Clinical Safety & Effectiveness
Cohort 18 Team #7

Increasing Early Detection of Sepsis

CENTER FOR PATIENT SAFETY & HEALTH POLICY
UT Health Science Center
SAN ANTONIO
The Team

• Division
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• Sponsoring Departments
Dr. James Barker, UHS VP for Clinical Services CMO Office
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Ronald Estrella, RN, Executive Director of Nursing on 5th floor
Dr. Daniel Dent, Program Director of General Surgery Residency Program
Dr. Jan Patterson, Associate Dean for Quality and Lifelong Learning
STATEMENT

To increase early detection of sepsis on the fifth floor Acute Care Unit at UHS hospital by reducing “Onset of sepsis to MD antibiotic order” cycle time by 50% from 9:28 to 4:44 hours by May of 2016.
Project Milestones

- Team Created: Jan 2016
- AIM statement created: Feb 2016
- Weekly Team Meetings: Jan-April 2016
- Background Data, Brainstorm Session, Workflow and Fishbone Analyses: Jan-Feb 2016
- Interventions Implemented: Mar-April 2016
- Data Analysis: May 2016
- CS&E Presentation: Jun 3rd, 2016
Severe Sepsis with Organ Injury
Background

• Sepsis is a common problem with a major global impact on healthcare resources and expenditure.
• Developed countries sepsis incidence: 300 cases per 100,000 population and rising.
• Mortality for patients with severe sepsis or septic shock ranges between 20% and 50%.
• The Surviving Sepsis Campaigns promoted internationally recognized pathways to improve the management of sepsis.
• To translate recommendations into the daily practice is challenging and requires a multi-disciplinary approach.
Background

• Severe sepsis: sepsis + sepsis-induced organ dysfunction or tissue hypo perfusion.
• Septic shock: severe sepsis criteria + hypotension despite IV fluid resuscitation.
• Fundamental approach: early recognition, appropriate, timely delivery of antibiotics, source control.
• Mortality increases by 7.6% for every hour delay in starting antibiotic therapy.
• Early goal-directed therapy (EGDT) has previously been associated with a 34% relative risk reduction in mortality.
Background

• The Surviving Sepsis Campaign
  – Joint collaboration of the Society of Critical Care Medicine and the European Society of Intensive Care Medicine committed to reducing mortality from sepsis worldwide.
  – Implementation of a core set of evidence-based interventions, otherwise known as ‘resuscitation bundles’

• Sepsis Six:
  – three diagnostic and monitoring steps and three therapeutic interventions:
Background- Sepsis six

1. Deliver high-flow oxygen

2. Take blood cultures prior to antibiotics but do not delay treatment

3. Administer empirical intravenous antibiotics

4. Measure serum lactate

5. Start intravenous fluid resuscitation with crystalloids

6. Commence urine output monitoring via either a catheter or chart


Plan - Determine the Baseline Performance

• Flow to determine bottle neck issues for lack of performance

• Cause and Effect Diagram to determine the root cause for non-performance

• Pareto chart to narrow to a focus

• Process control chart to determine stability of the process and present performance
Sepsis Team - UHS 5ACU - Flow Diagram

Bedside Patient Hand-off Report (RN to RN) → Patient Admitted to 5ACU → PCT Checks VS → PCT Notifies RN of Abnl VS (HR BP RR Temp) → RN Performs Patient Assessment → RN Pages/Calls 1st MD → MD Calls RN Back Within 15 Minutes?

Y

RN Notifies MD of Abnl. Assessment → Attending MD Calls RN → RN Pages Attending MD

N

RN Pages 2nd On-Call MD

2nd On-Call MD Calls RN

N

RN Pages 2nd On-Call MD

Y

MD Suspects Sepsis → MD Orders Labs: (CBC W/Diff, CMP, VBG, Lactic Acid, BC, UA, CSR)

RN Obtains Labs

IV Access Present?

Y

Lab Specimens Sent to Lab

Lab Specimens Received in Lab

N

RN Starts IV Access?

RN Starts IV Access?

