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Clinical Practice Guideline for Early Identification of Sepsis in the Emergency

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
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Walden University
2021

Abstract

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by

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MS, City University of New York, 2010

BS, University of Dundee, 2007

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

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Abstract

Sepsis, a life-threatening condition caused by infection, is a leading cause of mortality and morbidity globally. Researchers suggest that early identification of sepsis upon admission to the emergency department (ED) can help mitigate the consequences of sepsis. The emergency department of a hospital in a large urban U.S. city has participated in the Centers for Medicare & Medicaid Services' sepsis reporting system (SEP-1) since 2015; however, recent reports indicated below benchmark scores. As more than half of patients diagnosed with sepsis were admitted or readmitted through the ED, the purpose of this project was to develop a clinical practice guideline, informed by Rosswurm and Larrabee's evidence-based practice model and a literature search, for use in the ED with input from an expert advisory panel using the AGREE II tool criteria across six domains. A 4-member panel member, comprised of the ED's medical director, director of nursing, nurse manager, and an ED staff nurse unanimously recommended the use of the guideline. Domain scores ranged from 40 to 100%, with a mean of 83%. This sepsis clinical guideline scored highest in the domains of scope and purpose (100%) and clarity and presentation (95%) and applicability (83%). The domains of stakeholder involvement (40%) and editorial independence (57%) had the lowest domain scores. The overall quality assessment score was 7 based on a Likert scale ranging from 1 (*lowest possible quality*) to 7 (*highest possible quality*). In making sepsis screening a routine practice informed by a clinical guideline, nurses at the project site may be able to identify sepsis earlier in patients presenting to the ED, resulting in improved outcomes, promoting a positive social change, and increasing the SEP-1 scores.

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Dedication

This project is dedicated in loving memory of a close friend Cheryl Simon, who had been a constant support of all educational endeavors and who encouraged me to pursue my Doctor of Nursing Practice. Cheryl died from sepsis-related complication.

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To my daughter, Toya G. Robinson, and my grandson Carter, thanks for your support and patience. Toya, you always believe I can accomplish anything I attempt. Many thanks to my project mentor, Cheryl Holly, EdD, RN, ANEF, FNAP, for her encouragement, support, and guidance throughout this project. Dr. Holly, thank you for your unfailing support in keeping me on track with this project and for all the help provided. Dr. Frumenti, thank you for facilitating an excellent clinical experience. Special thanks to my manager Mary Mitchell, Sharon Simmons, and Shirley Hartley, for your support throughout this journey towards completing my DNP. Special thanks to Dr. Cheryl Etienne, Dr. Sally Francisco, and Ms. Degano for their encouragement, mentoring, and guidance throughout this project.

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Section 1: Nature of the Project

Introduction

Sepsis is a life-threatening condition caused by infection and represents a substantial global health burden. As a leading cause of mortality and morbidity, sepsis is responsible for more than five million patients dying yearly around the world (Centers for Disease Control and Prevention [CDC], 2016). The CDC (2016) noted that one in every three patients in the United States who die in the hospital dies from sepsis with most patients presenting with symptoms of infection on arrival at the hospital. Among those patients who are discharged after being treated for sepsis, 40% are readmitted to the hospital within 3 months with more than 70% of those readmitted having physical and cognitive functional decline (Al Khalaf et al., 2015; Iwashyna et al., 2010).

Early identification of sepsis and interventions are key elements in preventing this decline as well as preventing increased length of stay and mortality in this population. Both early identification and timely and appropriate interventions have been reported to decrease mortality and improve patient outcomes (Kim & Park, 2019). Nurses are in a unique position to identify the early signs of sepsis in patients presenting to the emergency department (ED) as they complete an initial assessment upon the patient's entry to the ED. Equipped with a clinical guideline on early identification, nurses may be able to ensure timely recognition of patients showing signs of sepsis that will prompt evidence-based interventions to diagnose and treat this condition.

Problem Statement

This project was based on the premise that use of an early identification sepsis clinical guideline by nurses in an ED located in a large urban center can improve sepsis management, reduce its burden, and support adherence to the Sepsis National Hospital Inpatient Quality Measure [SEP-1] (Dellinger, et al., 2004) quality measure. The Centers for Medicare & Medicaid Services (CMS) developed SEP-1 to address the need for timely delivery of high-quality sepsis care in U.S. hospitals. Officials use the SEP-1 as a quality indicator to measure a hospital's adherence to standards in comparison with other hospitals. Adherence to CMS quality measures is vital as hospitals risk losing accreditation with poor compliance.

The Doctor of Nursing Practice (DNP) project site--the ED of a hospital in a large urban U.S. city--provided an opportunity for improvement in the early identification of sepsis in the adult patient population, as more than half of patients diagnosed with sepsis are admitted or readmitted through the ED. Although the project site has participated in the SEP-1 reporting system since 2015, recent reports indicate scores that are below benchmark. In making sepsis screening a routine practice informed by a clinical guideline, ED nurses may be able to maximize outcomes for this population and increase the SEP-1 scores.

Purpose

The purpose of this project was to develop a clinical practice guideline (CPG) with input from an expert panel. The practice-focused question was: Can a multidisciplinary group develop evidence-based CPGs that meet the AGREE II criteria

for the screening and early identification of sepsis in patients presenting to the ED? Screening can lead to expedited delivery of care to patients with sepsis. Sepsis guidelines dictate that patients should receive antibiotics within 3 hours of admission to the institution making early identification crucial to quality outcomes. However, the patient must first be identified as having sepsis (Klienpell & Schorr, 2016).

Nature of the Doctoral Project

The purpose of this project was to develop a CPG with input from an expert panel. I developed a CPG on screening and early identification of patients for sepsis who present to an urban ED. The purpose of a CPG is to narrow the gap between an organization's current practice and delivery of optimal care (Graham et al., 2011; Holly, et al. 2021). The gap that exists is lack of early identification of sepsis in the adult population presenting to the project ED resulting in the SEP-1 reports as below benchmark. By following a guideline for early screening and early identification, nursing staff may be able to diagnose and treat sepsis in a timelier manner.

Sources of evidence used in this project included a literature review to support developing a clinical guideline on the early identification of sepsis in the ED using Medline/PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and the Cochrane Library. I constructed a table of evidence. The latest recommendations from the Surviving Sepsis Campaign were integrated into the guideline. Following completion of the guideline, an expert panel assessed the guideline using the AGREE II tool (Brouwers, et al., 2010).

Significance

Sepsis is the 11th leading cause of death in the United States and the 10th for those 65 years of age or older (Hayden et al, 2016; Rhodes et al., 2016). Between 2008 and 2011, combined Medicare and Medicaid inpatient reimbursements for sepsis totaled $17.7 billion, 5% of which was for hospital stays classified as high-cost outliers (Torio & Andrews, 2013). Reported in-hospital death rates vary by severity, ranging from 11% for sepsis to more than 40% for septic shock (Gajeski et al., 2013). Early identification in the ED to support focused interventions is essential for treating most life-threatening diseases, including myocardial infarction, stroke, and cardiac arrest (Kleinpell, 2017). However, compared with identification of these conditions, early identification of sepsis is more complex as early signs are more subtle. The Surviving Sepsis Campaign recommends the use of sepsis screening, which has been shown to reduce treatment time and improve outcomes (Rhodes et al., 2016). Screening, for the purposes of this project, was supported by the development of a sepsis clinical guideline for early identification of sepsis in adult patients admitted to the ED. Stakeholders in this project were patients who presented to the project site's ED, ED nurses, and ED leadership. Moran et al. (2017) stated that support and participation by stakeholders will increase stakeholders' awareness and commitment to the process thus increasing the project's credibility. Improvement in the hospital SEP-1 benchmark will denote excellence in the care of the sepsis patient, demonstrate that the organization is committed to maintaining a high standard of clinical care, potentially provide the project site with a competitive edge in reimbursement, and, last, reflect an improvement in patient outcomes.

Summary

Sepsis is a severe health condition associated with a high mortality rate. Positive patient outcomes are associated with the early identification and treatment of this condition (Baison et al., 2019). More than a third of patients presenting with sepsis symptoms are admitted through the project site ED making the area vital in lowering patient mortality. Early goal-directed therapy (EGDT) for sepsis is dependent on the timely recognition of the patient with sepsis. Nurses, as the largest bedside healthcare provider, play a key role in ongoing monitoring of a patient's condition. As such, nurses should be on the forefront directing the screening process.

Section 2: Background and Context

Introduction

The purpose of this project is to develop a CPG with input from an expert panel to address the practice problem of lack of early identification of patients presenting to an urban ED with signs suspicious of sepsis. The question I sought to answer in the project was: Can a multidisciplinary group develop evidence-based CPGs that meet the AGREE II criteria for the screening and early identification of sepsis in patients presenting to the ED?

