Sepsis Quality Improvement Project
Stony Brook Medicine includes six Health Sciences schools as well as Stony Brook University Hospital, Stony Brook Southampton Hospital, Stony Brook Children’s Hospital and more than 90 community-based healthcare settings throughout Suffolk County.

Stony Brook University Hospital (SBUH) is a premier academic medical center. With 603 beds, SBUH serves as the region’s only tertiary care center and Regional Trauma Center, and is home to the Stony Brook University Heart Institute, Stony Brook University Cancer Center, Stony Brook Children’s Hospital and Stony Brook University Neurosciences Institute. SBUH also encompasses Suffolk County’s only Level 4 Regional Perinatal Center, state-designated AIDS Center, state-designated Comprehensive Psychiatric Emergency Program, state-designated Burn Center, the Christopher Pendergast ALS Center of Excellence, and Kidney Transplant Center. It is home of the nation’s first Pediatric Multiple Sclerosis Center.
Stony Brook Medicine Sepsis (Workgroup) Team

**Team Leader:**
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**Facilitator:**
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**Members:**
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Susan Boudreau, RN, Quality Measurement and Analytics
Project Description

- The Sepsis Quality Improvement Project is spearheaded by the Sepsis Workgroup, an interdisciplinary team focusing on sepsis outcomes, improvement strategies, education and opportunities. The aims of this quality improvement project and its workgroup are:
  - To reduce severe sepsis and septic shock mortality
  - To improve compliance with New York State Department of Health (NYSDOH) and Centers for Medicare and Medicaid Services (CMS) Severe Sepsis and Septic Shock measures, reaching top decile by 2019
  - Include representation from the Emergency Department, all ICUs (except the Neonatal ICU), and all inpatient floors
  - Improve documentation and provide related education and feedback to Residents, Attendings and Rapid Response Team (RRT) members - believed to be essential to reducing mortality index
  - Review regulatory reports for 3 and 6 hour bundle compliance - communicating results house wide and following up with areas struggling to meet measure expectations
  - Use outcome measures of Sepsis Mortality Rate, Sepsis Mortality Index and Sepsis Bundle Compliance to evaluate success
Project Implementation

- Stony Brook’s Severe Sepsis/ Septic Shock Recognition and Treatment Protocols were updated and data elements were aligned with CMS Early Management Bundle, Severe Sepsis/Septic Shock Measure (Sep-1) guidelines
- Staff education was developed and made available on the Learning Management System (LMS)
- Physician champions were identified from ED and Inpatient areas
- Quality Nurses were identified to monitor responses of alerts and provide feedback to units on Alert compliance
- “War Room” meetings, a multidisciplinary, rapid cycle improvement team, where participants evaluate Sepsis registry requirements for ways to enable compliance through electronic fixes in the Electronic Medical Record (EMR) commenced
- Tools were imbedded into the (EMR) to assist with identifying severe sepsis and septic shock as early as possible
  - Severe Sepsis & Septic Shock Alerts- fire once EMR has been opened by a provider and criteria has been met
  - Alert responses are noted on an M-page, designed to audit alert cooperation & bundle compliance
  - Sepsis Dashboard- shows a timeline of when a patient has met severe sepsis criteria, whether or not the alert has been fired, and which bundle elements have been completed
Sepsis M-page

Sepsis Alerts Within the Last 12 Hours

<table>
<thead>
<tr>
<th>Patient Name</th>
<th>DOB (Age)</th>
<th>Alert Type</th>
<th>Alert Date/Time</th>
<th>Alert Date/Time (Patient Current Location)</th>
<th>Provider on Alert</th>
<th>Provider Response</th>
<th>Last 6 Hours Vital</th>
<th>Last 6 Hours Labs</th>
<th>Last 6 Hours IV Fluids</th>
<th>Last 6 Hours IV Antibiotics</th>
<th>Last 6 Hours Blood Cultures</th>
<th>Last 6 Hours Time Cultures</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>08/20/1948 (69 Years) SEVERE SEPSIS (OpenChart) 08/31/17 08:17 041Z - ED Critical Care (0550 - Cardiac Acute Care Unit) GUSOVA, ADRIANA Neither Vital (5) Labs (6) IV Fluids (8) IV Antibiotics (9) Blood Culture (8) Urine Culture (0) View/Add</td>
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<tr>
<td></td>
<td>01/12/1931 (86 Years) SEVERE SEPSIS (OpenChart) 08/31/17 08:09 088N - Burn Unit (088N - Burn Unit) MILES, JOSIAH Neither Vital (5) Labs (5) IV Fluids (1) IV Antibiotics (9) Blood Culture (9) Urine Culture (0) View/Add</td>
<td></td>
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Sepsis Dashboard

One Lactic Acid drawn either within six hours before or three hours post Severe Sepsis.