Y

RN Calls MD for PICC/Central Line

MD Inserts IV Access

N

PICC Team Inserts IV Access

RN/MD Re-Assess Patient Within 3 Hours

Patient Improved?

Y

Continue Care as Appropriate

N

MD Orders Abx

MD Orders IV Fluids

Transfer to ICU
Sepsis Team - UHS - Fishbone

**Problem Statement:** Late Detection of Sepsis

**Process/Methods**
- Lack of stat orders and reporting
- Lab processing
- Frequency of RN Checking Pt
- No awareness/Late Sepsis Detection
- No Education/Training on Sepsis
- Lack data on Late Sepsis Detection
- Lack unit based test for Sepsis

**Materials Supplies Machines**
- Only initial antibiotics stored on Unit
- NO GEM
- No lab supplies at bedside

**People**
- Patient Care Techs
- Lab Techs
- Nurses
- Attendings
- House Staff
- Poor Communication

**Lack Education**
- Lack training & Clinical Judgement

**Lack IV Access**
- Overwhelmed Rapid Action Team
- Poor Hand off Skills
- Lack system/EMR back up
University Hospital - ALL Inpatient Cases n=5607 by Sepsis Cases n=378

Nov 2015 - Jan 2016 -- Sepsis Rate = 6.7

Inpatient Sepsis

- ST-5TH FL ACUTE CARE: 118 (31.5%)
- ST-5TH FL INTENSIVE CARE: 60
- ST-9TH FL ACUTE CARE: 51
- NS-GENERAL MEDICINE: 48
- ST-10TH FL NORTH: 23
- ST-6TH FL ACUTE CARE: 15
- ST-8 HEM/ONC: 11
- ST-6TH FL INTENSIVE CARE: 10
- ST-7TH FL ACUTE CARE: 8
- Other: 31

Total: 353
University Hospital - All Inpatient Top Principal Dx
Nov 2015 - Jan 2016 Cases n=112

Count by Top Principal Dx:
- Sepsis, unspecified organism: 186, 72.1%
- Sepsis due to E. Coli: 20, 7.9%
- HIV Disease: 16, 8.6%
- Hepatic Failure: 8, 9.1%
- Acute Kidney Failure: 7, 9.1%
- Hepatic Failure: 5, 9.3%
- Acute Kidney Failure: 4, 9.3%
- Acute Kidney Failure: 4, 9.5%
- Acute Kidney Failure: 4, 9.6%
- Acute Kidney Failure: 4, 9.8%

Top Principal Dx:
0%  10%  20%  30%  40%  50%  60%  70%  80%  90%  100%
0  25  50  75  100  125  150  175  200  225  250
Sepsis, unspecified organism: 186, 72.1%
Sepsis due to E. Coli: 20, 7.9%
HIV Disease: 16, 8.6%
Hepatic Failure: 8, 9.1%
Acute Kidney Failure: 7, 9.1%
Hepatic Failure: 5, 9.3%
Acute Kidney Failure: 4, 9.3%
Acute Kidney Failure: 4, 9.5%
Acute Kidney Failure: 4, 9.6%
Acute Kidney Failure: 4, 9.8%
University Hospital - All Inpatient Sepsis Discharge Cases n=367
Nov 2015 - Jan 2016

Count by Discharges Category

01-DC Home/ Self Care/ Res Care/GRP 20-Expired 03-DC/TNSF to SNF 06-DC/TNSF TO HOME W/ HOME HEALTH 63-DC/TNSF MCARE CERT LTCH OR LTAC 50-DC TO HOSPICE/HOME 07-AMA/ELOPEMENT Other

190 61 38 26 15 7 6 6 5 4 9
51.8% 68.4% 78.7% 85.8% 89.9% 91.8% 93.5% 95.1% 96.5% 97.5%
Mean (X) Cycle Time in Hours
Sepsis Symptoms to MD Antibiotic Order

Cycle Time

Cases
DO – Plan & Test the Actions

• After analysis of UH statistics in preliminary data analysis and noticed that the majority of sepsis occurred on 5ACU and not in 6ACU, teaching and implementation of screening tool was done in 5ACU (Feb 2016, completed)