Sepsis is a clinical syndrome that triggers physiologic, biologic, and biochemical abnormalities. It is a multifaceted response to infection and results in organ dysfunction, which is attributed to insufficient tissue perfusion and oxygen delivery (Keep,2015). Sepsis often begins when there is an infection in the body, whether bacterial, viral, fungal, or parasitic. Potential sources of infection include the lungs, abdomen, urinary tract, skin, intestines, brain, and bone, which are the most common venues for sepsis ((Keep,2015)).

Sepsis symptoms include shaking, chills, fever, weakness, rapid heart rate, rapid breathing, low blood pressure, decreased urine output, nausea, vomiting, and diarrhea. (Keep, 2015). The earliest indication of sepsis is the presence of temperature, less than 36°C (96.8 F) or greater than 38.3°C (100.9 F) (Keep,2015). Other commonly seen vital signs associated with sepsis include a heart rate greater than 90 beats per minute and/or respiratory rate greater than 20 breaths per minute (Keep,2015). Any of these signs should prompt the triage nurse to suspect sepsis, thus triggering an emergency response

(Keep et al, 2015). However, the hallmark of diagnosing sepsis is obtaining a blood culture to identify the causative organism, so that the proper antibiotic is provided.

Sepsis is a life-threatening condition that if not treated early in its onset has a high mortality rate and poor patient outcome (Keeley et al., 2017, Levy et al, 2020; Thompson et al., 2019). Patients presenting to hospital with diagnosis of sepsis require prompt and aggressive management to prevent complications and to improve outcomes as sepsis is a leading cause of morbidity and mortality (Baison et al., 2019). The World Health Organization (2019) identified sepsis as a global health crisis affecting more than 49 million individuals and resulting in more than 11 million deaths yearly.

Clinical Practice Guidelines

CPGs are statements that are systematically developed from a critical analysis of the literature about a clinical question to assist practitioners in making appropriate decisions regarding providing health care for specific clinical situations or conditions (Graham et al., 2011). Guidelines promote high-quality, evidence-based health care and decrease or reduce inappropriate variations in practice. The goal of a CPG is to optimize patient care and improve patient outcomes (Emergency Nurses Association, 2015, The National Academies of Science Engineering and Medicine: Health and Medicine Division, 2018).).

The purpose of CPGs is to narrow the gap between an organization's current practice and optimal care. CPGs guidelines can be a reference for clinicians, providing information and supporting materials such as methodology, scientific evidence, and a comprehensive bibliography (Holly et al., 2021). Guidelines focus on specific clinical

circumstances, which may sometimes include clinically relevant organizational factors, community characteristics, social variables, and similar influences on health care delivery.

CPGs have a range of purposes and are intended to improve effectiveness and quality of care, decrease clinical practice variations, and decrease costly and preventable mistakes and adverse events (Agbassi, 2014). They usually include expected practice statements; provide benchmarks or standards against which individuals can audit, compare, and potentially improve their practices; or offer guidance regarding undertaking tasks (Agbassi, 2014). The clarity of the guidelines determines a CPG's effectiveness and whether it is appropriate for the individual condition (Agbassi, 2014). CPGs can improve processes and patient outcomes; however, their effectiveness is determined by the organizational structures that support or undermine evidence-based practice and successful implementation. CPGs must be well developed, be based on current scientific evidence, and be user-friendly to be readily adopted (Busse et al., 2019). CPGs require periodic revision and reviewing to guarantee that the recommended guidelines are current and valid (Agbassi, 2014).

In 2004, the Surviving Sepsis Campaign recommended early goal-directed therapy (EGDT) to manage severe sepsis and septic shock to decrease sepsis mortality by 25% over the following 5 years globally. Campaign officials developed the international guidelines in response to the deadly effects of sepsis and to find means to improve the morbidity and mortality rate (Dellinger et al., 2012). The Surviving Sepsis Campaign guidelines were developed in 2004 and revised in 2008, 2012, and 2015. The aims of the

guidelines for sepsis diagnosis and management were to reduce the mortality rate, improve patients' outcomes, and ensure a more reliable and timely application of evidence-based care and standardized clinical practice with evidence-based bundles (Dellinger et al., 2015). A bundle is a set of interventions that, when implemented together, result in better outcomes than when implemented separately. The recommended 3-hour bundle requires that a blood culture be obtained before administration of any antibiotic, that blood for lactate levels be sent to the laboratory for analysis, that broad spectrum antibiotics be administered, and that 30 mL/kg of crystalloid fluid for hypotension mean arterial pressure (MAP) < 65 or lactate > 4 be administered as necessary (Dellinger et al. 2017).

The upgraded 2017 bundle recommendation is treatment within the first hour known as *time zero* or *time of presentation* at triage in the ED or at the earliest time of known assessment for sepsis symptoms in other clinical areas (Dellinger et al., 2017). Clinicians can adapt and use the evidence-based guidelines recommended by the Surviving Sepsis Campaign to impact patient outcomes and improve patient mortality rates. Many researchers have adapted the Surviving Sepsis Campaign guidelines using different strategies to change practices and improve sepsis outcomes in emergency and inpatient units.

Romero et al. (2017) sought to establish the impact of implementing the sepsis guidelines on triage assessment, ED management, and time to antibiotics. The investigators conducted the study in a metropolitan Australian tertiary referral ED serving a population of 70,000 annually. The Australian New South Wales government had

identified that the recognition, assessment, and management of sepsis was a significant challenge for ED clinicians. The recommendation was the standardization of sepsis management of patients presenting with sepsis by emergency clinicians and triage nurses. The sample included 157 patients pre- and postintervention. The intervention strategy included an educational component for ED clinicians. The investigators selected a randomized sample of medical records of presepsis guidelines over 12 months and the same for postintervention patients (12 months). They audited records by comparing the pre- and posteffect and identified that the sepsis guideline created a significant change in the clinicians' management of sepsis patients. The time to antibiotics was within 60 minutes and significantly improved in the post sepsis guideline group. The time for the pre- and post-group for patients to be seen by a nurse or doctor after triage was 39 minutes before guideline implementation. This decreased to 20 minutes after implementation. There was also a 758 minute (12.6 hours) mean reduction in time to the second liter of intravenous fluids (IVF) when comparing the pre- and post-group.

As well, Oliver (2018) conducted a retrospective chart review in a rural hospital in Arkansas in a 33-bed ED treating over 70,000 patients yearly. Oliver measured if implementing a sepsis assessment tool can increase the early recognition of a sepsis patient and increase blood culture collection before antibiotic administration, and decrease door to diagnosis times, presentation time to serum lactate measurement, and diagnosis to antibiotic times. The investigator concluded that a screening tool could improve the quality of care for sepsis patients and suggested that the assessment tool be

embedded in the electronic medical record triage process as it would benefit the nurses and promote compliance.

Gyang and colleagues (2015) conducted a pilot study to determine if using a screening tool for sepsis as part of the nursing assessment may identify early sepsis in an inpatient unit. Nurses involved in the pilot study had extensive education on sepsis and related information before the pilot study. Clinical data were retrospectively analyzed over 1 month. The medical team evaluated those patients who screened positive for sepsis or severe sepsis and recorded their interventions. They screened 245 patients (169 surgical patients, 76 medical patients). Thirty-nine patients screened positive; 51% were positive for sepsis, and 49% screened positive for severe sepsis. The screening tool sensitivity and specificity were 95% and 92%, respectively. The test accuracy was 92%. No statistically significant difference was noted.

Rusconi et al. (2015). conducted a systematic review and meta-analysis to assess the effectiveness of EGDT versus usual care in the treatment of septic shock in those 18 years of age or older with a sepsis diagnosis. Rusconi et al. based their study on River et al.'s (2006) landmark review stating that EGDT can reduce mortality with severe sepsis and septic shock. Clinical studies were identified by searching the MEDLINE, EMBASE databases and the Cochrane Central Register of Controlled Clinical Trials. The purpose was to identify randomized controlled trials assessing the effectiveness of EGDT for sepsis. The data from five studies, enrolling 4,033 patients, were included in the meta-analysis and analyzed using a random-effects model. The electronic search yielded 3,551 citations: 1,115 references in MEDLINE and 2,436 in EMBASE. Six hundred forty-nine

references were duplicated between the two databases. Of a total of 2,902 references, only 17 were relevant to the title and abstract screening. Due to variability across the studies, the reviewers did not have a definitive conclusion about the effectiveness of EGDT on severe sepsis and septic shock. Although Rosconi et al did not agree about the EGDT effectiveness, Jirajariyave et al (2018) stated that sepsis is a serious disease with high mortality and implied that early hemodynamic resuscitation after diagnosis with severe sepsis or septic shock can led to lower organ dysfunction together with lower in-hospital mortality rates.

