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Research & Policy Brief

Improving Access to High Quality Sepsis Care in a South Dakota Emergency Telemedicine Network

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Introduction and Background

In 2013, sepsis was responsible for nearly 400,000 emergency department (ED) visits in the United States and nearly 1 in 5 hospital deaths, at a cost of $24 billion dollars annually.[1,2] Aggressive early care is associated with improved survival,[3] yet adherence with international guidelines remains low.[4] Sepsis patients in low-volume hospitals have worse outcomes than patients treated at high-volume hospitals, [5] and inter-hospital transfer to high-volume centers does not ameliorate this disparity.[6] Much of this mortality gap has been associated with low ED volume,[7] and outcome differences have also been partially attributed to poor adherence with sepsis care guidelines in low-volume hospitals.[8]

Key Findings

- Telemedicine consultation for emergency department (ED) sepsis care is rare, but a dedicated utilization initiative modestly increased use.
- A multi-pronged approach of nurse-directed screening, recommended consultation criteria, and real-time hub decision-support were implemented in a large rural ED-based telemedicine network.
- Appropriately balancing the sensitivity of telemedicine consultation recommendations is critical to limit alarm fatigue and identify patients most likely to benefit.

Many strategies have been proposed to improve sepsis care and outcomes. Multiple reports have shown that implementation of a local sepsis quality improvement program using care protocols improves patient outcomes.[9] Regional quality improvement initiatives, like the STOP (Strengthening Treatment and Outcomes for Patients) Sepsis Collaborative[10] and the Kansas Sepsis Project[11], have shown that standardizing care across health systems also improves outcomes. These programs seem to reduce unnecessary practice variability and improve overall performance by standardizing care through screening, education, and order sets.

This study will seek to explore whether the use of real-time access to sepsis experts as part of an ED-based telemedicine network can decrease overall variation in care and improve clinical outcomes. Although no studies have yet evaluated how telemedicine consultation influences sepsis care or outcomes, changes in sepsis interventions could be implemented quickly through the network, potentially decreasing the time from innovation to application. Telemedicine could also promote adherence by providing a "monitor" to track guideline adherence and provide real-time prompts to bedside clinicians who might otherwise be occupied with competing demands.

Purpose

Avera Health, a regional health system based in Sioux Falls, South Dakota, implemented a pilot program to increase utilization of telemedicine for ED patients with sepsis in critical access hospitals that participate in Avera's eCARE telemedicine network. Avera Health serves as the hub of a 140-hospital ED-based network spanning 12 states. Increasing telemedicine utilization drove the goal of improving sepsis care within the participating health system. A

secondary objective was to measure the effect of telemedicine consultation on sepsis care quality and clinical outcomes.

The Avera eCARE Emergency network connects a board-certified emergency physician and ED nurse with local ED providers using a real-time, high-definition video connection available 24 hours a day. This subscription-based service is available for any ED patients. Early focus areas included trauma, cardiac, and stroke care, with few of these consultations requested in patients with sepsis.[12]

Implementation Plan

The ED telemedicine initiative for sepsis was implemented in tandem with ongoing system-wide process improvement in treating sepsis. The initiative was built on six pillars: (1) an Advisory Committee of experts in sepsis care and implementation science to design clinical tools, (2) robust, nurse-directed, system-wide sepsis screening, (3) sepsis-specific telemedicine consultation triggers, (4) standard care recommendations incorporated in the telemedicine hub clinical decision support, (5) an education plan for hub and spoke clinical staff on screening and consultation recommendations, and (6) screening transfer calls for sepsis telemedicine utilization. Ongoing evaluation of the program success was conducted by reviewing monthly consultations for sepsis care. The implementation roll-out was initiated on February 1, 2017.

Advisory Committee – To support the development of clinical guidance, we assembled a group of sepsis clinicians and implementation science experts to develop the algorithms used in the program. This group consisted of 3 clinical sepsis experts from 3 medical centers, the Director of the Kansas Sepsis Project (who provided resources implemented in another rural implementation science program), an expert in the SEP-1 measure[13] (defined by the Centers for Medicare & Medicaid Services), and the medical director of the telemedicine hub program. This group reviewed data, explored similar implementation projects in other settings, and made recommendations to align the sepsis telemedicine program with other work being done contemporaneously within the health system.

