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Evaluation of Automated Reminders to Reduce Sepsis Mortality Rates

Maria M. Lindo
Walden University

Walden University

College of Health Sciences

This is to certify that the doctoral study by

Maria Lindo

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

and that any and all revisions required by

the review committee have been made.

Review Committee

Dr. Mattie Burton, Committee Chairperson, Health Services Faculty

Dr. Oscar Lee, Committee Member, Health Services Faculty

Dr. David Sharp, University Reviewer, Health Services Faculty

Chief Academic Officer

Eric Riedel, Ph.D.

Walden University

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Abstract

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Maria Lindo

MSN/FNP, Walden University, 2014

BS, University of Texas Arlington, 2012

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

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Abstract

Sepsis is still a leading cause of death in the United States despite extensive research and modern advancement in technology. Early recognition of sepsis and timely management strategies are important for effective reduction of sepsis-related morbidity and mortality. Guided by the logic model, the purpose of this project was to evaluate the effectiveness of electronic reminders in enhancing clinical decision-making among 30 nurses in 3 medical-surgical units. The practice-focused question addressed the effectiveness of electronic reminders for early recognition and initiation of goal-directed treatment of sepsis in hospitalized patients on medical-surgical units in an effort to reduce sepsis mortality rates. Data were collected from a randomized convenience sample using a self-constructed questionnaire and through observation. The observations were aimed at assessing whether the nurses adhered to the sepsis protocol, while the questionnaire captured the participants' perceptions regarding the use of automated alerts measured on a 5-point Likert scale. Statistical analysis involved the use of frequencies and percentages, positive predictive value (PPV), and negative predictive value (NPV). The results indicated that all the nurses adhered to sepsis protocol. The sepsis-related mortality rate, mean response time, and rate of severe sepsis at the hospital were reduced by 17.2%, 14 minutes, and 11.1%, respectively. It was concluded that automatic alert systems improve nurses' ability to recognize early symptoms of sepsis and their ability to initiate Code Sepsis. However, replication of this study using a large sample size could provide findings that are more generalizable. Electronic reminders may promote positive social change because earlier recognition of sepsis by nurses may lead to a reduction of healthcare costs through improved management of sepsis patients in acute care settings.

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Dedication

I dedicate this capstone project to my very supportive husband, Brad, who has patiently encouraged me through these graduate studies. His understanding, continued devotion, and encouragement made this all possible. His reminder that hard work, dedication, perseverance, and determination are key secrets to success kept me through the rough times. Thanks to my dogs, Princess, Bo, Kadee, and Jay, who kept me on my daily exercise regimen.

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Section 1: Nature of the Project

Introduction

Sepsis is a medical condition that is characterized by systemic inflammation as a result of infection. The primary challenges associated with sepsis are early recognition of symptoms, early goal-directed treatment, and early management of the condition. According to Fisher (2014), the treatment of sepsis is resource intensive and time sensitive, and positive patient outcomes are dependent on early, aggressive intervention practices applied to restore sufficient perfusion of vital organs (Dellinger et al., 2013). Another challenge is that half of all patients admitted for sepsis are in need of admission into an intensive care unit (ICU; Martin, 2012). Costs are increased with admissions to ICU, and patients become more susceptible to decreases in function, which then increase costs for long-term acute care services.

Early diagnosis and treatment of sepsis can be effective in reducing its effects, rapid decline, and undesired outcomes. Schmidt and Mandel (2016) established that the early, time-sensitive administration of fluids along with antibiotics is the basis of management for patients with septic shock and severe sepsis. Initiation of supportive care is required to correct physiologic abnormalities, including hypotension and hypoxemia. There is also need to distinguish systemic inflammatory response syndrome (SIRS) from sepsis in order to treat and manage the infection early in an effort to prevent undesired outcomes. Automated reminders provide real-time alerts from changes in physiological measurements and laboratory data through programmed data retrieval founded on evidence-based practice guidelines. Real-time automated alerts assist in early recognition of symptoms, health care utilization, cost-effective care, reduced length of stay in the

intensive care unit, clinicians' decision-making processes, timely antibiotic therapy, decreased mortality rates, and improved outcomes. The Surviving Sepsis Campaign recommends consistent use of early goal-directed therapy for sepsis recognition and treatment (Leibovici, 2013).

The short-term implications of failure to identify sepsis early may include progressive organ failure, which can culminate in death. In this situation, the patient's quality of life is impaired, and the patient has increased risk for rapid degradation in cognition and functional capacity during the first year after survival from severe sepsis (Leibovici, 2013). Early recognition and management have significant long- and short-term implications. Patients who develop sepsis but are not diagnosed or treated early are at risk for increased systemic inflammation, abnormal blood clotting, organ damage, multiple organ failure, leaking blood vessels, and death from septic shock (Martin, 2012). Further short-and long-term implications include increased healthcare costs and increased length of stay in healthcare facilities. Long-term implications are numerous because sepsis causes deterioration in life expectancy, loss of function, and increased risk for exacerbation of underlying disorders (Leibovici, 2013). High healthcare costs result from cognitive impairment and physical disability, which are long-term sepsis implications (Iwashyna et al., 2010). Early identification results in improvement in social outcomes, cost reduction, healthcare utilization, and patient outcomes.

Problem Statement

Early identification and initiation of treatment for sepsis reduce mortality rates and improve patient outcomes in hospitalized patients. This evaluation provided a framework to improve patients' outcomes at the healthcare facility and in the community,

which would effect social change in recognition and treatment that would enhance outcomes. The sepsis mortality rate at the facility was 40.8%, which was above the national average. Electronic health reminders had been introduced 8 months prior to the time of the study, and hospital-wide education was provided to the nurses. This project was designed to evaluate the effectiveness of electronic reminders in early recognition and treatment of sepsis in an effort to reduce high mortality rates in this acute care setting.

Sepsis mortality rates are high because sepsis signs and symptoms are not recognized early for the initiation of goal-directed treatment, and this delay results in undesired outcomes for patients. Sepsis is potentially fatal to hospitalized patients because of the weakened immune system and the exaggerated response to this systemic infection (McClelland & Moxon, 2014). According to the Centers for Disease Control and Prevention (CDC, 2015), sepsis affects more than 750,000 hospitalized patients yearly and accounts for more than 24 billion dollars in costs, with more than 28% of hospitalized patients dying yearly from sepsis. Automated reminders are programmed to detect data trends and incorporate changes in physiological and laboratory data that are directly linked to sepsis, providing a support tool for clinicians in decision making.