• The primary and secondary outcome analysis will be based on the data collected from screening tool and chart review (May 2016, completed)
PLAN: Intervention

- Initial analysis of pre-intervention data
- Screening tool implementation
- Post-Intervention data to be collected until May
- Final analysis of post-intervention data
PLAN: Intervention

Dynamic changes in statement, population, and primary and secondary outcomes:

– **Population:** Change the focus from 6ACU to 5ACU

– **Primary outcome:** Cycle time from time of sepsis onset to initiation of antibiotics for patients located on 5ACU

– **Secondary outcomes:** ICU transfers and mortality
# Action Plan

**Aim Statement:** To increase early detection of sepsis on the fifth floor ACU in UHS hospital by 20% by May of 2016.

<table>
<thead>
<tr>
<th>Action Strength</th>
<th>Action Driver (Taken from Flow or Cause &amp; Effect Diagram)</th>
<th>Action</th>
<th>Who?</th>
<th>Why?</th>
<th>Start Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong</td>
<td>Lack of data on late sepsis detection</td>
<td>Sepsis Screening Tool</td>
<td>Maria Salak, RN Helena Quezon, RN</td>
<td>1) Standardize 2) Simplify 3) Reduce Wasted Time 4) Redesign the process</td>
<td>March 1st-ongoing</td>
</tr>
<tr>
<td>Strong</td>
<td>No awareness/late sepsis detection</td>
<td>Teaching Material for the Sepsis Screening Tool</td>
<td>Maria Salak, RN Helena Quezon, RN</td>
<td>1) Standardize 2) Simplify</td>
<td>Feb 22nd-29th</td>
</tr>
<tr>
<td>Strong</td>
<td>No education/training in sepsis</td>
<td>Educate and Train the nurses &amp; MDs</td>
<td>Maria Salak, RN Helena Quezon, RN Ha Lam, MD Alexandra Castro MD</td>
<td>1) Standardize 2) Simplify</td>
<td>Feb 22nd-29th</td>
</tr>
<tr>
<td>Strong</td>
<td>Lack systems/EMR back up</td>
<td>Automate the Screening Tool</td>
<td>Mohammed Al Fayyadh, MD</td>
<td>1) Software Modification &amp; Enhancement</td>
<td>Feb 22th-march 5th</td>
</tr>
</tbody>
</table>
Intervention 1

SEPSIS SCREENING TOOL

Instructions: Use this tool to screen patients for sepsis upon admission or inpatients if infection is suspected.

Location: ________________
1. Underlying Diagnosis: ________________________________________________
2. Source of infection suspected? □ YES □ NO
3. Is this patient have lines/drains/Foley?
   □ PICC/midline □ TLC/DL □ MEDIPORT
   □ PERMACATH/temporary catheter (Quinton) □ FOLEY/suprapubic
   □ OPEN WOUND/PRESSURE ULCER
4. Does this patient meet (SIRS) criteria?
   □ Hyperthermia >100.4°F (38 °C) □ Hypothermia <97 °F (36 °C)
   □ Tachycardia HR > 90 bpm □ Tachypnea RR >22bpm
   □ WBC (leukocytosis) >12,000µ-1/Bands >10% □ WBC (Leukopenia) <4,000µ-1
   □ PaCO2 <32mmhg □ SBP <100mm Hg
   □ Altered mental status from baseline (GCS <13)

If you check 2 or more boxes on question 4, suspect presence of infection.

5. Code Sepsis activated? (RRT 30975 /ACT on the floor) □ Yes □ No
6. Name of MD notified? ________________ Time: ________________
7. Did MD order Sepsis Protocol within 3 hours?
   □ Lactic acid □ Blood cultures □ Initiate antibiotics □ IV Fluids
Intervention 1: SIRS criteria
Intervention 2

