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Disseminating the Sepsis Bundle: Evaluating an Evidence-Based Education Module

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Walden University

College of Health Sciences

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Elyse Isopo

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Walden University

2018

Abstract

Disseminating the Sepsis Bundle: Evaluating an Evidence-Based Education Module

by

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MS, Adelphi University, 2002

BS, Adelphi University, 1998

Project Submitted in Partial Fulfillment
of the Requirements for the Degree of
Doctor of Nursing Practice

Walden University

February 2018

Abstract

Due to increasing incidence and noncompliance with sepsis at a local hospital, an educational deficit was identified on the sepsis bundle in the medical intensive care unit. The purpose of this project was to develop and validate a sepsis bundle education program for all frontline staff in the MICU at a local University Hospital. The goal was for the educational tool to be validated by a multidisciplinary team to increase awareness, education, and ultimately, compliance with the severe sepsis and septic shock guidelines. The diffusion of innovation theory was utilized to support the process of change by encouraging the use of screening tools and best practice guidelines. The research question asked whether the education program meets critical care expert panel standards to educate frontline MICU staff on the sepsis bundle. The research design included a 5-member panel of experts in critical care, utilizing the Likert scale to review the proposed educational project on the sepsis bundle. Results are averaged from each reviewer. Results from the review included a unanimous “5” rating on every issue identified, equating to strongly agree on the Likert scale. This rating supported the validity of the educational project, the use of evidence-based practice and that the educational material was clear and easy to follow. Utilizing this validated tool will guide the education of sepsis, severe sepsis, and septic shock and promote social change by increasing education, awareness, recognition and early deployment of the sepsis bundle to improve patient outcomes.

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Dedication

This project is dedicated to my husband and three children, Arianna, Alex, and Ava. You are the light of my life and this project shows you all that dreams do come true. This paper is also dedicated in memory of my mentor, William Senicola, whose love for critical care lives on through me. And to my parents, Kathie and Barry Wheatman, who always knew and believed in me. This is proof that your hard work and dedication to me has paid off.

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Section 1: Overview of the Evidence-Based Practice Project

Introduction

Sepsis is one of the leading causes of death around the world and a common illness in the intensive care unit with increased mortality rates (Mayr, Yende, & Angus 2014). Sepsis bundles have been developed to assist practitioners in the timely diagnosis and treatment of sepsis, severe sepsis, or septic shock because accurate diagnosis is imperative for proper treatment, and initiation of early intervention and resuscitation have been shown to improve survival from sepsis (Semler et al., 2015). It is essential that healthcare practitioners identify patients with sepsis early and initiate early resuscitation and treatment utilizing bundles to increase survival rates in patients with severe sepsis and septic shock.

Problem Statement

According to the quality manager at the study facility, compliance with the 3-hour bundle for severe sepsis and septic shock is problematic, despite the initiation and implementation of National Institute for Health (NIH) guidelines and Center for Medicare and Medicaid Services (CMS) guidelines. Compliance with bundle measures are not being met consistently within the facility. According to data collected by the quality manager, the overall 2016 average for inpatient compliance with the 3-hour bundle for severe sepsis and septic shock was 25.17. The compliance rates with all elements of the sepsis bundle in the medical intensive care unit (MICU) were: January 2017 = 15%, February 2017 = 22%, March 2017 = 27%, and April 2017 = 30%. Based on these significantly low compliance rates, it was necessary to create and validate an

educational tool for MICU providers. There has been a significant lack of education regarding evidenced-based practice (EBP) supporting the bundle for treating severe sepsis and septic shock. At the time of the study, sepsis education was performed upon initial hire to the institution, but there was no on-going education for senior staff within the hospital. Initiating education of the sepsis guidelines to all frontline staff would improve knowledge and lead to an increased compliance with bundles, ultimately decreasing the hospital mortality from severe sepsis and septic shock.

Purpose Statement and Project Objectives

The practice problem I identified was the lack of consistent compliance with all elements of the 3-hour sepsis bundles for treatment of severe sepsis and septic shock. The purpose of this project was to develop and validate a sepsis bundle education program for all frontline staff in the MICU at University Hospital (UA). Sepsis screening tools have been initiated and developed to assist MICU providers (attending physicians, residents, nurse practitioners, and physician assistants) in the timely and accurate diagnosis of sepsis, severe sepsis, or septic shock. Guidelines for fluid resuscitation and antibiotic selection are established for the MICU as well. Despite these interventions, the sepsis bundle is not always being followed by providers. The project objective validates educational material to be used to educate the health care team on the elements of the bundle, utilizing a PowerPoint presentation and an interactive and fun video to increase awareness, education, and ultimately, compliance with the severe sepsis and septic shock guidelines. I hypothesized that by doing this, overall MICU mortality will decrease from a rate of 50% mortality to 40% in the MICU at UA. Performance improvement programs

have been shown to increase compliance with sepsis bundles and decrease mortality from sepsis (Damiani et al., 2015).

Significance/Relevance to Practice

Sepsis is one of the leading causes of death around the world and a common illness in the intensive care unit with increased mortality rates (Mayr et al., 2014). In the United States, sepsis is the 10th leading cause of mortality (Melamed & Sorvillo, 2009). According to the quality manager at the study hospital, within this MICU, sepsis has continued to be the Number 1 admission diagnosis and cause of death for over a decade. In the ICU, severe sepsis and septic shock account for 20% of admissions with a mortality rate ranging from 20%–50% (Levy et al., 2010). However, initiation of early intervention and resuscitation have been shown to improve survival from sepsis (Semler et al., 2015).

Mortality from sepsis, severe sepsis, and septic shock varies by hospital setting as well as disease severity but has been reported up to 30% for sepsis, 50% for severe sepsis, and 80% for septic shock (Jawad, Lukšić, & Rafnsson, 2012). A meta-analysis concluded that early intervention is associated with decreased mortality rates from severe sepsis and septic shock (Jones., et al, 2008). The guidelines put forth by the Surviving Sepsis Campaign (SSC) have been sufficiently studied and concluded that a statistically significant mortality *OR* of 0.5 (95% CI 0.37–0.69) is improved with early intervention (Jones et al., 2008). Sepsis continues to be an epidemic condition that has statistically significant mortality rates and debilitating long term effects on survivors (Rhodes et al, 2015). The SSC initiated the sepsis bundles in attempt to decrease mortality and improve

compliance with EBP, yet not all providers and intuitions are compliant (Rhodes et al, 2015). Quality improvement (QI) initiatives helps increase compliance with the sepsis bundles and decrease sepsis mortality. According to the quality manager at the study hospital, compliance with sepsis bundle elements has been as low as 19% in 2017, despite the overwhelming positive statistics showing that meeting bundle elements has an odds of dying reduction of 40%. Despite the vast evidence supporting the sepsis bundles, compliance continues to be significantly low. It is essential that healthcare practitioners identify patients with sepsis early and initiate early resuscitation and treatment utilizing bundles to increase survival rates in patients with severe sepsis and septic shock.

