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Using Infographics to Improve Completion Rates of the Sepsis Protocol Bundle

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USING INFOGRAPHICS TO IMPROVE COMPLETION RATES OF THE SEPSIS PROTOCOL BUNDLE.

A DNP Project Submitted to the
Graduate Faculty
of Jacksonville State University
in Partial Fulfillment of the
Requirements for the Degree of
Doctor of Nursing Practice

By

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ABSTRACT

Hospitals have sepsis protocols that must be implemented when a patient shows positive signs and symptoms of a septic infection. Nurses learn about sepsis in nursing school and rarely further their education beyond this basic understanding of the disease. So, when nurses fail to comply with organizational instructions outlined within a defined sepsis protocol bundle, this often leads to a progression of severe sepsis in a patient and, most likely, increased cost for the healthcare facility. Multiple sepsis protocol bundle failures negatively impact organizational ratings established by The Joint Commission for patient care and are highly associated with increased sepsis mortality. Sepsis is one of the leading causes of 30-day readmission rates for many hospitals. Four factors have been shown to affect the success rate of sepsis protocol bundle compliance: a lack of effective communication between nurses and nursing units, a lack of continuing education about current evidence-based practices of sepsis prevention and care, cumbersome tasks and mental loads that nurses endure in using electronic health care systems, and high acuity patient loads and responsibilities. Nurses need a set of tools and education methods that will increase their ability to remain 100% compliant with sepsis protocol bundles with minimal distractions.

Keywords: sepsis, Rogers, PEMAT, Infographics

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Introduction

Septicemia, also known as sepsis, is a potentially dangerous medical condition associated with bacterial infection progression in the body. The body's overwhelming systemic response to the disease can lead to organ failure, tissue damage, and possibly death. Septicemia is a global problem responsible for one in four deaths (Dellinger et al., 2013). A particular pathogen does not cause sepsis but instead occurs when infection runs unchecked in the body, and organ systems begin to fail. As a result, other diagnoses are often assigned to a patient's condition when septicemia as the underlying cause. The solution that will allow nurses to identify septicemia and reduce sepsis-related mortality rates will be achieved using early detection and intervention tools. This project created a nursing-led initiative in the critical care environment to improve sepsis protocol bundle compliance rates. Compliance rate improvement was accomplished by utilizing educational programs and tools that increased a nurse’s awareness of active sepsis protocol bundles and allowed the nurses to identify the steps needed to complete the bundle. The project occurred over two months and involved nurses in the emergency services department (ER).

Background

Several standards have been created and utilized worldwide to identify when a patient may enter a septic condition. A past research study has shown that sepsis-related hospitalizations were about 64.7 per 100,000 persons in 1993 (Rhee & Klompas, 2020). The study demonstrated that as better techniques for detection and documentation were

developed, researchers could better understand how easy it was for sepsis to go undetected. From 1993 to 2003, their research indicated that sepsis infection rates more than doubled to 134.6 per 100,000 persons (Rhee & Klompas, 2020). The Surviving Sepsis Campaign (SSC) was created in 2002 by a collaborative team of doctors and nurses to reduce mortality from septicemia by 25% in five years using a seven-point agenda addressing the following areas: 1) building awareness of sepsis, 2) improving diagnoses, 3) increasing the use of appropriate treatments, 4) educating healthcare professionals, 5) developing guidelines of care, 6) improving post-intensive care unit (ICU) care, and 7) implementing a performance improvement program (Society of Critical Care Medicine, 2020). The guidelines established by this committee were designed to give practitioners a tool based on evidence-based practices to assist them in diagnosing septic conditions in patients. The committee identified a six-hour window from when septicemia occurred for providers to initiate effective treatment plans. Based on this research, many medical organizations have established sepsis protocol bundles for their staff to follow when patients in the hospital meet specific criteria. The advent of implementing electronic health records (EHR) systems to document patient care has allowed computer software programs to utilize the guidelines developed by the SSC to identify potential septic states in patients in real-time. The ability to monitor and alert medical staff when using a computer program also has the benefit of helping nurses to manage treatment timelines and remain within protocol expiration deadlines. Since implementing SSC guidelines, many organizations have reported significant decreases in severe sepsis infection rates and overall sepsis mortality rates. A recent study showcased that the application of the SSC guidelines allowed a facility to reduce sepsis-related

mortality by 15.85% and show a reduction of severe sepsis diagnoses by 18.68% (Radigan, 2017). Radigan (2017) quickly noted that the rates of decline would have been higher if there was better compliance with completing established sepsis bundle protocols.

Problem Statement

Early detection of patients entering into a septic state has been identified as the most crucial tool in combating the deadly diagnosis (Kurczewski, Sweet, McKnight, & Halbritter, 2015). Nationally in 2016, it was estimated that the average cost to treat sepsis in a hospital was about $32,421 (Arefian et al., 2017). Much of the cost was related to the increased use of antibiotics, intravenous fluids, and lab work associated with the continuum of care in treating septic infections (Esposito et al., 2018). Mayr et al. (2017) stated that the Centers for Medicare & Medicaid Services (CMS) reported that sepsis was a significant contributor to 30-day readmission rates. The mean length of stay for unplanned readmissions was longer for patients previously diagnosed with a septic condition. CMS noted in 2016 that the average cost of readmission for sepsis-related cases was $10,021, which was the most expensive diagnosis compared to chronic obstructive pulmonary disease ($8,417), heart failure ($9,051), acute myocardial infarctions ($9,424), and pneumonia ($9,533) (Mayr et al., 2017). Therefore, it is in a hospital's best financial interest to invest in a sepsis prevention program rather than absorb a 30-day readmission cost.

Objective measurements of vital signs and lab results are valuable cohesive indicators that are interdependent and important in diagnosing septic conditions. Statistically, analyzing these values for significance is easy to do with a computer

program, but clinical data is only relevant if someone acts upon it in a timely fashion. Clinical staff must be trained to recognize septic conditions and have evidenced-based protocols in place as guidelines for what actions to execute when septic conditions occur. Before the advent of the SSC guidelines, identifying septic conditions was not a consistent practice. Determining a patient's septic condition was left entirely to the caregiver, nurse, or practitioner's critical judgment. Changing the human behaviors of medical care providers can be difficult, and training results may not be consistent across the entire medical staff (Steinmo, Fuller, Stone, & Michie, 2015). Using computer software to monitor and alert for septic criteria thresholds is a recent paradigm in medical care that can assist and enhance patient care across a wide variety of educational backgrounds and experiences of care providers. In addition, continual education about current sepsis-related research can enhance the nurse's ability to focus and react more efficiently to septic conditions in their patients. This study sought to identify the effect on improving sepsis protocol bundle compliance with critical care nurses by developing a set of educational programs and tools that would increase their awareness of septic infections in patients. The study also elevated the nurse's ability to delineate the steps needed for successful sepsis bundle completion.

Organizational Description of Project Site

Sepsis is a condition that is easily misdiagnosed and, if left undetected, can have a high mortality rate. Hospitals bear the brunt of this mortality because of the collective classifications of sickness and disease that affect their patients. All too often, patients who are admitted to intensive care (ICU) or emergency (ER) units may already be advancing into septic states, and without proper tools in place for rapid detection and

prevention, the patient outcome can become fatal (Taylor et al., 2016). The Northeast Regional Medical Center (RMC) in Anniston, Alabama, is a regional Tier 1 facility with two hospitals caring for over 167,000 patients per year. Over the past several years, infection rates for severe sepsis have been averaging around 45% and sepsis-related mortality as high as 67%. Although the hospital had a sepsis protocol in place, failures to identify severe sepsis progression continued to occur because the collaborative team did not execute facility protocols within timeframes defined by SSC guidelines. The hospital identified several factors they believed were the cause of the failures: 1) the current EHR system was not designed with the nurse or nursing process in mind, 2) physicians do not always follow the defined sepsis protocols, 3) nurses do not feel empowered to act with the defined sepsis protocols, and 4) the current printed sepsis protocols were challenging to read and to understand what actions were needed to accomplish next. The hospital was also concerned about patients' current 30-day readmission rate due to previous septic infections, averaging four to five patients each month. Because the hospital was a regional Tier-1 facility, they are more likely to treat individuals who do not have insurance or access to primary care, which is a significant factor in many readmission rates.

Review of Literature

A literature review using keywords sepsis, education, Rogers, nurse-driven, guidelines, and sepsis bundles was conducted using PubMed, CINAHL, Ovid MEDLINE, and OneFile. Sepsis is a potentially dangerous medical condition associated with the progression of a bacterial infection and a systemic inflammatory response in the

body. The body's overwhelming systemic response to the infection can lead to organ failure, tissue damage, and possibly death. Sepsis is a problem responsible for one in three deaths worldwide (Whitfield et al., 2019). A particular pathogen does not cause sepsis. Instead, it occurs when the infection runs unchecked in the body, and organ systems fail as the body starts to attack itself. Unfortunately, it is not unusual for this systemic response in the body to be misdiagnosed as something else when, in reality, sepsis is the main culprit (Abe et al., 2019).

Several standards have been created worldwide to identify when a patient may be entering a septic condition. The Surviving Sepsis Campaign (SSC) was established in 2002 by a collaborative team of doctors and nurses to reduce sepsis-related mortality (Society of Critical Care Medicine, 2020). It is essential to note that the guidelines are only as practical as the team that uses them. In her research, Radigan (2017) stated that when the entire collaborative team, including the physician, nurse, pharmacist, and nursing supervisors, were involved in improving their failure rates, their compliance rates improved. The team's collaborative involvement in seeking a solution is supportive of the application of Rogers' Diffusion of Innovation Theory in this project and showcasing to the staff the value of being a part of the solution process. Rogers (2003) understood that it was important for team members to recognize that one person cannot contain all the necessary knowledge to solve a problem. He showed that issues do not exist in a confined space but rather mutate over a period of time (Rogers, 2003). His Diffusion of Innovation Theory is highly effective in several research projects in the healthcare field. Zimmerman, Yeatman, Jones, and Murdoch (2015) applied Rogers' philosophy to improve their hospital's infection prevention and control program.

