Implementing an Interdisciplinary Code Sepsis Response and 24/7 Sepsis Nurse (RN) Initiatives

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Topical area(s) of focus in this application: Patient Safety & Performance Improvement

EXECUTIVE LEADER INTRODUCTION

I am proud of the work that our hospital and in collaboration with our sister hospitals of the region have done to help ensure each of our patients gets the best possible sepsis care. Our efforts for clinical effectiveness are focused on reducing variation and applying consistent best practices with the goal of improving outcomes and improving our affordability. For the past two years, the progress in sepsis has definitely shown this to be true. At St. Joseph Hospital, we have saved 747 lives since 2014. The multidisciplinary collaboration has been effective and a great example of how we can come together to make a difference for our patients.

Jeremy S. Zoch, PhD, MHA, FACHE
Chief Executive Officer
St. Joseph Hospital
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EXECUTIVE SUMMARY

This initiative aimed to prevent sepsis progression in Emergency Care Center patients by this multi-department collaboration. The Code Sepsis response and a designated Sepsis nurse coordinate early case-finding plus appropriate therapies and follow the at risk sepsis patients throughout their hospitalizations. After two years of implementing this interdisciplinary Sepsis program, results show at least a fifty percent reduction of sepsis patients progressing to septic shock. Along with reducing the length of stay by twenty-two percent, there is also a forty-one percent reduction in variable costs per case for all sepsis cases. Since implementation in July 2015, the mortality rate has been reduced by forty-two percent for all sepsis cases.

BACKGROUND AND RELEVANCE (OF THE PROBLEM BEING ADDRESSED)

Latest consensus published in early 2016 by the Journal of the American Medical Association, continues to define Sepsis as “[l]ife-threatening organ dysfunction caused by a dysregulated host response to infection.” Per the Centers for Disease Control (CDC) and their Mortality and Morbidity Weekly Reports (MMWR), sepsis continues to be a major driver of mortality and indicator of morbidity in the United States. In 2014, per the Centers for Medicare and Medicaid Services (CMS), the in-hospital mortality is 48% for patients 65 years and older with a diagnosis of sepsis. The latest MMWR summary (August 2016) reports 72% of patients having had a previous hospitalization and over 95% having at least one co-morbidity attributing to a patient’s sepsis diagnosis. At least 30% of cases isolate Escherichia coli (E.Coli) as the primary pathogen from blood cultures. Respiratory illnesses attribute as the main source of infection (35%) of all sepsis cases, with urinary tract infections being second (25%). In the United States, incidence has increased to 1.6 million cases per year and the impact on inpatient cost per case is estimated to at least 14.6 billion dollars and rising per the National Center for Health Statistics (NCHS).

During the past decades, the international efforts of the Surviving Sepsis Campaign championed for the early identification and early implementation of bundled interventions for the care of the sepsis patient. Main bundle elements (See Figure 1) needed to be executed for the sepsis patient included: blood cultures, broad spectrum antibiotics, lactic acid level and trends, fluid resuscitation, and vasopressors if needed. When executed together and timely within 3 and 6 hours of identification, patient outcomes improved, including progression to septic shock and decreased mortality. As of October 2015, sepsis bundle elements became time dependent and reportable measures to CMS.

St. Joseph Hospital of Orange (SJH) was challenged by the end of FY14 (June 2015) with a sepsis observed to expected mortality (O/E) of 1.19, representing an average mortality rate of 12%. The average length of stay was 6.7 days and the proportion of sepsis cases progressing to septic shock was 21%. The variable cost per case from January to June 2015 was over $21,000. Over 95% of patients coded with a sepsis diagnosis, originated from the Emergency Care Center (ECC), spending an average of 5 hours being cared for in the ECC.