Project Question

Sepsis screening tools and guidelines have been established to aide providers in the timely diagnosis of sepsis, severe sepsis, or septic shock because accurate diagnosis is essential for appropriate treatment. Despite algorithms and guidelines available for the treatment of sepsis, many times these guidelines are not being followed by practitioners. In October 2015, CMS initiated guidelines for the care of the patient with severe sepsis or septic shock (CMS, 2015). Despite these recommendations providers are still not compliant with these guidelines. With this project, I aimed to validate a sepsis bundle educational program to be given to all MICU frontline staff. The validators of the educational material included five key stakeholders in the MICU: the MICU medical director, nursing director, nurse educator, a nursing peer with greater than 10 years of ICU experience, and a critical care advanced practice provider with greater than 5 years of critical care experience. The educational piece consisted of a pre- and posttest,

PowerPoint presentation, and an animated video outlining the treatment guidelines for severe sepsis and septic shock. My goal was to have expert-validated educational material to aid in increasing compliance with the sepsis bundles and ultimately, decrease mortality associated with severe sepsis and septic shock. The primary goal of the educational material was to enhance compliance with the sepsis guidelines to decrease mortality in the study population.

Evidence-Based Significance of the Project

EBP recommends the implementation of sepsis bundles, which can significantly reduce the incidence and mortality rates caused by complications of sepsis, severe sepsis, and septic shock (Institute for Healthcare Improvement, 2007). Rapid identification and initiation of the SSC guidelines are essential for decreasing mortality caused by sepsis. For this project, I completed a focused literature review on the need for prompt identification and treatment with the sepsis guidelines in patients admitted to hospitals with sepsis. In 2009, researchers demonstrated a 12% reduction in 1-year sepsis mortality rate (Puskarich, Marchick, Kline, Steuerwald, & Jones, 2009). This significant decrease was correlated with early interventions put forth by the SSC for patients with sepsis, severe sepsis, and septic shock. A meta-analysis supported the benefits of the SSC guidelines as demonstrated by a mortality *OR* of 0.5 (95% CI 0.37–0.69) with early intervention and 1.16 (95% CI 0.6–2.22) with late intervention (Jones, Saak, & Kline, 2008).

Many studies have shown the SSC guideline bundled interventions have profound reductions in mortality. Nguyen et al. (2011) compared four different patient groups,

which were broken down treatment groups who followed all elements of SSC guidelines versus those who did not follow all the guidelines. Their study resulted in a mortality rate of 24.5% for those who were compliant with the guidelines, while those who were partially compliant had a mortality rate of 32.7% (Nguyen et al.,2011). Within their study, guidelines had a relative risk-of-death reduction of 0.486 (95% CI = 0.274–0.642) while the ratio of the relative risk-of-death reduction for those not 100% compliant with the guidelines was 1.94 (95% CI = 1.45–39.1; Nguyen et al., 2011). This information emphasizes the importance of compliance with sepsis guidelines since both mortality and hospital length of stay can be reduced.

Trzeciak et al. (2006) looked at the feasibility of implementing the SSC guidelines with a secondary goal of assessing resource allocation and utilization. Their study concluded no significant reduction in ICU, ED, or in-patient LOS but found with the implementation of these guidelines in-hospital mortality rates decreased by 25.6% with a cost savings of approximately \$50,000. In their study, the estimated cost savings before initiation of the sepsis guideline was \$135,199 and \$82,233 after implementation (Trzeciak et al., 2006). Another study validated these results, with the researchers concluding that the sepsis guidelines reduced mortality and cost (Shorr, Micek, Jackson, & Kollef, 2007). The results of these studies estimated the cost savings and mortality higher than the previous studies and validated that implementation of sepsis guidelines has a cost-savings on institutional finances and saves years of life for patients.

There continues to be a knowledge gap concerning the importance of compliance with the sepsis guidelines among hospital providers, specifically, on the importance of

compliance with all aspects of the guidelines. This problem has been assessed and reported by the Society of Critical Care Medicine (SCCM) as well as other studies. In a proof of concept study, the researchers identified that failure to recognize septic patients early delays in diagnosis and treatment results in worse outcomes (Rivers, Nguyen, Huang, & Donnino, 2004). Delay in identification of septic patients is thought to be due to the many providers having multiple responsibilities and conflicting priorities at any given time (Moore et al., 2009). The translation of knowledge into practice is estimated to be delayed in up to 50% of patients that require acute interventions (White & Dudley-Brown, 2011). Many other researchers have identified poor knowledge translation at the bedside, such as barriers to implementation (Carlbon & Rubenfeld, 2007; Jones et al., 2008; Jones, Shapiro, & Roshon, 2007).

Due to the high mortality from sepsis, the SSC was developed to protocolize care of septic patients. The campaign was initiated in 2002 and resulted in an unadjusted 6.2% mortality reduction which continues to demonstrate mortality reduction that correlates with increasing sepsis bundle compliance (Dellinger & Vincent, 2005). The SSC released in 2010 continues to recommend bundling interventions for sepsis management (Levy et al., 2010). As demonstrated by Rivers (2004), the SSC initiatives have established guidelines for the improvement of care and mortality reduction associated with guideline utilization. Despite the extensive literature available, barriers to implementation and compliance with these guidelines continue to exist.

Implications for Social Change in Practice

Researchers have seen a correlation between sepsis-related mortality, hospital length of stay, and resource utilization of hospital stay (Yang, Yang, Hsann, Lim, & Ong, 2010). Solving this issue has both a social impact on the population as well as a financial impact on health care organizations. Compliance with the sepsis bundles has been demonstrated to save lives and improve morbidity and mortality for patients with severe sepsis and septic shock. Early recognition, appropriate treatment interventions, and compliance with the sepsis bundles will contribute to overall increased mortality (Levy et al., 2010). Reducing the hospital length of stay and increasing resource utilization will have a positive social impact as well. The validation of educational material by an expert panel will guide current and on-going education of sepsis bundle compliance in the study hospital. By educating staff, bundle compliance rates will increase and positively impact patients in the MICU suffering from sepsis.

The health outcome goal that I sought to achieve with this project is the reduction in incidences of multisystem organ failure, septic shock, and the associated mortality with compliance of the guidelines. The primary goal of this project was to validate educational material to be used for the sepsis education of all frontline MICU staff emphasizing the importance bundle compliance. With a proper education, implementation plan compliance with the sepsis guidelines is likely to increase, while mortality rates and complications from severe sepsis and septic shock is likely to decrease.

Definition of Terms

Sepsis: A systemic inflammatory response caused by suspected or proven infectious process. The most common cause of sepsis is the presence of bacteria in the blood also known as bacteremia (Bone, et al., 1992). Other causes of sepsis are viral, fungal, and parasitic pathologies. The disease process of sepsis falls on a continuum, from initial infection to multiple organ system failure (severe sepsis), and septic shock (Bone, et al., 1992).

As reported by the American College of Chest Physicians and the Society for Critical Care Medicine (1992), a patient must exhibit two or more of the criteria for systemic inflammatory response syndrome (SIRS) and have a suspected infection to meet the criteria for sepsis. SIRS criteria include: a body temperature of less than 36 degrees C (96.8 degrees F), or greater than 38 degrees C (100.4 degrees F), heart rate greater than 90 beats per minute, tachypnea (respiratory rate of greater than 20 breaths per minute) or an arterial partial pressure of carbon dioxide of less than 32mmHg, and leukocyte count of less than 4000 cells/mm³ or greater than 12,000 cells/mm³ or the presence of greater than 10% bandemia (Bone et al., 1992). Examples of systemic inflammatory response not caused by infectious etiology include: trauma, burns, pancreatitis, ischemia and hemorrhage (Bone et al., 1992). SIRS criteria alone are nonspecific (Levy et al., 2010).