Nurses are frontline caregivers and are ideally positioned to be the first to identify early signs and symptoms of sepsis. Increasing sepsis awareness and ensuring early treatment are vital to improvement in sepsis mortality rates, outcomes, and quality care initiatives. Sepsis is costly, produces undesired outcomes in hospitalized patients, and affects members of the community. In the acute care hospital setting, there are clinical decision support (CDS) tools to assist nurses with early recognition of sepsis through

automated reminders. Gaps in practice settings have been recognized, and the Global Sepsis Alliance and the Surviving Sepsis Campaign have formed partnerships to increase awareness and provide evidence-based guidelines for the recognition of early sepsis signs that will reduce mortality rates (McClelland & Moxon, 2014). Early identification of sepsis and translation of evidence to the practice setting are keys to the early initiation of treatment to reduce sepsis mortality rates (McClelland & Moxon, 2014). The electronic health record (EHR) utilizes evidence-based practice (EBP) guidelines in presenting physiological and laboratory data to assist clinicians in the decision-making process. Automated reminders are simple tools that are designed to compile data and patient-specific information based on best evidence for assessment, early identification, and evidence-based interventions to prevent progressive sepsis decline that leads to death (McCoy, Thomas, Krousel-Wood, & Sittig, 2014).

In the acute care setting, automated alerts are programmed to assist nurses as a clinical support tool. Effective EBP strategies are needed for extracting information that can be applied to the practice setting to assist the clinician in the decision-making process for early identification and robust initiation of interventions to prevent further decline. Barriers to effective use of automated alerts may be identified from individual, system, and organizational standpoints. Providing real-time alerts improves clinical decision making from synthesized data received from clinical decision support tools in the organization.

This doctoral project is significant to the field of nursing practice because the use of automated reminders in acute care settings can prevent the high rates of mortality and morbidity associated with sepsis. The success of the project will allow nurses to identify

and treat early signs and symptoms with antibiotic and standardized treatment plans, thus improving patients' outcomes (Senthil, Nachimuthu, & Haug, 2012). With regard to improved outcomes, the findings should show that automated reminders can be effective tools that can improve quality care, disease management, decision making, and timely interventions.

Purpose

The intent of this quality improvement project was to evaluate the effectiveness of electronic reminders for early sepsis recognition in a current healthcare setting to assist in the clinical decision-making process on 3 medical-surgical units in an acute care community hospital. Early recognition of sepsis and initiation of its treatment reduces mortality rates and improves outcomes in hospitalized patients.

The question for this capstone project was the following: What is the effectiveness of electronic reminders for early recognition and initiation of goal-directed treatment of sepsis in hospitalized patients on medical-surgical units in an effort to reduce sepsis mortality rates?

The study was guided by the following practice-focused specific questions:

- Can early recognition and treatment of sepsis reduce mortality rates and outcomes in hospitalized patients? To answer this question, I compared data on mortality rates prior to the use of automated reminders and after the initiation of automated reminders.
- How can new practice strategies improve health care quality? To answer this question, I evaluated how the use of automated reminders in the acute care setting provided alerts to clinicians and nurses to assist them in deciding

whether a patient requires immediate attention, can wait to be assessed, or can be checked at a later time (tiered responses).

- How effective are automated reminders in sepsis recognition? To answer this question, I quantified the time in minutes between the first recognition of sepsis in patients with the use of methods of usual practice (no automated reminders) and with the use of automated reminders.

By answering the practice-focused questions, I sought to show how automated reminders can be used to enhance sepsis recognition and can significantly influence patients' outcomes through the identification of early signs and symptoms of sepsis. For the nursing profession, early recognition and treatment would affect outcomes and mortality rates. This project has the potential to address gaps in practice where sepsis bundles or automated reminders are not in place to assist clinicians in early recognition.

Nurses in medical-surgical units are assigned an average of five patients in an acute care setting and may not be aware of real-time changes at the point of care. With a workload of five patients, a nurse may not be able to note physiologic and laboratory changes in a timely manner, thus delaying care, which can lead to increased morbidity and mortality rates. This delay in treatment increases the risk for undesired outcomes. A key factor in survival of sepsis is early recognition and initiation of treatment, which remain outstanding challenges for some organizations. There are identified gaps in the management of sepsis, in that not all facilities have adopted early warning scores that can assist the clinician in identifying high-risk patients. Protocols that are not updated can result in delayed care and long-term complications resulting from sepsis. These complications place an increased burden on the already fragmented and burdened

healthcare system in the United States. Hospitalized patients are at increased risk for sepsis, and unless bedside nurses are equipped with resources to recognize and initiate early treatment, sepsis mortality rates will be high. The pathway for management of early sepsis can be improved through early recognition of symptoms and early treatment. Sepsis places a strain on healthcare resources at the organizational level and at the national level, with increased resources and expenditures needed for continued treatment, increased length of stay, and undesired outcomes.

Nature of the Doctoral Project

Evidence for the doctoral project was sourced from credible websites and the library at Walden University. Government websites, regulatory organizations, primary sources, secondary sources, Cochrane reviews, CINAHL, PubMed, OVID, EMBASE, Medline, bibliographic databases, professional journals, and nursing organization websites were also used. References were obtained from peer-reviewed scholarly articles written within the last 5 years.

Strategies for obtaining evidence to complete this project included the use of direct observation, administration of questionnaires, literature review, and data synthesis to evaluate the system in place and the nurses' use of the CDS tool. Data were not collected or analyzed prior to the approval of the project by the Institutional Review Board (IRB).

Evidence from the findings was used to determine the effectiveness of automated reminders in prompting early sepsis recognition and early goal-directed treatment to improve patient outcomes. In addition to enhancing a healthy community, the outcomes would be beneficial to the nursing profession because they may be used in enhancing

policy change, leadership involvement, and measurement of quality outcomes. The gaps in practice involve lack of recognition of early symptoms of sepsis, which delays the use of early treatment options and thus directly impacts outcomes. Utilization of CDS tools and automated reminders in the acute care setting could be addressed by evaluating the effectiveness of automated reminders as a clinical support tool for clinicians.

The purpose of this project was to evaluate processes and programs in place to determine the effectiveness of electronic reminders in assisting the nurse in identifying early sepsis signs and initiating protocol-driven plans of care to reduce sepsis mortality rates. The goal of the project was to evaluate awareness among acute care nurses and to note how electronic reminders serve as a guide in recognizing early sepsis signs in an effort to reduce mortality rates.

Significance

The primary stakeholders that had interest in and could influence the outcomes of the project were patients in acute care, nurses, administrators, the state and federal government, the hospital, and family members. Resources, expenditures, and healthcare utilization directly affect stakeholders within and outside an organization. Increasing awareness of the implications of suboptimal identification and treatment of sepsis affects nursing staff, administrators at the hospital, federal funding, value-based purchasing power, meaningful-use initiatives, and patient outcomes. There are monetary implications at stake at the organizational level if mortality rates are high or if length of stay increases. Institutional leadership is impacted because outcomes are reflected in satisfaction scores, which are publicly reported and thereby have a direct impact on reimbursements from

major payers such as Medicare and Medicaid. Education and validation on the consistency of stakeholders at the bedside are essential for sustainability.

