

Using a Clinical Guideline Coupled with Education to Improve Healthcare Providers'  
Knowledge of Early Sepsis Recognition in the Post-Acute Care Setting: A Quality Improvement  
Project  
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## Abstract

**Aims:** The goals of this project were (1) develop a sepsis clinical guideline, (2) enhance direct patient care staff knowledge of sepsis and (3) survey staff comfort level with identifying sepsis post intervention.

**Background:** Sepsis remains a significant healthcare problem associated with high treatment costs and high mortality rates. Older adults are at an increased risk for developing sepsis, especially when age is combined with any type of compromising factor, such as chronic illness, recent hospitalizations, wounds, or invasive devices. Current evidence demonstrates that sepsis screening is effective for early identification of sepsis. Early identification of sepsis improves time to treatment initiation, which improves outcomes.

**Methods:** An evidence-based, provider approved clinical guideline was developed for a post-acute care facility after an extensive review of the literature. Upon implementation, brief educational sessions were provided to direct patient care staff. Participants completed pre- and post-tests as well as a demographic survey. A satisfaction survey was administered 30 days post intervention. A paired samples t-test was used to analyze the difference in test scores. Pearson's correlation was used to analyze the relationship between staff comfort levels and the clinical guideline.

**Results:** The samples included 25 participants in the educational intervention and 18 in the satisfaction survey. There was a significant difference in the scores between pre-test ( $M = 72.3$ ,  $SD = 12.43$ ) and post-test scores ( $M = 86.6$ ,  $SD = 10.2$ );  $t(24) = -5.578$ ,  $p < 0.001$ . There was a significant correlation between staff who felt comfortable in identifying sepsis with ease of screening ( $r = .831$ ,  $p < .01$ ) and high comfort levels with the policy ( $r = .889$ ,  $p < .01$ ).

**Conclusion:** Utilizing a clinical guideline, coupled with education, improves staff knowledge and comfort identifying sepsis in the post-acute care setting, which may improve early recognition and treatment initiation. This outcome is clinically significant as patients in this setting represent a vulnerable population.

**Keywords:** Clinical guideline, early recognition, post-acute care, screening, sepsis

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Septicemia, more commonly referred to as sepsis, is a serious illness, which may lead to shock, organ failure or death (Sutton & Friedman, 2013). Sepsis is a significant healthcare problem in the United States (U. S). It was the sixth most common reason for hospitalization in 2009 (Sutton & Friedman, 2013). Since that time, the incidence of sepsis has continued to increase, especially among vulnerable populations. Sepsis is associated with high healthcare costs and mortality rates (Elixhauser, Friedman, & Stranges, 2011; Hall, Williams, DeFrances, & Golosinskiy, 2011; Sutton & Friedman, 2013). These impacts make sepsis a serious concern for patients, providers and policy makers (Sutton & Friedman, 2013). The Surviving Sepsis Campaign (SSC) was created in 2002 with the challenging goals of changing the perception of sepsis, influencing policy, creating guidelines and ultimately, improving management (Schorr & Dellinger, 2014).

### **Problem Statement**

Sepsis is a clinical syndrome, defined as the presence of infection, either potential or actual, coupled with signs of a systemic inflammatory response (Dellinger et al., 2013; Levy et al., 2003). There are a myriad of clinical inflammatory markers used to diagnose sepsis (Dellinger et al., 2013; Levy et al., 2003). Severe sepsis is the progression of sepsis to include signs of organ dysfunction or tissue hypoperfusion (Dellinger et al., 2013; Levy et al., 2003; Umberger, Callen, & Brown, 2015). Not all variables are required to diagnose sepsis or severe sepsis, which can prove problematic for clinicians, especially in the early stages of onset as these signs and symptoms are often subtle and mimic other disease processes (Lopez-Bushness,

Demaray, & Jaco, 2014). The SSC first created guidelines for sepsis management in 2004. Since that time, the guidelines have been updated and revised in 2008 and 2012 (Schorr & Dellinger, 2014). The sepsis management guidelines represent best practice, which the SSC considers the aim of clinical practice (Dellinger et al., 2013).