Severe sepsis: The progression of sepsis to include acute organ dysfunction or tissue hypo-perfusion (Iwashyna et al., 2014). Sepsis-induced organ dysfunction may affect any organ system such as the heart, lungs, kidneys, or respiratory system (Iwashyna et al., 2014).

Septic shock: Severe sepsis-induced hypotension refractory to fluid resuscitation (Dellinger et al., 2013). In this case, vasopressors become necessary to keep mean arterial pressure > 65 to prevent tissue hypo-perfusion and end organ damage.

Sepsis guidelines/bundles: A defined group of interventions linked to sepsis that when completed together, yield better outcomes together than when executed independently (Dellinger & Vincent, 2005). The resuscitation and management bundles for severe sepsis and septic shock patients are recognized as best practice due to the evidence that supports the positive outcomes when implemented as bundles (Dellinger & Vincent, 2005).

Assumptions and Limitations

The first limitation I identified in this study was the use of a single center MICU of a quaternary teaching hospital. Another limitation was that the population in the MICU was limited to adults older than 18. The third limitation was my use of a convenience sample. Lastly, a limitation to this study was the omission of documentation with an intervention start and completion time for the identification and treatment of sepsis. For example, what time the intravenous fluid bolus was initiated and time it is completed. This information is essential for the data to be complete and accurate.

One assumption I held in this study was that severe sepsis and septic shock guidelines would continue to be best EBP while the study was in progress. Another assumption was that all documentation is accurate and truthful in the medical record.

Summary

Performance improvement programs have been shown to increase compliance with sepsis bundles and decrease mortality from sepsis (Damiani et al., 2015). The aim of this project was to produce validated educational material for the treatment of severe sepsis and septic shock bundles. Utilizing an expert-validated PowerPoint presentation and an entertaining video produced by hospital staff, the educational material will increase bundle compliance. Utilizing a systemized evaluation program, I focused and readdressed progress during planning, implementing, and intervention stages of the project to ensure the goals and outcomes were achieved. Another result that I expect from the implementation of this educational material is a lower health care cost for patients due to the decrease in sepsis mortality in the MICU.

Section 2: Review of Scholarly Evidence

Introduction

Sepsis bundles were established to aide providers in early diagnosis and interventions for sepsis, severe sepsis, or septic shock. In this section, sepsis literature is discussed, highlighting past and current treatments. Despite evidence based practice guidelines, these bundles are not consistently being utilized. Discussed below is the use of the diffusion of innovation theory to help guide practitioners through the process of change to adopt and utilize best practice sepsis bundles.

Literature Review

Sepsis carries a significant incidence of death associated with an inflammatory response from a known or suspected infection, requiring immediate attention and treatment. In the United States, sepsis is the leading cause of death, exceeding myocardial infarction and stroke (Fleischmann et al., 2016). Among critically ill patients, severe sepsis has the highest mortality rate in noncardiac ICUs (Mayr et al., 2014). The incidence of sepsis is approximated at 300 cases per 100,000 population (Mayr et al., 2014). Death from sepsis is between 25%–30% within the hospital setting and has as high as 50% mortality from septic shock (Fleischmann et al., 2016)

In early 1992, the definition of sepsis was modified to include an occurrence of a suspected infection coupled organ dysfunction syndrome (Bone et al, 1992). Since then the care of patients with sepsis has been standardized to improve its definition and interventions. At the beginning of 2002, an international conference arrived at consensus guidelines on the management and treatment of septic patients, and new terms emerged

known as severe sepsis and septic shock (Levy et al., 2003). Severe sepsis is a continuation of sepsis with known organ dysfunction, and septic shock included the definition of severe sepsis along with refractory hypotension requiring vasoactive medications (Dellinger, et al., 2013). Simultaneously, the SSC in collaboration with the Society of Critical Care Medicine, European Society of Intensive Care Medicine, and the International Sepsis Forum collaborated their efforts to reduce mortality associated with sepsis (Calandra et al., 2004). In 2004, the SSC aimed at setting regulations and guidelines for the management and treatment of sepsis.

Specific Literature Review

Over a decade ago in a proof-of-concept study, Rivers et. al (2004) developed protocols which address initiation of treatment using 6-hour, early goal directed therapy (EGDT) bundle to treat septic shock. The goal of this treatment bundle was to decrease mortality and length of stay, which later was adopted by the SSC guidelines known as EGDT (Rivers et al., 2004). Despite these recommendations there has been significant controversy surrounding different elements of the EGDT bundle. Many studies have recently been published negating the need for EGDT and concluded that usual care had similar outcomes. Three recent studies, the ARISE, ProCESS and ProMISe trials, aimed at determining if EGDT decreases mortality as compared to other resuscitation strategies (Angus et al., 2015). These researchers concluded that EGDT did not improve mortality over usual care in patients with septic shock. Current usual care for sepsis patients differs considerably as compared to treatment provided over a decade ago (Angus et al., 2015). As such, it has been determined that EDGT no longer reduces mortality rates as

compared to usual care. The primary goal of sepsis management is early identification, early antibiotics, and fluid resuscitation.

Studies have demonstrated that sepsis continues to be associated with high mortality and debilitating long-term effects (Rhodes et al., 2015). QI projects, such as education and sepsis, bundles have shown to decrease mortality from sepsis (Levy et al., 2014). Despite these findings many facilities are not implementing QI efforts to assist with compliance of sepsis bundles. The primary goal of the SSC was to improve outcomes from severe sepsis and septic shock and decrease mortality. To obtain these outcomes, the SSC developed educational material about sepsis, initiated evidenced-based guidelines, and QI resources to guide best practice (Rhodes et al., 2015). Over a 7.5-year period, the adherence to the SSC guidelines has been associated with decrease mortality from sepsis (Levy et al., 2014). In addition, there has been an increased compliance over time in facilities which utilize guidelines. Despite positive outcomes, there continues to be inconsistency in care delivery.

Between the years of 2006 and 2008 in a clinical study, researchers looked at adherence with the SSC guidelines (Levy & Parker, 2010). In this study, one group focused on process changes to improve clinical behaviour, while the other group focused on process improvement and patient outcomes. Results revealed that initiating a QI project rooted in evidenced-based guidelines led to increased compliance with the SSC bundles and improved patient outcomes (Levy & Parker, 2010). Similar results were also found in the IMPreSS study, a multicenter prevalence study that looked at the SSC bundles and outcomes Rhodes et al., 2015. In this study, researchers concluded that with

an increased compliance in the sepsis bundle patient outcomes improved (Rhodes et al., 2015). The IMPReSS study demonstrated a low compliance of 19% and 35.5 % for the 3-hour and 6-hour bundle respectively (Rhodes et al., 2015). Bundle elements in the study yielded a 40% reduction in the odds of dying in the hospital with the 3-hour bundle and 36% for the 6-hour bundle.

QI projects demonstrate that focusing on compliance of the SSC bundles reduces patient mortality (Rhodes et al., 2015). Despite these results, there continues to be many hospitals not participating in these initiatives. Varying compliance rates with the SSC bundles identifies a need to implement process improvement projects to globally decrease mortality related to sepsis (Levy et al., 2014).