Electronic health care record systems play an essential part in fighting sepsis because computer automation makes it very efficient to analyze patient vital signs and labs to monitor and alert medical staff when potential septic conditions exist. The use of computer alerting systems has effectively reduced the amount of time to recognize septic conditions and reduce septic-related mortality rates (Kurczewski et al., 2015). However, there is a concern that the use of computer monitoring software based upon the SSC guidelines cannot adjust for other comorbidities or concurrent medical conditions, which may cause false-positive alerts to be generated and sent to staff. Nurses must remain involved because their critical assessment skills allow them to see things a computer may not recognize. Nurses are on the front line of care for patients diagnosed with sepsis and essential stakeholders to sepsis protocol bundle completion. This is why it is vitally important to keep nurses involved in developing the sepsis protocol bundles, forming the response teams, and developing the education and tools needed to create an innovative solution (Jacobs, 2020). Drahnak, Hravnak, Ren, Haines, and Tuite (2016) shared that consistent training for nurses and the development of hands-on tools generate the most significant opportunities for nurses to combat sepsis.

The readability and actionability of documentation used in the healthcare setting can significantly affect how information is utilized in patient care. The Agency for Healthcare Research and Quality (AHRQ) sought to develop a tool that could measure the effectiveness of educational material printed on paper or presented in an audio-visual format. Although initially targeted for patient educational material, the research in developing the measurement tool showed that the same principles could be applied to educational material for users in the clinical setting. The development of the Patient

Education Materials Assessment Tool (PEMAT) focused on measuring two critical components of a document's understandability and actionability (Shoemaker, Wolf, & Brach, 2014). Understandability is achieved when readers of diverse backgrounds and various levels of education can process and explain key components of the document's intent (Shoemaker et al., 2014). Actionability is defined as the reader's ability to clearly understand what they are able to accomplish after reading the material (Shoemaker et al., 2014). Based on an in-depth analysis of a document using various levels of analysis of understandability and actionability, a score is generated, which can be used to identify if educational content is too complex to understand or is too confusing for readers. The fundamental purpose of using PEMAT is to reduce the level of health literacy demands from educational material and ensure that healthcare professionals can effectively utilize the material.

Evidence-Based Practice: Verification of Chosen Option

To improve sepsis bundle completion rates at the hospital, the choice was made to use the evidence-based Patient Education Materials Assessment Tool developed by the Agency for Healthcare Research and Quality. This tool allowed me to evaluate their current sepsis bundle documentation for alerts and identify areas that scored low for readability and actionability. This evaluation redesigned the hospital sepsis alert form utilizing a new infographic layout that improved readability and presented clear action items for the staff to follow.

Theoretical Framework/Evidence-Based Practice Model

Rogers' Diffusion of Innovation Theory is ideal for applying to improving sepsis protocol compliance as the implementation of new standards of care requires constant adjustment and feedback during the implementation process (DeNisco & Barker, 2016). Rogers identifies four stages of change nurses will go through when deciding to adopt or reject the validity of a standard of care: 1) knowledge acquisition, 2) process of persuasion, 3) decision phase, and 4) adoption into clinical practice (see Appendix A) (Rogers, 2003). Suppose a sepsis protocol is based on evidence-based practices. In that case, continuous efforts to educate the staff about the effects of sepsis, using Rogers' theory, can eventually reinforce the protocol's purpose. Zimmerman et al. noted this effect while researching the ability to utilize Rogers' theory while improving an infection prevention and control program (Zimmerman et al., 2015). Their study highlighted that developing infection prevention and control protocols was a process that perpetually changed with new research. As their research staff applied the various stages of Rogers' theory to their work, they realized the importance of involving the end-users in developing the innovative process (Zimmerman et al., 2015). Rogers' theory demonstrates an effective method to engage the hospital staff in creating an innovative solution that will be acceptable to the critical care teams and present the opportunity to improve the bundle compliance rate (DeNisco & Barker, 2016).

Goals, Objectives, and Expected Outcomes

This quality improvement study aimed to create a nursing-led initiative in a local hospital's critical care environment to improve sepsis protocol bundle compliance. This was accomplished by creating a set of educational programs and tools that increased the

awareness of the hospital's active sepsis protocol bundles and allowed nurses to delineate the steps needed to correctly complete a bundle. The study occurred over two months and involved nurses in the emergency services department (ER).

Two objectives were executed in support of the goals of the overall project. The first was to determine the relationship between an education program focused on the hospital's sepsis protocol bundle and the bundle compliance rate. Drahnak et al. (2016) noted that when nurses are provided current evidence through educational efforts coupled with appropriate tools, a strong foundation can create a more effective collaborative team. The second objective was to develop a paper-based worksheet that visually indicated the percentage of completion of a sepsis protocol bundle and serve as a hand-off communication tool. This improved the nurse's ability to understand the status of an active sepsis protocol bundle set and supported therapeutic communication between units when the patient was transferred to another unit.

At the completion of this project, it was desired to improve the rates of sepsis protocol bundle compliance in ER patients. This was measured by analyzing the severe sepsis infection rates and overall sepsis-related mortalities before and after the two-month study. Secondly, a pre-study and post-study survey documented 1) the knowledge level of critical nurses about the purpose of the sepsis protocol bundle set and how it affects patient care and hospital finances, and 2) the effectiveness of the new document to communicate the status of a septic patient's care when transferring to another unit.

Project Design

This project is based on a process improvement plan to streamline and improve sepsis diagnosis and treatment in the clinical care environment. The current site had a valuable tool and process to detect sepsis, but the clinical staff had a high failure rate in completing the established protocols. As a result, many sepsis cases in hospitalized patients progressed into severe sepsis, and the probability of sepsis-related deaths increased. The increased sepsis bundle failure rates were a concern of the hospital because the failure rates could be directly associated with increased patient care costs in the critical care environment (Mayr et al., 2017).

This study examined the process of how critical care nurses acknowledge sepsis alerts and then execute the elements of the hospital's established sepsis protocol bundle. The project was quantitative and based on a non-experimental design to determine if modifying a nurse's level of sepsis education and ability to visualize the bundle components can impact increasing bundle compliance.

Project Site and Population

The study occurred in an acute care setting within the Northeast Regional Medical Center Hospital in Anniston, Alabama. Critical care nurses in the ER and Intensive Care (ICU) departments were more likely to treat patients who would become septic. This environment provided ample opportunity to observe how nurses function while treating patients with possible septic conditions. This study was executed in the first half of the year 2021 during the Coronavirus pandemic. Like many hospitals worldwide, access to the ICU was highly restricted as patients with COVID-19 were treated. As a result, the study population was focused on ER nurses. The target population size was a total of ten

registered nurses. This population group was further subdivided into two groups of five nurses. Each classified by 1) a group of nurses with less than five years' experience and 2) a group of nurses equal to or greater than five years' experience in a critical care environment.

Setting Facilitators and Barriers

The stakeholders in this study included patients who became septic, the critical care nursing staff, and the hospital administrative staff. No personal information about patients was utilized in this study, but their deteriorated medical condition presented the opportunity to diagnose and treat their septic states. Critical care nurses were an essential element in this study because their level of knowledge and experience in treating sepsis was the independent variable and had the most significant effect on the outcome of a patient's status in the hospital. The nurses had to use critical judgment skills and experience to execute a balanced care plan with the sepsis protocol bundle, the dependent variable, and with the collaborative medical team.

The hospital administrative staff involved included the 1) Chief Nursing Officer (CNO) who was responsible for hospital-wide nursing operations, 2) the Quality Director who developed, implemented, and monitored evidenced-based nursing practices in the hospital, 3) the ER manager who was responsible for the operation of the ER department, and 4) the nursing education staff. Although the administrative staff was not involved in direct patient care, they were responsible for monitoring and controlling infection rates within the hospital and managing the financial impact of readmission rates (Mayr et al., 2017). In addition, the nursing education staff was necessary to develop an educational curriculum that can reinforce the nurse's knowledge base about sepsis and any new

evidence-based treatments that could be incorporated into established sepsis protocol bundles.

The most significant barrier in this study's execution was the Coronavirus pandemic's impact on hospital operations and patient diagnosing. The Coronavirus pandemic reduced the study population size because one area of critical care, the ICU, was placed under a strict access policy. As a result, ICU nurses could not be included in the study population. In the early stages of the pandemic, the hospital patient census was significantly reduced because people were afraid to enter hospitals. Many elective and non-elective surgeries were delayed because doctors and patients did not fully understand the risk of catching coronavirus in hospitals (Khalafallah et al., 2020). Fewer patients in the ER meant decreased opportunities to observe nurses caring for septic patients. The pandemic also impacted the clinical staff's ability to diagnose the presence of the coronavirus and possibly a septic infection since many of the symptoms were the same for both diseases. This project needed to consider a nurse's ability to identify when a patient was septic or affected by the coronavirus.

Implementation Plan/Procedures

The implementation of this project occurred in three phases 1) Primary Analysis and Fact Gathering (PAFG), 2) Focused Knowledge Building (FKB), and 3) Post Analysis (PA).

