

Collaborative, Data-Driven Approach Reduces Sepsis Mortality by 54 Percent

HEALTHQUEST



HEALTHCARE ORGANIZATION

Integrated Delivery System

PRODUCTS

- Health Catalyst® Analytics Platform and a broad suite of analytics applications

SERVICES

- Installation Services

EXECUTIVE SUMMARY

In the U.S., sepsis impacts more than 1.5 million people annually, of which about 250,000 will die. This accounts for one-third to one-half of all deaths for hospitalized patients. Health Quest focused on identifying ways to improve these outcomes. Despite instituting several evidence-based recommendations, the organization had not succeeded in reducing sepsis mortality to its desired rate.

Health Quest established a multidisciplinary sepsis committee to lead improvement efforts, including the use of analytics to combat sepsis mortality rates and improve patient outcomes, resulting in a:

- 54 percent relative reduction in sepsis mortality, saving 92 lives in 10 months.
- 57.1 percent relative reduction in catheter-associated urinary tract infection (CAUTI) standardized infection ratio (SIR).
- 30.7 percent relative reduction in *C. difficile* SIR.

SEPSIS NEGATIVELY IMPACTING HEALTH OUTCOMES

Sepsis is the body's overwhelming response to common infections anywhere in the body, such as the respiratory system, gastrointestinal tract, integumentary system, or urinary tract. Sepsis can lead to tissue damage, organ failure, amputations, and death.¹ It impacts more than 1.5 million people annually in the U.S., of which about 250,000 will die, contributing to one-third to one-half of all deaths for hospitalized patients.²

Evidence-based guidelines for early recognition and rapid treatment of sepsis, combined with an understanding of the patient demographics, risk factors, and infections that can lead to sepsis, are needed to develop comprehensive interventions for prevention.³

Health Quest began looking at its sepsis data to determine if there was a way to improve outcomes. A local family of nonprofit hospitals and healthcare providers in the Hudson Valley and northwestern Connecticut, Health Quest is comprised of four award-winning



We understood how important it was to gain physician engagement, not only in reviewing current literature for the development of the protocol, but also spreading ongoing process changes through peer to peer discussions for successful improvements.

Diane Kantaros, MD
Internal Medicine,
Associate VPMA, Quality
Systems

hospitals with deep roots in their respective communities. Its mission is to deliver exceptional healthcare to the communities it serves by pursuing the highest standards of quality, safety, service, and compassion.

LOWERING SEPSIS MORTALITY RATES

Health Quest had pursued efforts to reduce sepsis mortality rates yet was unable to make sustainable gains, despite instituting several recommended prevention activities. The organization lacked stakeholder buy-in and consensus on the approach needed for clear and consistent early sepsis recognition protocols, to address clinicians' varied experience with understanding patient demographics, risk factors, and the infections that lead to sepsis.

Health Quest needed specific, timely data for patients with a sepsis diagnosis. Limited insight into sources of variation, data regarding infections contributing to sepsis mortality, and the impact of interventions on patient outcomes made it difficult to take a data-driven approach to improvement.

GAINING CLARITY FOR PREVENTION AND INTERVENTION

Understanding that engaging providers and nursing staff in a comprehensive improvement process is necessary to make significant sustainable improvements, Health Quest established a multidisciplinary sepsis committee to identify and implement the resources needed for combating sepsis mortality rates.

Establishing protocol

The sepsis committee membership includes physician champions from the emergency department (ED), pediatrics, intensive care, infectious disease and hospitalists, operational leaders, nursing leadership, bedside registered nurses, and representatives from pharmacy, laboratory, care management, quality, and information technology services.

Focusing on reducing care variation, the sepsis committee developed and implemented a customized protocol for early recognition of sepsis and sepsis care using evidence-based guidelines, including processes for early identification, rapid resuscitation using a three-hour sepsis bundle, and maintenance interventions employing a six-hour sepsis bundle. The protocol and standard work also addressed regulatory documentation needs across the system.