EFFORT DESCRIPTION

The Code Sepsis Initiative was a phased approach including alignment with the Southern California Sepsis Collaborative, a St. Joseph Hoag Health (SJHH) affiliation targeting one of the health system’s Clinical Effectiveness Initiatives. At St. Joseph Hospital (SJH), the development of a Code Sepsis Core Team and
Workgroup was established, comprised of champions and stakeholders from clinical and administrative departments overseeing the care of the sepsis patient. The physician lead is a Critical Care Board Certified Physician Intensivist, collaborating with the Emergency Services Medical Director and designated lead Hospitalist. Nursing representation is from Critical Care, Emergency Services and Rapid Response. Administrative support is from nursing leadership and analysts from quality management. The SJH team liaisons met with the multi-facility collaborative on a monthly basis aiming to standardize processes, resources and the electronic health record’s (EHR) documentation for physicians, nursing and order sets. The SJH Code Sepsis Core Team meets twice a month to review status of mortality, length of stay, bundle compliance and readmission rate, issues management and communication with the hospital departments. A Code Sepsis subgroup reviews all cases of severe sepsis and septic shock admitted to the Medical Intensive Care Unit (MICU) and the Definitive Step-Down Unit (DSU). They identify gaps and trends in bundle compliance and care and communicate to involved departments, providers and caregivers. This is in addition to the Quality team’s analysts reviewing all sepsis cases concurrently. Then, the most pertinent and recent data is made available for the Code Sepsis team to illuminate trends, identify issues, determine tests of change, communicate timely to parties involved and assess if the tests of change were effective (See Figure 2, SJO Concurrent Sepsis Dashboard). The Code Sepsis Workgroup provides guidance on scope and direction for the Code Sepsis Initiative.

Phase I: In an effort to improve mortality and use of clinical guidelines, sepsis-related activities became a focus in the Emergency Care Center (ECC). A four day pilot was conducted in July 2015 for a “Code Sepsis” rapid response to ECC for patients identified for Severe Sepsis and Septic Shock. Activation of Code Sepsis triggers the execution of the 3 and 6 hour care bundles once a patient at risk has been identified. Members of the Medical Emergency Team (MET), Critical care-trained rapid response nurses, respond to the alert in the ECC and collaborate with the ECC team. Prior to this pilot, the MET nurse had responded only to inpatient sepsis alerts. With initiation of the response to ECC, compliance to the bundles was greatly improved. This phase required MET nurse training, communication across the hospital, allocation of resources, creating and augmenting patient care tools (i.e. Sepsis RN Checklist, See Figure 3), and staff education for ECC staff, intensive care unit and the definitive step down unit. Extensive physician education in emergency services, the Intensivist and major hospitalist teams also occurred at this time. Focus of physician education was on care bundles for sepsis, severe sepsis and septic shock patients. Our physician champion led this education effort with his colleagues.

Phase II: In January 2016, in response to increased MET nurse activity and identifying majority of Code Sepsis alerts occurred during the hours of 8 AM to midnight, a 12 hour Sepsis nurse pilot was initiated. From the MET nurse pool, 6 nurses participated in the 6 month pilot capturing the majority of Code Sepsis alerts occurring in the ECC from the hours of 9 AM to 9:30 PM. This pilot also included initiating proactive rounding of sepsis patients alerted for potential progression to severe sepsis and septic shock, stabilized and then admitted to the medical surgical floors. The Sepsis nurse in collaboration with the MET nurse, would proactively round on the patients admitted to the medical-surgical units for the first 24 hours. A severe sepsis screening tool was imbedded in the electronic health record (EHR). Each shift, the bedside RN would assess their patients for signs and symptoms of sepsis. Patients with a positive severe sepsis screen would be further assessed by the MET RN or attending physician. Sepsis interventions would be initiated as appropriate. During this phase, EHR optimization occurred to standardize clinical tools to help identify and manage sepsis. These included a
physician sepsis documentation template, an ECC nursing sepsis screening, an ECC sepsis order set and the inpatient sepsis order set for both critical care and non-critical care sepsis admissions.

**Phase III:** With trends of improved compliance, as of July 2016, two dedicated 12-hour critical care-trained Sepsis Nurses were added, in addition to the dedicated MET nurse, to assist in ECC responses and proactive rounding for sepsis patients. This allowed 24/7 coverage for sepsis-related activities. The Sepsis nurses track all sepsis patients they are alerted to and proactively monitor on the floors. They are equipped with technology to assist in the identification and care of the sepsis patient. At times, the nurse or physician call to the Sepsis nurse might not always be consistent or timely, thus adoption of a high alert application on their portable smart device allows the Sepsis nurse to receive alerts on patients that may meet severe sepsis or septic shock criteria. Some patients with histories of end-stage renal disease or heart failure may prompt a physician or nurse to hesitate to administer fluids to a patient with severe sepsis and septic shock. Utilization of a non-invasive cardiac output monitoring device assists the nurses and providers to objectively assess a patient’s tolerance and responsiveness to fluid resuscitation.