The incidence of sepsis continues to rise. Sepsis was the sixth most common diagnosis for hospitalization in 2009. However, it was the most expensive treated condition, with costs totaling almost \$15.4 billion (Elixhauser et al., 2011). The rate of sepsis as a primary diagnosis increased 148% between 2000 and 2009. During that time, the rate of sepsis as a secondary diagnosis increased 66% (Elixhauser et al., 2011). The rate of hospitalization for sepsis is higher for those 65 and older at 122.2 per 10,000 population. For those 85 and older, the sepsis hospitalization rate is 30 times higher than for those under 65, at 271.2 per 10,000 population and 9.5 per 10,000 population respectively (Hall et al., 2011). Patients hospitalized for sepsis experience greater illness severity and longer hospital stays. The average length of stay for sepsis is 75% longer than other conditions. Patients 65 and older who are hospitalized with sepsis have an average stay that is 43% longer than other patients with the same condition (Hall et al., 2011).

A diagnosis of sepsis is associated with significant morbidity and mortality. Despite improvements in management, mortality rates remain high, ranging from 14% to 43% (Angelelli, 2016; Lopez-Bushnell et al., 2014; Umberger et al., 2015). Patients hospitalized from a skilled nursing facility (SNF) for sepsis are more likely to die. In 2010, 28% of SNF patients admitted with sepsis died (Sutton & Friedman, 2013). Conversely, survivors of sepsis are more likely to be discharged to a SNF (Hall et al., 2011; Kumar et al., 2011; Lagu et al., 2012). In addition,

sepsis survivors are more likely to experience readmissions. Thirty-day readmission was 62.3% in 2010 for sepsis survivors (Sutton & Friedman, 2013).

### **Risk Factors**

Sepsis has several associated risk factors. These risk factors include age (elderly and very young), compromised immune system, currently sick or hospitalized, wounds or injuries, and invasive devices (i.e. urinary or intravenous catheters) (Mayo Clinic, n.d.). Healthcare advancements have contributed to the increase in life expectancy. However, as the population ages people are living with multiple chronic conditions (Englert & Ross, 2015). Chronic illness coupled with the polypharmacy necessary for management increases the risk of sepsis (Englert & Ross, 2015). Older patients are at a higher risk of delayed detection of sepsis due to the subtlety of signs and symptoms and the often atypical presentation of infection (Umberger et al., 2015).

### **Practice Guide and Early Identification**

The SSC clinical practice guideline for sepsis management is evidence based. The SSC partnered with Institute for Healthcare Improvement (IHI) to develop sepsis treatment bundles based on the guideline in order to facilitate clinicians in best practice. Two bundles have been developed, the three-hour resuscitation bundle for severe sepsis and the six-hour bundle for septic shock. The National Quality Forum (NQF) has approved these bundles (Institute of Healthcare Improvement [IHI], 2013). The three-hour resuscitation bundle includes measuring serum lactate, obtaining blood cultures prior to antibiotic treatment, broad-spectrum antibiotic administration and fluid resuscitation (IHI, 2013). Greater compliance has been achieved with the three-hour bundle.

Paramount to the SSC guideline is routine screening to allow early identification and initiation of treatment (Dellinger et al., 2013). Early identification of sepsis enables prompt

initiation of appropriate treatment, which may have the greatest effect on outcomes (Dellinger et al., 2013). Process changes, such as screening, and education serve to enhance the identification of sepsis in patients (Buck, 2014). To date, much of the research on sepsis has been conducted in the intensive care unit (ICU) setting. However, evidence suggests that a significant number of patients are diagnosed and treated in the non-ICU setting (Gyang, Shieh, Forsey, & Maggio, 2014; Mearelli et al., 2015). Routine screening of patients outside the ICU setting is necessary as these patients represent a vulnerable population and may suffer significant morbidity and mortality if sepsis develops. This leads to the clinical inquiry: In adults (>18 years old) in the post-acute care setting, how does the use of an evidence-based clinical guideline for sepsis screening compared with not using a guideline affect early detection of sepsis and treatment initiation?