Rhodes et al. (2017 evaluated the recommendations using the Surviving Sepsis Campaign guidelines. The researchers formed a consensus committee of 55 international experts from 25 international organizations grouped to evaluate Surviving Sepsis Campaign Guidelines for sepsis. The consensus committee was then further divided into subgroups. The committee used the principles of the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) methodology in assessing the quality of evidence from high to low and to formulate recommendations as strong or weak or best practice statements (related to hemodynamics, infection, adjunctive therapies, metabolic, and ventilation). The Surviving Sepsis Guideline panel evaluated 93 reports on early management and resuscitation of sepsis or septic shock patients. Of the results, 32 were strong recommendations, 39 were weak recommendations, and 18 were best-practice statements.

In conclusion, even though early sepsis intervention is critically important to patient survival, compliance in the clinical setting remains low. In institutions, the

primary issue is identifying sepsis early in a patient, making early recognition one of the most crucial aspects in sepsis care. Furthermore, clinicians need to know the importance of time for sepsis patients and understand their roles in the patient's outcome. All clinicians must understand the urgency and importance of time associated with sepsis management.The Surviving Sepsis Campaign's guidelines can provide on-hand resources to clinicians to help identify and manage sepsis treatment promptly. However, many institutions do not have a detailed clinical guideline based on the campaign's recommendations to assist nursing clinicians in using real-time resources. Evidence-based clinical guidelines are tools that guide a clinician's practice (Holly et all, 2021). CPGs have the potential to reduce practice variations and improve the translation of research into practice. A guideline based on scientific evidence can improve patient outcomes by optimizing the process of care. A clinical guideline for the project institution may help nursing clinicians in their decision-making to reduce delays from first medical contact to appropriate therapy and avoid systemic errors when facing a suspected sepsis case.

Concepts, Models, and Theories

I used Rosswurm and Larrabee's (1999) evidence-based practice model as the foundation for this project. The model describes a process for guiding nurses to integrate evidence into their practices. The model has six stages: (a) assess the need for a practice change; (b) link the problem, interventions, and outcomes; (c) synthesize best evidence; (d) design the practice change; (e) implement/evaluate the change; and (f) integrate/maintain the change.

Step 1. Assess the Need for Change in Practice: Major steps in this phase are identification of stakeholders, collection of internal data about current practice, comparison of internal and external data to confirm the need for a practice change, identification of the practice problem, and linking the problem interventions and outcomes (Larrabee, 2009). The DNP project site demonstrated an opportunity for improvement in the early identification of sepsis in the adult population presenting to the ED as more than half of patients diagnosed with sepsis are admitted or readmitted through the ED. Although the project site has participated in the SEP-1 reporting system since 2015, recent reports indicate below benchmark scores (Larrabee, 2009).

Step 2. Locate the Best Evidence: Major steps in this phase are identifying the best available evidence upon which to build the CPG. For this project, I developed keywords and inclusion and exclusion criteria to guide a search using Medline/PubMed, CINAHL, and the Cochrane Database of Systematic Reviews available in the Walden University Library (Larrabee, 2009).

Step 3. Critically Analyze the Evidence: Major steps in this phase are **c**ritically appraising and weighing the strength of the evidence; synthesizing the best evidence; and assessing the feasibility, benefits, and risks of the new practice. I determined levels of evidence and GRADE recommendations during this step (Larrabee, 2009).

Step 4. Design Practice Change: Major steps in this phase are defining the proposed practice change and identifying the needed resources. In this phase, I

used the relevant articles found in searching the library and recommendations of the Surviving Sepsis Campaign to develop the CPG for early sepsis identification (Larrabee, 2009).

Although this project did not include implementation, this model can continue to be used by stakeholders in the future for implementation purposes following the development of the guideline.

Step 5. Implement and Evaluate Change in Practice: Major steps in this phase are implementing a pilot study; evaluating the processes, outcome, and costs; and developing conclusions and recommendations (Larrabee, 2009).

Step 6. Integrate and Maintain Change in Practice: Major steps in this phase are communicating recommended change to stakeholders, integrating the new practice into standards of practice, monitoring the process and outcomes indicators, and celebrating and disseminating the results of the project (Larrabee, 2009).

Relevance to Nursing Practice

Nurses are the largest provider of care in the ED and usually the first contact for patients arriving in the department, usually at the triage process, making their role crucial in the early recognition of sepsis symptoms. The patient sepsis outcome depends on early recognition as delayed management can create a negative outcome. The key to early identification is the nurse who first encounters the patient and suspects sepsis and initiates an alert to the clinical team. Registered nurses are responsible for assessing patients using the nursing process. As the role of the assessor of a patient, the registered

nurse is vital to the outcome of patients diagnosed with sepsis. Seventy percent of patients are admitted through the ED making it the most appropriate area for using guidelines for early recognition and management of septic patients (Al Khalaf et al., 2015; Iwashyna et al., 2010).

The American Nurses Association (2015) supports nursing interventions utilizing evidence from research studies to improve patient outcomes. Evidence-based practice is the process of gathering, processing, and incorporating research findings to improve clinical practice, the work environment, or patient outcomes. The utilization of evidence-based practice in nursing practice supports the provision of the highest quality of patient care thus the evidence-based sepsis guidelines should be applied to patients presenting to an institution with suspected sepsis symptoms. Sepsis can be difficult to identify as other conditions present with the same signs and symptoms; nurses must be aware of the Surviving Sepsis Campaign evidence-based guidelines strategies to identify and manage sepsis. Providing resources that alert practicing clinicians to diagnosis can aid in making informed decisions to identify sepsis. Sepsis is a time-dependent emergency that requires prompt, effective interventions that focused on reducing the interval between a suspected sepsis diagnosis and the effective evidence-based practice management that can improve the patient outcome.

Early recognition of sepsis can be a challenge. Where barriers to improving sepsis care exist, nursing education that teaches adherence to a policy or guideline has the potential of impacting sepsis outcome. Identifying and addressing barriers to sepsis recognition is vital in optimizing patients' outcomes. Implementation of a CPG can

provide the needed resources and empower clinical nurses to impact patient outcomes. Advanced practice nurses such as DNP students/scholars can actively contribute and lead positive patient outcomes by using evidence based, sustainable, context-sensitive solutions. through ongoing evaluation and research in expanding body of knowledge as well as actively participating in health policy agenda in all levels (Bateson & Patton, 2015).

Local Background and Context

The setting for this doctoral project was a 530-bed not-for-profit urban teaching hospital in a large Northeastern U.S. city that provides a wide range of services including medical-surgical, thoracic, cardiac, neurological, and pediatric services. It is a Level 2 Trauma Center with an ED with more than 100,000 visits yearly. The project site is designated as a critical access hospital, where individuals who are acutely ill are seen in large numbers due to the closure of many nearby healthcare facilities.

To improve quality care and reimbursement, the hospital began to participate in the CMS core-bundle SEP-1 in October 2015. However, the hospital sepsis care had fallen below the benchmark each year since participating in SEP-1. In the last few years according to state report on Hospital Quality Performance on Sepsis Care Improvement Initiative, the project institution was reported in the category of lowest performer in the 3- hour bundle and worst performer in the 6-hour bundle, such that the project institution was below the 50th percentile in the 3-hour bundle and below the 20th percentile in the 6-hour bundle (see Appendix A). The performance on these sepsis measures makes the project institution an ideal place for utilizing a CPG. The ED admits approximately 70%

of patients diagnosed with sepsis, making it the most appropriate area for a sepsis guideline to be initiated.

Role of the DNP Student

The DNP Essentials refers to the student's education by outlining the curriculum and competencies needed before conferring a DNP degree. Eight skills are the initial outcome competencies deemed essential for all graduates of a DNP regardless of specialty. The DNP graduate is prepared to use the knowledge gained from ethics, biophysical, psychosocial analytical, and organizational sciences, incorporating it into nursing science to provide the optimal nursing practice. The graduate used advanced strategies to enhance, alleviate, and improve health and health care delivery using scientific theories to develop and evaluate new practice approaches. The Doctor of Nurse Practice Essential II: Organizational and Systems Leadership for Quality Improvement states that the graduate role should contribute to nursing science by evaluating, translating, and research into practice (*American Association of Colleges of Nursing (2006)*.