Theoretical Framework

Sepsis guidelines were developed to assist practitioners in the timely diagnosis and treatment of sepsis, severe sepsis, or septic shock. Despite best practice guidelines, these protocols are not consistently being followed by practitioners. The diffusion of innovation theory supports the process of change, and thereby, encourages the use of screening tools and best practice guidelines (Sanson-Fisher, 2004). The health care environment is comprised of providers and other health care professionals that require working together for improved outcomes. Health care is a complex environment with both internal and external forces requiring change.

The diffusion of innovation theory aims to explain the spread of new ideas which is socially significant in health care (Sanson-Fisher, 2004). There are four main concepts that influence the spread of a new idea according to Rogers's theory (diffusion of

innovation), and these elements include innovation, communication channels, time, and a social system (Estabrooks, Thompson, Lovely, & Hofmeyer, 2006). The diffusion of innovation theory suggests a conceivable explanation on why some new innovations are embraced quickly and others are not despite evidence of improved outcomes and cost effectiveness (Reinhardt, Hietschold, & Spyridonidi, 2015). More complex innovations have multifaceted relationships between “social systems, communication style, and the decision-making process” (Sanson-Fisher, 2004). Change is inevitable in healthcare, but with a well-developed plan, change will be adapted quickly, efficiently, and hopefully with minimal resistance.

The implementation of sepsis bundles is complex, necessitating adoption from a multidisciplinary team to be effective. As such, the diffusion of innovation theory was the best suited theoretical framework for my practice problem. Rogers (2003) sees the diffusion as the process in which an innovation is communicated through a social system. As applied to the practice-focused question, sepsis bundles represent the innovation, communication addresses the elements of the sepsis bundle, and the ICU providers and nurses represent the social system. The characteristics of an innovation include relative advantage, compatibility, complexity, trialability, and observability are how the innovation is perceived and eventually adopted or rejected (Rogers, 2003). This is true for the sepsis bundle due to its complex, multi-step bundle which if implemented in its entirety improve patient outcomes.

Summary

Implementing bundles to identify and treat sepsis has shown to improve mortality. Despite best evidence, compliance with sepsis bundles continues to be problematic. Education and bundle compliance has shown to decrease mortality from sepsis (Levy et al., 2014). The next section will describe the methods used to validate an education tool to educate and improve compliance with the sepsis bundles.

Section 3: Approach

Introduction

This section will describe the method utilized to validate the sepsis education tool. An expert panel was used to validate the material to help improve bundle compliance in the MICU at UH. The data collection and data analysis are explained below. The primary outcomes of validating this educational material was to increase compliance with the sepsis bundles and decrease sepsis mortality.

Project Design/Methods

In this DNP project, I used an expert panel, that included the MICU medical director, nursing director, nurse educator, a nursing peer with greater than 10 years of ICU experience, and a critical care advanced practice provider with greater than 5 years of critical care experience, to validate a sepsis education piece generated for MICU frontline providers (attending physicians, residents, nurse practitioners, physician assistants); staff nurses; nurse managers; and patient care associates (see Appendix B). The expert panel provided written feedback using a 5-level Likert scale (see Appendix E) pertaining to the information being disseminated to staff. The primary goal of the education tool was to address bundle elements and the importance of compliance for patients with severe sepsis and septic shock in an adult MICU of a nonprofit, private, suburban hospital in the northeastern United States. In the education tool, I included a PowerPoint presentation (see Appendix B) and an entertaining educational video (see Appendix C) that was produced by staff to assist in the education of sepsis bundle elements. I will show the video to staff during sepsis education sessions. The main goal

of this project was to produce educational material that has been validated by a panel of critical care experts.

Population and Sampling

The validators included the MICU leadership team, which is comprised of the medical director, nursing director, nurse educator, a nursing peer, and a critical care advanced practice provider. The MICU is a 17-bed unit within an 814-bed private, Level 1 trauma center in a suburban acute care quaternary facility located in the northeastern United States. The targeted population was the MICU frontline providers, staff nurses, nurse managers, and PCAs.

Data Collection

The expert panel reviewed the educational material and provided feedback utilizing the Likert scale questionnaire I provided them as well as any additional verbal feedback needed for me to improve the educational material. I collected the data using a Microsoft Excel spreadsheet, which included the feedback received from the five-member MICU expert panel. The questionnaire was deidentified and maintained in a locked cabinet in the manager's office.

Data Analysis

I used descriptive statistics to evaluate the information obtained from the Likert scale and expert panel's feedback. Implementing this educational project will lead to an increase in awareness and knowledge as it pertains to the sepsis bundle. After implementation of this validated tool, I will be following up through the QI department at

3 months, 6 months, 9 months, and at 1 year to evaluate sepsis bundle compliance post educational sessions and the need for follow-up or additional learning sessions.

Conclusion

Using an evaluation process can improve the structure of the educational sessions prior to and during its development, which aides in assuring its impact and benefits. Evaluation of an intervention or program should begin as soon as the idea is being created (Friis & Sellers, 2014). The expert panel feedback and Likert scale provided me with the information needed to validate the sepsis educational material for frontline MICU staff. In the following section a summary of the finding will be described. The primary outcomes of validating the educational material were to increase compliance with the sepsis bundles and decrease sepsis mortality by introducing an educational and multimedia piece created on the platform of the Sepsis Bundle (Levy et al., 2010) in the MICU of a suburban hospital in the northeastern United States.

Section 4: Discussion and Implications

Introduction

In this DNP project, I utilized an expert panel, which included the MICU medical director, nursing director, nurse educator, a nursing peer with greater than 10 years of ICU experience, and a critical care advanced practice provider with greater than 5 years of critical care experience, to validate a sepsis educational PowerPoint and video created for MICU frontline providers (attending physicians, residents, nurse practitioners, and physician assistants); staff nurses; nurse managers; and PCAs. The validators selected were an expert panel of medical and nursing leadership as well as stakeholders with extensive critical care experience. The expert panel provided written feedback using a 5-point Likert Scale (see Appendix E) pertaining to the information being disseminated to staff. The experts ranked the quality of the educational material from low, with 1 being *strongly disagree*, to high, with 5 being *strongly agree*. The central tendency was evaluated for all four questions. The overall mode score was 5, and the median score was a 5 as well.

Summary and Evaluation of Findings

With the first question on the questionnaire, I asked if the educational material supported EBP for the treatment of sepsis, and it received a median and mode score of 5 (*strongly agree*). In Question 2, I asked if the educational material provided is clear and easy to follow, and the responses had a median and mode score of 5 (*strongly agree*). With Question 3, I asked if the educational material provided addressed all the sepsis bundle elements, and this received a median and mode score of 5 (*strongly agree*). In the

last question, I asked whether the educational material provided stressed the importance of bundle compliance for the treatment of sepsis, and the responses also had a median and mode score of 5 (*strongly agree*).

I was offered verbal feedback from several of the experts whom all voiced overwhelmingly positive feedback concerning the educational material. All five participants keyed in on the animated video produced by the frontline staff and felt this helped support and supplement the information delivered in the PowerPoint presentation. One of the 5 validators felt more research needed to be done on sepsis because he felt the literature was outdated but agreed that what was being evaluated is the current best practice. Despite his feelings about the sepsis bundles, he did feel that the information contained in the educational material was as current as was available at this point and that the material was evidenced based and easy to understand. Another validator stated, “I love the PowerPoint slide that compared acute myocardial infarction, trauma, and stroke to sepsis.” This validator stated that this was even new information to her and felt it would help staff understand the importance of the sepsis bundles and that this was an excellent start to the presentation.