### **Search Strategy**

In light of the proposed clinical question, a comprehensive search was conducted in order to examine best practice for sepsis screening in the non-ICU setting. Evidence was obtained by searching the following databases: Cumulative Index of Nursing and Allied Health Literature (CINAHL), Cochrane Database and PubMed. Keywords for the search included: *sepsis, early identification, early warning signs, screening tools, and clinical guideline*. The Boolean operator 'AND' was used to combine sepsis with the intervention and descriptive search terms. Initial yield results are as follows: CINAHL 231 references, Cochrane 59 references and PubMed 300 references. Searches were limited to publications between January 2010 and January 2016, adults only, written in the English language and studies conducted in the non-ICU setting. After review of the references, a final yield of 10 studies was obtained for analysis.

### **Evidence Synthesis**

In reviewing the evidence, 10 studies were appraised; half of the studies were conducted in the non-ICU setting and the other half were conducted in the ED. All studies utilized screening parameters and treatment initiatives outlined in the SSC guideline. The evidence demonstrates that sepsis screening is effective for early identification of sepsis and improving treatment initiation. Positive benefits demonstrated throughout the studies include: improved time intervals to antibiotic administration, improved time intervals to intravenous fluid (IVF) bolus administration, and improved adherence to blood culture and lactate measurement. These clinical actions are important because they have been shown to improve outcomes. The evidence also reveals a positive trend to decreased mortality. Additionally, the evidence demonstrates that screening outside of the ICU setting is not only possible, but also necessary, especially when vulnerable populations are concerned, such as those in the post-acute care setting. In summary, sepsis screening improves early identification and treatment initiation, which positively affects outcomes.

### **Framework and Purpose**

The Physiologic Model served as the driving conceptual framework in the majority of studies, and is the model underpinning this project. This theory provides an explanatory mediator to the degree of biophysical markers and potential for sepsis. The evidence review demonstrates the need for screening based on common biophysical markers to enhance early identification and treatment initiation.

The ACE Star Model of Knowledge Transformation provided the framework to facilitate the proposed change. This framework was developed as an interdisciplinary strategy to guide the implementation of evidence based practice to accomplish the goal of quality improvement (Schaffer, Sandau, & Diedrick, 2013). The ACE Star Model has five key steps, which are



discovery, evidence summary, translation, integration, and evaluation (Schaffer et al., 2013). Major emphasis of this model is on knowledge transformation including not only the summarized evidence, but also the integration of the organizational and patient preferences (Melnyk & Fineout-Overholt, 2015). This model laid the groundwork to facilitate a multidisciplinary practice change.

The goals of the project were threefold, including: (1) development of a clinical guideline for sepsis screening and treatment initiation, (2) provide education to direct patient care staff on sepsis and the new guideline, and (3) survey staff comfort level with guideline and screening post intervention.

## **Methods**

### **Project Design, Setting and Population**

The project served as a quality improvement project for a 155 bed skilled nursing facility in the southwestern United States. Direct patient care staff were invited to participate in the intervention. Ethical approval was obtained from the Institutional Review Board at Arizona State University.

### **Project Protocol and Measurement**

An evidence-based clinical guideline was written for the facility. The guideline outlined sepsis screening parameters and treatment initiation for positive screens. Staff roles and responsibilities were defined in the guideline. The sepsis guideline received provider approval from key stakeholders including physicians and nurse practitioners within the facility. After final approval was obtained from the medical director, an educational intervention was provided to staff. The educational sessions consisted of general sepsis information, the importance of screening, and the new clinical guideline being implemented. Educational sessions were

approximately 10 minutes in length. Sessions were held over a period of four weeks on various days and at various times in order to facilitate optimal staff participation. Sessions were open to all direct patient care staff. Participants completed a demographic questionnaire, pre-test and post-test. No identifiable information was obtained. Demographic information collected includes age, race, gender, highest level of education, highest level of nursing education, years of experience, current position title, years of experience in current position, and hours worked per week. Thirty days post intervention staff were asked to complete an anonymous satisfaction survey to assess their comfort level with sepsis identification and use of the clinical guideline. The demographic questionnaire, pre-test, post-test and satisfaction survey were all developed by the project investigator.