The DNP student's role in the project is to review and analyze evidence-based research to develop and inform the CPG development and to lead the project team in the assessment of the sepsis guideline using the AGREE II tool. As a DNP student, using the knowledge I gained from Walden University and the experience as an ED nurse to assess, I analyzed gaps in nursing practices, analyzed and reviewed evidence-based research, translated it into nursing practices in the form of an CPG with the intent to improve processes and patient outcomes for those patients presenting to the ED with sepsis.

Role of the Project Team

The project team was a multidisciplinary group from the ED at the project site. The team consisted of the ED medical director, ED nursing director of the nursing, ED nurse manager, and ED staff nurse. The chairman and nursing director facilitated the DNP student's access to the sepsis information and mentored the student throughout the project. The project team reviewed the clinical guidelines and assessed it using the AGREE II tool to aid in the eventual recommendation of the guideline.

Summary

In this section, I described the uses and current research on the use of clinical guidelines for early sepsis identification. Rosswurm and Larrabee's (1999) model guided the project as it is a change theory that guides a systematic approach to developing and integrating an evidence-based practice change. Four stages of the model were used. Stages five and six can be used to implement, disseminate, and maintain the guideline, but were not used in this project. Using this model assisted in the use of a systematic process develop a CPG

The ED is the most used port of entry for sepsis patients, making it an ideal area to start a sepsis management CPG. Providing a resource guideline is ideal and necessary for nurses as the largest provider of care. They are usually the first contact with patients arriving in the department, typically at the triage stage, making their role crucial in the early recognition of sepsis symptoms.

Section 3: Collection and Analysis of Evidence

Introduction

CPGs support the uptake of evidence into practice. They are developed to provide healthcare practitioners with up-to-date information to make evidence-informed decisions about health care and interventions for specific clinical conditions at the point of care (Holly, et al. 2020). In this project, I developed a CPG using the *Walden University Manual on Development of Clinical Guidelines* and the following four steps in guideline development based on Rosswurm and Larrabee's (1999) evidence-based practice model:

1. Identifying and refining the target area
2. Assessing evidence identified by systematic literature review.
3. Translating evidence into recommendations.
4. Subjecting the guideline to stakeholder review.

Practice-Focused Question

The guiding question for this project was: Can a multidisciplinary group develop evidence-based CPGs that meet the AGREE II criteria for the screening and early identification of sepsis in patients presenting to the ED? This guideline and its subsequent use may improve adherence to the SEP-1 quality measures and improve the early identification and management of sepsis in the ED.

Sources of Evidence

I reviewed the literature to identify evidence to support developing a clinical guideline on the early identification of sepsis in the ED. Sources for this search included

Medline/PubMed, CINAHL, and the Cochrane Library. The search parameters were from 2004 to the present as 2004 was the initial publication of the Surviving Sepsis Campaign recommendations. Keywords and phrases used were *sepsis*, *sepsis guidelines*, *early identification*, *screening*, and *sepsis outcomes*. The guideline is evidence based in that the latest recommendations from the Surviving Sepsis Campaign and literature review were integrated. The use of guidelines increases adherence, according to researchers; Camp et al. (2014) noted, for instance, that using a clinical guideline to confirm understanding of discharge instructions, home care plans, and follow-up care promoted compliance to home regimens.

Analysis and Synthesis

Synthesis

Appendix B presents the articles and other evidence I used in developing the guideline for the project. Synthesizing the articles involved concisely summarizing and linking different sources in a literature review on the topic and connecting the findings to the guideline elements to be evidence-based. Instead of describing each article individually, the integration of each source's main points resulted in overall evidence-based conclusions. This involved looking for similarities and differences among evidence sources (Holly et al., 2020). I determined the level of evidence for each source using the Agency for Healthcare Research and Quality (AHRQ) guidelines for determining levels of evidence. The levels of evidence and GRADE recommendation of each source were assigned based on the quality of their design, validity, and applicability to patient care

(see Hendrickson et al. 2005). Using evidence levels enabled the expert panel to determine how much confidence to put into findings.

Analysis

After developing the guideline, I gave it to an expert panel that included the ED leadership (the director of nursing, director of medicine, nurse manager, and an ED staff nurse) who assessed, evaluated, and determined their agreement using the 23-item AGREE II instrument developed by Brouwers of McMaster University. This tool offers a consistent and effective way to evaluate clinical guidelines (AGREE Research Trust, 2018). The instrument's two primary focus areas are overall guideline quality and recommendation for use. Hoffmann-Eber et al. (2018) investigated the AGREE II instrument's strength via a survey and found a robust assessment of guideline quality and recommended it for use. Although the AGREE II instrument can be time-consuming in comparison to other tools available, it is superior and the gold standard for clinical guideline appraisal because of its focus on quality and application of a guideline (Hoffmann-Eber et al. (2018).

This was a minimal risk, non-human subject project, and no patient information was required for its completion. I obtained approvals to conduct the project from Walden University's Institutional Review Board and the project site.

Summary

Sepsis is a condition associated with a high mortality rate and poor patient outcomes. Research has shown that EGDR for sepsis can positively impact patient outcomes if there is timely recognition and management of the patient with sepsis.

Multiple studies have confirmed that recognition and prompt treatment of sepsis, EGDT, and the use of protocols improve patient outcomes (Chen et al. 2020; Chiweshe & Ekelund, 2018; Ferguson et al. 2019; Hayden et al., 2016; Kleinpell,2017; Mattison et al., 2016). Guidelines that integrate evidence-based research findings and meet the AGREE II criteria for the screening and early identification of sepsis in patients presenting to the ED may help alleviate sepsis patients' morbidity and mortality by providing on-time resources to clinicians.

Section 4: Findings and Recommendations

Introduction

This DNP project was concerned with sepsis, a medical emergency in which outcomes depend on early recognition and rapid institution of resuscitative measures. Sepsis triggers physiologic, biologic, and biochemical abnormalities that are a multifaceted response to infection and results in organ dysfunction attributed to insufficient tissue perfusion and oxygen delivery. The local problem was a lack of early identification and treatment for patients presenting to an urban ED with signs of sepsis resulting in poor performance on the SEP-1 standards for sepsis. The gap in practice was lack of an evidence-based guideline to assist in early recognition. The purpose of this project was to develop that guideline following the *Walden DNP Manual for Clinical Practice Guidelines*. I conducted a literature search using PubMed, the CINAHL, Nursing & Allied Health Database (ProQuest), and the Cochrane Library. Search terms included in various combinations were *sepsis*, *sepsis management in the ED*, *sepsis research*, *sepsis protocols*, and *sepsis guidelines*. Studies were selected using the following criteria: original research, peer-reviewed, published in English, and with 5-year timeframe for date of publication. Each article was reviewed to determine relevance to the clinical question. I found 12 full-text articles that met the inclusion criteria and informed the development of the CPG and placed these in a table of evidence (see Appendix B). An expert panel reviewed the guideline against the AGREE II Tool to appraise the quality of the developed guideline.

Findings and Implications

I found 12 articles that supported the development of the guideline. The articles were all peer reviewed and published between 2014 and 2019. Of these, one was Level I evidence (Rusconi et al., 2015); three were Level III evidence (Gyang et al., 2015; Romero et al., 2017; Trosvik et al., 2016); six were Level IV evidence (Freund et al., 2017; Hayden et al., 2016; Leisman et al., 2019; Mattison, et al., 2016; Oliver, 2018; Potocka et al., 2014), and two were Level V evidence (Nishida et al., 2018; Rhodes et al., 2017). As presented in Appendix B:

- eight of the studies were conducted in the United States
- one study each was conducted in Norway, Japan, England, and Australia
- seven studies took place in an ED
- one study took place on an oncology unit
- one study took place in an intermediate care unit
- two studies were consensus statements
- one study was a systematic review

The included studies were limited primarily using a single site in one hospital and the use of data from medical record reviews. As I discuss, I categorized each of the included studies by their level of evidence. Each study's evidence was graded using the GRADE system (see Table 2).

Table 1

AHRQ Levels of Evidence

Level of evidence	Description
Level I	Meta-analysis of multiple studies
Level II	Experimental studies
Level III	Well-designed quasi-experimental studies
Level IV	Well-designed non-experimental studies
Level V	Case reports, clinical examples

Table 2

AHRQ GRADE Recommendation

GRADE	Recommendation
A	Strongly, recommend. Good evidence
B	Recommend. At least fair evidence
C	No recommendation for or against Balance of benefits and harms too close to justify a recommendation
D	Recommend against; Fair evidence is ineffective, or harm outweighs the benefit
E	Evidence is insufficient to recommend for or against routinely; Evidence is lacking or of poor quality; Benefits and harms cannot be determined.