Discussion of Findings Based on Literature and Framework

Sepsis bundles have been developed to assist practitioners in the timely interventions for the treatment of sepsis, severe sepsis, or septic shock. Compliance with sepsis bundles are imperative for proper treatment. Validation of a sepsis education tool will assist in the dissemination of evidence based practice. This project, which was validated by an expert panel of critical care providers, will guide the education and

ultimately the compliance of the bundles. The tool will educate healthcare providers regarding the importance of compliance with the sepsis bundles and the bundle elements based on best evidence practice.

Roger's diffusion of innovation theory supports the process of change, and thereby, encourages the use of screening tools and best practice guidelines (Sanson-Fisher, 2004). The diffusion of innovation theory aims to explain the spread of new ideas, which is socially significant in health care. Utilizing Roger's theory, this educational material on sepsis bundles will be disseminated and implemented to critical care staff.

Implications

Sepsis bundles are based on best practice guidelines established by the SSC (Angus et al., 2015). Timely recognition and initiation of sepsis bundles improves patient outcomes, reduces ICU and hospital length of stay, and decreases health care costs (Levy et al., 2014). Early recognition of sepsis and the initiation of sepsis bundles relies on the health care provider's compliance with all elements of the sepsis bundles, so it is essential that compliance with the sepsis bundles be implemented timely and in its entirety. Educating frontline staff is essential to improve compliance with the sepsis bundles. Using this validated tool will guide the education of sepsis, severe sepsis, and septic shock.

Following sepsis guidelines directly effects critical care nursing practice and is essential for the treatment of sepsis. Critical care nurses must be directly involved in the assessment and treatment of sepsis patients following sepsis bundles. Nursing

interventions and treatments based on these guidelines directly affect patient outcomes, and for this reason, it is imperative that proper education is provided to frontline nurses to ensure all bundle elements are provided to patients based on the best available evidence.

Sepsis is a major public health concern in the United States and accounts for increasing health care costs. In 2011, health care costs due to a sepsis accounted for \$20 billion dollars in the United States (Singer et al., 2016). Improving compliance with sepsis bundles by providing education to frontline staff with an expert validated tool will save lives and improve outcomes. Research has shown early recognition, appropriate treatment interventions, and compliance with the sepsis bundles will contribute to improved mortality, reduced hospital length of stay, and increased resource utilization (Levy et al., 2014). With proper education and appropriate interventions, this expert validated sepsis educational tool will have a positive social impact.

Project Strengths and Limitations

I achieved the primary goal of this study, which was to validate a sepsis educational tool for all frontline staff. The validation panel was an expert panel who were all critical care certified by their professional governing bodies. All validators had had more than 15 years of critical care experience in many ICU setting including medical, cardiac, and surgical ICUs.

One limitations that may have interfered with the results of the expert-validated educational material was the validators were currently experts working in the MICU. This made it difficult to generalize the findings. The second limitation was the experts were certified in adult critical care, so the educational material cannot be used on patients

less than age 18. The final limitation I identified was that a convenience sample was used from a hospital in a suburban area in the northeastern United States and cannot be generalized.

One assumption I held this study was that severe sepsis and septic shock bundles will continue to be best evidence practice while educating with the validated sepsis tool. Another assumption was that all experts were accurate and truthful in their responses.

Analysis of Self

Being a change agent is an essential role for me as a practitioner. Solving this issue has a social impact on both the population and health care organizations, which makes it important to disseminate the results and comply with the evidence. As a nurse practitioner for more than 10 years primarily in critical care, it is disheartening that sepsis continues to be the leading diagnosis in a many ICUs. Compliance with the sepsis guidelines has demonstrated to save lives and improve morbidity and mortality for patients with severe sepsis and septic shock (Levy et al., 2014). It is my goal to provide the tools for frontline staff to be able to provide early recognition, appropriate treatment interventions, and compliance with the sepsis bundles to all the patients they care for with the diagnosis of sepsis.

Conclusions

The results of this study indicated the educational material was valid and an excellent source for critical care frontline staffs' learning needs. For this reason, the tool should be used to educate critical care frontline staff on the diagnosis and treatment of sepsis. It is important to encourage leaders, educators, and providers to use this validated

sepsis educational material for the education of staff because the use of this material to educate on and increase compliance with the sepsis bundles has the potential to improve patient outcomes, reduce health care cost, and reduce hospital and ICU length of stay. The results of this study provide a useful tool to educate ICU frontline staff about the diagnosis and treatment for sepsis, severe sepsis, and septic shock.

Section 5: Dissemination Plan

Introduction

The purpose of this project was to develop and validate a sepsis bundle education program for all frontline staff in the MICU. The educational material will be used to educate the frontline MICU team with the use of a PowerPoint presentation and an interactive video to increase awareness, education, and ultimately, compliance with the severe sepsis and septic shock guidelines. Key stakeholders from the medical intensive care unit, reviewed and validated the educational material for the learning of the sepsis bundles for quality and usability. Results indicated the educational material is valid, in support of evidence-based practice, and is clear and easy to follow. Educating frontline staff is essential to improve compliance with the sepsis bundles. Utilizing this validated tool will guide the education of sepsis, severe sepsis, and septic shock.

The study site is part of a 22-hospital health system with over 20 Intensive Care Units. This validated education tool can be used across the health system for the education of frontline critical care staff. The facility where this study was conducted has begun implementing this validated tool for the education of MICU staff. Sepsis compliance data is collected throughout the entire health system and maintained and compared through a central database. After implementation of this validated tool throughout the health system, following up through the QI department at 3 months, 6 months, 9 months, and at 1 year to evaluate sepsis bundle compliance post educational sessions and the need for follow-up or additional learning sessions.

Also included in my plan is a poster presentation to disseminate my scholarly project. Within the health system I work, there is an annual research fair where I plan on presenting my poster. I am honestly looking forward to this because I feel my project can improve quality of care and look forward to sharing it with so many health care providers. One interesting lesson I have learned about poster presentation is they help the presenter overcome speaking anxiety. Public speaking is outside my comfort zone and based on the literature beginning speaking through poster presentations have positive influences on public speaking. Posters provide a dynamic way to share your information. Knowledge translation is essential and can be done in many venues such as journal entry and conference presentations. For my project, another way I plan to disseminate my project outcomes is through hospital and health system grand rounds. By educating frontline ICU staff with this validated education tool could improve sepsis bundle compliance and ultimately improved mortality from sepsis.

Analysis of Self

Upon reflecting on the journey of obtaining my doctoral degree, I can't help but be filled with excitement and joy for all that was accomplished. Hard work, determination, lots of tears has got me to this point of my journey. The primary goal of my project was to develop and validate a sepsis education tool for frontline MICU providers. I have worked in critical care for the past 20 years and sepsis has always been the leading diagnosis in the critical care environment. Since being a young nurse, I have always been fascinated by sepsis and education and this project has afforded me to develop and improve care for patients with sepsis. Utilizing many education and learning

strategies developed throughout the doctor of nursing practice program and has given me the opportunity to educate the health care team on the elements of the bundle, utilizing a PowerPoint presentation and an interactive fun video to increase awareness, education, and ultimately compliance with the sepsis guidelines.

