

## Solving Sepsis with Clinical Process Improvement

### Summary

Sepsis is a leading cause of morbidity, mortality and healthcare cost, contributing to an estimated one-third to one-half of all in-hospital deaths. Early detection and initiation of evidence-based treatment is imperative to improving outcomes in this condition.

Unfortunately, early detection and initiation of treatment in sepsis remains a challenging problem. Whether developed internally or as part of a purchased sepsis solution, many health systems have implemented complex clinical processes designed to alert clinicians to the possible presence of sepsis based on patient criteria, and then prompt the clinician to make the appropriate interventions. Despite significant work in this area, most health systems remain frustrated by how difficult it is to measure and understand the effectiveness and adoption of the process that was implemented. In most cases, if a health system is

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not realizing the hoped-for outcome, they have little insight into where to target their interventions for improvement. Creating a process combining clinical decision support elements such as alerts and order sets and building them into appropriate workflows is a necessary first step. For health systems to achieve reliable, high quality, evidence-based care, ongoing management and measurement over time is a requirement. Quality improvement teams need insight into how well their process is working; how clinician users are interacting with and adopting the process; and, whether the process is driving the desired outcomes. Equipped with this information, health systems can target interventions to reduce unnecessary variation and deliver highly reliable, high quality care.

### **CASE STUDY: SEPSIS TASK FORCE**

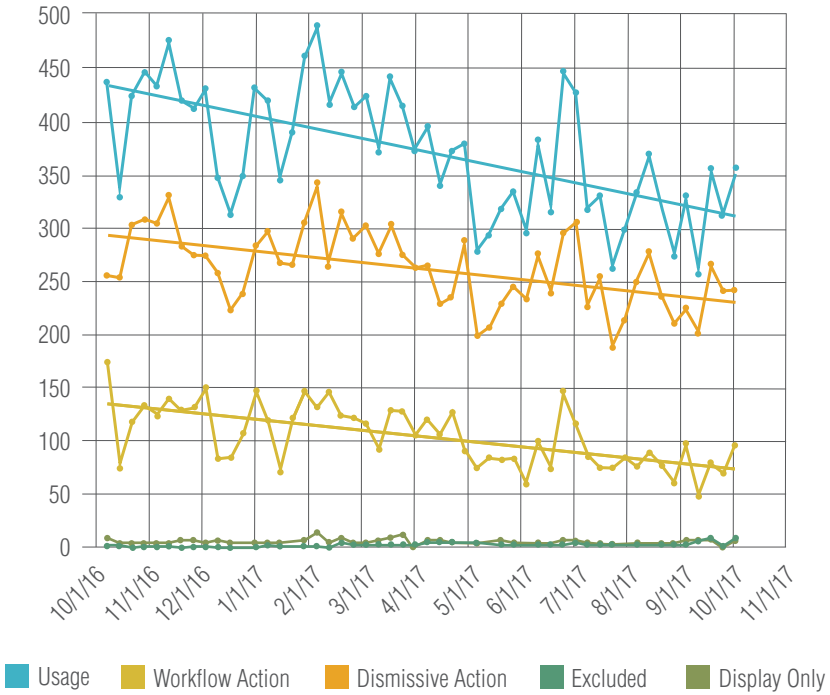
An academic medical center located in the Midwest charged its Sepsis Task Force with implementing a standardized care process to improve their sepsis outcomes. More than two years into this work, the group was not realizing their hoped-for improvements in sepsis-related outcomes. Frustrated by lack of progress, this CMO-led initiative sought greater insight into what was going wrong. With the Clinical Process Improvement (CPI) Software-as-a-Service (SaaS) Platform from LogicStream Health, the task force immediately gained insights into factors that were hindering their improvement.

The team had implemented clinical alerts designed to alert nursing staff to the possible presence of sepsis. Despite firing more than 30,000 times in a year for one hospital, the alerts were rarely acted upon in the intended manner. The team realized the right information was not being presented to the right user in the right place in the workflow to direct clinicians to make the targeted interventions. Based on this information, the sepsis team quickly made changes that increased the specificity of the alert firing, thereby decreasing alert fatigue.