Primary Analysis and Fact Gathering (PAFG) Stage

The PAFG stage of the project began by delivering a questionnaire using the hospital's education portal that ascertained a nurse's ability to recognize sepsis, display

an understanding of the execution of the hospital's sepsis protocol bundle, and display an understanding of the financial impact of a severe sepsis diagnosis for a patient and the hospital. In addition, the critical care nursing staff was observed to identify how they functioned as a team and implemented current sepsis protocol bundles. The first stage was also a fact-finding opportunity to understand the hospital's vision in managing sepsis and the current rates for septic infections, severe sepsis infections, and sepsis-related mortalities. This information was obtained in the initial meetings with the Quality Director, Chief Nursing Officer, and the ER manager, who were considered permanent members of the hospital's sepsis response team (SRT). The first session with the SRT established an initial project timeline of implementation, identified the remaining members of the SRT, and selected a sepsis champion. A second and third meeting with the SRT was scheduled before the subsequent two phases to review project status and clarify expectations for the remaining stages. The knowledge obtained from these meetings benefitted the project and allowed for user feedback to guide its progression. The total length of time to execute the first phase of the study was four weeks.

Focused Knowledge Building (FKB) Stage

The FKB stage was focused upon monitoring and refinement of sepsis protocol bundle execution and nursing knowledge improvements. Although the nursing staff utilized an electronic health record (EHR) system for patient charting and documentation, the project focused on implementing a visual bundle document (VBD) presented to the nurses as a method to track and execute the sepsis protocol bundle. The VBD was a document maintained on the front of the physical chart that identified each element of the sepsis protocol bundle that must be executed. The VBD was created around a knowledge

framework based on the defined sepsis protocol that emphasized the duration timeframes of each step of the bundle (see Appendix D). When a VBD failure occurred or the VBD was completed, this DNP student collected the form from the ER Director. In addition, weekly meetings with the administrative staff facilitated the study's rate of progress by comparing weekly infection rates and posting a summary report of rates of infection in the ER nursing unit. When consistent points of failure on the VBD were identified, then nursing education content was created to reinforce poorly understood concepts of the sepsis protocol bundle. The total length of time to execute this first phase of the study did not exceed four weeks.

Post Analysis (PA) Stage

The PA stage focused on statistically analyzing the VBD documents to identify which areas of the sepsis protocol bundles nurses were most likely to fail and if education initiatives during the second stage helped improve those areas. A post-project survey was delivered to identify if nurses improved their knowledge of sepsis and the importance of completing sepsis protocol bundles. A final report of the project's results will be presented to the nurses and hospital staff.

Measurement Instruments

The instruments utilized in this study to collect vital sign information were identified as appropriate for use by the Health and Psychological Instruments Online database (Gray, Grove, & Sutherland, 2017). The measurement of patient vital signs is a routine practice. The methodology and skill level needed to use such equipment critically is already outlined in the certification requirements for nurses, nursing assistants, and physicians. The hospital in this study was certified by the Joint Commission, responsible

for accrediting health care organizations and programs in the United States (Commission, 2015). As a result, all equipment used must be certified for use in measuring vital signs, meets national standards of measurement performance, is utilized within the manufacturer's guidelines framework, and is calibrated and recertified every six months (Gray et al., 2017). The instruments used in this study were included as part of the Welch Allyn Connex Wall System that consists of a thermometer, heart rate monitor, and blood pressure measuring equipment. This equipment has been standardized and is available next to every bed in the hospital. IntelliVue Telemetry System, provided by Phillips, may also be utilized to remotely record patient vital sign measurements (Phillips, 2015). Telemetry equipment is wireless and portable and connects to the patient's body with foam adhesive electrode pads. To confirm the proper operation of measuring equipment, medical staff should compare vital sign readings on a test patient using two different equipment sets at least once a week. Variances in readings should not be more than one degree (Celsius or Fahrenheit) for temperature, two beats per minute for heart rate, and three mmHg for blood pressure readings.

Data Collection Procedure

The outcome of this study was determined by measuring the completion rate of sepsis protocol bundles compared to the rate of severe sepsis infections in patients admitted to the hospital from the ER. For each alert generated by the hospital's sepsis alert system, a bundle completion document was created and printed on the ER nurses' station printer by the alert system. The patient's assigned nurse was responsible for ensuring each step of the protocol bundle was executed and completed in the appropriate

time frames indicated on the bundle completion form. When the ER nurse completed the form, it was be submitted to the ER Director for review.

Extraneous Variables

When using electronic equipment to measure vital signs, several factors must be taken into consideration to prevent the effects of extraneous variables. Beyond manufacturer certification for measuring equipment, care must be given to inspect wires for electrical shorts, sufficient battery capacity and charging, the equipment's ability to display and transmit recorded information properly, equipment malfunction, and ensure that other electronic equipment transmissions are not affecting the utilized equipment. Other variability elements can come from user error, including misreading measurement values, improper measurement technique, and improperly recording measurements in the patient's chart. Variability and error can occur with blood pressure readings if they are taken too frequently or improperly. Errors can also occur if the correct patient identifiers are not correctly associated with historical information.

For this study, the goal was to take vital sign measurements at least once every hour. The SSC has indicated that patients who receive interventions within the first six hours of entering a septic state are more likely to recover successfully (Kurczewski et al., 2015). The temperature was taken with an electronic thermometer for fifteen seconds, recording the maximum value reported. The heart rate was recorded by attaching a probe onto a finger for at least thirty seconds and recording the maximum rate reported. Alternatively, a patient's heart rate manual measurement could be ascertained by palpating a radial or carotid pulse for one minute. Respirations were recorded by counting

the number of times a patient breathed for one minute. Blood pressure was recorded utilizing a patient's left or right upper arm while lying in a semi-fowlers position.

All electronic measurement instrumentation used in this study could transmit and record vital sign measurements to a central server in the patient's electronic health record. If measurements were taken manually, the medical staff member had to record the information correctly in the patient's electronic health care record. If any recorded values appear outside their normal range, repeated measurements and inspection of equipment operation are performed.

Data Analysis

The sepsis bundle protocol document consists of identified steps and procedures that must be completed when a sepsis alert is generated. A quantitative analysis of each step was recorded in an Excel spreadsheet for each document, indicating if the step was completed in the required timeframe. If a failure occurred, then an indication of why the failure occurred was recorded. Each document was graded by its percentage of completion. The reasons for failure for each step on the document were registered. In the weekly review meetings with the SRT, a summary report of failures was reviewed. Areas of the bundle protocol document that were greater than 50% of the total areas reported earned consideration for the need to create reinforcement education or identified process changes that needed to occur. Monthly reports included line graphs showing the weekly percentage of error for each step of the bundle.

The infection rates for severe sepsis were received from the Quality Director in the weekly SRT review meetings (see Appendix E). These rates were recorded and diagrammed against the bundle protocol completion rates. A comparison of severe

infection rates from previous years will be compared to severe infection rates during the project's timeframe. The rates of severe sepsis infections from the same period in previous years were used as a control or comparison group. Based on this information, it was desired to show that an increase in bundle protocol completion rates directly affected reducing the rates of severe sepsis progression in the hospital.

Cost-Benefit Analysis/Budget

The costs to implement this project were relatively low because the hospital already provided most of the resources needed for implementation and observation. The DNP student utilized a personal computer for summary analysis and report generation. There was no physical resource cost associated with producing new education material since this was accomplished in association with the hospital's education department. The hospital allowed the use of a color printer to generate any regular reports or graphics that were needed during this study for the hospital's use.

Timeline

The processes of implementing the steps of this project are listed below chronologically. Although they are listed in a serial fashion, many steps were executed at the same time, as indicated by the Timeline table (see Appendix B).

1) Meet with the Chief Nursing Officer and Quality Director to discuss the hospital's goals and objectives for sepsis prevention. Seek to understand why current bundle compliance rates are below 95% and the causes for failure (1 day).

2) Meet with nursing leadership to understand the financial impact of sepsis-related infections (1 day).
3) Identify who the hospital sepsis champions are with nursing leadership and who will be on the sepsis response team (1 day).
4) Obtain a report from the Quality Director (QD) that summarizes the current rate of sepsis infections, the rate of sepsis protocol bundle failures, and the rate of sepsis-related mortalities for each month since January 1, 2020 (1 day).
5) Establish with nursing leadership a timeline of implementation (1 day).
6) Create an initial survey for critical care nurses about their experiences with the current processes and procedures for identifying sepsis in their patients and sepsis protocol compliance (3 days).
7) Meet with the SRT to discuss the development of the sepsis protocol bundle monitoring form and how it will integrate with the current Electronic Health Record system (EHR) and the present sepsis alerting system (1 day).
8) Discuss with CNO and QD what information will be recorded on the monitoring form to ensure HIPPA compliance (1 day).
9) Develop a process to collect forms daily and record completion rates in a Microsoft Excel spreadsheet. This spreadsheet will be used to identify bundle step failures. Review this process with the SRT (7 days).
10) Review with nursing leadership the process to alert and record pending bundle failures. Observations will be compared with current manual methods of tracking (14 days).
11) Identify who will be notified when a potential bundle failure is about to occur (1 day).

12) Create a weekly reporting template to showcase the number of identified septic infections and bundle compliance rates for each unit in the hospital (4 days).
13) Create an education module for nurses to review current evidence-based protocols for septic infections and current hospital guidelines for sepsis prevention (7 days).
14) Create an education module overviewing the purpose of this project and highlight its importance as a nurse-led initiative (7 days).
15) Create an informative document for sepsis response team members highlighting the steps to take when a bundle failure alert occurs (1 day).
16) Create an informative document giving instructions for the sepsis response team members to report system failures/bugs with the electronic tool (1 day).
17) Set up weekly review meetings with nursing leadership and the sepsis response team members to review current reporting statistics, monitoring tool performance, and review feedback from clinical staff. Outcomes of these meetings will be used to support manual and electronic process improvements for sepsis protocol bundle compliance (weekly).
18) At the end of the study, create a survey for critical care nurses to evaluate the monitoring tool's effectiveness and identify if having the tool improved their nursing workflow for septic patients (3 days).
19) Present a final report of study results to the hospital leadership (1 day).