### **Data Analysis**

Descriptive statistics were used to analyze demographic data. Pre-test and post-test raw scores and percentages were calculated for each participant. The paired samples t-test examined the difference between pre-test and post-test scores. Pearson's correlation coefficient examined the relationship between staff comfort level of identifying sepsis with the use of the clinical guideline and screening parameters. Correlation analysis was conducted independently of demographics, pre-test and post-test. Statistical analysis was performed using SPSS for Windows version 24 (SPSS Version 24, 2016).

### **Results**

Twenty-five direct patient care staff members participated in the educational intervention (Table 1). The sample ranged in age from 22 to 64 with a mean age of 37.8 (SD=12.2) years. Eighty percent of the sample was female. Nearly half of the participants were white (40%), with the remaining 60% ethnically diverse (Table 1). The highest educational level of the sample was

a bachelor's degree (40%), followed by an associate's degree (32%) and certificate (28%). Participants had a mean of 9.2(SD=11.1) years of total experience and a mean of 4.9(SD=8.2) years of experience in their current position. Most of the participants were nurses, 15 (60%) were licensed practical nurses (LPN) and 8 (32%) were registered nurses (RN). One participant was a respiratory therapist (RT) and one was a nursing student. The highest level of nursing education for the sample was a bachelor's of science in nursing (BSN) (32%), associates degree in nursing (ADN) (12%) and a diploma in nursing (36%). Participants worked a range of 32 to 60 hours per week with a mean of 42.04(SD=7.04).

Table 1

*Demographic Information for Educational Intervention Participants (n=25)*

|                                    | M (SD)      | Percent (%) |
|------------------------------------|-------------|-------------|
| Age                                | 37.8 (12.2) |             |
| Gender                             |             |             |
| Female                             |             | 80          |
| Male                               |             | 20          |
| Race                               |             |             |
| White                              |             | 40          |
| Asian                              |             | 24          |
| Black or African American          |             | 20          |
| Hispanic or Latino                 |             | 12          |
| Other                              |             | 4           |
| Highest Educational Level          |             |             |
| Certificate                        |             | 28          |
| Associates Degree                  |             | 32          |
| Bachelor's Degree                  |             | 40          |
| Years of Experience                |             |             |
| Total                              | 9.2 (11.1)  |             |
| Years of Experience                |             |             |
| Current Position                   | 4.9 (8.2)   |             |
| Current Position Title             |             |             |
| RN                                 |             | 32          |
| LPN                                |             | 60          |
| Other                              |             | 8           |
| Highest Level of Nursing Education |             |             |
| BSN                                |             | 32          |
| ADN                                |             | 12          |
| Diploma                            |             | 36          |

|                       |              |    |
|-----------------------|--------------|----|
| N/A                   |              | 20 |
| Hours Worked per Week | 42.04 (7.04) |    |

A paired t-test was conducted to compare pretest and post test results. There was a statistically significant difference in the scores between pretest (M = 72.3, SD = 12.43) and post test scores (M = 86.6, SD = 10.2);  $t(24) = -5.578, p < 0.001$ , as shown in Table 2. These results are clinically significant because staff that is better educated serve to improve early identification of sepsis, which improves outcomes for patients.

Table 2

*Paired Samples t-Test of Pre-test and Post-test Scores*

|                                  | M (SD)      | 95% Confidence Interval |       | t    | df | Significance (2-tailed) |
|----------------------------------|-------------|-------------------------|-------|------|----|-------------------------|
|                                  |             | LL                      | UL    |      |    |                         |
| Pair                             |             |                         |       |      |    |                         |
| Pre-test Score & Post-test Score | -14.3(12.8) | -19.6                   | -9.02 | -5.6 | 24 | .000                    |

Eighteen direct patient care staff members participated in the satisfaction survey. All participants indicated the screening parameters located in the guideline were helpful. A significant correlation was found between staff comfort level in identifying sepsis and the ease of using screening parameters ( $r=.831, p < .01$ ). In addition, a significant correlation was found between staff comfort level in identifying sepsis and comfort with using the clinical guideline ( $r=.889, p < .01$ ), as shown in Table 3. These results demonstrate that staff members who felt comfortable with identifying sepsis found the clinical guideline and screening parameters within the guideline easy to use. Clinically this is significant because it is important for staff to have clinical tools that are utilized correctly to improve early recognition of sepsis.