Early recognition and time-sensitive interventions and treatment of sepsis by bedside nurses can improve the health of patients and patient outcomes. Increasing awareness not only in healthcare providers, but also in patients and families of the signs and symptoms of sepsis would allow for improved outcomes in society. Quality of life and social independence are greatly impacted by early sepsis recognition, and ensuring that CDS are used effectively would impact nurses' response to and management of sepsis and patient outcomes. The hospital would reduce the number of deaths related to sepsis, and patients' admission to the intensive care unit would decrease with earlier sepsis recognition and treatment in hospitalized patients. Greater awareness of the effectiveness of electronic recognition of sepsis can promote the management of sepsis to prevent septic shock and severe shock. Early goal-directed therapy after early identification would reduce mortality rates, improve patient outcomes, and increase patient satisfaction. Patient safety is of major concern because it is the inherent mission of the organization, and the ethical obligation of the clinician, to provide efficient care in order to improve outcomes and provide safe care for patients.

Change in the practice setting would result in improvement in the quality of care, patient outcomes, and the perception of quality of care of the organization, and it would increase incentive payments to the organization. Improved early care would affect the social environment in terms of cost-effectiveness as well as improved quality outcomes. In the organization, the effective and efficient utilization of automated reminders would improve the outcomes of hospitalized patients because early recognition of sepsis would

reduce the resources used in the acute care setting and would reduce length of stay in the hospital. Healthcare providers and practitioners may find the results of this study applicable to the management of early sepsis recognition and the evaluation of the effectiveness of CDS tools within their organization. The cost of hospitalization, the length of stays and, patient outcomes would be significantly improved with early sepsis recognition and early goal-directed treatment.

This project has various potential implications for social change in practice. Each year, sepsis is reported to cost the United States approximately $17 billion (Hooper et al., 2012). In addition to sepsis being costly, patients diagnosed with sepsis require intensive care unit management (ICUM). Twenty percent of all ICU admissions are associated with other infections, which make treatment of sepsis complex. The findings may thus be used to note the effectiveness of automated reminders paired with goal-directed treatment to improve patient outcomes by recognizing early signs of sepsis and initiating goal-directed treatment in an effort to reduce mortality rates. Transferring knowledge from evidence-based practice to the practice setting is a means of quality improvement in workflow processes that can improve patient outcomes. Quality and safety outcomes would be improved with early sepsis recognition and treatment. Nurses have the ability to improve outcomes and to initiate early goal-directed therapy when sepsis is recognized early.

Sepsis negatively impacts society through increased costs associated with treatment, healthcare utilization, and post sepsis syndromes. Early sepsis recognition would reduce readmission rates, which are costly to insurance companies and hospitals and place the patient at increased risk for infections. The aging population is a risk factor for sepsis in hospitalized patients, and if sepsis is not recognized early, it places an

increased burden on society to care for those with this condition. An aging society, increases in chronic diseases, readmissions to hospitals, increased healthcare cost, and increased drug-resistant bacteria are factors that create the need for social change initiatives to drive early sepsis recognition and treatment.

Summary

Sepsis is prevalent in acute-care hospital settings. The use of automated or electronic systems to recognize sepsis at early stages through the use of real-time physiological data can be an effective method to enhance positive outcomes for patients, for the organization, and for the society. Sepsis recognition is enhanced through the use of programmed, evidence-based, specific guidelines that are incorporated into CDS tools and systems that trigger automated alerts for early sepsis recognition. The patient-specific information is filtered and presented in real-time data that assist the healthcare provider in recognizing signs and symptoms of sepsis early and providing early goal-directed treatment in an effort to improve patient outcomes. Through this project, I sought to evaluate the effectiveness of automated reminders for early sepsis recognition and early goal-directed therapy in an effort to reduce sepsis mortality rates in hospitalized patients. When sepsis is identified at an early stage, early intervention and treatment are encouraged, which minimizes sepsis mortality rates. Section 2 presents the background and context of the project; applicable concepts, models, and theories; the project's relevance to nursing practice; the local background and context for the project; my role in the project; and the role of the project team (Walden University, 2015).

Section 2: Background and Context

Introduction

In this acute care setting, the chief nursing officer identified sepsis as a health issue that needs to be evaluated because sepsis mortality rates are high. Recent hospital-wide mandatory training and education of nurses was completed in compliance with Surviving Sepsis Campaign recommendations, and a sepsis coordinator was hired. Automated alerts were introduced, and dashboards were placed strategically on each unit for visual screens on changes based on early warning scores, physiological measurements, and laboratory data. Early identification and initiation of treatment for sepsis through the use of automated reminders can minimize mortality rates and improve patient outcomes in hospitalized patients, given that sepsis can progress rapidly (Hooper et al., 2012). At this facility, many improvement initiatives have been implemented within the past year, and it is essential to evaluate the effectiveness of these initiatives.

The purpose of the doctoral project was to evaluate a current healthcare practice that involved the use of automated reminders to assist in the clinical decision-making process on 3 medical surgical units in an acute care community hospital setting. The general practice-focused question to be answered was the following: What is the effectiveness of electronic reminders for early recognition and initiation of goal-directed treatment of sepsis in hospitalized patients on medical surgical units in an effort to reduce sepsis mortality rates?

The study was guided by the following practice-focused specific questions:

- Can early recognition and treatment of sepsis reduce mortality rates and outcomes in hospitalized patients?

- How can new practice strategies improve health care quality?
- How effective are automated reminders in sepsis recognition?

In this section, I present relevant concepts, models, and theories; address the project's relevance to nursing practice; describe the local background and context; address my role as a DNP student; and describe the role of the project team.

Concepts, Models, and Theories

The program logic model is the most appropriate model to address the effectiveness of automated reminders for early sepsis recognition and goal-directed therapy in an effort to reduce mortality rates in hospitalized patients. I evaluated resources, interventions, and outcomes that would contribute to and reflect the intended outcome. The program logic model assisted in effectively evaluating the feasibility of automated reminders in the practice setting with regard to early detection of sepsis. Primarily, the logic model provides a visual map or graphic illustration of how an intervention (automated reminders) produces the desired outcome of reducing mortality rates through early identification and initiation of treatment (Agency for Healthcare Research and Quality [AHRQ], 2015).

In the practice setting, the relationships among the inputs and resources available were assessed in order to assist me in identifying the impact on the effectiveness of the intervention and the desired outcome (AHRQ, 2015). The model can be used at all stages in the evaluation process to identify the inter relationship among the intervention and the environmental components and to recognize the influence of external and internal factors that can affect outcomes, and it serves as a guide for evaluating programs (AHRQ, 2015). In the practice setting, micro, meso, and macro components can affect the effectiveness

of processes, projects, or programs and need to be addressed in identifying the contribution to the overall effectiveness of the intervention. According to the University of Kansas (2016), the logic model is useful in addressing new or already existing programs and initiatives for planning or evaluating as noted in Figure 1.