At least one dose of IV antibiotics given within 24 hours before or within three hours post Severe Sepsis.

At least one blood culture drawn up to 48 hours before or within three hours post Severe Sepsis.

Severe Sepsis Alerts Totals

AGREE: 0  DISAGREE: 0
Tools & Resources

○ Sepsis education designed and rolled out May 2017 on New Innovations and hospital LMS
  ○ New Employees and Physicians complete at orientation, All others complete as part of annual recertification
  ○ New Sepsis Recognition and Treatment Protocols Policy
○ Severe Sepsis alert and Septic Shock alert
○ Sepsis M-Page and Dashboard
○ Noncompliance and Alert Monitoring reports
○ Bundle Reference Cards
○ Physician and Nurse Champions
○ Dedicated Sepsis Coordinator
○ Database built to encompass NYS DOH Sepsis cases for abstraction and data reporting
○ Department of Medicine Grand rounds in September 2017 (Sepsis Awareness Month) with Dr. R. Phillip Dellinger
Successful Strategies & Tips

**Strategies**

- Monthly meeting with ED staff to review noncompliant cases and outliers
- "War Room" meetings including participation from: Information Technology, ED staff, Chief Medical Information Officer and Quality nurses
- Sepsis Workgroup with representation from RRT, Unit Level Staff and ED
- Monthly Feedback on noncompliant cases, alert responses and bundle compliance to each unit

**Tips**

- Clinician identification of Time Zero is a key factor to success
- Answering severe sepsis & septic shock alerts assists with real time identification and intervention
- Monitoring of the Sepsis Dashboard can make providers aware of possible cases of severe sepsis without having to review individual patient records
- Quick Sepsis Bundle Reference Cards, laminated and placed by computers, assist staff in identifying presentation time, documenting appropriately and intervening according to the hospital Sepsis Protocols
Severe Sepsis Criteria

- All 3 below must be met w/i 6 hours of each other

A. Documentation of suspected source of clinical infection

B. Two or more:
- Temp > 38.3°C/101°F or < 36°C/96.8°F
- HR > 90
- RR > 20 per min
- WBC > 12,000 or < 4,000 k/uL or 10% bands

C. Organ dysfunction evidenced by one:
- SBP < 90, or MAP < 65, or SBP↓ > 40 mmHg
- Cr > 2 mg/dL or u.o. < 0.5 mL/kg/hr
- Lactate > 2 mmol/L  Bilirubin > 2 mg/dL
- Platelet count < 100,000 k/uL
- INR > 1.5 or a PTT > 60 sec
- Acute resp failure needing new need for invasive or non-invasive mechanical ventilation.

"Time of presentation" is: time presenting in triage, previous care venue or earliest chart annotation consistent with all elements of severe sepsis or septic shock.

Septic Shock Criteria

Severe Sepsis with:
- Lactic acid ≥ 4 mmol/L
- Persistent Hypotension in the hour following crystalloid bolus

OR
- Physician / LIP dx

TO COMPLETE within 3 HOURS
1. Measure lactate (STAT)
2. Blood culture prior to broad spectrum antibiotic

TO INITIATE within 3 and COMPLETE within 6 HOURS
3. Adm 30mL/kg crystalloid for hypotension or lactate ≥ 24

TO COMPLETE within 6 HOURS
4. Vasopressors for hypotension that doesn't respond to fluid.
5. Re-assess volume status and tissue perfusion (Table 1)
6. Repeat Lactate if initial value > 2

TABLE 1

Document Reassessment of Volume Status and Tissue Perfusion after fluid resuscitation with:

CLICK ON or Document: ☐ “I have performed a sepsis focus exam” (with a time stamp) Focus exam includes vital signs, cardiopulmonary, capillary refill, pulse, and skin findings.

