Supporting Clinical Decision-Making Through Technology

A Sepsis Story
Conflict of Interest Disclosure

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has no real or apparent conflicts of interest to report.
Session Objectives

• Discuss how to use data to support changes to processes
• Demonstrate how rule based data mining can improve the accuracy of clinical response
• Discuss importance of giving clinicians information at the correct place in their workflow supports better practice
Why Sepsis?

Every 2 minutes (122.4 seconds), someone in the U.S. dies from sepsis. (Based on 256,000 deaths annually)

Sepsis affects up to 1.6 million people in the U.S. yearly with a 28-50% mortality rate.

Sepsis contributes to about half of all hospital deaths.

On average, there are 4,383 new sepsis patients per day in U.S. hospitals.

Only 44% of U.S. adults have heard of sepsis.

Sepsis costs the healthcare system $24 billion per year (as of 2015).

Sources: sepsis.org, CDC.gov, & JAMA.Jamanetwork.com

https://learn.premierinc.com/ebooks/sepsis-infographic
There are six steps in the RCB design processes, completed for each care module:

1. Define **goals and outcomes** for each module.
2. Define the **clinical specifications** for every patient to achieve desired outcomes.
3. Identify the **enablers** required to reliably deliver the specifications.
4. Depict people, process and technology in an integrated **workflow**.
5. Finalize the **functional requirements** for creating the required enablers.
6. Identify **process measures** to gauge how progress and success will be tracked.
Sepsis Screen

- Based on a paper tool
- Screened 100% of ED patients
- Expected the nurse to answer question based on limited information
- Does not utilize functionality that would facilitate accurate documentation and timely patient care
Sepsis Mortality Rates & Initial Documentation of Suspected Infection

With some exceptions hospitals have higher mortality rates when suspected infection was answered ‘No’ during screening.
TOP THREE
Shortness of Breath
Abdominal Pain
Altered Mental Status
Suspected Infection with

SI-SIRS-MEWS
Quick SOFA
Sepsis Organ Failure Assessment
Systemic Inflammatory Response Syndrome
Shock Index
Modified Early Warning System
Time to Get Real

• Data and outcomes showed intended process was not followed
  • Even when screening was done correctly we were missing sepsis patients
• Eliminate the nurse’s decision whether the patient has an infection
• Needed a better way to inform the clinician of the individual patient’s risks/evidence of infection
• Put the right information in the right place, at the right time, in the right way, to the right person
Identification of At-Risk Patients in the ED

• **Goal:**
  - Identify risks for infection accompanied by early indicators of organ dysfunction
  - Ease the cognitive burden on clinicians

• **Objective for identification of those at:***
  - Leverage existing research and guidelines
  - Utilize known characteristics of infection/septic patients
  - Avoid complex scoring/weighting of attributes
  - Aggregate information found in numerous locations for succinct viewing
  - Notify clinicians when simple criteria is met
Phases of an ED visit

- Documentation and data availability increases as the patient moves through the phases of an ED visit.
- Each phase contains evidence of suspected infection AND physiological changes when used in the right context.
Using What We Know

• Who is at risk for infection
  • Recent hospitalization
  • Immunocompromised
  • Recent surgeries, invasive lines, visits for infection, antibiotic therapies
  • Elderly at higher risk, especially living in a healthcare facility

• What is an abnormal functioning body system?
  • Assessment findings can identify potential problems before it is actually diagnosed
  • Baseline function of body systems must be accounted for (i.e. renal failure)
Identification Begins Before ED Visit Begins

Patient Arrival

Recent Treatment for Infection
- Diagnosis
- Antibiotics
- Cultures
- Isolation

Recent Procedures
- Surgery
- Dialysis treatment
- Airways
- Wounds/Incisions
- Invasive lines
- Implanted device/ports

Chronic Health Conditions
- Immuno-compromise
- Cancer
- HIV/AIDS
- Asplenia

Extended Contact with Healthcare Institution
- Recent Admission
- Lives in a nursing home or institution

Registration
- Arrival Complaint

Triage
- Chief Complaint
- Vital Signs
- Home Meds
- Patient History
- Living Arrangements

Roomed
- Nursing Assessment

Treatment
- Orders-Infection-related
- Lab results
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Simple Criteria