Ethics and Human Subject Participation

During this project's scope, no personal patient information was captured for analysis in this study. The VBD will initially contain a patient label for identification purposes, vital signs, and lab values to be used by the nurse in caring for the patient, but when the form is turned in, the DNP student blacked out any patient information. Therefore, as an added security measure, the VBD documents remained in the control of the hospital ER Director.

On July 30, 2020, a copy of this project's Abstract was presented to the Northeast Alabama Regional Medical Center Institutional Review Board (RMC-IRB). This DNP student answered questions from the board members about the purpose and efficacy of the project. The project was reviewed and approved for implementation.

The Jacksonville State University Institutional Review Board (IRB) approved the implementation of this project on December 4, 2020 (see Appendix K).

Discussion

Analysis of the completion of this project is divided into several components 1) measurement of staff comprehension of sepsis protocols in the hospital, 2) utilization of the PEMAT tool to analyze and reformat the hospital's Sepsis Protocol Bundle document, and 3) an analysis of the effectiveness of sepsis protocol bundle completion rates and its effect on severe sepsis admission rates in ER patients admitted to the hospital.

The utilization of the project was centered around ten initial nurses across two shifts who volunteered to participate in the project. The participants' nursing experience

ranged from two years to thirty-five years. Each of the nurses completed a pre-project survey consisting of 25 questions designed to ascertain their understanding of recognizing sepsis and the general concepts necessary to treat it (see Appendix J). The initial knowledge survey produced an average score of 78%. Many nurses understood what sepsis was but failed to comprehend the actual vital sign and lab value thresholds. The results of this initial score were valuable in redesigning the sepsis protocol bundle document with the PEMAT tool. At the end of each week of the project, a summary report was created indicating bundle completion progress and notes from spot interviews of the nursing staff to evaluate their use of the new sepsis protocol bundle document. This DNP student found that knowledge about sepsis increased significantly because the nurses were forced to engage and utilize the alert document and the health status of their patients. Before this project, nurses typically discussed septic conditions when the physician initiated a discussion. A lead participant in the project made a key observation. She stated that there was greater accountability for each nurse's actions because the sepsis protocol bundle document was printed at the nurses' station when an alert was generated. The document was then required to be submitted to the ER Director for review. Although nurses had access to a sepsis checklist in the EHR software, which they were told to utilize, it was rarely used because there was no follow-up accountability for its lack of use. In addition, the form in the EHR software was just a list of checkboxes for the nurse to document actions completed on the old paper document. This was not a practical implementation of the SSC guidelines.

After the project was completed, each of the nurses was surveyed again to ascertain if their knowledge of sepsis had improved. The post-survey score was 96%.

Many of the nurses expressed appreciation for being a part of this project. It was difficult in the beginning to get everyone trained on how to use the new document, but once they adapted to the alternate alerting process, utilization of completing the document improved. This DNP student utilized the principles of Roger's Diffusion of Innovation Theory continually throughout the project to educate nurses about how to use the new form to improve the recognition and treatment of sepsis in their patients. This DNP student would like to recognize an additional positive benefit of this project. The new sepsis protocol bundle documents were printed for every patient that generated a sepsis alert in the ER. As a result, nurses on all shifts in the ER became familiar with the new document and began using it as well. The documents became a focal point of discussion among all members of the team, and the feedback this DNP student received was valuable enough that other units in the RMC hospital system have showed interest in utilizing the new document structure.

The PEMAT tool developed by the Agency for Healthcare Research and Quality was used to analyze the hospital's original sepsis protocol bundle document. The scoring is based upon a document's understandability and actionability utilizing a percentage value. The higher the percentage, the more readable or actionable a document is rated. The original sepsis protocol bundle document attained an understandability score of 66%, and actionability score of 57% (see Appendix F). These scores indicate that the document is difficult to understand and does not give clear instructions for what nurses needed to do based on the document's content (see Appendix C). As a result, this DNP student met with the sepsis response team members to discuss how to repurpose the sepsis protocol bundle document. The key points of discussions were 1) to simplify the document to only

include initial sepsis criteria and actions, 2) create a visual path on the document for nurses to follow to make it easier to read, 3) display a grid of concrete actions for the nurse to take, 4) allow the sepsis alert system to perform calculations and place them on the document to reduce nursing loads, and 5) show the nurse what criteria created the sepsis alert. This DNP student then worked with the hospital's information services department to create a new document layout that would be printed at the ER nursing station when the alerts were generated (see Appendix D). The new document layout is less cluttered and uses infographic elements to cluster data into actionable elements. Throughout the new document's development, the PEMAT tool was used along with staff feedback to make provisional improvements. The final revision of the sepsis protocol bundle document's PEMAT evaluation produced an understandability score of 100% and an actionability score of 83% (see Appendix G). The use of the PEMAT tool helped to significantly improve the document's presentation of what caused the alert and what was needed for the nurse to do next. The sepsis team felt that the actionability score was sufficient; to achieve a rating of 100% with the PEMAT tool, it would have required the use of pictures and photographs, which the team felt was unnecessary. The nursing staff gave feedback that the new document was easier to read and reduced the confusion of what was expected of them when the document was placed in their hands. In addition, the nursing staff appreciated that the document was automatically printed out with relevant information about the patient, what caused the alert, and gave them a summary of items to discuss with the physician and other medical staff.

Data Outcomes

The success of this project is derived from analyzing the effectiveness of the new sepsis protocol bundle document to reduce severe sepsis rates in hospital patients admitted from the ER. This is derived from a summary analysis of bundle completion rates for sepsis alerts during the project's execution. The project was executed from March 1, 2021 until April 30, 2021, and there was a total of 342 sepsis alerts generated for ER patients. There were 151 alerts during March, and 191 alerts for April. The hospital began using its automated alerting system in March 2020; however, alerts were only generated through a secure text messaging platform to the nursing supervisor. For each alert generated, the nursing supervisor would call the ER to alert the staff of a potential sepsis alert. It was only during the execution of this project that sepsis alerts were delivered by the nursing supervisor and printed on paper for nurses to utilize. In researching severe sepsis rates for inpatient admissions for the months of March-April in 2019, the ER admitted sixteen patients with a diagnosis of severe sepsis with three deaths possibly related to sepsis-related mortality. In the following year during March-April 2020, the ER admitted nineteen patients diagnosed with severe sepsis and four deaths perhaps associated with sepsis-related mortality. It is possible that the COVID pandemic of 2020 influenced the increased numbers of severe sepsis admissions and deaths. During the course of this project, March-April 2021, the ER admitted only six patients to the hospital with a diagnosis of severe sepsis and three deaths related to possible sepsis-related mortality. Thus, the numbers of severe sepsis admissions rates from the ER during this project's scope are lower than the previous two years. This is a decrease of 45% from 2019 and 52% from 2020 (see Appendix H).

At the end of the project, participating nurses submitted a total of 61 new sepsis protocol bundle documents. During March 2021, 21 out of 29 documents were properly completed showing a percentage of completion rate of 72%. In April 2021, 26 documents out of 32 were completed for a total of 81%. For the total project, the overall completion rate was 77% (see Appendix I). The higher percentage of completion in April 2021 is most likely due to the nurses' increased familiarity with the document and having received reinforcement training about using the document. A bundle document was considered completed if the nurse reviewed the sepsis alert, reassessed the patient, either indicated no further action was warranted, or completed the checklist of actions for labs and antibiotics and reviewed the list for items indicating organ failure.

Conclusion

The conclusion of this project indeed highlighted the validity of the initial project hypotheses and showcased the value of nursing-led initiatives to solve clinical problems. Formative education techniques were highly effective at reinforcing sepsis knowledge initiatives in nurses who participated in the study. The sepsis protocol bundle completion rates increased dramatically because the new documents were easier to read, showed clear action items, and were designed based on participant feedback.

Lastly, severe sepsis infection rates decreased in ER admitted patients. Through the methods and tools developed in this project, nurses became more aware of diagnosing and treating their patient's septic condition. In addition, the nursing staff achieved a renewed focus on how to communicate their patient's needs with other medical staff.

Sustainability of Project Results at Project Site

The implemented ideas were a simple extension of the hospital's current policies and methods already in place. Their reliance on the Surviving Sepsis Campaign guidelines never changed, nor required any other policies to change as well. In speaking with the sepsis response team in the hospital, it was complicated to track sepsis bundle completion rates for the previous years because completion rates were rarely and sporadically quantified. Nurses were simply not in the rhythm of attacking septic infections systematically. In addition, the reason for overall decreases in severe sepsis infection rates in previous years mainly was attributed to the implementation of the SRT, but this was not entirely conclusive. The results from the implementation of this project have shown that using the new sepsis protocol bundle document had a marked effect in decreasing severe sepsis progression in patients admitted to the hospital from the ER. As a result, the hospital has inquired if the use of the new sepsis protocol bundle document from this project can be used hospital-wide.