Going forward I look forward to not only disseminating the outcomes of my project but implementing the education to frontline MICU staff with this now validated sepsis education tool. I am overwhelmed with delight and enthusiasm as I begin educating staff with the work that I have created. As DNPs we are the leaders of our profession and by disseminating our research we help advance our profession and lead the future of nurses.

The future of educating with this tool is not without challenge but the DNP program has afforded me with the tools to transform the culture in the MICU regarding sepsis compliance. I am committed to be the change agent needed to improve patient outcomes. I have learned that as a leader, it is imperative to stay current and knowledgeable on influences that may affect new practice approaches. To stay current and increase my knowledge, I plan review the latest research articles by utilizing journals, state and national databases, as well as EBP guidelines to guide care. I have developed skills during this journey to be a successful nursing leader in a health care organization by advocating for the nursing staff and profession and positively translating evidence into practice to improve outcomes and patient care. The nursing and medical leadership during this journey has helped guide me become the transformational leader I

have been striving to be. As a transformational leader, I engaged staff from the onset of the project which helped gain support and staff ownership during this journey.

Summary

This now validated educational material can provide an excellent resource for critical care frontline staffs' learning needs. As leaders in healthcare it is essential to encourage educators and providers to use this validated sepsis educational material for the education of staff. The goal of utilizing this material is to increase compliance with the sepsis bundles and ultimately improve patient outcomes, reduce health care cost, and reduce hospital and ICU length of stay. The results of this study provide a useful tool to educate ICU frontline staff about the diagnosis and treatment for sepsis, severe sepsis, and septic shock.

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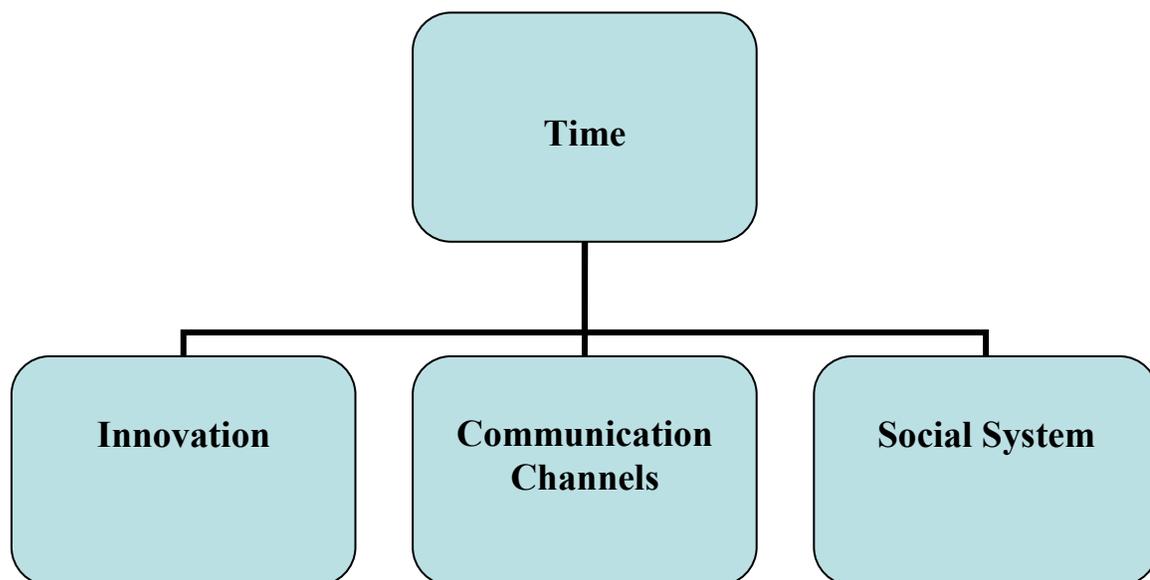
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Appendix A: Diffusion of Innovation Concept Model



Appendix B: MICU Frontline Staff - Sepsis Education Powerpoint

Essentials of Early Sepsis

Management

Elyse D. Isopo

Expectations

- How many of you would put up with your car not starting two out of ten attempts?
- How many of you would fly commercially if the airplane crashed or aborted the flight two out of ten trips?
- How many of you would frequent a restaurant that served contaminated food two times out of ten meals?

Why do we care so much about Sepsis?

- Among the top 10 leading causes of death
- As many as 1 million cases annually
- 600-1000 deaths DAILY in the US
- Most common cause of death in the Medical-Surgical ICU.
- Incidence and severity are increasing

A Case for Change in our Health System

- In the past year there were approximately 3,500 patients discharged with a Sepsis diagnosis across the System
- Septicemia ranked as the top APR-DRG by number of deaths across the System (883)
- Greatest single cause of in-hospital mortality in our health system
- Health Grades mortality rates that were statistically higher than predicted
- NSLIJ CEO identifies sepsis as our key opportunity for preventable mortality

Time Sensitive Diseases

Changing the Paradigm of Practice

AMI	Stroke	Trauma
		
< 10%	< 8%	< 5%

Sepsis



20 - 46%

Time Sensitive Diseases

Changing the Paradigm of Practice

U.S.A. CDC Data

2010

Sepsis is the single most expensive and prevalent condition treated in hospitals

AMI, CHF, Pneumonia <10% now die during hospital stay

Severe Sepsis in the United States from 1993-2003

- Percentage of severe sepsis among all sepsis increased from 25% to 44%.
- Adjusted rate for hospitalization for severe sepsis grew from 67 to 130/100,000 population.
- Population mortality rate increased from 30 to 50/100,000 population.
- Hospital case fatality rate decreased from 46% to 38%.

Dombrovsky, CCM 2007

Or.. Is interaction treatment?

Impact of delayed transfer of critically ill patients from the emergency department to the intensive care unit*

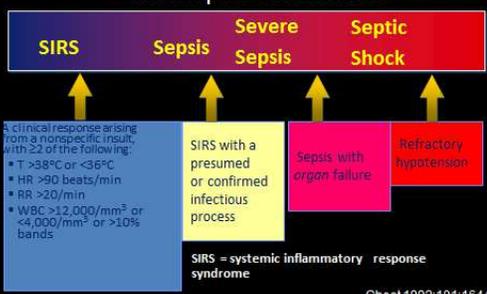
Dorval B. Chaille, MD, MS, FCCM; Stephen Trzeciak, MD, MPH; Antonio Licuanon, MA, MPH; Brigitte M. Bauwens, MD, MSCE; R. Phillip Dellinger, MD, FCCM; for the DELAY-ED study group

- Each 1-hr delay in seeing the patient:
 - 1.6% increased risk of hospital death
 - 2.1% increased risk of death after including propensity score.
- In patients seen promptly (<6 vs. >6 hrs):
 - shorter hospital length of stays (11 vs. 14 days, $p<0.03$)

Recognizing Sepsis



The Sepsis Continuum



Chest 1992;101:1644.

