Reducing Inpatient Adult Severe Sepsis and Septic Shock Mortality: A Quality Improvement Project

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BACKGROUND:
- Sepsis is a clinical term to describe the body’s systemic and detrimental response to a known or suspected infection.
- If sepsis is not identified and treated early in the infectious process it can progress to severe sepsis (organ system failure), septic shock (multiple organ failure), and death.
- Sepsis contributes to over 228,000 emergency room (ER) visits in the U.S. annually with associated costs over $31 billion.
- Over 8% of adult inpatients with sepsis are admitted through the ED.
- Patients with severe sepsis or septic shock consistently have higher hospital mortality rates resulting from delayed recognition and lack of standardized treatment interventions.
- Sepsis continues to be a primary cause of infection related deaths in the U.S.
- Sepsis contributes to over 500,000 emergency room (ER) visits in the U.S.
- If sepsis is not identified and treated early in the infectious process it can progress to severe sepsis (one organ system failure), septic shock (multiple organ failure), and death.
- Sepsis is one of the most expensive diseases treated in the U.S. compared to all other hospitalizations ($103,529 vs. $17,298).
- Other hospitalizations ($103,529 vs. $17,298).
- Mortality rates up to 50%.
- Overall compliance with process measures showed small improvement; delayed recognition of signs and symptoms of sepsis, severe sepsis, and septic shock may be reduced when bundled care treatments are implemented.

OBJECTIVE
- Reduce adult inpatient sepsis mortality and associated length of stay (LOS) by implementing standardized processes for early recognition and treatment of severe sepsis and septic shock in the ED.
- Primary Objective
- Reduce adult inpatient severe sepsis and septic shock mortality by 25% (12% to 9%).
- Secondary Objective
- Reduce hospital LOS 10% (6.5 days to 5.23 days)
- Achieve outcomes in a 12 month period (January to December, 2014)

INTERVENTIONS:
- In two non-profit community based Magnet hospitals three root causes of sepsis mortality were identified:
  - Provider and staff knowledge base
  - Delayed recognition of signs and symptoms of sepsis, severe sepsis, and septic shock
  - Lack of standardized sepsis treatment interventions
- Quality Improvement Interventions:
  - Provider and staff sepsis education using computer based training and high fidelity simulations
  - Implementation of rapid sepsis screening at ED triage
  - Implementation of a dedicated sepsis alert and treatment algorithm
  - Implementation of ED sepsis order set (includes Surviving Sepsis Campaign Guidelines 3 and 4 hour bundle in treatment implementation)
  - Review ED RN collaborative practice systems

METHODS:
- Pre post intervention QI study design
- Pre intervention group: October – December, 2013
- Post intervention group: October – December, 2014
- Data Sources
  - University Health System Consortium database
  - Electronic health records
  - Inclusion
    - Adult patients ≥ 18 years old admitted to an adult inpatient unit
    - Primary or secondary discharge diagnosis of sepsis, severe sepsis, or septic shock
  - Analysis
    - Descriptive statistics and univariate analysis
    - Matched pairs t-test was used to compare continuous variables
    - Logistic regression was used to analyze categorical variables
- Retrospective data collected monthly (January 2013 to December 2014)

PROCESS MEASURES:
- Pre-intervention: October – December, 2013
- Post-intervention: October – December, 2014
- Utilization of the electronic ED sepsis order set
- Appropriate fluid resuscitation (30 ml/kg) initiated
- Antibiotics administered within one hour of sepsis detection
- Blood cultures prior to antibiotics
- Serum lactate within 3 hours of sepsis detection
- Sepsis alert and treatment algorithms
- Patient adherence to Surviving Sepsis Campaign guidelines
- Adult inpatient sepsis mortality
- Adult inpatient sepsis LOS
- Process measures:
  - None
- Improved adherence to treatment algorithms and bundled interventions
- The ED case load was also expected to substantially improve patient outcomes.

CONCLUSIONS:
- UC Health Northern Region’s sepsis initiative has been successful and continues to evolve.
- Appropriate and timely sepsis care is a key component of the ED physician’s responsibilities.
- The ED physician plays a crucial role in reducing mortality and length of stay.
- Improved adherence to treatment algorithms and bundled interventions in the ED can be expected to substantially improve patient outcomes.

REFERENCES:

[Metrics and Outcomes]
- Decreased adult inpatient sepsis LOS from 4.3 (M = 4.25, SD = .47) to 5.23 days (M = 5.23, SD = .62) (p = .004, OR = 2.23, p = .021)

[Graphs and Data]
- Kaplan-Meier survival curve
- Blood cultures prior to antibiotics
- Sepsis alert and treatment algorithms