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## Users

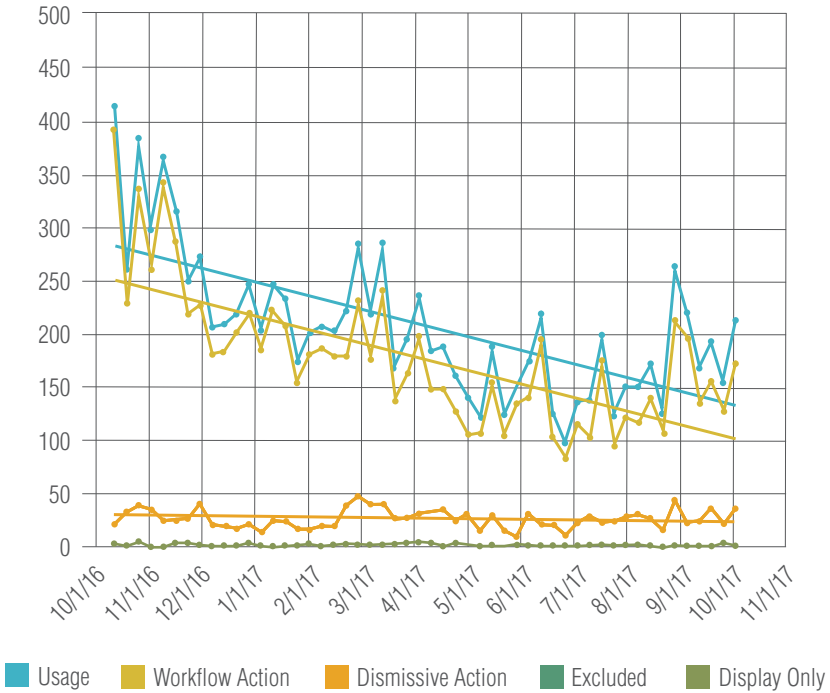
Cumulative Usage  
from 10/1/2016 to 11/1/2017



*This graph shows the firing of a sepsis alert to inpatient nurses. The alert has fired 17,261 times in the last year (blue line). Changes made to the alert have slightly decreased the overall firing rate of the alert, but more importantly, have increased the “health” of the alert – or the percentage of time the user took the desired action (in this case, ordering a lactate) when the alert fired. We are seeing a converging of the blue line (overall firing) with the orange line (desired action taken) which is a good indicator of decreasing alert fatigue. This alert is particularly effective, with a health of 71.4%.*

## Users

Cumulative Usage  
from 10/1/2016 to 11/1/2017



*This graph shows the firing of a sepsis alert to ED nurses. Changes in the alert have resulted in a dramatic decrease in alert firing over time (blue line). However, changes in the alert have not impacted the appropriate response rate, and users rarely take the desired action (in this case, ordering a lactate; indicated by the orange line). Given this information, the sepsis team now knows the alert is not firing to the right user at the right time or the right place in the workflow.*

The team had also built order sets aimed at directing providers to follow standardized, evidence-based process interventions. They were amazed to discover a vast amount of sepsis-related content in their EHR that had not been updated or retired as new content was added. Clinician preferences and customization of order sets was leading to additional variation. Armed with this information, the team cleaned up the sepsis-related EHR content to drive users to the desired workflow. Once this was accomplished, they continued to see poor adoption of the inpatient sepsis order set. On further evaluation, they discovered that despite the lack of use of the sepsis order set, clinicians were following the recommended process interventions in their sepsis patient population 93% of the time. By measuring what was being ordered, by whom and at what point in the workflow, the team combined this knowledge to create content and workflows that were more usable by the clinicians.

## Components

UU U4C MEDICAL ICU  
from 10/1/2016 to 11/1/2017

EHR Id	Code	Name	Component Type	Health	Usage	1 Week Trend	% Pop	Updated
<b>Order Sets</b>					<b>2,006</b>			
1601010235		ED SEPSIS ADULT	Order Set		1,857	▼-100.00%	27.0%	03/01/2017
3041060675		IP ICU SEPSIS ADULT	Order Set		149	▼-100.00%	2.8%	05/16/2017
<b>Lactate Orders</b>					<b>19,336</b>			
134316	LAB95	LACTIC ACID	Procedure Orderable		1,281	▼-52.2%	12.2%	01/01/2017
134322	LAB730	LACTIC ACID WHOLE BLOOD	Procedure Orderable		18,055	▼-87.3%	81.5%	01/01/2017

*The sepsis order sets were only being used in about 30% of patients who ended up with a coded diagnosis of sepsis. However, when the individual evidence-based process interventions were measured, such as lactate ordering shown here, the desired actions were taken more than 93% of the time in the same population.*

Once the content and workflow were improved, some variation in care remained. The next step for the team was to use the LogicStream Health platform to examine the population of sepsis patients and determine which clinicians, departments and hospital facilities were and were not following the best practices in these patients. Interventions were then able to be efficiently targeted at the few outliers rather than across the entire organization.