“Having a comprehensive team helped create our success—you need medical staff, pharmacy, lab, nursing, quality, all at the table. Without working together and hearing other perspectives, you end up missing valuable insights.”

Melissa Hansen-Hall, RN
Director of Quality and
Performance Improvement,
Northern Dutchess Hospital

Workflows were standardized, and process steps were added to the EMR to simplify the tasks needed to provide care. This standardized workflow includes the three-hour and six-hour sepsis bundle components:

- Three-hour bundle components.
 - ED sepsis alert to expedite initial early interventions.
 - Obtaining a serum lactate.
 - Gathering blood cultures prior to antibiotic administration.
 - Standardized antibiotic timing and dosing.
 - Fluid resuscitation orders.
- Six-hour bundle components for patients who remain hypotensive.
 - Reassessment of serum lactate level.
 - Administration of vasopressors to control blood pressure.
 - Central blood pressure monitoring.

Once the sepsis protocol was developed, Health Quest provided education to physicians and nursing staff, focusing on early sepsis identification and the three-hour and six-hour sepsis bundle components. It also delivers support to patient care technicians, ensuring they are aware of signs and symptoms that should be escalated to nursing immediately. This education is now part of the new hire orientation and annual ongoing educational activities.

Understanding the impact of early recognition and treatment, Health Quest provided education within the community, reviewing information to help community members recognize signs of sepsis and providing guidance for when it is appropriate for patients to seek care in the ED rather than waiting to see their primary care provider.

Utilizing data for customization of protocols further reducing sepsis mortality

Health Quest leverages data within the EMR and the Health Catalyst® Analytics Platform for data and analytics. The analytics platform enables Health Quest to automate extraction, aggregation, and integration of clinical and other relevant data, enabling feedback and monitoring of key process measures for ongoing performance improvements in patient outcomes.

Health Quest's quality improvement professionals use the EMR and analytics platform to explore the data, allowing them to drill down to patient, clinician, unit, and hospital of interest. They can also conduct concurrent chart reviews for patients with sepsis and provide timely feedback to the care team. Early buy-in was gained by engaging the multidisciplinary committee in reviewing the data and providing input into needed customization of the protocol.

The medical audit committee conducts a regular mortality review to determine trends in identifying high-risk sepsis populations, including:

- Patients with influenza.
- Patients with neutropenia (a low level of the white blood cells that fight infection) who are receiving chemotherapy.
- Patients using steroids.
- Patients arriving from skilled nursing facilities.
- Patients within the first 12-hours of admission.

A deep dive into Health Quest's performance data revealed two complicating trends that required action: there were patients being treated for other disease states who subsequently developed sepsis as a complication of their treatment, and there were patients admitted for sepsis who developed complications as a result of the treatment for sepsis. Both situations increased the risk of mortality. Health Quest identified that the patients at the highest risk for developing sepsis during their hospital stay included patients with central lines or indwelling urinary catheters, patients who were receiving antibiotics, and patients with a long length of stay.

Gaining actionable data improved Health Quest's insight and awareness of specific risk factors leading to sepsis. The sepsis protocol was subsequently expanded to include risk reduction strategies to prevent patients from developing sepsis as a complication of treatments. It now includes standard work for:

- The ED, which focuses on early isolation and lactate point of care testing for patients who are also at high risk for developing sepsis, such as neutropenia or suspected influenza.
- Daily monitoring and prompt removal of indwelling urinary catheters, decreasing the likelihood that the patient will develop a CAUTI.
- Decreasing use of central lines, adopting new midline catheters in lieu of central line catheters. Health Quest

implemented new protocols outlining the standard work for midline catheters, including use of improved occlusive dressings and alcohol impregnated caps.

- Addition of probiotics to decrease the risk of patients developing *C. difficile*.
- Stress dosing for steroid-dependent patients.
- Increased monitoring for first 12 hours after admission, particularly for those patients who are receiving steroids that cannot be discontinued, patients with neutropenia, patients who developed *C. difficile* after receiving antibiotics, patients with decreased urine output or a change in mental status after admission, and for patients with sustained tachycardia after fluid resuscitation.