OR Signature to Septic Shock Form:
After agreeing to Septic Shock Alert, form appears with all recent hemodynamic assessments made by nurse and MD.

OR TWO:
- Measure CVP
- Measure ScVO²
- Cardiovascular ultrasound
- Dynamic assessment of fluid responsiveness with passive leg raise or fluid challenge.

Refusal of care must be specifically documented within 6 hours of the presentation of severe sepsis or septic shock. Comfort measures or Palliative Care within 3 hours for severe sepsis & 6 hours of septic shock presentation.

2016 Society of Critical Care Medicine, European Society of Intensive Care Medicine: www.survivingsepsis.org
Points to Note:

- Fluids given 6 hours prior to the identified start time for Septic Shock count in the fluid resuscitation required.
- The full amount of fluid resuscitation must be given within the 6 hours of the identified start time for Septic Shock.
- If the request for a second Lactic Acid appears as an alert in EPR, it has been pulled from the previous resulted LA ≥2.1. A second LA must be drawn – do not delete or ignore.
- DOH scores on the aggregate of compliance to the bundle elements.
- CMS is publicly reported: Pass or Fail.
- DOH excludes patients with current s/s of CHF, Pulmonary edema and ESRD w/ fluid overload.
- Persistent hypotension during the first hour following fluid resuscitation requires vaspressors to be started. Two measurements of BP are required if the first shows hypotension (SBP <90 or MAP <65). If only one hypotensive BP is taken in that hour, it is an immediate fail for the case. If 3 BPs are taken, one result hypotensive and the remaining 2 results normotensive, this is NOT persistent hypotension.
- Antibiotic Therapy started within 3 hours after severe sepsis presentation:
  - Monotherapy (alone)
  - Combination Therapy – one from column A / one from column B

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
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<tbody>
<tr>
<td>Aminoglycosides</td>
<td>Cephalosporins, (1st and 2nd Generation)</td>
</tr>
<tr>
<td>OR</td>
<td>(OR) Cindamycin (OR)</td>
</tr>
<tr>
<td>Aztreonam</td>
<td>Daptomycin (OR) Glycopeptides (OR)</td>
</tr>
<tr>
<td>OR</td>
<td>Linezolid (OR) Macrolides (OR) Penicillins</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
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</table>
Challenges & Barriers

- Identifying Time Zero in real time – remains a challenge as we continue to strive for 100% compliance with responses to Alerts.

- Adherence to 3 hour Bundle Protocols

- We continue to seek additional champions at the unit level to guarantee alerts are addressed and protocols are adhered to.

Sepsis View:
Pulls criteria for severe sepsis consideration into one place
Key Lessons Learned

○ Identification of severe sepsis by front line clinicians must:
  ○ Occur immediately
  ○ Initiate communication with interdisciplinary care team
  ○ Coincide with time zero identified by abstractors on retrospective reviews

○ Physician champions are needed at the unit level, to follow-up with unaddressed alerts and encourage bundle compliance

○ Departments where non-compliant cases are reviewed regularly by front line, clinical staff are more successful

○ A grass roots, boots on the ground approach, with ownership and accountability house wide, on each unit, for their response to alerts and identification and treatment of severe sepsis patients is most effective
Outcomes & Data

CMS SEP-1 Bundle Compliance 2017 YTD

- Bundle Compliance
- Top Decile (Vizient)
- Linear (Bundle Compliance)

Difference: 40%
95% CI: -5.0465 to 72.7491
Chi-squared: 3.873
DF: 1
Significance level: *P = 0.0491

*Increase in Bundle Compliance is statistically significant with p=0.0491
Steps for Hardwiring & Spread

Our focus now is on integrating these successful changes house wide. We are working to take a model that has been a great success in the ED and recreate it on each of the hospital units.

- M-page and Dashboard
- Sepsis Alerts
- Identified Champions
- Sepsis View (pulls criteria for severe sepsis consideration into one place)
- Publish sepsis tips in Physician Newsletter
- Bullets for leadership to disseminate at meetings with Department Chairs
- Monthly reports to units detailing noncompliance and alert responses (focus on high volume units)

Example of Severe Sepsis Alert Non-Compliance Report
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