Situation

High sepsis mortality rate (28%)

Inputs	Outputs		Outcomes—Impact		
	Activities	Participation	Short	Medium	Long
▪ Time ▪ Finances ▪ Research Base ▪ Technology ▪ Partners ▪ Stakeholders	▪ Meetings, workshops, and seminars. ▪ Training and educating nurses ▪ Assessing the effectiveness of the project ▪ Dissemination of outcomes	▪ Stakeholders ▪ The community ▪ Nurses ▪ Management of the facility	▪ Early sepsis recognition and early goal-directed treatment ▪ Reduce the resources used in acute care ▪ Reduce hospital length of stay ▪ Improve management of sepsis	Increase patient satisfaction	▪ Provision of efficient care ▪ Reduce mortality rates ▪ Improve patient outcomes ▪ Reduce number of patients with sepsis and septic shock ▪ Reduce costs and resources used in acute care

Assumptions

- Resources needed are available, and the facility will adopt automated reminders
- Partners and the facility will help to initiate the process

External Factors

- Continuation of funding for the project
- No hurdles to divert resources and time
- Approval from the facility and nurses

Figure 1: Conceptual framework.

Definition of Terms

Severe sepsis: This is sepsis that has progressed to organ function as a result of insufficient blood flow. The characteristics of insufficient blood flow are evident in low blood pressure, low urine output, or high blood lactate. When sepsis does not improve as a result of low blood pressure, the patient undergoes septic shock (Gauer, 2013).

Automated reminders: *Automation* is the use of information technologies (ITs) and control systems to minimize time spent on a task in order to increase efficiency and effectiveness. Automated reminders are systems that are used in healthcare settings to ensure that nurses pay attention to the protocols or processes that need to be in place to ensure that the patient does not have an undesired outcome (Parke et al., 2015).

Clinical decision support (CDS): CDS entails a number of tools to improve decision making in clinical workflow (HealthIT, 2013). The system tools consist of computerized alerts and reminders to healthcare providers, documentation templates, focused patient data summaries and reports, condition-specific order sets, clinical guidelines, diagnostic support, and significant reference information. Clinical decision support provides different stakeholders with person-specific information and knowledge, intelligently presented at suitable times, to improve the quality of health care.

Relevance to Nursing Practice

Sepsis is costly and has been identified as one of the reasons for hospitalization and extended length of stay in hospitals (CDC, 2015). The United States is spending more than $20.3 billion on hospital care, and patients with sepsis are reported to stay 75% longer than other inpatients (CDC, 2015). Patients who have sepsis are most likely to be discharged to a facility after hospitalization and are at increased risk for readmission,

which costs approximately $2 billion annually. Many quality improvement projects have noted that early identification of sepsis and treatment would stop progressive deterioration from sepsis to severe sepsis and to septic shock, which then increases the risk of mortality (Sepsis Alliance, 2013). Sepsis costs accounted for 6.9% of Medicare costs in 2011 (Sepsis Alliance, 2015). According to the AHRQ (2016), if sepsis were identified early and evidence-based treatment were administered, there would be 92,000 fewer deaths annually, 1.25 million fewer hospital days annually, and reductions in hospital expenditures of over $1.5 billion. Patients with sepsis have a high risk for mortality, and it remains the primary cause of death from infection in hospitalized patients in the United States.

Current State of Nursing Practice

Schmidt and Mandel (2016) noted that there is a measure of severity that ranges from sepsis to severe sepsis and finally to septic shock. Statistics indicate that 1,665,000 cases of sepsis are reported in the United States each year, with a mortality rate of up to 50% (Schmidt & Mandel, 2016). Even after patients receive optimal treatment, mortality resulting from severe sepsis or septic shock is estimated to be 40%, and it can exceed 50 %among highly affected patients. Sepsis has a prevalence level of three cases per 1,000 persons (Gauer, 2013). Advances in both pharmacotherapy and supportive care have enhanced survival rates among the affected population. In spite of supportive care given to patients, mortality rates have remained between 25 %and 30% for severe sepsis, and for septic shock, the mortality rate is approximately 40 %to 70% (Gauer, 2013; Schmidt & Mandel, 2016). Sepsis accounts for 20% of all in-hospital deaths each year (210,000),

and this is equivalent to the number of yearly deaths linked with acute myocardial infarction (Gauer, 2013).

The signs and symptoms linked with sepsis are highly variable. Gauer (2013) pointed out that even though localized symptoms may be present, shock or organ hypoperfusion can be evident without clear cause. Early manifestations can be noted in physiological data and certain laboratory values that are important in early recognition. To effectively diagnose sepsis, physicians are required to acquire historical, laboratory, and clinical findings suggestive of infection together with organ dysfunction. Schmidt and Mandel (2016) established that the most common site of sepsis is the respiratory system, but for older patients (older than 65 years), the genitourinary tract is the susceptible site for infection. A requirement for timely initiation of early goal-directed therapy requires early recognition of sepsis. Early recognition supported by a rapid treatment of patients with sepsis is crucial to mitigating the advancement of organ dysfunction, preventing the development of sepsis to septic shock, and maximizing desired patient outcomes (Mayr, Yende & Angus, 2014). Nurses can effectively use automated reminders incorporated into electronic health care systems to enable early recognition of sepsis in acute care hospital settings.

Early provider recognition and treatment can be challenging on medical surgical units, with nurses being assigned 4-5 patients each and not being able to keep up with subtle changes that can progress rapidly. With advances in technology and intensive patient-centered care, evidence-based guidelines have been initiated to improve patient outcomes. Advancements in pharmacotherapy and supportive care have increased survival rates, although sepsis mortality rates are still high even with optimal treatment.

A goal-directed therapy protocol can be an effective tool in reducing mortality rates among hospitalized patients.

Strategies and Standard Practices

Early recognition of sepsis is crucial because it allows the clinician to initiate early goal-directed therapy to prevent rapid decline to severe sepsis and septic shock. The implementation of a sepsis protocol in hospitals can facilitate the management of patients with severe sepsis and septic shock, hence reducing mortality rates (Tazbir, 2012). Such management is vital in promoting intervention and reducing death rates from sepsis. According to Fisher (2014), patients who received early, protocol-driven care had more than 1.5 times more positive results than those who were given provider-driven care (Nguyen et al., 2012). Protocol-driven care is also linked with decreased time used to diagnose and offer therapeutic interventions. Fisher (2014) demonstrated that when a sepsis protocol was implemented, the outcomes indicated significant reduction in times to blood culture collection and transfer to the ICU (p = .011, 85 minutes). In the same way, Cannon et al. (2013) established that in comparison to patients treated for sepsis before the implementation of a protocol, those attended to after the evidence-based protocol was implemented were more likely to receive an intravenous fluid challenge.

Yu, Chi, Wang, and Liu (2016) conducted a meta-analysis of randomized controlled trials to determine the effect of early goal-directed therapy (EGDT) on mortality in patients admitted in intensive unit with severe sepsis or septic shock. Overall, studies that included EGDT showed a slight decline of mortality rates within 28, 60, and 90 days (Yu et al., 2016). Although the studies reviewed did not show a survival benefit

of EGDT among patients with sepsis, these implemented protocols were significant as effective intervention strategies.

Wira et al. (2013) carried out a meta-analysis of protocol driven goal-directed hemodynamic optimization based on previous studies on severe sepsis and septic shock management in the ED using primary outcome data in comparison to in-hospital mortality. There is evidence that when hospitals implement early protocol-driven hemodynamic optimization in the ED for patients with sepsis, mortality rates are reduced. The ED protocols are essential in the identification of patients with severe sepsis, and when implemented, they help to realize resuscitative endpoints (Wira et al., 2013). Further studies are necessary to establish which treatment components should be incorporated into a protocol-driven pathway in an effort to show how interventions in the ED setting can be effective.

