

REDUCING SEPSIS MORTALITY

STONY BROOK UNIVERSITY MEDICAL CENTER (SBUMC)

- ◆ Stony Brook, NY
- ◆ 540 beds
- ◆ www.stonybrookmedicalcenter.org

SBUMC is the only academic medical center on Long Island. Comprised of Stony Brook University School of Medicine and Stony Brook University Hospital, it is the only tertiary care hospital and Level 1 trauma center in Suffolk County.

STEEEP

Safe

New processes and training identify potential sepsis patients faster and begin treatment sooner.

Timely

Start antibiotics, fluids and central venous line for delivering vasopressors to maintain adequate blood pressure faster than in the past.

Equitable

All ICU patients are screened for sepsis.

THE PROBLEM

Severe sepsis is one of the most significant challenges in critical care. Although Stony Brook's sepsis mortality rate of 26.7 percent was below the national average, reducing these deaths became a priority to enhance critical care. Additionally, Margaret Parker, MD, SBUMC's acting chair of the department of medicine and director of the pediatric intensive care unit (ICU), was president of the Society of Critical Care Medicine when it joined with other groups to create the international Surviving Sepsis campaign in 2005.

THE SOLUTION

In 2006, Stony Brook committed to meeting the Institute for Healthcare Improvement (IHI) and the Surviving Sepsis campaign's goals of reducing sepsis mortality by 25 percent by 2009. It also set a goal of achieving a 95 percent compliance rate by May 2009 for adhering to a set of best practices for early recognition and treatment of severe sepsis, also recommended by IHI.

RESULTS

- » Mortality for severe sepsis cases fell 33.7 percent, from 26.7 percent in 2006 to 18 percent in late 2007.
- » The average length of stay for severe sepsis patients admitted through the ED has decreased an average of 19 percent, or three days.
- » Apart from charges, hospital cost savings per room range from \$3,500 to \$8,500 per severe sepsis patient.

BACKGROUND

As with most hospitals across the nation, Stony Brook is confronting a steady increase in patients with severe sepsis and septic shock. With most arriving through its ED, SBUMC now treats between 15 and 37 sepsis patients a month, an increase in detection from 12 patients a month in 2006.

In early 2006, SBUMC assembled a 15-person sepsis steering committee representing all affected services including its ICU, ED, nursing, quality and pharmacy. The steering

committee was chaired by the acting division chief for infectious disease. The group started by establishing a baseline for severe sepsis at Stony Brook, including its mortality rate.

Best practices show that implementing two bundles, one for resuscitation within six hours of initial presentation and a second management bundle within 24 hours of initial presentation, significantly improve outcomes. Working from that foundation, the steering committee oversaw efforts to apply the guidelines at Stony Brook.

PRINCIPLES OF PERFORMANCE EXCELLENCE

Reducing Process Variation

Although it is actively engaging in both bundles, SBUMC put most of its energies into implementing and increasing compliance with the sepsis resuscitation bundle. It is widely thought that the resuscitation bundle—consisting of six steps completed in a specific order—is crucial for the successful treatment of sepsis.

SBUMC standardized the medical center's approach to dealing with all suspected sepsis patients by implementing the resuscitation bundle:

- » Determining serum lactate levels as a method of early detection;
- » Collecting blood cultures prior to administration of antibiotics;
- » Starting a broad-spectrum antibiotic within one hour of onset for inpatients and three hours for ED patients;
- » Administering a fluid bolus of 20 ml per kilogram, double the rate most doctors would prescribe; and
- » Inserting a central venous access device:
 - To measure the adequacy of fluid resuscitation and to apply vasopressors for hypotension if needed.
 - To measure central venous oxygen saturation (ScvO₂) and central venous pressure (CVP) to obtain goals of ScvO₂>70 percent and CVP >8mm Hg.