Level I Evidence

Level I evidence is signified by a systematic review and meta-analysis according to the AHRQ Levels of Evidence (see Table 1). One study met this criterion (Rusconi et al., 2015). The researchers conducted a systematic review and meta-analysis to compare the effectiveness of EGDT to usual care in patients 18 years of age or older with suspected sepsis diagnosis. MEDLINE and EMBASE databases and the Cochrane Central Register of Controlled Clinical Trials were searched for studies that met their inclusion criteria. The authors concluded that most of the reviewed studies showed EGDT to be effective in the treatment of sepsis and recommended using EGDT until further evidence is available. According to the AHRQ Grade schema (see Table 2), the use of EGDT in the treatment of severe sepsis and septic shock would be considered GRADE A (Strongly recommend; Good evidence). Consequently, it is reasonable to consider EGDT in the care of patients with severe sepsis and septic shock.

Level II Evidence

There was no Level II evidence

Level III Evidence

Level III evidence is signified by a well-designed quasi-experimental study according to the AHRQ Levels of Evidence (see Table 1). Three studies met this criterion. Torsvik et al. (2016) conducted a non-randomized pre-post intervention study to investigate whether implementing a clinical tool for triage of systematic inflammatory response syndrome (SIRS), which included an organ failure alert prompt, treatment flow chart along with reinforced training to improve clinical observations. After analyzing 900

patients, Torsvik et al. realized that an increase in 30-day survival, less deterioration of sepsis patients to severe sepsis, and shorter length of stay in the ICU in the postintervention group could occur with the use of the clinical tool. According to the AHRQ GRADE recommendations (see Table 2), this would be GRADE A evidence (Strongly recommend; Good evidence).

Romero et al. (2017) sought to establish the effect of sepsis guidelines on triage assessment, ED management, and time to antibiotics pre-and postimplementation of a sepsis guideline in a metropolitan institution ED serving 70,000 annually in New South Wales Australia. A new sepsis guideline was introduced into the ED to improve sepsis recognition, assessment, and management. Data were collected included patient demographics, clinical information (time of arrival, triage code, seen by time, disposition, time to antibiotic, pathology, time to intravenous fluids), and patient assessment data (heart rate, respiratory rate, blood pressure, temperature, oxygen saturation, medication). Romero et al. concluded that the sepsis guidelines improved the early assessment, recognition, and management of patients presenting with sepsis in the ED. The study established a statistically significant 230-minute reduction in time to antibiotics postimplementation of the guidelines. This study is GRADE A evidence (Strongly recommend, good evidence)

Gyang and colleagues (2015) conducted an analysis to determine if using a screening tool as part of the nursing assessment could identify early sepsis on an inpatient unit. The assessments were conducted every 8 hours by nursing staff. A total of 2,143 screening tests were completed for 245 patients (169 surgical, 76 medical). ICD-9 codes

confirmed that the sepsis incidence was 9%. Of the 39 patients who screened positive, 51% were positive for sepsis, and 49% screened positive for severe sepsis. The primary team evaluated and provided intervention for patients screened positive for sepsis or severe sepsis and recorded management of interventions. The authors determined that a screening tool as part of a nursing assessment can identify early sepsis in medical and surgical patients. This is a GRADE B study (Recommend, at least fair evidence).

Level IV Evidence

Six of the included studies were Level IV evidence (Freund et al., 2017; Hayden et al., 2016; Leisman et al., 2019; Mattison et al., 2016; Oliver, 2018; Potocka, et al., 2014) meaning that the evidence was generated from well-designed nonexperimental study. Patocka et al. (2015) utilized a triage screening tool in a retrospective chart review to detect septic patients presenting to the ED and determine the effect on time to antibiotics in patients with suspected severe sepsis or septic shock. The reviewers examined the time interval to antibiotics pre-and post-implementation of the triage tool. Patocka et al. concluded that a screening tool could decrease antibiotics in patients suspected of sepsis or septic shock. This study has Grade B evidence (Recommend; At least fair evidence).

Mattison et al. (2016) investigated the use of a nurse-led protocol on time to antibiotic administration in patients with neutropenia in an oncology department in Northwest England. A chart review was performed 1 year after nurses were responsible for assessing patients presenting with fever post-chemotherapy, including prescribing and administering the first dose of intravenous antibiotics. The investigators concluded that

there was a significant improvement in the time to antibiotic postintervention and recommended that nurse-led protocols are safe and effective. This study is GRADE B (Recommend, at least fair evidence).

Hayden et al. (2016) conducted a retrospective chart review to evaluate the effectiveness of early, rapid identification of sepsis during ED triage. The investigators hypothesized that a sepsis workup and treatment (SWAT) protocol that included rapid mobilization of resources, standardized order sets, and early broad-spectrum antibiotics and fluid resuscitation can reduce the time-to-intravenous fluids and time-to-antibiotics. The investigators collected pre-and postinterventional patient medical records to determine if a triage alert system and sepsis protocol can reduce door-to-antibiotics time, door-to-intravenous (IVF) bolus time, and overall mortality. The researchers found a reduction in the time-to-intravenous fluids and time-to-antibiotics in patients with suspected sepsis, severe sepsis, or septic shock after implementing an EHR-based triage sepsis alert using the SWAT protocol. This is GRADE B evidence (Recommend, at least fair evidence).

Freund et al. (2017) conducted an international prospective cohort study using a retrospective data base with 879 patients with suspected infection treated in an ED. Freud et al. used screening tools, a quick Sequential Organ Failure Assessment (qSOFA) tool, and SIRS criteria to predict patients' inhouse mortality following admission through the ED. The researchers compared the qSOFA and the SIRs criteria to determine which can better predict admission to the ICU, a stay longer than 72 hours in the ICU, and/or sepsis related mortality from sepsis. The researchers concluded that the use of qSOFA resulted

in greater prognostic accuracy for in-hospital mortality than did either SIRS or severe sepsis to identify patients at high risk of mortality. This is a GRADE B study (Recommend, at least fair evidence).

Oliver et al. (2018) conducted a retrospective chart review in a rural hospital in Arkansas with a 33-bed ED treating over 70,000 patients yearly. The researchers concluded that implementing a sepsis assessment tool can increase a sepsis patient's early recognition; decrease door-to-diagnosis times, presentation time to serum lactate measurement, and diagnosis to antibiotic times; and increase blood culture collection before antibiotic administration. This is GRADE B evidence (Recommend, at least fair evidence)

Leisman et al. (2019) conducted a comparative study to (a) measure and compare the prevalence, characteristics, process, and patient outcomes of hospital-presenting sepsis (HPS) patients versus ED-presenting sepsis (EDPS) patients and (b) estimate risk differences in patient outcomes initial resuscitation disparities. The researchers used a retrospective analysis of the Northwell Sepsis Database of all severe sepsis and septic shock patients treated at a large hospital system in New York. The authors concluded that HPS patients had more complex presentations than the EDPS group, received timely antibiotics half as often as EDPS patients, and had twice the mortality odds. This is a GRADE E study as it is only a descriptive study and no recommendations were made (Evidence is insufficient to recommend for or against routinely; Evidence is lacking or of poor quality; Benefits and harms cannot be determined).

Level V Evidence

Rhodes et al. (2017) used an expert panel to assess the quality of 2012 Surviving Sepsis Campaign guidelines. The expert panel researched and evaluated hemodynamics, infection, adjunctive therapies, metabolic, and ventilation. Questions on population, intervention, comparison, and outcomes (PICO) were reviewed and updated as needed. Each group developed clinical questions to search for and assess the quality of available evidence using the GRADE system. The expert panel developed a total of 93 statements on early management and resuscitation of patients with sepsis or septic shock with 32 strong recommendations, 39 weak recommendations, and 18 best-practice statements. This is GRADE B evidence (Recommend, at least fair evidence).

Nishida et al. (2018) also convened an expert panel in Japan to develop context-specific CPGs for the care of sepsis patients. A total of 87 clinical questions were selected among 19 clinical areas, including pediatrics. A meta-analysis was conducted for 29 of the clinical questions resulting in 37 recommendations in the form of an expert consensus due to insufficient evidence from the meta-analysis. No recommendations were provided for five clinical questions. This is GRADE E evidence (Evidence is insufficient to recommend for or against routinely; Evidence is lacking or of poor quality; Benefits and harms cannot be determined).