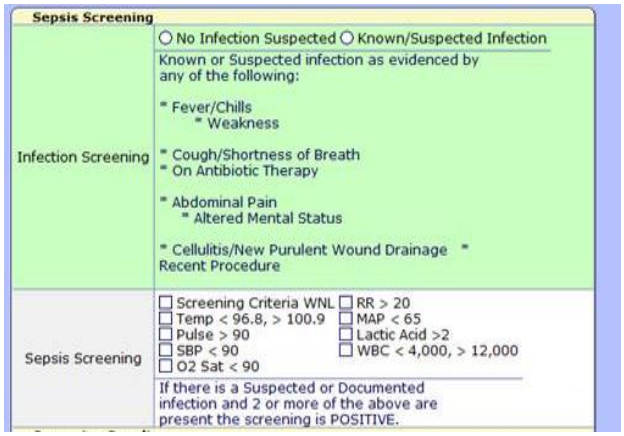

Figure 1. Standardized nurse screening for sepsis for all patients during ED triage (prior to telemedicine activation).

Nurse-Directed, System-Wide Sepsis Screening – To standardize early identification, a nurse-directed screening protocol developed at Avera was used in ED triage in all participating rural hospitals. This protocol was based on existing *Surviving Sepsis Campaign* guidelines and was already in place (Figure 1), but it was bolstered for the purposes of this program with a goal of 100 percent screening. The goal of the protocol is to identify patients who have evidence of infection, which then triggers a sepsis work-up.

Sepsis-Specific Consultation Triggers – In addition to nurse-directed screening, the Advisory Committee wanted to identify a set of criteria that would trigger a request for telemedicine consultation. These criteria were intended to identify patients who were at risk for poor clinical outcomes, while minimizing over-triage and alarm fatigue.

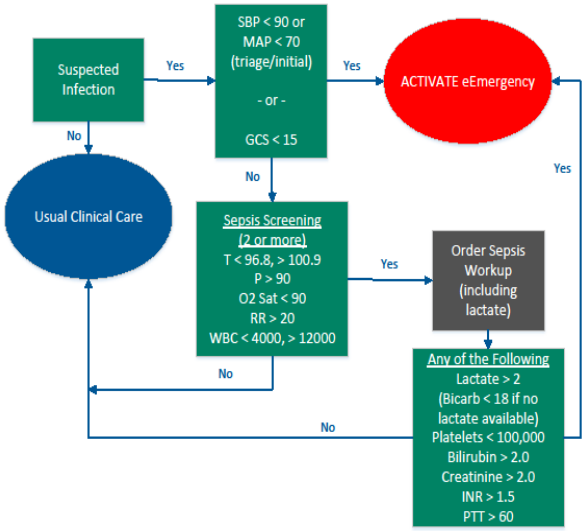

Figure 2. Sepsis Telemedicine Activation Criteria. This flow sheet clarifies the patients for which telemedicine consultation was recommended.

In the first iteration of the consultation trigger, all patients with a nurse-directed screen that suggested sepsis were flagged for consultation. This potential over-triage contributed to alarm fatigue, so revised criteria required evidence of more severe illness prior to consultation (Figure 2).

We also learned that a number of rural hospitals in the primary cohort (28 percent) did not have serum lactate measurement capabilities, which is one of the diagnostic tests used to diagnose sepsis.[13] This was an early criterion for telemedicine consultation, but based on this realization, we added an additional criterion for consultation using serum bicarbonate. While this measurement has only modest concordance with lactate measurement,[14] this surrogate parameter was consistent with guidance used by the Kansas Sepsis Project, a similar initiative aimed at reducing mortality for rural sepsis patients.[11]

Standard Care Recommendations – Standardizing care is a complex process that involves changing expectations and providing patient-specific decision support at the time care is delivered. The telemedicine hub uses computerized decision support software while consultations are in process. This software not only allows for data collection, but also provides hospital information and patient-specific decision support. This software incorporated recommendations from the Surviving Sepsis Campaign guidelines to guide clinicians through the elements of the 3-hour and 6-hour bundles (including fields for recording completion times for each of the elements). This real-time checklist aided hub staff in guiding local clinicians through elements of guideline-adherent sepsis resuscitation.