Additionally, Health Quest enhanced the room cleaning procedures used by environmental staff to reduce the potential for *C. difficile* exposure and transmission.

To help ensure a safety net for vulnerable patients, Health Quest introduced the role of a stat intensive care unit (ICU) registered nurse (RN). The stat ICU RN conducts rounds on patients who have been identified as at higher risk for sepsis within the first 12 hours of admission. The stat ICU RN also responds to calls for assistance from other RNs, and helps to provide the standard interventions to stabilize patients with sepsis, helping to ensure appropriate delivery of timely care, avoiding the need to provide more intensive care in the ICU.

The sepsis improvement team continues to meet monthly. To support ongoing improvement and dissemination of the most recent evidence-based guidelines, Health Quest convenes journal clubs to evaluate new evidence, and continues to refine the sepsis protocol to align with new evidence, or when new trends are identified in the data. This infrastructure is keeping sepsis at the forefront of clinicians' minds.

RESULTS

Using this collaborative, evidence-based, data-driven approach for early recognition and treatment of sepsis, Health Quest has improved sepsis mortality rates, achieving a systemwide O/E ratio for sepsis mortality of 0.72, saving 92 lives in 10 months. Individual hospital outcomes include:

- 61 percent relative reduction in sepsis mortality at Northern Dutchess Hospital.
- 54 percent relative reduction in sepsis mortality at Vassar Brothers Medical Center.
- 28 percent relative reduction in sepsis mortality at Putnam Hospital Center.

Additionally, Health Quest successfully reduced its CAUTI SIR and *C. difficile* infections at Vassar Brothers Medical Center, demonstrating a:

- 57.1 percent relative reduction in CAUTI SIR.
- 30.7 percent relative reduction in *C. difficile* infections.

WHAT'S NEXT

Building upon these successes, Health Quest continues to analyze its data to identify potential trends for emerging high-risk populations. The organization is beginning to use the analytics platform to track mortality, length of stay, and readmission in relation to the antibiotic choice and source of infection. This data will support Health Quest in ongoing refinement of its sepsis protocols and interventions. ♪

REFERENCES

1. Sepsis Alliance. (n.d.) *Definition of sepsis*. Retrieved from <https://www.sepsis.org/sepsis/definition/>
2. Centers for Disease Control and Prevention. (2017). *Sepsis*. Retrieved from <https://www.cdc.gov/sepsis/datareports/index.html>
3. Rhodes, A., Evans, L. E., Alhazzani, W., Levy, M. M., Antonelli, M., Ferrer, R., . . . Dellinger, R. P. (2017). Surviving sepsis campaign: International guidelines for management of sepsis and septic shock 2016. *Critical Care Medicine*. Retrieved from http://journals.lww.com/ccmjournalFulltext/2017/03000/Surviving_Sepsis_Campaign

ABOUT HEALTH CATALYST

Health Catalyst is a next-generation data, analytics, and decision support company committed to being a catalyst for massive, sustained improvements in healthcare outcomes. We are the leaders in a new era of advanced predictive analytics for [population health](#) and [value-based care](#), with a suite of machine learning-driven solutions, decades of outcomes-improvement expertise, and an unparalleled ability to integrate data from across the healthcare ecosystem. Our proven data warehousing and analytics platform helps improve quality, add efficiency and lower costs in support of more than 85 million patients and growing, ranging from the largest US health system to forward-thinking physician practices. Our technology and professional services can help you keep patients engaged and healthy in their homes and workplaces, and we can help you optimize care delivery to those patients when it becomes necessary. We are grateful to be recognized by Fortune, Gallup, Glassdoor, Modern Healthcare and a host of others as a Best Place to Work in technology and healthcare.

Visit www.healthcatalyst.com, and follow us on [Twitter](#), [LinkedIn](#), and [Facebook](#).