Research undertaken by Sivayoham et al. (2012) aimed at determining the outcomes of patients diagnosed with sepsis, severe sepsis, or septic shock. The study was carried out on patients who received and did not receive EGDT in the ED. The variables considered were in-hospital mortality rate and increased length of stay in hospital, both in the ICU and on the medical surgical units. The inclusion criteria for the participants included patients who met the SIRS criteria. The patients were admitted in the ICU after meeting the EGDT criteria as well as the SIRS criteria. According to the findings, 174 patients with sepsis satisfactorily met the EGDT criteria, while 90 of them were given EGDT initiated in the ED. According to Sivayoham et al. (2012), the mortality rate was 22.7 % in comparison with 42.9 % for the non-EGDT group. However, there was no statistically significant difference in the length of in-hospital stay, although this was

evident in the ICU stay. In their conclusion, it was noted that when EGDT was initiated in the ED for patients with severe sepsis, there was a noteworthy decline in length of stay in the ICU and in-hospital mortality rates.

Andrews et al. (2014) carried out research to assess the efficacy of a goal-directed sepsis treatment protocol to reduce mortality among patients with severe sepsis in EDs, medical wards, and intensive care units in Zambia. The design applied was a single-center non blinded randomized controlled trial used among 112 patients diagnosed with SIRS and severe sepsis. A simplified Severe Sepsis Protocol that involved up to 4 liters of IV fluids within 6 hours paired with jugular venous pressure assessments was applied. Overall, 62.4 % (68 patients) died before they were discharged. Andrews et al. concluded that in-hospital mortality was not significantly different between the two groups. In addition, 53 patients who were part of the intervention group died in hospital, compared with 34 of 56 in the control group. The study was terminated early because of high mortality rates, especially among patients diagnosed with hypoxemic respiratory failure in comparison with the control group. An evaluation was conducted on the effectiveness of a sepsis education program and clinical outcomes that were associated with the implementation of clinical guidelines in a 350-bed community based teaching hospital (Nguyen, Schiavoni, Scott, & Tanios, 2012).

The researchers retrospectively reviewed medical charts of patients who had been identified upon admission to the emergency department who met the criteria for severe sepsis or septic shock (Nguyen et al., 2012). Clinical outcomes were assessed during two time periods, and the outcomes were noted before and after the implementation of the guidelines. The ANOVA, Fisher's exact test, v2 test with Yates, and two-sided statistical

testing were used for statistical analysis (Nguyen et al., 2012). Continuous and independent variables were compared, and analysis was conducted on highly skewed data. The results showed significant positive outcomes when early resuscitation was implemented. Those who received early resuscitation had a *p* value of 0.006, and those who received resuscitation at 6 hours had a p value of 0.013 (Nguyen et al., 2012).

Local Background and Context

The topic of the project was examined based on the need to improve the quality of patients' outcome in the health care facility. The chief nursing officer identified sepsis as a quality issue in the facility that required evaluation because sepsis mortality rates were high. Nonetheless, after establishing the high levels of mortality rates, initiatives that included mandatory hospital wide training, the hiring of a new sepsis coordinator, and unit based dashboards with visual representations of graphical data on changes for each patient, there were no significant changes. Subsequently, implementation of automated reminders was carried out with the desire to note early warning signs and a significant decrease in sepsis mortality rates from 40.8%.

At the institutional level, the facility had experienced increase in deaths from sepsis. The progressive decline from sepsis to severe sepsis and septic shock can be rapid and early recognition of sepsis is essential to survival and to outcomes. An aging population, infections from chronic diseases, hospitalizations, readmissions, age, immunosuppression, and continued use of immunosuppressive agents placed hospitalized patients at increased risk for sepsis. In spite of the limited studies on the risk factors for organ dysfunction, current findings have indicated that preexisting organ function during the intervention process, underlying health status, patient's genetic composition, and

causative organism are the primary causes of sepsis in hospitalized patients (Martin, 2012). With reference to the incidence of severe sepsis, factors like ethnic groups, race, sex, and age influence sepsis occurrence. Elderly persons and infants are prone to sepsis compared to population in other age groups (Angus & van der Poll, 2013). The incidence is also higher among males in comparison to females and considerably common among blacks than in whites (Martin, 2013).

The need for this project was also driven by current statistics that over 240,000 patients with sepsis succumb to death annually (Gaieski et al., 2013). The implication is that about one patient admitted with sepsis dies every 2 minutes. Therefore, sepsis has far-reaching effects not only to the patient but also to the community, the state and the nation since the outcome if not recognized early far exceeds the desire to provide safe and effective care. Early recognition of symptoms is essential for reducing mortality rates. Sepsis is a public health issue that needs to be addressed especially in this aging population, increase in chronic diseases, antibiotic resistance, and the increased focus on quality improvement, and outcomes. Early recognition is important for the initiation of goal-directed therapy to prevent progressive decline to severe sepsis, septic shock, and death (Tazbir, 2012). There are limited studies on whether EGDT increases the length of hospital stays compared to usual routine care. However, Chelkeba et al. (2015) evaluated the effects of EGDT on mortality in septic shock and severe sepsis patients, and established that EGDT significantly reduced mortality. In addition, the mortality rates were significantly reduced in low to middle economic income countries in comparison to higher income countries. Patients who received EGDT while in emergency department had longer length of hospital stay when they were compared to those under the usual

care. Early recognition and timely goal directed therapy for sepsis are practical approaches to optimizing hemodynamically unstable patients in an effort to prevent progressive decline leading to death.

The primary goal of an automated, real time electronic medical record is to provide health care providers, especially physicians and nurses in acute units with symptoms of the infection in order to initiate immediate diagnosis and initiate goal directed treatment. Nelson et al. (2012) hypothesized that the rates and timeliness of sampling of blood elements would be increased when the tool is used. The system's algorithm provided a 54% positive predictive value with a media of 152 minutes in accumulating SIRS and blood pressure criteria. Once the tool was implemented, 2 interventions were carried out, however, the strategy failed to detect severely septic cases before caregivers. Stage 2 of Medicare's meaningful use (MU) initiatives requires that hospitals meaningfully use electronic health records to improve population health and health outcomes through direct use to measuring and monitoring based on advanced processes (CDC, 2015). Implementing clinical decision support at the point of care is essential to timely interventions and quality measures (Health Management and Information Systems [HIMSS], 2015).