Each department then set up its own sepsis team to apply and monitor compliance to the

TEAM MEMBERS

- » **Richard D. Dickinson, MD**
Attending Physician,
Emergency Medicine
- » **Kimberly Fenton, MD**
Pediatric ICU
- » **Debbie Fitzgerald**
Surgical ICU
- » **William H. Greene, MD**
Chief Quality Officer
- » **Christine McMullan**
Assistant Director
for Continuous
Quality Improvement
- » **Barbara Mills**
Rapid Response Team
- » **Paul Murphy**
Data Analyst, Continuous
Quality Improvement
- » **Margaret Parker, MD**
Acting Chair, Department of Medicine
and Director, Pediatric ICU
- » **Paul Richman, MD**
Director, Medical ICU
- » **Marc Shapiro, MD**
Director, Surgical ICU
- » **Jeralyn Sigwart, RN**
Nurse Manager,
Pediatric ICU
- » **Steven L. Strongwater, MD**
CEO
- » **Debbie Tlockowski, RN**
Nurse Educator, Emergency
Department
- » **Bernadette Valente, RN**
Nurse Manager, Medical ICU
- » **Peter Viccellio, MD**
Associate Chair of
Emergency Medicine

guidelines. “It was an iterative process. The actual modifications were done at the service levels, with a lot of back and forth between the team members and quality management,” notes William Greene, MD, chief quality officer.

Each department and service line modified its approach to applying the bundle to ensure success. For example, after experimenting in the ED with performing point-of-care testing on blood lactate, it became evident that tests performed in the lab were more accurate. This became more practical when the lab agreed to prioritize those tests ordered from the ED. In contrast, in the ICUs it was evident that lactate tests could be run timelier if the respiratory therapist could perform them on the units. Therefore, Stony Brook purchased adapters for its blood gas analyzers to make this possible.

The ED developed some tools to streamline the assessment and initial treatments. For example, Stony Brook built a sepsis screen into the triage assessment process and a sepsis fever panel with order sets. These panels are printed on the first page of a patient’s chart to guide a physician’s initial assessment, notes Richard Dickinson, MD.

Although all ED tests are handled stat and are usually back within an hour, lactate tests higher than four require a call from the lab to a nurse or physician. A lactate over four is also used to trigger an immediate ICU consult.

Creation of High-Reliability Culture

The steering committee reached out to the entire clinical staff to make the case

for change, explain the interventions and reinforce use of the best practices. Stony Brook held numerous grand rounds on sepsis focusing on instituting the new order sets developed by the steering committee. The nursing division rolled out formal training, while quality professionals discussed specific sepsis cases at department and service line meetings, providing feedback as close to the events as possible. Medical residents also receive a formal presentation about sepsis as part of their training.

Some changes took longer than others, says Dickinson. “It’s hard getting physicians to order antibiotics without knowing the source of infection. In medical school, we are trained to wait to identify the source and then treat it,” he explains.

The Patient Experience

SBUMC has put in place many steps that have enhanced patient safety, care and outcomes. For one, Stony Brook screens all critical care patients for lactate. It even took the initiative to a local veterans’ home, whose residents are often transferred to Stony Brook for hospitalization. SBUMC staff made a presentation at the home to help its nursing staff recognize the early signs of sepsis and to encourage them to transfer residents sooner to the hospital for treatment.

CONTINUAL IMPROVEMENT

SBUMC continues to refine its protocols. It is piloting a requirement to insert a central line if a patient’s lactate continues to be greater

than 4 despite two to three hours of fluid resuscitation and treatment. To facilitate timely central-line insertion, ED residents are given the option of calling Stony Brook’s trauma service for a back-up to place the central line.

In addition, each blood screen that tests positive for the elevated lactate level is faxed to the quality management department, which conducts a timely chart review to determine whether the bundles have been appropriately applied, explains Christine McMullan, assistant director of continuous quality improvement. During monthly morbidity and mortality conferences, ED residents may be called to present sepsis cases where the bundle was not followed. To keep compliance visible, metrics depicting adherence to the sepsis bundle are updated at least monthly on performance dashboards for each service line and department.

In late January 2009, Stony Brook recently gained a new tool for helping with compliance—computerized provider order entry system. The system automatically provides standardized order sets. In addition, the order sets specify preferred antibiotics for treating suspected organisms based on the likely origin of the infection, such as pneumonia or urinary tract infection.

Stony Brook also encourages compliance by celebrating its successes. “Surviving Sepsis: Increasing Detection and Standardizing Care” presented at the New York Presbyterian Healthcare System’s quality symposium received the 2008 Quality Award for Merit.