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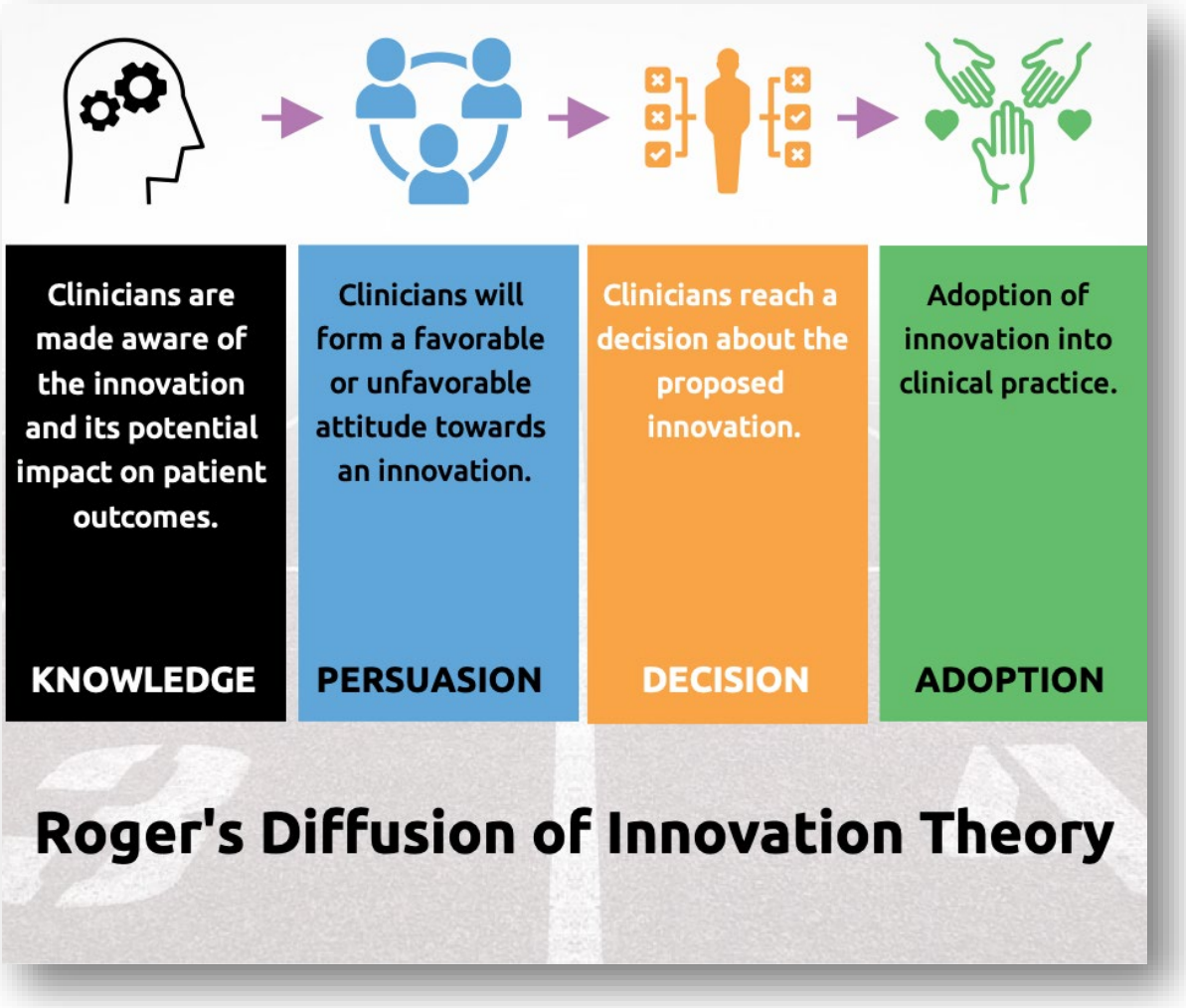
APPENDIX A

Roger's Diffusion of Innovation Theory



APPENDIX B

Project Implementation Timeline

Task	October	November	December	January	February	March	April
Meet with the Chief Nursing Officer and Quality Director to discuss the hospital's goals and objectives for sepsis prevention. Seek to understand why current bundle compliance rates are below 95% and the causes for failure (1 day).	●						
Meet with nursing leadership to understand the financial impact of sepsis-related infections (1 day).	●						
Identify who the hospital sepsis champions are with nursing leadership and who will be on the sepsis response team (1 day).	●						
Obtain a report from the Quality Director (QD) that summarizes the current rate of sepsis infections, the rate of sepsis protocol bundle failures, and the rate of sepsis-related mortalities for each month since January 1, 2020 (1 day).	●						
Establish with nursing leadership a timeline of implementation (1 day).	●						
Create an initial survey for critical care nurses about their experiences with the current processes and procedures for identifying sepsis in their patients and sepsis protocol compliance (3 days).	●						
Meet with the SRT to discuss the development of the sepsis protocol bundle monitoring form and how it will integrate with the current Electronic Health Record system (EHR) and the present sepsis alerting system (1 day).	●						
Discuss with CNO and QD what information will be recorded on the monitoring form to ensure HIPPA compliance (1 day).	●						
Develop a process to collect forms daily and record completion rates in a Microsoft Excel spreadsheet. This spreadsheet will be used to identify bundle step failures. Review this process with the SRT (7 days).	●	●					
Review with nursing leadership of the process to alert and record pending bundle failures. Observations will be compared with current manual methods of tracking (14 days).		●					

Task	October	November	December	January	February	March	April
Identify who will be notified when a potential bundle failure is about to occur (1 day).	●						
Create a weekly reporting template to showcase the number of identified septic infections and bundle compliance rates for each unit in the hospital (4 days).		●	●	●			
Create an education module for nurses to review current evidence-based protocols for septic infections and current hospital guidelines for sepsis prevention (7 days).	●			●			
Create an education module overviewing the purpose of this project and highlight its importance as a nurse-led initiative (7 days).		●					
Create an informative document for sepsis response team members highlighting the steps to take when a bundle failure alert occurs (1 day).		●					
Create an informative document giving instructions for the sepsis response team members to report system failures/bugs with the electronic tool (1 day).						●	
Set up weekly review meetings with nursing leadership and the sepsis response team members to review current reporting statistics, monitoring tool performance, and review feedback from clinical staff. Outcomes of these meetings will be used to support manual and electronic process improvements for sepsis protocol bundle compliance (weekly).		●	●	●	●	●	
At the end of the study, create a survey for critical care nurses to evaluate the monitoring tool's effectiveness and identify if having the tool improved their nursing workflow for septic patients (3 days).							●
Present a final report of study results to the hospital leadership (1 day).							●

APPENDIX C

Current Hospital Sepsis Response Sheet

SEVERE SEPSIS CRITERIA AND TREATMENT 2019

Step 1 SEVERE SEPSIS Criteria

If ALL 3 criteria Below are met within 6 hours of each other, patient is in SEVERE Sepsis

☐ **Identified or Suspected infection documented**

AND

☐ **Two or more manifestations of systemic infection**

Temperature > 100.9 F or < 96.8 F

HR > 90

RR > 20

WBC > 12,000 or < 4,000 or > 10% bands

AND

☐ **Organ dysfunction, evidenced by ANY ONE of the following (not a chronic condition):**

SBP < 90, or MAP < 65, or a SBP decr of > 40 pts

Lactic Acid > 2.0mmol/L
RESULT:_____

On Bipap or Ventilator

Bilirubin > 2 mg/dL (NA if known ESLD)

Platelet <100,000

INR >1.5 or PTT > 60 sec

Cr > 2 or uo <0.5 ml/kg/hr x 2 hrs (NA if known ESRD)

TIME ZERO #1: _____ (last criteria identified)

ABOVE CRITERIA NOT MET. DO NOT MOVE TO STEP 2. Continue to monitor. Restart form if criteria met anytime during pt stay.

ABOVE CRITERIA MET. Call MD to initiate Severe Sepsis Order Set.

Step 2 SEVERE SEPSIS Treatment

Complete within 3 hours of presentation of Severe Sepsis (Time Zero #1)

☐ Draw Blood Cultures **prior to antibiotic administration**

Administer IV Broad spectrum antibiotic (Zosyn, or Levaquin, or Rocephin) **TIME:** _____

Crystalloids fluid resuscitation if SBP < 90(x2), or MAP < 65, or a SBP decr of > 40 pts **or** lactic acid > 4.0 mmol/L **or** MD/APN/PA documentation of septic shock

30 ml x _____ kg = _____ ml (round UP)

Infuse NS _____ ml over _____ hours (specify) or
LR _____ ml over _____ hours (specify)

RN must document IV START and STOP time

RN must document VS q15-30 min & **WITHIN 1 hr of completion**
T _____ BP _____ HR _____ RR _____

Complete within 3 hours of TIME ZERO #1

Repeat lactate level measurement.
TIME: _____
(MD order as Lactic Acid every 3 hr x 2)

SEPTIC SHOCK Criteria (because Septic Shock may not occur at same time as Severe Sepsis)

If ONE of the 3 criteria below is met, patient is in Septic SHOCK

☐Both elements are present:

Initial Lactate level is > = 4.0mmol/L **AND**

Patient must meet criteria for **"Severe Sepsis"**

OR

☐Criteria for septic shock NOT met, but MD documented Septic Shock or Suspected Septic Shock

OR

☐Tissue hypo-perfusion persists in the HOUR AFTER crystalloid given evidenced by **ONE** of the following:

SBP < 90(x2), or

Mean arterial pressure (MAP) < 65

Decrease in SBP by > 40 points from the last reading

TIME ZERO #2: _____ (last criterion identified)

Step 3 SEPTIC SHOCK Treatment

Complete within 6 hours of presentation of Septic Shock (Time Zero #2)
If Septic Shock time is different from Severe Sepsis time and fluids not already given:

30 ml x _____ kg = _____ ml (round UP)