As a result of more stabilized sepsis patients being admitted to the floors (See Figure 4) with the potential to decompensate, hospital-wide education was provided in the spring of 2017. All nursing departments from ECC to inpatient to procedural areas received general sepsis and Code Sepsis education. Case studies were practiced in group discussions facilitated by Sepsis nurses or department Sepsis champions. Patients and families also receive sepsis education via the Sepsis Nurse rounding. A Sepsis Education flier was developed in collaboration with our Patient Family Advisor Committee, to further educate patients and families on sepsis.

**Phase IV:** Emerging opportunities still are on the horizon for the Code Sepsis program as more and more patient populations also come into light to be addressed: surgical services, maternal health, and the at risk oncology patients. We are currently developing sepsis collaborative programs that focus on care after the initial hospitalization, and aimed at reducing readmissions and lessening the impact of post-sepsis syndrome.

**RESULTS**

**Sepsis Outcomes:** Prior to interventions, the proportion of sepsis patients progressing to septic shock was 31.25% in the last quarter of 2014. By the last quarter of 2016, the proportion of sepsis progression was 14.65%; an over fifty percent reduction (See Figure 5). Concurrently, the length of stay for all sepsis patients decreased from 8.01 days (quarter 4, CY2014) to 6.2 days (quarter 1, CY2017), a 22% reduction (See Figure 6). In addition, variable costs per case were reduced by 41% by 1st quarter of 2017 ($21,162.20 to $12,469.39, see Figure 7). Readmissions have trended down slightly with an average O/E of 0.92. Mortality rates have also been reduced from an average pre-intervention rate at 13.33% to 7.72%, a 42% reduction (see Figure 8). Bundle compliance has steadily improved (67% to 91% bundle compliance) over the months since the pilot of the Sepsis RN January 2016 (See Figure 9).

**Sepsis RN and MET RN Activity:** Since becoming dedicated 24/7, the Sepsis nurses consult on average 324 patients a month. The rate of proactive rounding on at risk patients rose to 124 visits per 1000 patient days as each Code Sepsis consult admitted to the medical-surgical floors is followed for the first 24 hours from admission (see Figure 10). In combination to alerts and visits by the MET nurses, sepsis-related cases account for an average of 63% of monthly rapid response visits (see Figure 11).
SIGNIFICANCE

As other hospitals utilize tools for early sepsis identification in the ED or care pathways, successful use of a Code Sepsis response facilitated by a Sepsis Nurse has improved outcomes for sepsis-related patients as well as decreased costs per case. This strategy could be implemented at other hospitals who want to improve mortality, decrease length of stay and cost, and improve overall outcomes.

SUSTAINABILITY

Establishing systemic standards of practice (i.e. documentation, order sets, standardized procedures and communication tools) assures sepsis bundle compliance and ultimately quality care of the sepsis patient. The Code Sepsis response is supported by education of providers and caregivers that monitor for signs and symptoms of the decompensating sepsis patient, engaging early communication to appropriate team members, and allow for early interventions to be executed timely. The Sepsis RN initiative serves as a constant in the sepsis patient’s continuum of care in the inpatient setting by bridging the early identification and early goal therapies executed in the ECC and continue monitoring of this high risk patient to prevent deterioration and failure to rescue when admitted to the medical-surgical departments. In addition, as an additional resource, the Sepsis nurse can provide real time feedback and education and collaborative support for their fellow clinician at the bedside.