Finally, the team could see how the changes they made were impacting sepsis-related outcomes. Role-specific graphics and self-service access allowed stakeholders across the organization to view the trends in care delivery and how they related to the outcomes of interest. Because of the flexibility and usability of the LogicStream Health platform, this organization quickly began to apply the same practices to multiple initiatives across the organization while sustaining the improvements made with the sepsis initiative.

### **CASE STUDY: PROCESS CONTROL AND BEHAVIOR CHANGE**

In 2016, a 1,011-bed teaching hospital in Florida initiated a CPI program aimed at enhancing standardization and efficacy of treatment for conditions it identified as being high priority. The goal was to develop scalable and repeatable models to tackle difficult-to-solve clinical initiatives and improve patient outcomes. Of the priorities hospital leadership identified, most pressing was early diagnosis and treatment of sepsis in the emergency department (ED), where 80% of sepsis cases originated.

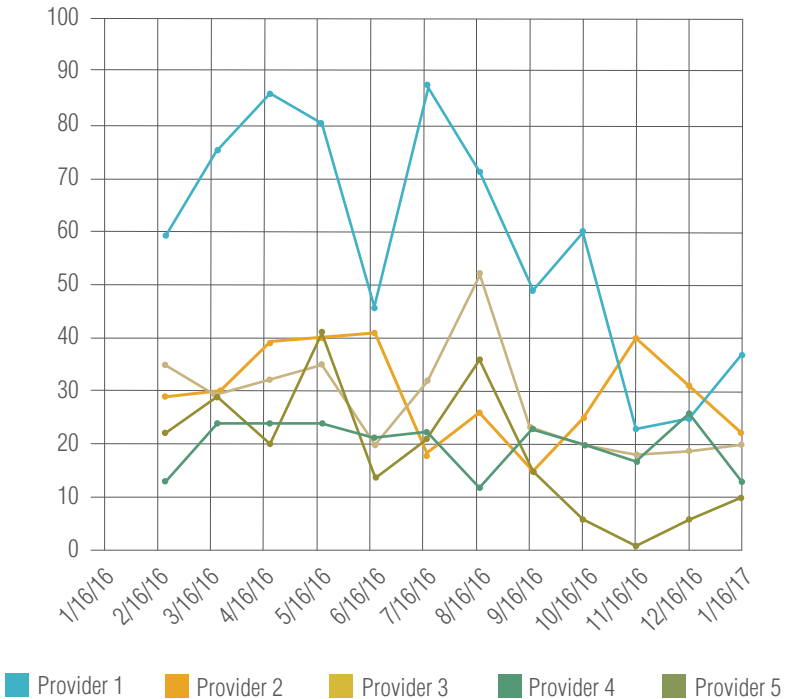
As the team set out to standardize the clinical processes for responding to potentially septic patients in the ED, they were immediately faced with several challenges. Sepsis care bundles are complex and time-sensitive, making clinician adherence to the process imperative in delivering appropriate and timely care. At the same time, rapidly evolving medical evidence around sepsis management makes it difficult to maintain up-to-date sepsis care processes and order sets. Additionally, life-saving screening alerts can be lost in a cacophony of EHR-based warnings and notifications and lead to alert fatigue.

The hospital used the LogicStream Health software platform to help. The first step was to standardize the care delivery process and align their EHR content and workflow with that process. Early analysis derived from the LogicStream Health platform revealed a high rate of

firing of sepsis screening alerts with a low rate of appropriate response. The team used this information to refine alert criteria for improved sensitivity and specificity which resulted in desired actions being taken nearly 100% of the time and decreasing alert fatigue. They also discovered that too many order sets, some with outdated content or too many choices, were driving inappropriate practices in IV fluid resuscitation. The team streamlined and updated the sepsis order sets, resulting in an immediate 50% increase of appropriate IV fluid resuscitation practices.