Sepsis Definitions

Sepsis Syndrome
Site of Infection (+):

- tachypnea, tachycardia, fever (hypothermia), leukocytosis (leukopenia)

Severe Sepsis
Sepsis Syndrome (+):

- hypoperfusion - oliguria, altered mental status, lactic acidosis

Septic Shock
Severe Sepsis (+):

- hypotension refractory to fluid infusion requiring vasopressors

Identifying Acute Organ Dysfunction

CNS

- Acute change in mental status

Respiratory

- PaO₂/FiO₂ ≤200 if lung only dysfunction or site of infection
- PaO₂/FiO₂ ≤250 with other organ dysfunction if lung not site of infection
- Tachypnea
- Increasing need for O₂

Metabolic

- Unexplained metabolic acidosis
- pH < 7.30 or base deficit ≥ 5.0, Lactate > 3.0

Cardiovascular

- Tachycardia
- SBP < 90mmHg or > 40 below baseline
- MAP < 65mmHg (despite fluid)
- Need for vasopressors

Renal

- UO < 0.5 ml/kg per hr (despite fluid)
- Cr ↑ > 0.5 above baseline
- Has not voided or does not feel the need

Hematologic

- Platelets < 80,000
- Decline in platelet count of 50% over 3 days

Liver

- INR > 1.5
- ↑ AST, ALT, Alk Phos

Treating Sepsis

Sepsis Bundles

- Early Identification
- Early Antibiotics and Cultures
- Early Goal Directed Therapy (EGDT) (i.e. Aggressive hemodynamic management)

Sepsis Treatment The 3 Hour Bundle

Early recognition of Sepsis First 3 hours

- 1- Measure lactate level
- 2- Obtain blood cultures prior to administration of antibiotics
- 3- Administer Broad spectrum Antibiotics
- 4- Administer 30ml/kg crystalloid for hypotension or lactate ≥4mmol/L

Surviving Sepsis Campaign

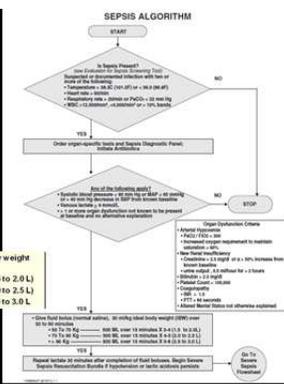
TO BE COMPLETED WITHIN 6 HOURS OF TIME OF PRESENTATION:

5. Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥65mmHg
6. In the event of persistent hypotension after initial fluid administration (MAP < 65 mm Hg) or if initial lactate was ≥4 mmol/L, re-assess volume status and tissue perfusion and document findings according to Table 1.
7. Re-measure lactate if initial lactate elevated.

Algorithm revised October 2015

Key Change

- Give fluid bolus (normal saline), 10 ml/kg ideal body weight (IBW) over 30 to 60 minutes
 - 50 to 70 Kg — 500 ML over 15 minutes X 3-4 (1.5 to 2.0 L)
 - 70 to 90 Kg — 500 ML over 15 minutes X 4-5 (2.0 to 2.5 L)
 - > 90 Kg — 500 ML over 15 minutes X 5-6 (2.5 to 3.0 L)

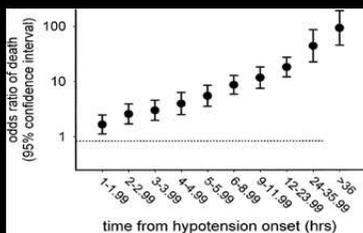


Septic Shock Treatment

- Treatment of underlying infection
- Restoration of systemic perfusion
- Modulation of inflammatory response

1.) Early, Appropriate Antibiotics

Time to Antibiotics And Survival From Septic Shock



Kumar, CCM 2006

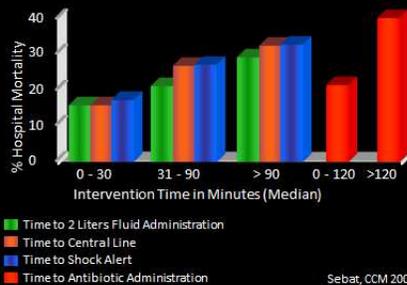
2.) Restore Systemic perfusion

Early Goal Directed Therapy in Septic Shock

- Oxygen, intubation, mechanical ventilation
- Central venous catheter placement
- Fluids to CVP 8 - 12 mmHg
- If MAP < 65 mmHg vasoactive drugs
- If ScvO₂ < 70% and HMCT < 30%, transfusion
- If ScvO₂ < 70% and HMCT > 30%, inotropes

Rivers, NEJM 2001

Time to Intervention and Survival in Shock



Sebat, CCM 2007

Septic Shock

- Septic shock continues to be associated with a high mortality rate of 40% to 60%.
- Treatment consists of therapy directed at the underlying infection, restoration of systemic perfusion, and efforts to modulate in the inflammatory response.

Sepsis Bundle: Review

- Resuscitation (within 6 hours)
 - Measure lactate
 - Culture; start antibiotics within 1-2 hours
 - Fluids if hypotensive or lactate increased
 - If unresponsive to initial fluid bolus, use vasoactive drugs
 - Place CVP catheter, titrate to CVP >8 mmHg, ScvO₂ >65%
 - Dobutamine and/or transfusion if ScvO₂ < 65% after fluids

Pt name – IB 89 y/o male

- 0515 hrs – Present to ED with c/o abdominal pain and vomiting x 1 day
 - Past hx – Extensive Cardiac history including MI, CHF, pacemaker
- v/s @ triage – 127/70, 70, 20, 98.4 (oral), 97% on RA
 - Note: Does not meet SIRS criteria at triage
- Initial orders
 - routine abd workup with Abd CT, Abd and chest X-Rays, routine bloods and 1L NS bolus.
 - Routine cardiac work up.
- 0555 hrs – Temp – 102.1 (oral) Tylenol was given.
 - Note – now meets minimal SIRS criteria (abd pain with RR of 20 or >, Temp > 101.0F)
- 0653 hrs. WBC results :
 - WBC -8.1 (WNL)
- 0700 hrs.
 - Doctors change shift with report out (important – new set of eyes)

0751 hrs. Differential returns

Measurement	Result	Units	Range
GRANULOCYTES	83.0%	%	37.0-78.0
LYMPHOCYTES %	1.0%	%	20.0-48.0
MONOCYTES %	2.0%	%	1.0-10.0
EOSINOPHIL %	0.0	%	0.0-0.0
BASOPHIL %	0.0	%	0.0-0.0
NEUTRILSAND	12.0mm	%	0.0-1.0
GRANULOCYTES	6.8	THOUS/DIM	1.0-8.0
LYMPHOCYTES	0.1%	THOUS/DIM	1.0-4.0
MONOCYTES	0.2	THOUS/DIM	0.0-0.8
BASOPHILS	0.0	THOUS/DIM	0.0-0.2
EOSINOPHILS	0.00	THOUS/DIM	0.00-0.00
RBC MORPH	NORMAL		
PLTMR	NORMAL		

- 0752 hrs. Blood cultures and lactate (bundled) are ordered – Thus establishing time “zero”
- 0800 hrs. – Sepsis screen initiated (due to Sepsis criteria now met).
- 0802 – 1000 cc bolus of NS ordered. Total given 2000 cc (patient weight = 68 kg)
 - Patient did not meet severe sepsis criteria but bacteremia was indicator of possible end organ involvement

