as we continue the journey of continuous improvement.

**Table 1: Adjusted Analyses Results**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Incident Risk Ratio (95% CI)*</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inpatient Mortality</td>
<td>0.755 (0.683-0.835)</td>
<td>There was an associated 24.5% reduction in mortality if eLink was engaged.</td>
</tr>
<tr>
<td>30-Day Readmission</td>
<td>0.764 (0.628-0.932)</td>
<td>There was an associated 23.6% reduction in 30-day readmission rates when eLink was engaged.</td>
</tr>
<tr>
<td>Progression to septic shock</td>
<td>0.890 (0.810-0.980)</td>
<td>There was an associated 10.9% reduction in progression from sepsis to arrival to septic shock when eLink was engaged.</td>
</tr>
<tr>
<td>Total cost of care</td>
<td>*</td>
<td>There was no statistically significant difference in the cost of care when eLink was engaged compared to cases without eLink engagement. However, the ROI calculated when 40 cases of shock were averted was 126% over 2.51 years. This is 38.6% annualized return when using eLink to monitor timely sepsis care.</td>
</tr>
</tbody>
</table>

**Resources**


**Contact Info**

Pamela.smith@conehealth.com

Acknowledgements

Thank you to the sepsis team, ED staff, and eLink nursing for the outstanding care provided to our patients.