### Vancomycin Usage

Ordering Providers  
from 1/16/2016 to 1/16/2017



During their work, the team also looked at medication utilization for clinicians placing orders on patients included in the sepsis population. They quickly identified one clinician who was ordering Vancomycin at nearly twice the rate of his peers. Following that discovery, clinical leadership was able to have a targeted, data-driven discussion with that clinician to encourage behavior change and standardization of the care delivery process. As displayed in the graph above, Provider 1 quickly changed ordering and utilization of Vancomycin. This discovery came as a result of one clinician's curiosity and the ability to easily and rapidly access the data in a self-service function using the LogicStream Health platform.

Because of the flexibility and usability of the LogicStream Health platform, this organization quickly began to apply the same practices to multiple initiatives across the organization while sustaining improvements made with the sepsis initiative.

## The Challenge

- ▶ When not functioning properly, clinical alerts intended to notify clinicians of the possible presence of sepsis and trigger the appropriate workflow led to over-alerting, alert fatigue and poor compliance with best practices.
- ▶ Unnecessary care variation occurs when there are multiple sepsis order sets and orderables available in the EHR and clinicians have additional custom orders and modifications of order sets.
- ▶ Clinical leaders have limited ability to measure and manage clinician adoption of sepsis best practices and track adherence at the individual clinician, department or organizational entity levels.
- ▶ The outcomes of interest in sepsis including mortality, length of stay and readmissions are difficult to correlate with the implemented process.





## The LogicStream Health Software Platform

LogicStream Health offers health systems the opportunity to improve patient outcomes with early detection and treatment of sepsis. This flexible and scalable approach can be applied to a multitude of initiatives throughout any given health system. With LogicStream Health, you can:

- Monitor, manage and control clinical alerts to ensure they are presenting the right information to the right user at the right time in the workflow thereby minimizing alert fatigue and improving effectiveness
- Manage, optimize and control clinical content to direct clinicians to the proper care paths and minimize variations in care
- Specify populations of sepsis patients and determine if the appropriate clinical process was followed for that population
- Measure the adoption and usage of accepted workflows by clinician, department or entity thereby understanding where care variation is occurring and where to target interventions

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## About LogicStream Health

LogicStream Health is trusted by a community of high-performing healthcare providers across the United States. The company's software-as-a-service (SaaS) platform stands alone in its ability to help customers gain instant insights to improve vital clinical processes and better control patient care. As a result, customers reduce cost and improve outcomes. Healthcare customers are saving millions of dollars on the LogicStream Health platform, for example, by reducing high-cost medications; achieving significant reductions in catheter-associated urinary tract infections (CAUTI); and, reaching nearly 100% compliance with venous thromboembolism (VTE) protocols. The LogicStream Health SaaS platform complements modern EHR systems and is designed for rapid implementation and easy adoption by end-user clinicians, informaticists, data analysts, and executive teams striving to better control and manage clinical processes in near-real-time. LogicStream Health, developed by clinicians for clinicians, today is supporting hundreds of hospitals on a scalable and sustainable technology platform to standardize process and deliver highly reliable healthcare. For more information, visit [LogicStreamHealth.com](https://LogicStreamHealth.com)

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## Clinical Executive Insights

“We use LogicStream to give us clinically meaningful ways to analyze the multiple EHR-based clinical tools we have deployed across our organization.”

— *Dr. Peter Chang, Chief Medical Informatics Officer,  
Tampa General Hospital*

“With LogicStream, our medical leadership and operational teams have self-service access to information they need to drive standardized care delivery and tremendous insight into where clinical process and care delivery improvements can be made.”

— *Dr. Judi Binderman, VP-Corporate CMIO at Community Medical Centers*

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<sup>1</sup> Howell, M., Davis, A. “Management of Sepsis and Septic Shock.” JAMA. 2017;317(8):847-848. doi:10.1001/jama.2017.0131

<sup>2</sup> National Center for Health Statistics Data Brief No. 62 June 2011. Inpatient care for septicemia or sepsis: a challenge for patients and hospitals .

<sup>3</sup> Wood KA, Angus DC. Pharmacoeconomic implications of new therapies in sepsis. Pharmacoeconomics. 2004;22(14):895-906.

<sup>4</sup> Agency for Healthcare Research and Quality Healthcare Cost and Utilization Project Statistical Brief No. 160 August 2013. National inpatient hospital costs: the most expensive conditions by payer, 2011 [PDF, 142KB].

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