KEY LESSONS AND ADVICE

First, it is essential for a successful program to establish a core team of champions and stakeholders leading the interdisciplinary effort: physicians, nursing, administration, quality, emergency care services, critical care, medical-surgical and rapid response. Second, assure an established rapid response team infrastructure that supports the activities of the rapid response and Sepsis RNs. This infrastructure includes dedicated ICU nurses, clinical policies, standardized procedures, emergency guidelines, rapid response processes and documentation. Third, always provide frequent and consistent communication to all parties involved. This includes education, interdisciplinary collaborative meetings, outcomes monitoring (concurrent reviews if possible) and data reporting. Lastly, the rapport and “Code Sepsis”/“Sepsis Consult” alert communications between the ED staff and Sepsis RN are key in capturing patients and implementing the 3 and 6 hour Sepsis bundles timely.
SUPPLEMENTAL MATERIAL

Figure 1: 3 Hour and 6 Hour Bundles, Surviving Sepsis Campaign

Figure 2: Sepsis Concurrent Dashboard
Figure 3: Sepsis RN Code Sepsis Tracking Sheet

### Sepsis RN PILOT - CODE SEPSIS TRACKING WORKSHEET (ver.4.11.2016)

- **Patient Sticker:**
  - (All suspected Sepsis patients)
  - (For all identified Severe Sepsis patients)

- **3 HR TIME GOAL:**
  - SEVERE SEPSIS CRITERIA:
    - Suspected OR Known Infection:
      - Yes □ No □
    - At least 2 SIRS:
      - Yes □ No □
  - Acute Organ Dysfunction:
    - Yes □ No □

- **3 HR BUNDLE ELEMENTS**
  - Initial Lactate:
    - Yes □ No □
  - BC:
    - Yes □ No □
  - Initial Fluid Challenge:
    - Yes □ No □

- **SIIRS CRITERIA**
  - Temperature > 39°C or < 36°C
  - HR > 90 bpm
  - RR > 20 breaths/min
  - PaCO2 < 32 mmHg
  - WBC > 12,000 cells/mm³, < 4,000 cells/mm³, > 10% Bands

- **ACUTE ORGAN DYSFUNCTION**
  - NEURO: ALOE, Confusion
  - RESPIRATORY: Tachypnea, PaO2 <70 mmHg, SaO2 <90%, PaO2/FiO2 <200
  - CARDIAC: Tachycardia, Hypotension, Altura M. Bundle Compliance
  - GENITOURINARY: Oliguria, Anuria, Elevated Creatinine (>=2)
  - LIVER: Jaundice, Increased enzymes, decreased Albumin, increased PT
  - COAGULATION: decreased platelets, increased PT/APTT, decreased Protein C, increased D-Dimer

- **WHY WAS AN ELEMENT NOT DONE OR DONE ON TIME?**
  - COMMENTS / ISSUES (Circle # or Write in Description):
  1. No fluids ordered for OR 20 mL/kg fluids not ordered or completed because:
     - ESRD (LA)
     - CHF (IB)
     - OTHER (JC)
  2. MD thinks, “Not Sepsis”
  3. MD says, “It’s a viral infection.”
  4. MD says, “No ABX because still working up patient/waiting for diagnostics.”
  5. Uncooperative Staff/MD: (please add description)

- **PHYSICIAN:**

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**Sepsis Patient Admissions - Inpatient Departments (CC & MS FOS)**

**June - December 2016**

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**Figure 4: Sepsis Patient Admissions to Inpatient Departments (Critical Care and Medical Surgical Families of Service)**

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Figure 5: Sepsis Progression to Septic Shock

Sepsis Progression to Septic Shock: Qtr4 CY14 to Qtr CY16
Sample Size: n=5,054 patients

Figure 6: Average Length of Stay

Sepsis Length of Stay (days): Qtr4 CY14 to Qtr1 CY17
Sample Size: n=5,054 patients

Figure 7: Variable Costs Per Case

Variable Costs Per Case, All Sepsis

<table>
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<tr>
<th>Quarter</th>
<th>Cost</th>
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<tr>
<td>JAN-JUN 2015</td>
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<td>JUL-DEC 2015</td>
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<td>JAN-MAR 2017</td>
<td>$12,469.39</td>
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</tbody>
</table>
Figure 8: Mortality Rate

Mortality Rate: Qtr1 CY15 to Qtr1 CY17
n=3,414 patients coded for sepsis, severe sepsis, septic shock

Figure 9: Sepsis Bundle Compliance

Sepsis Bundle Compliance Rate, Concurrent Review
(all or none 3 & 6 hour bundles, n= 1,035 cases)

Figure 10: Proactive Rounding Visits per 1000 Patient Days
Figure 11: Sepsis Related MET Visits to Total MET Visits