Infuse NS _____ ml over _____ hours (specify)

RN must document IV START and STOP time

RN must document VS q15-30 min & **WITHIN 1 hr of completion**
T _____ BP _____ HR _____ RR _____

If IVF bolus for Septic Shock given, Notify MD/APN/PA of need for TISSUE PERFUSION ASSSESSMENT (He must date and time)

Tissue Perfusion Assessment

A focused exam performed by MD/NP/PA only: **TIME:** _____

Vital Signs Review, **AND**

Cardiopulmonary exam, **AND**

Capillary refill evaluation, **AND**

Peripheral pulse evaluation, **AND**

Skin examination

OR

Any TWO of the following four: **TIME:** _____

CVP measurement or RAP (right atrial pressure)

Central venous oxygen measurement (SVO2, ScvO2 or O2 sat via central line)

Bedside Cardiovascular Ultrasound (Echo, TTE, TEE, IVC US, 2D echo)

Passive Leg Raise Exam by MD/APN/PA only if Fluid Challenge given

IF hypotension persists after fluid **administration, administer within 6 hours after presentation of Septic Shock** (Time Zero #2)

Vasopressor(s) (Levophed, Neosynephrin, Dopamine)
_____ **TIME:** _____

APPENDIX D

Project Modified Sepsis Response Sheet

RMC Stringfellow Memorial Hospital

SEPSIS ALERT EVALUATION

NOT PART OF THE PATIENT RECORD

Report Printed on 04/09/21 07:45
Room: SMHED
(0000000000) Sample Patient (0y)

Dr. NULL
STATUS: ☐ **Full Code** ☐ **DNR** ☐ **DNI**
Dx: Other
Allergies:

NOTE: SIX-HOUR RESPONSE WINDOW
STARTS → **ENDS**

STEP 1: REVIEW ALERT
04/08 13:10

STEP 2: REASSESS PATIENT

		MEWS Score
Temp:		
Pulse:		
Respirations:		
Systolic BP:		
Diastolic BP:		
Saturation:		
LOC:		
MEWS Score Total:		

Step 3: Checklist

If ANY items are checked, then initiate Severe Sepsis Order Set

- ☐ SBP<90, or MAP<65, or SBP decrease of >40 pts
- ☐ Lactic Acid > 2 mml/L
- ☐ On Bipap or Ventilator
- ☐ Bilirubin > 2 mg/dL (NA if known ESRD)
- ☐ Platelets < 100,000
- ☐ INR > 1.5 or PTT > 60 sec
- ☐ Cr > 2 or UO < 0.5 ml/kg/hr x 2 hrs (NA if known ESRD)

- ☐ Suspicion of infection
- ☐ Patient is receiving medications that may affect temperature control
- ☐ Sepsis protocol already initiated
- ☐ Physician has documented tissue perfusion
- ☐ Infectious Disease physician has been consulted
- ☐ Initiation of Sepsis Protocols not warranted at this time

Assigned Nurse: _____

1

Lactic #1	Lactic #2
☐ Ordered ☐ Collected	☐ Ordered (3 hrs post #1) ☐ Collected

2

Blood Culture #1	Blood Culture #2	Urine Culture
☐ Ordered ☐ Collected	☐ Ordered ☐ Collected	☐ Ordered ☐ Collected

3

Antibiotics Started	Fluid Bolus (kg)
☐ Zosyn ☐ Levaquin ☐ Rocephin ☐ Other	0 ml ☐ Ordered ☐ Completed
Patient Weight (kg)	**24hr Urine Output**
00.00 kg	

MEWS Score

Score	3	2	1	0	1	2	3
Temp		Less than 95	95-96.6	96.7-99.4	99.5-101.2	101.3 or greater	
Pulse	Less than 40		40-49	50-99	100-114	115-129	130 or greater
Resp		Less than 10		10-20	21-29	30-39	40 or greater
SBP	Less than 70	70-79	80-99	100-179		180 or greater	
O2 Sat	Less than 85	85-89	90-94	95 or greater			
LOC				Alert	Confused	Voice	Pain or Unresponsive

Actions to Take

Total Score	Nurse tells PCT	NURSE
3	1) Increase vitals/EWSS every 2 hrs X 3	1) Review vitals and EWSS if no change. 2) RN to assess pt 3) Use Severe Sepsis screening tool.
4	1) Increase vitals/EWSS every 30 min X3"	1) RN assessment immediately 2) Monitor repeat vitals/EWSS 3) Use Sepsis screening tool.
5	1) Increase Vitals/EWSS every 15 min.	1) Activate Code Purple 2) Assess pt immediately. 3) Call physician immediately. 4) Prepare for possible transfer to higher level of care."
>6		1) Activate Code Purple and call physician STAT 2) Recommend transfer to higher level of care

When this form is complete, submit to ER Director

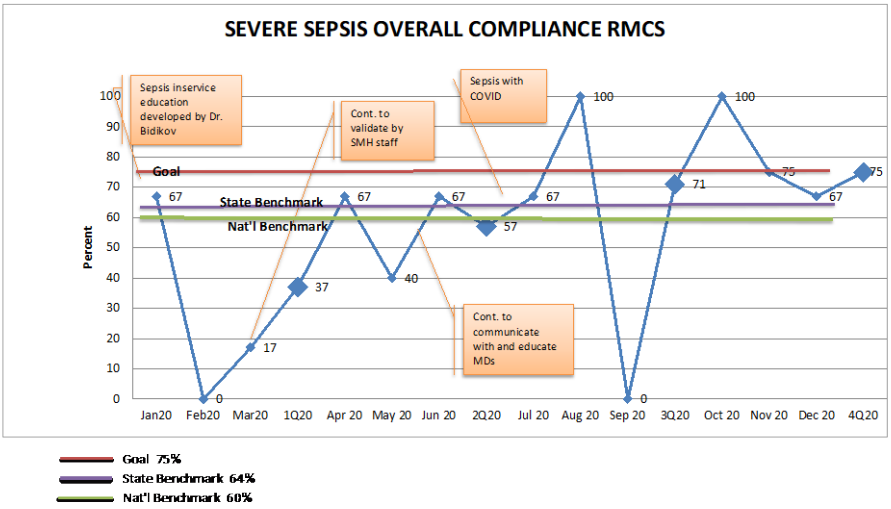
APPENDIX E

Sample of Weekly and Monthly Reporting Formats

RMCS **March 2021**

	% COMP	
1Q19	40	6/15
2Q19	45	14/22
3Q19	67	14/21
4Q19	69	18/26
Jan20	67	6/9
Feb20	0	0/4
Mar20	17	1/6
1Q20	37	7/19
Apr 20	67	4/6
May 20	40	2/5
Jun 20	67	2/3
2Q20	57	8/14
Jul 20	67	2/3
Aug 20	100	3/3
Sep 20	0	0/1
3Q20	71	5/7
Oct 20	100	1/1
Nov 20	75	3/4
Dec 20	67	2/3
4Q20	75	6/5

All 4Q2020 is preliminary



Goal 75%
State Benchmark 64%
Nat'l Benchmark 60%

APPENDIX F

Original Sepsis Protocol Bundle PEMAT Scores

Patient Education Materials Assessment Tool for Printable Materials (PEMAT-P)

Title of Material: OLD SMH SEPSIS BUNDLE FORM
Name of Reviewer: STEPHEN NEWBERN
Date of Review: FEBRUARY 2021

Each question has specific response options. Select your response option from the drop-down in the "Rating" column.

Read the PEMAT User's Guide (available at: http://www.ahrq.gov/professionals/prevention-chronic-care/improve/self-mgmt/pemat/) before rating materials.

Item	Response Options	Rating
UNDERSTANDABILITY		Select your responses here
TOPIC: CONTENT		
1. The material makes its purpose completely evident.	Disagree = 0 Agree = 1	1
2. The material does not include information or content that distracts from its purpose.	Disagree = 0 Agree = 1	0
TOPIC: WORD CHOICE & STYLE		
3. The material uses common, everyday language.	Disagree = 0 Agree = 1	1
4. Medical terms are used only to familiarize audience with the terms. When used, medical terms are defined.	Disagree = 0 Agree = 1	1
5. The material uses the active voice.	Disagree = 0 Agree = 1	1
TOPIC: USE OF NUMBERS		
6. Numbers appearing in the material are clear and easy to understand.	Disagree = 0 Agree = 1 No numbers = NA	1
7. The material does not expect the user to perform calculations.	Disagree = 0 Agree = 1	0
TOPIC: ORGANIZATION		
8. The material breaks or "chunks" information into short sections.	Disagree = 0 Agree = 1 Very short material* = NA	1
9. The material's sections have informative headers.	Disagree = 0 Agree = 1 Very short material* = NA	1
10. The material presents information in a logical sequence.	Disagree = 0 Agree = 1	1
11. The material provides a summary.	Disagree = 0 Agree = 1 Very short material* = NA	1
TOPIC: LAYOUT & DESIGN		
12. The material uses visual cues (e.g., arrows, boxes, bullets, bold, larger font, highlighting) to draw attention to key points.	Disagree = 0 Agree = 1	0
TOPIC: USE OF VISUAL AIDS		
15. The material uses visual aids whenever they could make content more easily understood (e.g., illustration of healthy portion size).	Disagree = 0 Agree = 1	0
16. The material's visual aids reinforce rather than distract from the content.	Disagree = 0 Agree = 1 No visual aids = NA	NA
17. The material's visual aids have clear titles or captions.	Disagree = 0 Agree = 1 No visual aids = NA	NA
18. The material uses illustrations and photographs that are clear and uncluttered.	Disagree = 0 Agree = 1 No visual aids = NA	NA
19. The material uses simple tables with short and clear row and column headings.	Disagree = 0 Agree = 1 No tables = NA	0
ACTIONABILITY		Select your responses here
20. The material clearly identifies at least one action the user can take.	Disagree = 0 Agree = 1	1
21. The material addresses the user directly when describing actions.	Disagree = 0 Agree = 1	1
22. The material breaks down any action into manageable, explicit steps.	Disagree = 0 Agree = 1	1
23. The material provides a tangible tool (e.g., menu planners, checklists) whenever it could help the user take action.	Disagree = 0 Agree = 1	0
24. The material provides simple instructions or examples of how to perform calculations.	Disagree = 0 Agree = 1 No calculations = NA	1
25. The material explains how to use the charts, graphs, tables or diagrams to take actions.	Disagree = 0 Agree = 1 No charts, graphs, tables, diagrams = NA	0
26. The material uses visual aids whenever they could make it easier to act on the instructions.	Disagree = 0 Agree = 1	0

**A very short print material is defined as a material with two or fewer paragraphs, and no more than 1 page in length.*

UNDERSTANDABILITY SCORE	64%
ACTIONABILITY SCORE	57%

Scores will appear RED if any items are left blank.