Table 3

*Pearson's Correlations of Satisfaction Survey*

|                                     |                     | Comfort level in identifying sepsis | Screening tool easy to use |
|-------------------------------------|---------------------|-------------------------------------|----------------------------|
| Comfort level in identifying sepsis | Pearson Correlation | 1                                   | .831                       |
|                                     | Sig. (1-tailed)     | 18                                  | .000                       |
|                                     | N                   |                                     | 18                         |
| Screening tool easy to use          | Pearson Correlation | .831                                | 1                          |
|                                     | Sig. (1-tailed)     | .000                                | 18                         |
|                                     | N                   | 18                                  |                            |

  

|                                     |                     | Comfort level in identifying sepsis | Comfort level with policy |
|-------------------------------------|---------------------|-------------------------------------|---------------------------|
| Comfort level in identifying sepsis | Pearson Correlation | 1                                   | .889                      |
|                                     | Sig. (1-tailed)     | 18                                  | .000                      |
|                                     | N                   |                                     | 18                        |
| Comfort level with policy           | Pearson Correlation | .889                                | 1                         |
|                                     | Sig. (1-tailed)     | .000                                | 18                        |
|                                     | N                   | 18                                  |                           |

**Discussion**

Healthcare has shifted to evidence-based care. Organizations need to embrace this change to promote best practice and improve patient outcomes. The use of evidence-based clinical practice guidelines can facilitate this process change within an organization. The development of an evidence-based provider approved clinical guideline on sepsis was the primary goal of this quality improvement project. Implementation of this guideline took place in a SNF and provided staff with the necessary tools to screen patients for sepsis and initiate treatment if warranted. Research demonstrates that early sepsis identification and prompt treatment has the greatest effect on outcomes (Dellinger et al., 2013). In addition, more patients are being identified with sepsis outside of the ICU setting (Gyang, 2015; Mearelli 2015). Patients in a SNF represent a high-risk population with regard to sepsis. These patients often

demonstrate more than one risk factor for the development of sepsis. Therefore, it is an important setting to improve early identification.

According to Buck (2014), screening and education are part of the process changes needed to enhance sepsis identification. Results demonstrate that the education was effective at improving staff knowledge of sepsis as evidenced by significantly improved post-test scores. Staff who felt comfortable with identifying sepsis found the clinical guideline and screening parameters easy to use. The use of a clinical guideline coupled with education enhanced staff knowledge and comfort level with identification of sepsis. This may improve early identification of sepsis and treatment initiation, which improves patient outcomes.

This project has several limitations. First, the samples are small and distinct. Data collection and analysis of those who participated in the educational intervention is completely separate from those who completed satisfaction surveys. There is no way to compare test scores with comfort level. Second, is the design of the educational intervention. Educational sessions were held over a period of four weeks in order to encourage greater participation. It is unknown whether participants communicated test materials to one another, which may threaten internal validity. Finally, organizational readiness may have impacted project implementation. Although the organization had identified a need for the implemented process change, it may not be fully engaged with the process of evidence-based change. This may affect staff motivation to embrace change.

The present project did not evaluate the effect of the intervention on patient outcomes. Future research should focus on the effect of sepsis screening in the post-acute care setting on patient outcomes, such as morbidity, mortality and costs. Due to the high-risk of sepsis in this patient setting, similar organizations may benefit from similar practice changes.

### **Conclusion**

Sepsis is associated with high mortality and treatment costs. Patients in the post-acute care setting represent a high-risk population for the development of sepsis. Sepsis screening is effective for improving early identification, which improves patient outcomes. The purposes of this project were to develop a clinical guideline for sepsis screening, provide education to enhance staff knowledge of sepsis, and evaluate staff comfort level with guideline use and recognition of sepsis. Results demonstrate that education significantly improved staff knowledge of sepsis. Staff who felt comfortable at identifying sepsis found the guideline and screening parameters easy to use. The use of a clinical guideline coupled with education may improve the early identification of sepsis and treatment initiation, which may improve patient outcomes.

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