Role of the DNP Student

As a DNP scholar practitioner I have a responsibility to evaluate organizational and systems leaderships in order to improve healthcare and patient outcome. Through the application of skills and knowledge related to the nursing profession, I will promote excellence in practice and improvement quality. I played an integral role in sourcing and synthesizing evidence in an effort to improve patient outcomes. As an active and

visionary Advanced Practice Provider, a leader, and a Nurse Practitioner, it is my professional duty to be a social change agent in an effort to effect and ensure changes for improved population health. I am empowered to make a difference in translating evidence to the practice setting in an effort to enact changes that are congruent with evidence based practices (American Association of Colleges of Nursing (AACN), 2006). As a practice focused terminal degreed professional, it is an essential part of my duty to expand scientific knowledge through dissemination, initiation, planning, or evaluating processes that will improve patient outcomes. I am motivated and driven by my personal and professional need to improve patients' outcomes, by being part of a study that sought to evaluate the effectiveness of automated reminders for early recognition of sepsis. I have worked at this acute hospital for2 years and had roles as a charge nurse, nurse manager, clinical specialist, nurse practitioner, and a director. My personal and professional goals are aligned with the facility's mission and values. I have been recognized with nurse excellence awards and also was nominated for the Texas Nurses Association award. In addition, professional rapport had been established with the staff, the leaders, and the community.

I consulted with the chief nursing officer and she identified sepsis as a quality issue that needed to be evaluated. As a valued employee in this organization, it is essential for me to ensure that programs and processes are evaluated to note effectiveness of interventions in an effort to maintain the pathway of excellence that has been established in this organization. Through this project, I was able to provide feedback to key stakeholders and the findings affords us to either modify, revise, revamp, review processes, or procedures in ensuring that objectives for automated reminders are met for

early recognition of sepsis and early initiation of goal directed therapy.

I have direct contact with the nurses in a different role in the hospital and professional relationships were already established. Such closeness can result in sampling bias. To prevent this, nursing leaders were used to introduce the intent of the study and also the direct collection of data was clearly outlined in a neutral setting at huddles and staff meetings. In addition, when personal assistance was required, I ensured that it was professionally provided. I also evaluated the times when screens would be completed and if there were opportunities to override alerts. Nurse's compliance on completing assessments after an alert was triggered was also assessed. Alert fatigue was examined and strengths, opportunities, weaknesses, barriers, and threats were identified to note micro or macro systems that could affect effectiveness or efficiency of this process. The timeliness of the intervention measures and administration of antibiotics were evaluated since these can have a direct impact on outcomes.

Role of the Project Team

A project team is comprised of a number of stakeholders, including experts in different areas of the field of nursing. Nurses with expertise in sepsis were observed to determine if all aspects related to sepsis, including reduction of stay in the 3 medical surgical units were reduced. The project team was also a part of the evaluation team to determine the effectiveness of best practices, and the use of EBP to reduce mortality rates. The project teams comprised of the sepsis coordinator and the preceptor who is the director of quality, and with whom I worked closely during this project. Working closely with the sepsis coordinator, leaders, and the preceptor proved beneficial to finding information and resource utilization for this project.

Summary

This section focused on the review of available literature relating to the topic of the project, concepts, models, relevance to nursing practice, background, and context, and the role of the student. Hospitalized patients are at increased risk for developing sepsis and automated reminders with real time alerts are designed to help with early recognition of sepsis symptoms in an effort to provide early goal directed treatment to reduce sepsis mortality rates. Sepsis is a systematic inflammatory infection that is complex and is associated with high mortality rates not only in hospitals, but in the community, and also at the national level. There is consensus from the reviewed studies that early goal directed therapy after early identification reduces mortality rates, improves patient outcomes, and increases patient satisfaction. Early identification and treatment affects the social outcome of the patient and also reduces sepsis mortality rates in the community and in the country. EGDT reduces length of stay, days in the intensive care unit, minimizes costs as well as death rates at the individual, community, and national level.

Gaps in practice settings include the untimely recognition of sepsis for early diagnosis, treatment, and interventions. Performance improvement**s** are directly linked to value based purchasing and incentives for hospital reporting systems. Most importantly performance improvement initiatives affect patients and their outcomes.

Automated real time reminders paired with EGDT can be effective in the detection of sepsis and promotion of goal directed treatment, hence, positively affecting the outcomes. The program logic model was suitable for this study because it shows the relationship between different elements and the subject under study. Section 3 highlights

the process used in the collection and analysis of evidence, practice focused questions, sources of evidence, and analysis and synthesis of findings (Walden University, 2016).

Section 3: Collection and Analysis of Evidence

Introduction

The purpose of the doctoral project was to evaluate a current healthcare practice that involved the use of automated reminders to assist in the clinical decision making process on three medical surgical units in an acute care community hospital setting. Early detection and recognition of sepsis among patients through the use of automated reminders are vital for early and timely goal-directed interventions and antibiotic administration in the hospital setting. Automated reminders have been designed to improve efficiency, assist clinicians in the decision-making process, achieve cost reduction, improve throughput, improve performance, and obtain desired outcomes. At this community acute care hospital, it was essential to evaluate the effectiveness of automated reminders for early sepsis recognition in an effort to significantly reduce sepsis mortality rates and prevent progressive decline from sepsis to severe sepsis and septic shock. This section consists of the practice-focused questions, sources of evidence, analysis and synthesis of findings, and a summary.

Practice-Focused Questions

Three medical surgical units in this acute care community hospital setting were used for the evaluation of automated reminders because of high sepsis mortality rates, recent additions of dashboards, unit sepsis champions, and interventions, in an effort to improve outcomes. There have been studies released to note whether EGDT increases the length of hospital stay compared to usual, routine care. Recent articles on this topic include work by Gauer (2013) and McClelland and Moxon (2014). An evidence search

was used to establish whether automated reminders for EGDT play an important role in the lives of hospitalized patients.

The general practice-focused question answered: was the following: What is the effectiveness of electronic reminders for early recognition and initiation of goal-directed treatment of sepsis in hospitalized patients on medical surgical units in an effort to reduce sepsis mortality rates?

The study was guided by the following practice-focused specific questions:

- Can early recognition and treatment of sepsis reduce mortality rates and outcomes in hospitalized patients?
- Do automated reminders for sepsis identification enhance early sepsis recognition?
- Can early sepsis sign and symptom recognition and initiation of goal-directed treatment reduce mortality rates?

The evaluation of the effectiveness of automated reminders was crucial because it would help nurses to make effective clinical decisions related to patients who are at increased risk for sepsis and thus reduce the risk of progressive decline to severe sepsis or septic shock. As noted by Chelkeba et al. (2015), the use of EGDT reduces mortality rates among patients with severe sepsis and septic shock and reduces length of stay in the ICU, yet this can increase the length of stay in the hospital setting.

Sources of Evidence

To address the practice-focused questions, electronic and online databases, government websites, and nursing organization websites were used to obtain the required up-to-date evidence. Evidence was sought to support the use of automated reminders and

the use of EGDT to affect patient outcomes. Safeguarding patient outcomes improves quality of life, decreases the risk of post sepsis syndromes, and ultimately reduces the risk of mortality and morbidity secondary to sepsis in hospitalized patients. The application of the evidence-based findings was expected to minimize length of stay in the ICU, reduce risks of increased systemic infection, reduce length of stay in the hospital, reduce cost, improve hospital utilization, improve perception of care, improve timeliness of care, and improve outcomes.