1. Risk or Evidence of Infection
2. 2 Body System Abnormalities

THINK SEPSIS
Risk For Infection

- Nursing home
- WBC
- Fever
- Swelling
- Infection origin
- Isolation
- Chief complaint
- Facility resident
- Age over 65 years
- Confusion
- Altered mental status
- Infection
- Facility
- Pressure ulcer
- Drainage
- Pressure
- Pain
- Pressure
- Acute Acid
- Rigor
- Malaise
- Catheter

Additional terms include:
- Clinical Documentation
- Assessment Documentation
- HEENT
- Illness
- Abscess
- Spum color
- Tears
- Muscle pain
- Cold
- Level of consciousness
- Genitourinary
- Dental issues
- Painful ostomy
- Breakdown
- Short-term lines
- Drain
- C-reactive protein
- Urinary frequency
- Nausea
- Hemoptysis
- Neutropenic
From Just Triggers to Real Change
Design Teams

- Iterative design team looked at the THINK SEPSIS infection risk identification tool and where to best place it in the ED workflow
  - Everyone was still thinking of this as a classic ‘screening’ tool, something done during assessment

- Physicians requested the new tool to fire for them instead of following the previous workflow of the nurse notifying the physician of a positive sepsis screen
  - Be very careful what you ask for
Infection Identification

Identification of Infection for Patients Who Had an Infection POA (ED Diagnosis or Coded Diagnosis)
9/13/2017 – 9/19/2017

Population: ED patients with Infection (ED physician diagnosis or Coded as POA)
Human Factors

• Easy to forget this is NOT a sepsis identification tool, it is a risk of infection identification tool

• Risk of infection is so common it is easy to be desensitized
  • Flu season = the whole world has an infection

• Over-firing versus including ‘infection’ in clinical thinking more often
  • Identifying infection means different work efforts

• Timing is everything
  • Information needs to be highlighted when the clinician can reasonably act on it
Population: ED patients with Sepsis (ED physician diagnosis or Coded as POA) who roomed in the ED 30 minutes or more

Sepsis Identification

Patients Who Had an Sepsis POA (ED Diagnosis or Coded Diagnosis)
9/13/2017 – 10/15/2017

- Yes - Suspect Infection: 219
- No - Does not Suspect Infection: 4

Think SEPSIS Flagged: 98.2%
You don’t know what you don’t know

• Nurse designers and Physician designers
  • Approved the new workflow using the trigger tool and clinical decision support tools

• Triggers in wrong spot
  • Even after the trigger tool was adjusted to fire less, the alerts were still not in the best place in the workflow for clinicians to act upon
  • Just because the trigger is met does not mean that is the best time to tell the clinician.
  • Good intention of instant alert when criteria was met had bad outcome of delaying action to the alert
Flexibility and Rapid Cycle Change

• Knew this new process would have unique issues associated
  • Intense data scrutiny by team to identify issues early
  • Kept open lines of communication with front line clinicians

• Made several ‘tweaks’ to the process immediately
  • Adjusted triggers to appropriately reduce firing

• Knowing what you know now
  • Listened to clinicians struggles with when alert was firing
  • Listened to struggles with how to use clinical decision support tools (BPA buttons, order sets)
  • Rapidly changed tools to meet the needs of front line staff
THINK SEPSIS TRIGGER PERCENTAGE

Change #1:
• remove traumatic ‘risk of infection’ Chief Complaints
• Remove chief complaints from physiological abnormalities (except Confusion)

Change #2:
• BPA alerts at Sign Orders
• Removal of chief complaints related to trauma (cont.)
• Nursing home patients changed from stand-alone inclusion criteria to a risk factor

Mean 20.0%
Mean 18.9%
Mean 17.9%
Mean 15.3%
Sepsis POA – Time to Alert

Sepsis POA patients – Arrival Time to First BPA Alert

Minutes to 1st BPA*

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<th></th>
<th>n</th>
<th>Mean</th>
<th>Median</th>
<th>(Min-Max)SD</th>
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<tr>
<td>Pre Go-Live (Jan-Dec 2016)</td>
<td>6376</td>
<td>193.2</td>
<td>168</td>
<td>(0-1981) 202.8</td>
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<tr>
<td>Post Go-Live (Sep 20-Oct 8 2017)</td>
<td>163</td>
<td>50.6</td>
<td>11</td>
<td>(0–1511) 134.9</td>
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*ED total time in minutes used for patients who had no alert

Though the Post Go-Live sample is small we see an improvement of > 2.5 hours in alerting the clinicians
Sepsis POA – Time to First Intervention

Though the post Go-Live sample is small, we see an improvement of 17 minutes to first intervention.
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