Transfer to ICU: Yes
Sepsis onset location: ST-6TH FL. ACUTE CARE
Sepsis onset date and time: 3/13/2016 1:00 PM
Pulse: 99
Respiratory Rate: 90
WBC: 99
Temperature: 99
SEP below 90: Yes
Infection source: IFAwe
Lactate order date and time: 3/13/2016 12:00 PM
Lactate collected date and time: 3/13/2016 1:20 PM
Lactate results date and time: 3/13/2016 11:03 AM
Blood cultures collected: Yes
IV Antibiotics ordered: Yes
IV Fluids: Yes
Previous location: ERU+EC OBSERVATION
Current unit: ERU+EC OBSERVATION
Date entered by: tests
• Compare the results to the plan
A 72% reduction in cycle time exceeding our aim of 50%
Nursing Survey

• 4 question survey using a 5 point Likert scale given to 5ACU RNs
• 42% of RNs felt confident diagnosing or recognizing sepsis PRIOR to the use of the Sepsis Screening Tool
• 64% of RNs felt confident diagnosing or recognizing sepsis AFTER the use of the Sepsis Screening Tool
• 48% of RNs felt that the tool changed the way they managed patients
• Neutral response in terms of time management
Act - Modify Plan for Next Test of Change

✓ Use the tool as part of shift change protocol for the nursing staff

✓ Incorporate an automated version of the tool into Sunrise

✓ If proven helpful this tool must be part of the new Employee or Unit Orientation, Graduate Medical Education and Continuing Education courses

✓ More data analysis and reporting to come.
Act - Modify Plan for Next Test of Change

- Continue to monitor and report the data to the staffs.

- Spread best practice to the ED and other units as appropriate.

- Focus education and training on proper tool use, its benefits and patient selection.
**Benefits**

- Standardizing and facilitating the right care via use of a protocol reduces both transfers to the ICU and mortality.

**Barriers**

- Bedside nurse may view screening tool as added workload and extra paperwork to be filled out.
- Additional unit activities on the wards may affect the timing and implementation of the screening tool.
Return on Investment

• Improved care represents fewer patients died with subsequent with a lower hospital ALOS and costs.
• % Mortality dropped from 4 of 8 or 50% to 0 of 6 or 0%
• Fewer transfers to the ICU represents a reduction in use of a highly skilled ICU and subsequent ALOS.
• % ICU transfers dropped from 8 of 8 or 100% to 4 of 6 or 66%
## Return on Investment

### ROI on Sepsis Cases

<table>
<thead>
<tr>
<th></th>
<th>Pre-Intervention</th>
<th>Post-Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>% Mortality</strong></td>
<td>4/8 or 50%</td>
<td>0/6 or 100%</td>
</tr>
<tr>
<td>LIVED n=4</td>
<td></td>
<td>LIVED n=6</td>
</tr>
<tr>
<td>DIED n=4</td>
<td></td>
<td>DIED n=0</td>
</tr>
<tr>
<td>TOTAL POPULATION</td>
<td></td>
<td>TOTAL POPULATION</td>
</tr>
<tr>
<td>Hospital ALOS</td>
<td>31.3 16.5 23.9</td>
<td>10.7 0 10.7</td>
</tr>
<tr>
<td>Hospital Average Cost</td>
<td>$41,264 $26,317</td>
<td>$15,355 $0 $15,355</td>
</tr>
<tr>
<td>Total Hospital Days</td>
<td>125 66 191</td>
<td>64 0 64</td>
</tr>
<tr>
<td>Total Hospital Cost</td>
<td>$165,058 $105,266</td>
<td>$92,127 $0 $92,127</td>
</tr>
<tr>
<td><strong>% ICU Transfers</strong></td>
<td>8/8 or 100%</td>
<td>4 of 6 or 66%</td>
</tr>
<tr>
<td>ICU Days</td>
<td></td>
<td>ICU Days</td>
</tr>
<tr>
<td>Non-ICU Days</td>
<td></td>
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</tr>
<tr>
<td>TOTAL POPULATION</td>
<td></td>
<td>TOTAL POPULATION</td>
</tr>
<tr>
<td>ALOS</td>
<td>11.4 12.5 23.9</td>
<td>3.3 7.3 10.7</td>
</tr>
<tr>
<td>Total Days</td>
<td>91 100 191</td>
<td>20 44 64</td>
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San Antonio

THANK YOU!