The collection and analysis of the evidence would allow for the evaluation of the processes and programs in place to determine the effectiveness of electronic reminders in assisting the bedside nurse in identifying early sepsis signs and initiating protocol-driven plans of care to reduce sepsis mortality rates (Gauer, 2013). I assessed micro- and macro systems prior to receiving IRB approval; however, evidence from staff and the organization was not analyzed before approval by the IRB (Walden University, 2016).

Databases and Search Engines

The following electronic databases were searched: Cochrane Reviews, CINAHL, PubMed, OVID, EMBASE, Medline, Database of Abstracts of Reviews of Effectiveness (DARE), Cochrane Database of Systematic Reviews (CDSR), Cochrane Central Register of Controlled Trials (CCTR), and Google Scholar. Bibliographic databases and nursing organization websites were also used. Books and other credible sources were used as references to support the information provided. References used included peer-reviewed articles written within the last 5 years. Collection of data for analysis and synthesis provided me with evidence-based practice guidelines that had been researched or reviewed on this topic to support the findings and provided a framework for this project.

To address this practice-focused question, it was essential to use updated and credible data from professional and regulatory sources with findings on the effectiveness of early recognition of sepsis symptoms and early goal-directed therapy initiation for hospitalized patients.

Search Terms and Scope

The following search terms were used in seeking appropriate sources: *automated reminders*, *effectiveness of automated reminders and sepsis*, *management of sepsis in acute care*, *effectiveness of automated reminders for early sepsis recognition*, and *goal directed treatment to reduce sepsis mortality rates in hospitalized patients*. Sepsis affects social aspects of care, especially after post progressive stages of sepsis. Survivors of sepsis require not only rehabilitative care in other long-term facilities, but also additional care in the home environment. Sepsis places a strain on healthcare resource and utilization which provides a financial strain on systems, and the society, and increases patients' risk of morbidity and mortality.

After searching databases and identifying relevant sources, I reviewed bibliographies and reference lists of included studies to increase the scope and relevance of the search. The inclusion criteria comprised articles written in the English language and articles published from 2012 to 2016. All sources not written in English published within the same period were excluded.

Assessment of the Setting

A needs assessment was conducted to note the sepsis awareness of the sepsis coordinator, the leadership staff, and the frontline staff to identify strengths, weaknesses, opportunities, and threats to the project. Micro-, meso-, and macro systems that could

affect the effectiveness or the efficient use of automated reminders in this setting were identified. A retrospective and current analysis of automated clinical data was conducted to determine the effectiveness of automated reminders in sepsis recognition and early treatment (Nguyen et al., 2014). Nurses were randomly selected for this project based on their patients' risk of sepsis and modified electronic warning signs (MEWS), which are designed to inform the nurse of physiologic changes in the patient's condition. Nurses were also selected based on their willingness to participate in the study. Nonetheless, the findings could have been biased if the individuals under study had known that they were being evaluated in terms of how to use the new protocols and procedures. This limitation was eliminated by ensuring that when a set of participants was observed, they did not mix with the remaining set of participants.

Approval was sought from the IRB of Walden University. The hypothesized outcome was that automated real time reminders would help in early identification and treatment of sepsis, thus reducing sepsis mortality rates in the hospital setting. The plan was to retrospectively review 30 charts prior to the initiation of automated alerts and to compare times in responses and outcomes after the initiation of automated reminders, house-wide comprehensive education, installation of dashboards at each nurses' station, and use of a sepsis coordinator along with sepsis champions on each unit. The plan was to review 30 charts concurrently to note comparisons of timeliness of care, identification of symptoms, and outcomes. The available EMR system was used to collect comprehensive clinical and demographic information for all patients receiving supportive care for sepsis.

Participants

The research took place on three medical surgical units in an acute care hospital setting. I had been practicing in the setting for 2 years and had already established professional rapport with leaders and nurses within the organization. The hospital is a 288-bed facility, and the problem was identified in collaboration with the chief nursing officer in order to ensure quality improvement. The preceptor for this project had been a director of quality for over 15 years. I identified real-time data that were electronically tabulated to create automated reminders (temperature above 101, heart rate above and sustained at or above 90, increased respiratory rate, lab results, and decreased urine output).

Population

The population targeted by this project included randomly chosen nurses from three medical surgical units who had patients with automated reminders that were triggered because of the patients' real-time data that identified them as being at high risk for sepsis. There were 500 nurses employed at this urban, mid-sized community short-term acute care hospital. The number of nurses directly employed to work on the three medical surgical units in either full or part time status was 240. The intent was to use at least 25% of nurses as the sample for this project. A sample of 30 participants was used in the project to provide necessary data required for this study over the period of 12 months.

Randomized convenience sampling was chosen because I practiced at the health facility, had access to protocols on the medical surgical units, and had established professional rapport with unit leaders and was thus able to identify patients who were at

high risk for sepsis based on their modified early warning signs (MEWS) scores. This score was displayed at convenient, secured settings on a dashboard on each unit. Accessibility was a major consideration when recruiting and selecting the sample. A randomized convenience sampling technique was appropriate for the project because it was simple, cost effective, and less demanding with regard to time spent in selection and recruitment of participants (Saunders et al., 2007).

The nurses were made aware of the plans for the project at unit meetings on the 3 medical surgical units through an outline of the project's goals, voluntary participation, and methods that would be used to determine the patients' risk for sepsis. The nurses taking part in this study volunteered to be part of the project. The participants had to meet the following criteria to participate in the study: (a) be a registered nurse of the facility, (b) have been at the facility for over 1 year, and (c) be directly assigned to patients who were at increased risk for sepsis based on age, diagnosis, and immunocompromised status. These requirements were necessary to ensure that reliable and quality data that aligned with the scope of the project were collected. Nurses were chosen because they spent most of their time at the bedside of the patients with sepsis and had first-hand association. Bedside nurses were in a better position to provide the required data on automated reminders for early detection of sepsis to reduce length of stay or transfers to the ICU and death. Patient safety and quality of care are major concerns for healthcare providers, and frontline staff nurses play a key role in improving quality of care and outcomes through initiation of early treatment plans. Nurses also have a responsibility to improve patient safety and promote quality of care in nursing through research and quality measurement.

Procedures

After IRB approval of the proposal, structured close-ended questionnaires were used, and evidence from the organization was collected. A simple questionnaire was created and approved by the IRB. Observations on the units were conducted at different times and during different shifts to confirm that there was adherence to protocol. Adherence to the protocol helped to establish nurses' attitudes toward the implementation of automated reminders in the facility. Nurses at this facility are scheduled for 12-hour shifts from 7:00 to 7:00. Responses would have been different based on resources available at the facility at different times. Each participant was required to complete the questionnaire within 20 minutes. After completion, the questionnaires were collected, and I stored them securely in order to conduct data analysis. Unique identification codes were provided to each participant.

Questionnaires were chosen over interviews because the latter are associated with interviewer bias or fatigue as well as respondent bias, and can be time consuming (Creswell, 2014). The questionnaire was used for its intended purposes, thus promoting reliability of the collected data.