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APPENDIX G

New Sepsis Protocol Bundle PEMAT Scores

Patient Education Materials Assessment Tool for Printable Materials (PEMAT-P)

Title of Material: NEW SMH SEPSIS BUNDLE FORM
Name of Reviewer: STEPHEN NEWBERN
Date of Review: MARCH 2021

Each question has specific response options. Select your response option from the drop-down in the "Rating" column.

Read the PEMAT User's Guide (available at: http://www.ahrq.gov/professionals/prevention-chronic-care/improve/self-mgmt/pemat/) before rating materials.

Item	Response Options	Rating
UNDERSTANDABILITY		Select your responses here
TOPIC: CONTENT		
1. The material makes its purpose completely evident.	Disagree = 0 Agree = 1	1
2. The material does not include information or content that distracts from its purpose.	Disagree = 0 Agree = 1	1
TOPIC: WORD CHOICE & STYLE		
3. The material uses common, everyday language.	Disagree = 0 Agree = 1	1
4. Medical terms are used only to familiarize audience with the terms. When used, medical terms are defined.	Disagree = 0 Agree = 1	1
5. The material uses the active voice.	Disagree = 0 Agree = 1	1
TOPIC: USE OF NUMBERS		
6. Numbers appearing in the material are clear and easy to understand.	Disagree = 0 Agree = 1 No numbers = NA	1
7. The material does not expect the user to perform calculations.	Disagree = 0 Agree = 1	1
TOPIC: ORGANIZATION		
8. The material breaks or "chunks" information into short sections.	Disagree = 0 Agree = 1 Very short material* = NA	1
9. The material's sections have informative headers.	Disagree = 0 Agree = 1 Very short material* = NA	1
10. The material presents information in a logical sequence.	Disagree = 0 Agree = 1	1
11. The material provides a summary.	Disagree = 0 Agree = 1 Very short material* = NA	1
TOPIC: LAYOUT & DESIGN		
12. The material uses visual cues (e.g., arrows, boxes, bullets, bold, larger font, highlighting) to draw attention to key points.	Disagree = 0 Agree = 1	1
TOPIC: USE OF VISUAL AIDS		
15. The material uses visual aids whenever they could make content more easily understood (e.g., illustration of healthy portion size).	Disagree = 0 Agree = 1	1
16. The material's visual aids reinforce rather than distract from the content.	Disagree = 0 Agree = 1 No visual aids = NA	1
17. The material's visual aids have clear titles or captions.	Disagree = 0 Agree = 1 No visual aids = NA	1
18. The material uses illustrations and photographs that are clear and uncluttered.	Disagree = 0 Agree = 1 No visual aids = NA	1
19. The material uses simple tables with short and clear row and column headings.	Disagree = 0 Agree = 1 No tables = NA	1
ACTIONABILITY		Select your responses here
20. The material clearly identifies at least one action the user can take.	Disagree = 0 Agree = 1	1
21. The material addresses the user directly when describing actions.	Disagree = 0 Agree = 1	1
22. The material breaks down any action into manageable, explicit steps.	Disagree = 0 Agree = 1	1
23. The material provides a tangible tool (e.g., menu planners, checklists) whenever it could help the user take action.	Disagree = 0 Agree = 1	1
24. The material provides simple instructions or examples of how to perform calculations.	Disagree = 0 Agree = 1 No calculations = NA	NA
25. The material explains how to use the charts, graphs, tables or diagrams to take actions.	Disagree = 0 Agree = 1 No charts, graphs, tables, diagrams = NA	0
26. The material uses visual aids whenever they could make it easier to act on the instructions.	Disagree = 0 Agree = 1	1

**A very short print material is defined as a material with two or fewer paragraphs, and no more than 1 page in length.*

UNDERSTANDABILITY SCORE	100%
ACTIONABILITY SCORE	83%

Scores will appear RED if any items are left blank.

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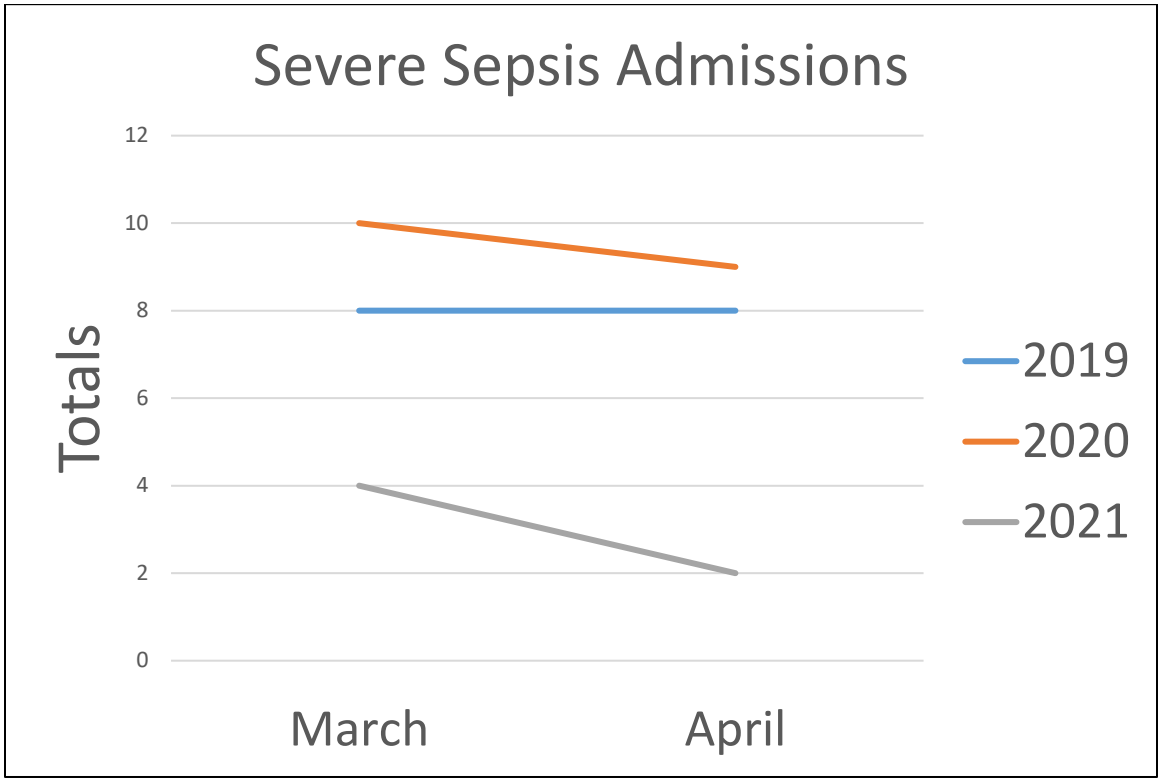
APPENDIX H

Patients Admitted with a Diagnosis of Severe Sepsis



APPENDIX I

Bundle Completion Rates (Mar-Apr 2021)

	Sum of Bundles Completed	Count of Files	Severe Sepsis Admissions
Mar	21 (72%)	29	4
Apr	26 (81%)	32	2
Grand Total	47 (77%)	61	6

APPENDIX J

Pre/Post Knowledge Survey

RMC Stringfellow Memorial Hospital

Pre-Study Assessment of Sepsis Knowledge

DNP Project: Stephen C. Newbern, APRN
Jacksonville State University

DNP Project: Using Infographics To Improve Completion Rates of Sepsis Protocol Bundles

Thank you for volunteering to be a part of this project. This DNP project aims to improve the ability of clinical staff at Stringfellow Memorial Hospital to respond to septic alerts in patients and allow for clinical staff to be as efficient as possible to complete the Sepsis Protocol Bundle.

Participation in this project will simply require you to respond to sepsis alerts, document your actions on the alert form, and then submit the form to the Emergency Department Director when it is complete. The form will not become a part of the patient's medical record and will only be used for the ER Director's training purposes. The duration of the project is six weeks.

Project Hypothesis: *Among Emergency Department Nurses in a rural health care setting, does the use of infographics for nursing education improve completion rates of the hospital's sepsis protocol bundle tool during a six-week time period?*

Thank you again for your time and interest in participating in this study and assisting the Stringfellow Memorial Emergency Department to become more efficient.

Stephen C. Newbern, APRN
Doctorate of Nursing Practice Student
Department of Nursing
Jacksonville State University

Participant Information.