Implications

Sepsis is a medical emergency with a substantial mortality rate; however, many studies have shown that early identification and rapid resuscitative measures can improve patient outcomes and decrease the mortality rate (Dellinger et al. 2017; Oliver et al.,

2018, Torsviket al., 2016). The 12 studies that I reviewed informed the development of the CPG for the project site. I categorized the studies based on their Level of Evidence (see Appendix B). Of the 12 studies, seven were done in an ED using screening tools, protocols, and clinical guidelines to improve the early recognition of sepsis. The authors of two studies (Nishida et al., 2016; Rhodes et al., 2017) used an expert panel to assess and improve the quality of previous guidelines, focusing on early management. Most of the researchers who used a screening tool or protocol found an improvement in reducing time-to-intravenous fluids and time-to-antibiotics in patients with suspected sepsis and improving recognition of sepsis. The implications for nursing practice include being able to identify sepsis in all patients; patients might not present with sepsis at triage but while awaiting a bed hence the inclusion of the three studies. The inclusion purpose is that nurses must identify sepsis in all patients, whether at triage or while awaiting inpatient beds.

Recommendations

Sepsis is a complex disease with a high mortality rate; therefore, the management of sepsis evidence-based guidelines are needed to decrease mortality adequately. Even though early sepsis intervention is critically important to patient survival, compliance in the clinical setting remains low. One primary issue is identifying sepsis early in a patient, as early recognition is crucial to sepsis outcomes. Sepsis treatment is time-sensitive research studies have recommended the early initiation of therapy for patient survival and quality of life. Furthermore, clinicians need to know the importance of time for sepsis patients and understand their roles in outcomes. All clinicians must understand the

urgency and importance of time associated with sepsis management. Identifying sepsis in ED is a challenge as it can mimic other conditions; therefore, recommended protocolized management can assist clinicians in early identification and management. Recognizing these challenges, ongoing education, reinforcement of evidence-based guidelines can assist in early and optimal resuscitation.

The institution's problem relating to sepsis is the lack of early identification of patients presenting in the ED with sepsis-associated symptoms. The initiation of a CPG on sepsis management may reduce ineffective practices, reduce morbidity and mortality, and improve the patient's quality of life. The CPG is focused on three main areas: screening and recognition of sepsis, early assessment and management, and reevaluation of the patient during care.

CMS sepsis guidelines recommend early sepsis care that includes early identification, and initiation of diagnostic testing and intervention. The proposed development of this guideline and its subsequent use can improve adherence to the SEP-1 quality measures and improve early identification and management of sepsis in an urban ED with a documented need for improvement in these areas. The purpose of this guideline is to

- propose criteria for early recognition of the signs and symptoms of sepsis, severe sepsis, or septic shock
- provide guidance in the timely implementation of evidence-based diagnostic interventions, treatment, and other therapies
- reduce delays in initiating therapy and improve patient outcomes

- narrow the gap between the organization's current practice and optimal evidence-based practice care
- increase SEP-1 scores

This CPG is focused on the adult patient, 18 years and older, presenting to the ED with confirmed or suspected sepsis or septic shock in a densely urban ED in a large Northeast city in the United States. I developed this CPG based on a critical analysis of the literature. The guideline is applicable to healthcare providers caring for adult sepsis patients in the ED.

Definitions

Sepsis: A clinical syndrome that triggers physiologic, biologic, and biochemical abnormalities. It is a multifaceted response to infection and results in organ dysfunction, which is attributed to insufficient tissue perfusion and oxygen delivery (Singer, 2016).

Septic shock: A subset of sepsis in which particularly profound circulatory, cellular, and metabolic abnormalities substantially increase mortality (Seymour et al., 2016). Septic shock is associated with hypotension and perfusion abnormalities despite the provision of adequate fluid (volume) resuscitation. Perfusion abnormalities include lactic acidosis, oliguria, or an acute alteration in mental status (Singer, 2016).

Systemic inflammatory response syndrome (SIRS): A systemic response of the body to a harmful stressor such as infection, trauma, surgery, inflammation, ischemia, or malignancy (Singer, 2016).

Guideline Recommendations

The initiation of the following guidelines is expected to reduce delays in identifying and managing sepsis in the following areas:

1. Early identification.
2. Referral to appropriate provider.
3. Rapid vascular access for laboratory testing and intravenous infusion.
4. Empiric antibiotic therapy.
5. Titrated fluid resuscitation.
6. Early initiation of inotropes.

1. Screening and Recognition of Sepsis in New Patients. All patients 18 years and older will be screened for sepsis by the triage nurse using the SIRS criteria. When two or more SIRs criteria are identified the nurse must initiate a SEPSIS CODE. The criteria for assessment are

- temperature below 36 or above 38 degrees Celsius
- systolic blood pressure (SBP) ≤ 90 mm Hg
- heart rate greater than 90 breaths per minute
- respiratory rate above 20 breaths per minute

Rationale. Sepsis is a medical emergency in which outcomes depend on early recognition and rapid institution of resuscitative measures. Studies on early screening show that rapid intervention helps to decrease mortality in septic patients (Hayden et al., 2016; Gatewood et al., 2015). Rhodes et al. (2016), Kim and Park (2019), and Morr, et al. (2016) stressed the importance of routine screening of potentially infected patients who

are likely to be septic to improve the early identification and treatment of sepsis. They highlighted the triage nurse's role in the ED as crucial in the early recognition of sepsis symptoms because these nurses are usually the first contact for patients arriving in the department.

Standard: 100%. The triage nurse will use the SIRS criteria for screening every patient over the age of 18 years who presents to the ED.

2. Specific Assessment. All patients must have their vital signs taken, recorded, and evaluated by a Registered Nurse. The importance of temperature, heart rate, respiration and blood pressure monitoring are essential to identify patients with abnormality relating to sepsis. Ongoing evaluation of admitted patients can identify patients at risk for sepsis or septic shock.

Rationale. Clinical evidence indicates that patients with acute deterioration or sepsis manifest clinical signs or symptoms several hours before the condition worsens (Roney et al, 2015). Thus, early identification, rapid initiation of antibiotics, and adequate fluid resuscitation can lead to improvement in outcomes (Hayden, 2016).

Standard: 100%. The triage nurse will use the document temperature, heart rate, respirations, and blood pressure for every patient over the age of 18 years who presents to the ED.

3: Intervention. When a patient presents with two or more of the SIRS criteria, the nurse will commence the following immediate actions:

- initiate a SEPSIS CODE
- place the patient in an ED room or equivalent treatment area

- address any compromise in airway and breathing
- attach cardiac and monitoring and oxygen saturation monitoring

Within 10-15 minutes, the following actions need to be taken:

- The medical provider must evaluate the patient.
- The team must establish vascular access. If necessary, use intraosseous needle (IO) for difficult vascular access.
- Blood specimens must be obtained for include complete blood counts (CBC) with differential, chemistries, serum lactate levels, liver function tests, lactate levels, blood culture, blood gas, coagulation studies, type, and crossmatch (optional), and urinalysis. (At a minimum lactate, blood culture, CBC, Chemistries, urinalysis)
- Initiate intravenous fluids resuscitation following the guidelines below.

Within 3 hours, the nurse must repeat serum lactate levels.

Rationale. The blood culture is the most important test in the management of sepsis, and the clinical significance of identifying the pathogenic microorganisms causing bacteremia. A blood culture should be taken prior to antimicrobial administration in patients with sepsis or septic shock. The results will provide the source of infection necessary for the diagnosis of sepsis or septic shock. The patient's presenting signs and symptoms, medical history, physical examination, and laboratory results will determine the severity of the sepsis.

Standard: 100%. The triage nurse and medical provider will adhere to all immediate, 15 minute, and 3-hour criteria.

4. Empiric Antibiotic Therapy. Administer broad-spectrum antibiotics within one hour of identification after obtaining blood cultures.

Rationale. Identification of the site of infection is vital to target antibiotic therapy. The five possible sites causing sepsis are: 1) intra-abdominal infection, 2) infectious pancreatic necrosis, 3) vascular catheter-associated infection, 4) urethral sources, and 5) necrotizing soft tissue infection. Empiric antibiotics should be selected based on the patient's background, organs suspected to be affected, epidemiological information, and recent use of antibiotics. The patient's allergy history must be obtained before antibiotic administration. According to the results of several studies, hourly delays in antibiotic administration can increase the odds of hospital mortality (Lui et al., 2017; Corl et al., 2020, Singer, 2017, Whiles, Deis, & Simpson, 2017). The recommendation is to administer broad-spectrum antibiotics within one hour of identification and after obtaining blood cultures.

Standard: 100%. Broad-spectrum antibiotics will be administered within one hour of identification and after obtaining blood cultures.

5: Titrated Fluid Resuscitation. Initiating an access line is important in obtaining labs, providing medications, and replacing loss fluid in patients with sepsis or sepsis shock. The initial fluid administration is a bolus of 30 ml/kg crystalloid for hypotension or a serum lactate of > 4 mmol/L within an hour of suspected sepsis or septic shock. Crystalloids are the recommended fluid of choice for initial resuscitation and subsequent intravascular volume replacement.