Education and Roll-out Program – Once screening and treatment algorithms were refined, a four-pronged approach to education was initiated. That approach included (1) an announcement to rural facilities about the sepsis project, (2) continuing education by physician champions who specialize in sepsis care, (3) reminders during the daily camera checks (i.e., discussions that happen daily between the hub and each rural hospital), and (4) presentations about the program at institutional leadership meetings (medical, nursing, and leadership).

Screening Transfer Calls – Patients can be transferred between hospitals within the health system either (1) by using the telemedicine link or (2) by calling a separate Transfer Center. Initially, we expected that some cases would come directly through the Transfer Center and that qualifying patients could be identified for conversion to telemedicine consultation. In reality, few patients were identified through this screening and finding these patients was logistically challenging, so identification through this mechanism was discontinued.

Utilization

During the implementation phase, the number of sepsis-related consultations was tracked monthly. Monthly conference calls with the Advisory Committee were used to identify opportunities for increasing consultation. After a period of initial enthusiasm, consultation rates fell, but remained above the baseline consultation rate (Figure 3). Overall, the implementation project increased sepsis consultation rates by 64 percent.

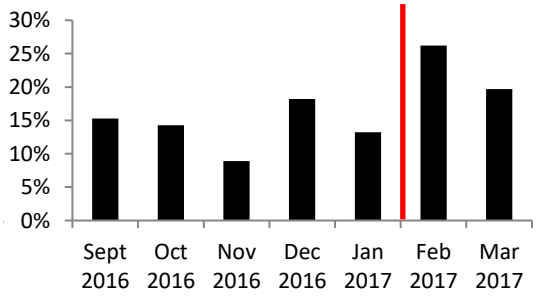

Figure 3. Telemedicine utilization for patients with positive sepsis screen. The protocol was implemented February 1, 2017.

Discussion

Rural sepsis care continues to be challenging, and optimizing therapy across distributed networks has been difficult. Some of this difficulty invariably comes from the infrequency with which sepsis patients are treated in low-volume EDs, rural staff having the training and experience to recognize a challenging diagnosis, and staff turnover. Telemedicine offers a promising alternative to standardize care while continuing to provide high-quality just-in-time sepsis education at the point of care. Our report illustrates the importance of system-wide implementation efforts to standardize sepsis quality improvement activities. It also highlights the importance of objectively defining consultation criteria, which can be applied to other diseases as well. Sepsis treatment via telemedicine continues to suffer from alarm fatigue: defining overly sensitive criteria risks alienating clinicians who see little value in telemedicine involvement for patients at low risk of sepsis, but overly specific criteria risks missing

qualifying patients. Defining patient groups most likely to benefit from telemedicine involvement is critical to improving outcomes.

Our study also showed that despite aggressive criteria, marketing, education, and follow-up, the consultation rate remained relatively low. This low rate could be related to several factors. The project teams suspected that many clinicians felt comfortable managing patients with severe infection, and felt that telemedicine consultation would add little value (compared with cardiac arrest and trauma care). Second, many patients in the network with severe sepsis (on chart review) were not diagnosed with severe sepsis, so the low consultation rate could be related to delayed recognition.

Another relevant finding in our project was the low availability of sepsis screening laboratory tests in rural hospitals. Serum lactate measurement was available in only 72 percent of rural critical access hospitals in Avera's primary service area. This finding is important because it affects how patients with infection are risk stratified. This rural hospital limitation is not specific to telemedicine consultation – this is a recognized problem with rural hospital capabilities generally and is an opportunity for improvement in rural sepsis care.

Future work will focus on measuring the effect of telemedicine in influencing the process of care and clinical outcomes in rural patients with severe sepsis and septic shock. We will also explore factors that function as barriers and facilitators to more widespread consultation. If telemedicine influences clinical outcomes, additional incentives or innovative consultation strategies may be necessary to encourage telemedicine use for sepsis patients.

In conclusion, increasing telemedicine utilization for sepsis requires a multi-pronged approach, which successfully increased telemedicine utilization in this study, albeit modestly. Future work will focus on the impact of telemedicine utilization on clinical outcomes of sepsis treatment and on barriers to more widespread telemedicine adoption.

Notes

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