Name:	
Title:	
Shift:	
Age:	
Years of nursing experience:	

RMC
Stringfellow Memorial Hospital

Pre-Study Assessment of Sepsis Knowledge

DNP Project: Stephen C. Newbern, APRN
Jacksonville State University

1) **The acronym SIRS is short for Systemic Inflammatory Response Syndrome.**
   a) True
   b) False

2) **What criterion determines that fluid resuscitation is required for a patient with sepsis?**
   a) Systolic BP < 90
   b) Lactic Acid > 4
   c) Lactic Acid < 4
   d) Both A and B

3) **What is the normal Lactic Acid level range?**
   a) 0.4 - 2.0
   b) 0.1 - 1.0
   c) 3.0 - 5.1
   d) 2.0 - 4.0

4) **If a patient weighing 163 pounds requires a fluid bolus for septic shock, what amount of fluid should be infused?**
   a) 1 liter
   b) 600 ml
   c) 2,200 ml
   d) 4,400 ml

5) **At what point should Blood Cultures be drawn on a patient with a possible diagnosis of sepsis?**
   a) After administration of antibiotics
   b) Upon admission to the hospital
   c) After the Lactic Acid lab has bewen completed
   d) Before administration of antibiotic

6) **Broad-spectrum antibiotics should be administered within the first three hours after a sepsis diagnosis, preferably within the first hour.**
   a) True
   b) False

7) **What is the recommended time frame for the administration of antibiotics from time zero?**
   a) 3 hours
   b) 6 hours
   c) 2 hours
   d) 1 hour

RMC Stringfellow Memorial Hospital

Pre-Study Assessment of Sepsis Knowledge

DNP Project: Stephen C. Newbern, APRN
Jacksonville State University

8) When does the clock start for time zero in measuring the sepsis three and six-hour bundles?

a) One hour after two SIRS criteria have been identified
b) When a patient is admitted
c) After antibiotics have been administered
d) When the patient meets criteria.

9) If the initial Lactic Acid level is elevated, in what time period should the second Lactic Acid level be drawn?

a) 2 hours after the first Lactic Acid level is > 2 mmol/L
b) 1 hour after first Lactic Acid level is > 4 mmol/L
c) 4 hours after first Lactic Acid level is > 2 mmol/L
d) 3 hours after first Lactic Acid level is > 2 mmol/L

10) When is the use of a vasopressor required in caring for a patient in septic shock?

a) When the systolic BP falls below 90 mmHg
b) When the systolic BP falls below 50 mmHg
c) When the systolic BP falls below 90 mmHg after patient has received fluid bolus requirement
d) When the patient's Lactic Acid level > 2 mmol/L

11) What is the recommended vasopressor for persistent hypotension in septic patients?

a) Dobutamine
b) Levophed
c) Dopamine
d) Epinephrine

12) Which temperature qualifies as SIRS criteria?

a) 102.4 °F
b) 98.6 °F
c) 96.4 °F
d) Both A & C

13) What heart rate qualifies as SIRS criteria?

a) 68 bpm
b) 92 bpm
c) 74 bpm
d) 89 bpm

14) What respiratory rate qualifies as SIRS criteria?

a) 16 bpm
b) 18 bpm
c) 8 bpm
d) 26 bpm

RMC
Stringfellow Memorial Hospital

Pre-Study Assessment of Sepsis Knowledge

DNP Project: Stephen C. Newbern, APRN
Jacksonville State University

15) What WBC level qualifies as SIRS criteria?

a) 13,000 mm3
b) 3,000 mm3
c) 6,000 mm3
d) Both A & B
e) Both B & C

16) What are indicators of septic shock?

a) Systolic BP < 90 mmHg after fluid resuscitation
b) Temperature of 100.8 °F
c) Lactic Acid > 4 mmol/L
d) Both A & C

17) What is the mortality rate of patients with sepsis?

a) 50%
b) 28%
c) 8%
d) 19%

18) What is the first sign of sepsis in a patient in most cases?

a) Fever
b) Hypotension
c) Tachycardia
d) Both A and B

19) Which populations of patients are more likely to develop sepsis?

a) Elderly
b) Infants
c) Pediatrics
d) Immunocompromised patients
e) All the above

20) What common finding is associated with a septic Infection?

a) Tachypnea
b) Decreased WBC count
c) Atrial Fibrillation on an EKG
d) Both A & B
e) None of the above

21) What are the two most common etiologies of sepsis?

a) Pneumonia and UTI
b) H-pylori and Colitis
c) Cellulitis and Otitis Media

d) Strep Throat and Influenza

22) Sepsis-induced organ dysfunction is:

a) Septic shock
b) Severe sepsis
c) Both A & B
d) None of the above

23) Which of the following is NOT part of the systematic approach to all patients with sepsis?

a) Antibiotics
b) Fluids
c) Steroids
d) Measuring Lactic Acid

24) What is the number one intervention that Stringfellow Memorial Hospital consistently fails with sepsis core measures?

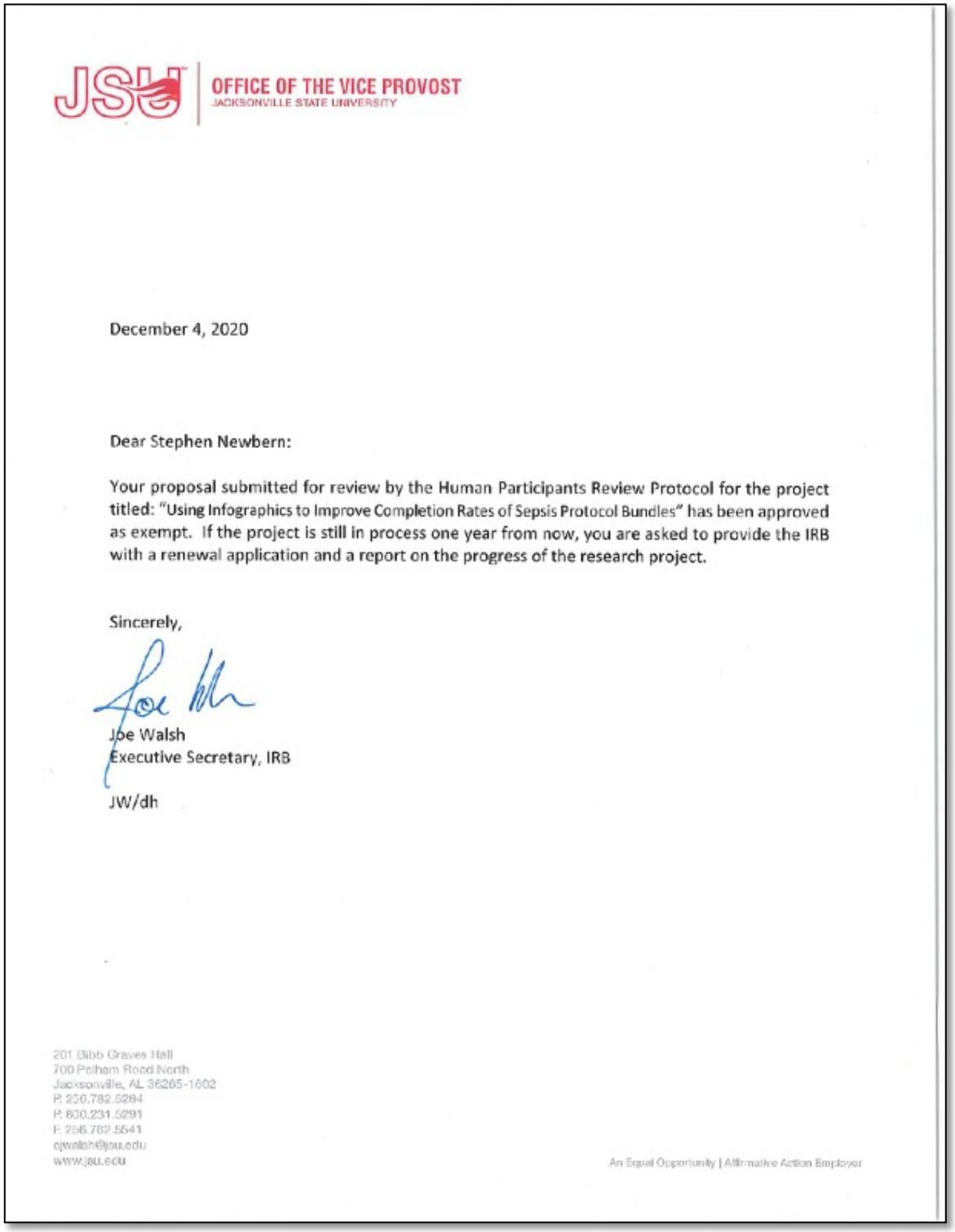
a) Antibiotic administration
b) Drawing Blood Cultures x 2
c) Measuring Lactic Acid
d) Fluid resuscitation
e) Recognition
f) Completion of the sepsis bundle

25) What is the proper fluid requirement for patients with septic shock?

a) 20 ml/kg of crystalloid fluid
b) 30 ml/kg of crystalloid fluid
c) 30 ml/kg of colloid fluid
d) 40 ml/kg of colloid fluid

APPENDIX K

JSU IRB Approval



JSU | OFFICE OF THE VICE PROVOST
JACKSONVILLE STATE UNIVERSITY

December 4, 2020

Dear Stephen Newbern:

Your proposal submitted for review by the Human Participants Review Protocol for the project titled: "Using Infographics to Improve Completion Rates of Sepsis Protocol Bundles" has been approved as exempt. If the project is still in process one year from now, you are asked to provide the IRB with a renewal application and a report on the progress of the research project.

Sincerely,

Joe Walsh
Executive Secretary, IRB

JW/dh

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