Rationale. Sepsis is associated with vasodilation, capillary leakage, and decreased circulating blood volume. This can lead to impaired tissue perfusion and organ disfunction. The goal of fluid resuscitation in sepsis and septic shock is to restore intravascular volume, increase oxygen delivery, and reverse organ dysfunction. Resuscitation with initial fluid bolus requires evaluating the benefits and risks of fluid administration based on the patient's assessed volume status. For example, a patient with heart failure may be considered fluid overload and the administration of fluids may worsen this condition. However, the heart failure patient can die from sepsis if not adequately treated whereas the fluid overload can be reversed.

Standard: 100%. An initial fluid administration bolus of 30 ml/kg crystalloid for hypotension or a lactate of > 4 mmol/L within an hour of suspected sepsis or septic shock.

6: Early Initiation of Inotropes. Placement of an arterial catheter as soon as practical is recommended for patients requiring vasopressors

Rationale. Vasopressors and inotropes restore oxygen delivery to tissues by increasing mean arterial pressure (MAP) and cardiac output. The practitioner must consider the administration of vasopressors for hypotension that does not respond to fluid bolus to maintain a MAP of 65 mm/Hg or greater. The drugs of choice include Norepinephrine as the first choice for vasopressor, but indicated only in selected patients (e.g., patients with low risk of tachyarrhythmias and absolute or relative Bradycardia). Vasopressin (up to 0.03U/min) or Epinephrine to raise the MAP to target is suggested.

Adding Vasopressin (up to 0.03U/min) to decrease Norepinephrine dosage and Dopamine as an alternative vasopressor agent to Norepinephrine.

Standard: 100%. The medical provider must consider the administration of vasopressors for hypotension that does not respond to fluid bolus to maintain a MAP of 65 mm/Hg or greater.

Expert Panel Review of the Clinical Practice Guideline

An expert panel was convened to assess the CPG using the criteria in the AGREE II tool. The panel consisted of an ED medical director, an ED Director of Nursing, an ED nurse manager, and an ED staff nurse. The AGREE II tool includes criteria to assess the quality of a guideline's development process by six domains which include: scope and purpose, stakeholder involvement, the rigor of development, clarity, and presentation, application, editorial independence; Each domain of the Agree II tool includes items numbered from 1 to 7, with each domain having a score calculated; an overall score is then calculated by summing all the domains (see Table 3). Also, each evaluator selected one of two overall guideline assessment choices: "lowest possible quality" or "highest possible quality," with answers "Yes," "Yes, with modification," or "No."

Table 3

AGREE Domains

AGREE II Tool Domains	Description
1. Scope and purpose	Project question and CPG aligns with the Picker domains of patient centered care.
2. Stakeholder involvement	Four expert panelists involved in review.
3. Rigor of development	Best practices, current guidelines and evidence used in development.
4. Clarity of presentation	CPG, and resources were clear and supported with evidence.
5. Applicability	CPG and resources can be applied in a variety of settings.
6. Editorial Independence	Each panelist completed an individual review and presented individual comments.

I performed an analysis of the AGREE tool answers and scores completed by the four evaluators according to the six domains of the AGREE II tool (see Table 4). The Sepsis Clinical Guidelines scored highest in the domain of the guideline's scope and purpose and clarity and presentation. All four evaluators gave the highest score for the specific recommendations with clarity and the key recommendations as easily identifiable. The stakeholder involvement and domain and editorial were having the lowest scores. The evaluators gave high scores on the overall guideline assessment and 100% recommended the guideline for use (see Table 5). Three recommended without modification; one evaluator scored recommended the guideline with modifications for use in the ED, however, the modifications were not specified. All evaluators scored

inclusion of patient stakeholders at the lowest level; however, this was to be expected as this project was guided by the Rosswurm and Larrabee model of evidence-based practice development Stages 1 through 4. In this model, stakeholders are part of the implementation phase in Stages 5 and 6.

Table 4

AGREE II Score Sheet

Domain		Item	Domain average
Scope and purpose	1.	The overall objective(s) of the guideline is (are) specifically described.	21/21 100%
	2.	The health question(s) covered by the guideline is (are) specifically described.	
	3.	The population patients, public, etc.) to whom the guideline is meant to apply is specifically described.	
Stakeholder involvement	4.	The guideline development group includes individuals from all the relevant professional groups.	8.5/21 40%
	5.	The views and preferences of the target population (patients, public, etc.) have been sought.	
	6.	The target users of the guideline are clearly defined.	
Rigor of development	7.	Systematic methods were used to search for evidence.	50.25/56 90%
	8.	The criteria for selecting the evidence are clearly described.	
	9.	The strengths and limitations of the body of evidence are clearly described.	
	10.	The methods for formulating the recommendations are clearly described.	
	11.	The health benefits, side effects and risks have been considered in formulating the recommendations.	
	12.	There is an explicit link between the recommendations and the supporting evidence.	
	13.	The guideline has been externally reviewed by experts prior to its publication.	
	14.	A procedure for updating the guideline is provided.	
Clarity of presentation	15.	The recommendations are specific and unambiguous.	20/21 95%
	16.	The different options for management of the condition or health issue are clearly presented.	
	17.	Key recommendations are easily identifiable.	
Applicability	18.	The guideline describes facilitators and barriers to its application.	23/28 82%
	19.	The guideline provides advice and/or tools on how the recommendations can be put into practice.	
	20.	The potential resource implications of applying the recommendations have been considered.	
	21.	The guideline presents monitoring and/ or auditing criteria.	
Editorial independence	22.	The views of the funding body have not influenced the content of the guideline.	8/14 57%
	23.	Competing interests of guideline development group members have been recorded and addressed.	

Table 5

Overall Assessment

Overall Guideline Assessment	1. Rate the overall quality of this guideline.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
	Panel Rating							**4**
Overall Guideline Assessment	2. I would recommend this guideline for use.	*Yes*		*Yes, with modifications*				*No*
		3		1				0

Contribution of the Doctoral Project Team

The team consisted of an ED medical director, ED director of nursing, ED nurse manager, and ED staff nurse. This expert panel assessed the CPG using the AGREE tool criteria. The guideline was recommended for use by the expert panel for nurses to review either on their smart phones or internet-based learning-based management system available in the ED (Healthstream).

Strengths and Limitations of the Project

There are strengths and limitations to this DNP doctoral project. This project's main strength is its significance to the intended target audience, which are patients presenting to the ED with suspected sepsis and registered nurses who need to identify these patients so that early treatment can begin. The registered nurses' have a pivotal role in identifying septic patients; having resources for guidance will reinforce the nurses' knowledge and use of the evidence-based sepsis CPG to improve patient outcomes. Using evidence-based sepsis guidelines within the project institution will be integrated into the merging hospitals to provide care in a widening area and throughout the

organizations. The project is limited by its inability to include patient stakeholders in the process of development.

Section 5: Dissemination Plan

This project was the development of a CPG for use in the ED with input from an expert advisory panel using the AGREE II criteria. The clinical guideline offers a sepsis screening for clinicians in the ED in identify sepsis early to improve early targeted treatment, thus improving sepsis patient outcomes for patients in the surrounding community. The goal is to improve the early identification of sepsis symptoms and prompt interventions to optimize sepsis care and improve the quality of life of individuals in the community receiving sepsis care from the ED. Adequate evidence-based intervention is crucial to patients' survival; therefore, all clinicians providing care to the institution patients need to be educated and aware of the morbidity and mortality of sepsis and their role in improving the outcomes for these patients.

Dissemination of evidence-based practices can provide needed resources to assist clinicians in providing the sepsis management care that is needed. Dissemination is a vital factor of the quality improvement cycle by integrating the best available evidence into standard practice. Dissemination of the project interventions of improving early identification of sepsis symptoms of patients arriving in the ED can improve nursing practices. I plan to share the quality improvement intervention with the project site's ED. This may encourage improvement in the EPIC triage prompts.

Analysis of Self

The lesson I learned in conducting this project is that organizational leadership must be knowledgeable about evidence-based guidelines. I also learned that the responsibility of an effective project leader involves conducting proper research when

proposing change. This is done by using current evidence-based knowledge to guide practice strategies and highlight quality improvement based on proven evidence. As I learned, implementing a quality improvement strategy or project necessitates bridging the gap between current practice and evidence-based practice by identifying the barriers and facilitators of change. Clinical experience with the various nursing leaders empowers me to develop evidence-based quality improvement projects/interventions within the constraints of time and the institution's resources. This lesson learned from this project is the meaning and importance of interprofessional collaboration, particularly about use of a CPG for early recognition of sepsis in the ED, which will ultimately improve nursing practice and patient outcomes.