CMP

Measurement	Result	Units	Range	Measurement	Result	Units	Range
BILLTOT.	2.1-H	MG/DL	0.4-2.0	SODIUM	140	MMO/L	136-144
ALT (SGPT)	474-H	U/L	17-63	POTASSIUM	3.8	MMO/L	3.6-5.1
AST (SGOT)	860-H	U/L	15-41	CHLORIDE	107	MMO/L	101-111
ALK PHOS.	152-H	U/L	38-126	CO2	25	MMO/L	22-32
ALBUMIN	3.0-L	G/DL	3.5-4.8	GLUCOSE	97	MG/DL	70-99
PROT.SERUM	5.9-L	G/DL	6.1-7.9	BUN	32-H	MG/DL	8-20
A/G RATIO	1.0-L	G/DL	1.1-1.8	CREATININE	2.0-H	MG/DL	0.7-1.2
BILLDR.	1.1-H	MG/DL	0.1-0.5	BUN/CREATININE	16.0		7.0-25.0
				ANION GAP K+	12	MMO/L	9-18
				CALCIUM	8.4-L	MG/DL	8.9-10.3

- 0820
– v/s 141/75, 74, 20 98.2 (oral), 97% on RA
- 0821
– Lipase results returned
- LIPASE
– 1378-H
- Lactates remained <2 throughout ED stay - Done x2
- 0854 – Lactate – 1.4
- 1245 – Lactate – 1.5

Lessons Learned

- –0848 – Invanz administered. (56 minutes from time “zero”)
- 1400 hrs. The patient was admitted to 5TSD (step down unit)
– v/s at that time – 130/66, 67, 18, 97.6(oral), 96% on RA
- Dx – Sepsis, Pancreatitis, Liver failure, Renal failure
- BC came back + for **E. Coli 4/4 bottles**
- Discharged from hospital after 5 days, did well
- RN should have flagged for MD to re-eval, and consider sepsis protocol earlier (@ 0555 hrs when patient met minimal SIRS criteria).
- The oncoming doc (looking with fresh eyes @ 0700) – realized he may be looking at a sepsis case (based on elevated bands, change in temp, organ failure upon receiving blood results).
- Moral of the story - If it walks like a duck, quacks like a duck It’s sepsis!

Case Failure Example

47 Year old female, admitted with abdominal pain. Hx of multiple previous hernia repairs, obesity and hypertension

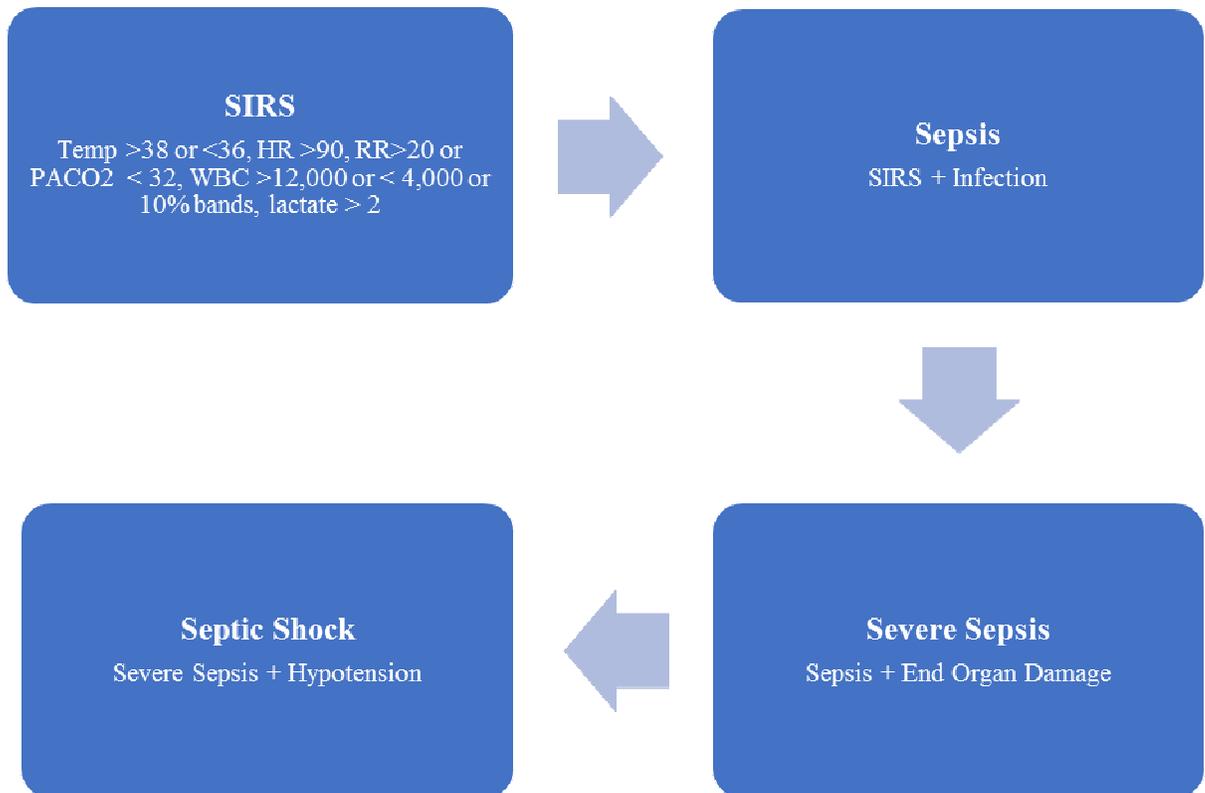
- Urgent hernia repair done with lysis of adhesions. Surgery > 8 hours. Transferred to post op unit.
- triple lumen catheter placed for inability to get IV access. Pain management successful, patient complaining of nausea.
- 2200 Patient is alert and oriented. NGT placed for nausea and vomiting.
- 0130 AMS- patient pulls out NGT, agitated and disoriented. PA called. B/P 122/77. HR 151. RR 19. T 103.3, vomiting. Tylenol given

- 0330 Surgeon called and arrives at 0430. Places another NGT. Documents R/O obstruction.
- 0715 Morning RN assess patient and seeing the difference from the day before calls a Code Stroke (AMS & B/P 82/60).
- Residents arrive. B/p 82/60. HR 150. RR 18. T 102.7 Initially they followed stroke protocol. Even though they were told that the patient met sepsis criteria they would not use order set but did order blood C&S, lactate and one fluid bolus. Impression: R/O sepsis and R/O obstruction. (lactate 9.8)
- Patient went to CT scan. Transferred to ICU.
- Upon arrival to ICU, admitting surgeon documents septic shock.
- 101.5 Code Blue. Patient is intubated, fluid boluses started as well as levophed. Patient died a few hours later.

Appendix C: Staff Produced Educational Video

<https://vimeo.com/220624300>

Appendix D: Sepsis Conceptual Model



Appendix E: Evaluation Tool for Expert Panel Validation

Please circle one response to each question:

1- The educational material provided support evidence based practice for the treatment of sepsis?

- 1- Strongly disagree
- 2- Disagree
- 3- Neither agree nor disagree
- 4- Agree
- 5- Strongly agree

2- The educational material provided is clear and easy to follow?

- 1- Strongly disagree
- 2- Disagree
- 3- Neither agree nor disagree
- 4- Agree
- 5- Strongly agree

3- The educational material provided addresses all sepsis bundle?

- 1- Strongly disagree
- 2- Disagree
- 3- Neither agree nor disagree
- 4- Agree
- 5- Strongly agree

4- The educational material provided stresses the importance of bundle compliance for the treatment of sepsis?

- 1- Strongly disagree
- 2- Disagree
- 3- Neither agree nor disagree
- 4- Agree
- 5- Strongly agree