Summary

In this project, I developed a CPG, informed by Rosswurm and Larrabee's evidence-based practice model and a literature search for use in the ED with input from an expert advisory panel using the AGREE II criteria. Panel members unanimously recommended the use of the guideline. In making sepsis screening a routine practice informed by a clinical guideline, nurses can maximize outcomes of this population and increase the SEP-1 scores.

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Appendix A: Sepsis Bundles

I created this table based on information in Rhodes et al. (2017).

3-hour and 6-hour sepsis bundle	2018 upgraded 1-hour bundle
3-hour bundle Measure serum lactate. Obtain blood cultures prior to antibiotic administration. Administer broad-spectrum antibiotics within 3 hours from time of presentation. Administer 30ml/kg crystalloid for hypotension or lactate ≥ 4mmol/L. 6-hour bundle Apply vasopressors for hypotension not responding to initial fluid resuscitation to maintain mean arterial pressure (MAP) ≥ 65mm Hg. In the event of persistent hypotension despite fluid resuscitation and/or lactate > 4mmol/L. Measure central venous pressure (CVP). Measure central venous oxygen saturation (ScvO2) of ≥70%. Remeasure lactate if initial lactate was elevated.	Measure lactate level. Re-measure if initial lactate is > 2mmol/L (weak recommendation, low quality of evidence). Obtain blood cultures prior to administration of antibiotics (best practice statement). Administer broad-spectrum antibiotics (strong recommendation, moderate quality of evidence). Rapidly administer 30ml/kg crystalloid for hypotension or lactate ≥ 4mmol/L (strong recommendation, low quality of evidence). Apply vasopressors if patient is hypotensive during or after fluid resuscitation to maintain MAP ≥ 65mm Hg (strong recommendation, moderate quality of evidence).

Appendix B: Table of Evidence

Author (Year)	Research design/Setting	Sample	Method	Findings that answer the question	Limitations	Level of evidence
Torsvik et al. (2016)	Pre-post-intervention Emergency Department	881 patients	Pre- and post-intervention study in one emergency and community hospital within the Mid-Norway Sepsis Study catchment area. All patients with confirmed bloodstream infection were registered on a continuous basis from 1994.	This research reported that early sepsis recognition by ward nurses might have reduced the progression of disease and improved survival for patients in hospital with sepsis.	One of the study's has important limitations such as the use of a historical pre-intervention group, which does not ensure comparison between pre-& post intervention and post-intervention groups. .	III
Gyang et al. (2015)	Medical record review Intermediate Care Unit	2143 screening tests were completed in 245 patients (169 surgical, 76 medical). ICD-9 codes confirmed sepsis incidence was 9%. Of the 39 patients who screened positive, 51% were positive for sepsis, and 49% screened positive for severe sepsis.	Retrospective Analysis of Completed Screening Forms	The researchers demonstrated that a simple screening tool for sepsis utilized as part of nursing assessment may be a useful to identify early sepsis in both medical and surgical patients in an intermediate care unit setting.	Limitations are that the study was conducted in one unit.	III
Mattison et al. (2016)	Medical record review Oncology	672 patients	Retrospective analysis was performed at a specialist oncology hospital in the Northwest of England	During the study period, 697 patients with suspected sepsis post chemotherapy were included in the study. Six hundred seventy-two (96.4 %) patients received their first dose of intravenous antibiotics within 60 min of presentation to the institution. Of this group, 323 (48.1 %) were administered antibiotics within 15 min of arrival. Of the 25 (3.6 %) patients who did not receive antibiotics within 1 h, root cause analysis revealed the reason in 23 (92 %) patients was an inability to ascertain intravenous access.	The study is limited because it was performed in a specialist tertiary oncology unit not an emergency department	IV

Author (Year)	Research design/Setting	Sample	Method	Findings that answer the question	Limitations	Level of evidence
				Nurse-led protocols can be used as an effective, safe method in achieving early intervention with antibiotic for patients with suspected febrile neutropenia. (sepsis)		
Romero et al. (2017)	postintervention Emergency Department	314 patients' medical Records	Descriptive analysis	The study established a statistically significant 230-minute reduction in time to antibiotics post implementation of the guidelines. The sepsis guidelines improved early assessment, recognition and management of patients presenting with sepsis in one tertiary referral emergency department.	The study was conducted in one urban Australian tertiary referral ED, and the results may not represent other EDs or those in different geographical settings.	III
Rhodes et al. (2016)	Expert Opinion	Assess the quality of 2012 SSC guidelines	The panel were group according to the following areas: hemodynamics, infection, adjunctive therapies, metabolic, and ventilation. Population, intervention, comparison, and outcomes (PICO) questions were reviewed and updated as needed, and the generation of evidence profiles	The Surviving Sepsis Guideline panel provided 93 statements on early management and resuscitation of patients with sepsis or septic shock. Overall, 32 were strong recommendations, 39 were weak recommendations, and 18 were best-practice statements. No recommendation was provided for four questions.	One in person meeting other by teleconference.	V
Nishida et al. (2018)	Expert Opinion	Adult patients with confirmed or suspected sepsis or septic shock.	Meta-analyses for 29 clinical sepsis questions and three large scales RCTs	The committee developed clinical practice guidelines for the Japanese healthcare clinicians	None noted	V
Rusconi et al. (2015)	Systemic review and meta-analysis based on EGDT to reduce mortality with in severe sepsis and septic shock.	Data from all trials were combined and analyzed using a random effects model.	Relevant primary studies were identified by searching the MEDLINE and EMBASE databases and the Cochrane Central Register of Controlled Clinical Trials to identify randomized controlled trials assessing the effectiveness of EGDT for sepsis.	The study did not permit a definitive conclusion of the utility of EGDT in severe sepsis and septic shock due to. variation in study outcomes.	None noted	I
Hayden et al. (2016)	Medical record review Emergency Department	238 patients' charts were analyzed in the study	Retrospective data comparison between the pre- and post-intervention group	The investigators concluded that the use of an EHR-based triage sepsis alert and SWAT protocol led to a major reduction	Fewer charts were analyzed in the pre intervention group	IV

Author (Year)	Research design/Setting	Sample	Method	Findings that answer the question	Limitations	Level of evidence
		with 108 charts in the pre-SWAT group, and 130 charts in the post-SWAT group. urban, teaching ED		in the time to intravenous fluids and time to antibiotics		
Freund et al. (2017)	Medical record review Emergency Department	Study conducted in a rural ED	Analysis of a chart review using a pre- and post-screening tool	The use of a screening tool led to a decrease in door to antibiotic time	There were two limitations. a) the study was conducted in a single ED. b) the study was conducted over a short time of three. months	IV
Leisman, (2019)	Medical record review Emergency Department and ICU	Done in nine hospitals over two years. To measure the prevalence of hospital-presenting sepsis (HPS) versus ED presenting sepsis (EDPS) patient cases and outcomes, presenting symptoms, and patient outcomes	Analysis of the hospital Sepsis Database, a prospectively, of a consecutive-sample cohort of all "severe sepsis" and septic shock patients treated at nine tertiary and community hospitals	The investigators found that hospital-presenting sepsis (HPS) patients had higher comorbidity and clinical presentations and had more significant mortality, LOS, and ICU utilization than emergency department-presenting sepsis (EDPS). The EDPS patients received antibiotics and fluids 1.62- 82 times more often than HPS patients.	The study did not differentiate between HPS patients admitted for noninfectious reasons and who became septic versus non-septic patients admitted for an infection who then became septic from that infection.	IV
Oliver (2018)	Medical record review Emergency Department	ED patients 18 years and older with suspected infection, and two or more systemic response	Pre and post interventional screening tool analysis	The analysis showed a decreased in door to antibiotic timing. The study data did not conclude there was a decreased in door to diagnosis, door to lactate measurement or increased in blood culture obtained before antibiotic administration.	The study was conducted in one hospital, and had a short time applying the screening tools.	IV
Patocka et al. (2014)	Medical record review Emergency Department	185 patients with severe sepsis or septic shock in the pre-triage tool group and	To determine the effect of a triage screening tool on time to antibiotics in patients with severe sepsis or septic shock presenting to the ED.	The implementing of the triage assessment tool result in decreased time to antibiotics by 21%. Sixty-four percent of the patients who qualified for the	Conducted at one site	IV

Author (Year)	Research design/Setting	Sample	Method	Findings that answer the question	Limitations	Level of evidence
		170 patients in the post-triage tool group		study were appropriately identified and triaged post implementation Although there was moderate adherence (64%), the implementing of a sepsis screening tool at triage have decreased the time from triage to antibiotic administration in patients presenting with suspected severe sepsis or septic shock		