Protections

A professional relationship between me and the participants in the study was crucial to avoid any form of bias in the results. Therefore, the participants were informed of the reason for the project and the process to gain information. Professional nursing ethics and relationships were employed during the data collection process. Ethics were observed in the course of undertaking this project. Consent was obtained from the healthcare facility to conduct this DNP capstone project. Consent was also sought from

potential research participants prior to recruitment and selection (Felzmann, et al., 2010). The consent form included the objective of the project and the exact roles of the project respondents. In addition, the role of the participants and the anticipated risks and benefits of participating in the study were provided. Only participants who signed the consent form were recruited to be part of the data collection process (Hammersley & Traianou, 2012). Privacy, confidentiality, and anonymity were observed. Anonymity and privacy of the participants were guaranteed in the entire project by not sharing personal details. I observed the set professional guidelines for participants' protection. Additionally, no personal identification details were revealed during the data collection process, analysis, and publication of the results. The data were securely kept in my password-protected computer to enhance anonymity and privacy. Thus, I was the only one with access to the computer storing the data. All hard copies of the questionnaires were safely stored in a private room under lock and key. To avoid data loss, the information was also stored in my email, OneNote, and Google drive. The IRB is responsible for making sure that all Walden University research complies with the university's ethical standards and U.S. federal regulations. Walden IRB approval was sought prior to contacting participants and initiating the data collection process. The IRB completion is 2016.09.1920:04:27-05'00.'

Analysis and Synthesis

Data collected were compared to data on patients who had been diagnosed with sepsis prior to the initiation of automated reminders. Times from early physiologic changes to treatment were compared to times after the introduction of automated reminders. Outcomes and rates were also compared. Patient outcomes were analyzed based on the effectiveness and responsiveness of the nurses to the real-time automated

alerts. Alert override rates, alert fatigue, lack of awareness, provider non adherence rates, identification of the amount of false-positive alert rates, and rates of clinician responsiveness to alerts were evaluated.

To assess the effectiveness of automated reminders for sepsis recognition and goal directed treatment to reduce mortality rates for hospitalized patients, positive predictive value (PPV) of the sepsis alerts was calculated. The analysis was conducted using the Statistical Package for the Social Science (SPSS). Statistical analysis of patient data was carried out to determine sensitivity, PPV, specificity, and negative predictive value (NPV). Frequencies and percentages were used to assess the perceptions of the participants on the use of automated alert systems. Cross-tabulation of frequencies of sepsis diagnoses before and after implementation of the automated alerts was also conducted. High sensitivity and specificity would be indicative that automated reminders are effective and valid for early detection of sepsis among patients. The screening process included monitoring for SIRS, assessment for infection, and introduction of EGDT. Thus, after the analysis, the time frame of early presentation of symptoms of sepsis was determined, which was the main variable in determining the effectiveness of the automated reminders for early sepsis recognition. The findings of this study were presented in tables, charts, and graphs.

Summary

Evidence sourced from databases and other relevant sources was used to address the practice-focused questions. A sample of nursing participants was selected through convenience sampling from three medical surgical units based on patient assignments and the patients' risk for sepsis. Observation, publicly reported data and questionnaires were

used to note the adherence to the protocol-driven guidelines on how to respond to automated alerts for early identification and early goal-directed treatment of sepsis. The outcome expected was that real-time automated alerts would be effective in early recognition and treatment of sepsis, thus reducing sepsis mortality rates and adverse outcomes in hospitalized patients. Section 4 addresses findings and implications, recommendations, contributions of the doctoral project team, and strengths and limitations of the project (Walden University, 2016).

Section 4: Findings and Recommendations

Introduction

The local problem in this project involved the increased number of sepsis-related deaths at the practice site. The acute care facility had experienced a number of sepsis-related deaths that had necessitated the development of an evidence-based intervention to progressively reduce the deterioration of sepsis to severe sepsis and septic shock among hospitalized patients at the primary care facility. The aging population, increases in chronic diseases, the upsurge in major surgical procedures, the spread of antibiotic-resistant organisms, and prolonged use of immunosuppressive and chemotherapeutic agents increase the risk of sepsis among hospitalized patients (Sundar & Sires, 2013). The purpose of this DNP project was to address a gap in practice by evaluating the effectiveness of the use of electronic warning systems by nurses to identify early signs of sepsis and initiate goal-directed sepsis treatment in an acute care setting. Early identification of sepsis would result in decreased sepsis mortality rates and prevent rapid progression of sepsis to severe sepsis and then septic shock. Sepsis is costly and has been identified as one of the reasons for hospitalization, readmission, and extended length of stay in hospitals (CDC, 2015). The United States is spending more than $20.3 billion on hospital care, and patients with sepsis are reported to stay 75% longer than other inpatients (CDC, 2015).

The main objective of this DNP project was to evaluate the knowledge and awareness of sepsis among acute care nurses and to evaluate the effectiveness of automated reminders for early sepsis recognition. This DNP project was guided by the following practice-focused question: What is the effectiveness of electronic reminders for

early recognition and initiation of goal-directed treatment of sepsis in hospitalized patients on medical surgical units in an effort to reduce sepsis mortality rates? To address this practice-focused question, I gathered current research evidence from reliable online databases including PubMed, EMBASE, OVID, Medline, CINAHL, Cochrane, and other bibliographic, governmental, and organizational databases. For analysis purposes used primary data from 30 RNs, conducted observations, and administered questionnaires to RNs on 3 medical surgical units. Publicly reported sepsis data were also used as comparison for this study. The data were collected using two tools: a 20-item questionnaire t had a Likert scale ranging from *strongly disagree* to *strongly agree*. Statistical analysis was conducted using percentages and frequencies to assess the participants' perceptions regarding the use of automated alerts in sepsis management in acute care settings. The PPV, NPV, sensitivity, and specificity were also calculated to assess the predictive ability of the automated reminders.

Findings and Implications

Demographic Characteristics

This total quality improvement project involved a sample of 30 RNs at the healthcare facility. Among participating nurses, 97% (n = 29) were directly assigned to patients who were at increased risk of sepsis infection, and 3% (n =1) were not sure whether their patients were at risk of sepsis infection. In terms of age, 50% (n =15) of the participants were 40 years or older, while the rest of the participants were aged 30-40 years (20%), 26-29 years (20%), and 18-25 years (10%). With regard to gender, 90% (n =27) of the participants were female, 7% (n =2) were male, and 3% (n =1) indicated that they belonged to other genders. In terms of level of education, 7% (n =2) reported

college-level education, 83% (*n* = 25) reported a bachelor's degree, and 10% (*n* = 3) reported a graduate degree. In response to a question regarding experience, the largest group of participants (40%, *n* =12) indicated at least 5 years of experience, 17% (*n* =5) reported 1-20 months of experience, 30% (*n* =9) reported 1-3 years of experience, and 13% (*n* =4) reported 3-5 years of experience.

Summary of Findings

Table 1 provides a summary of the results from the respondents.

Table 1

Summary of Findings

Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
7-Adequate training	0	7	11	2	10
8-Weekly emails	5	6	6	6	7
9-Initiate Code Sepsis	0	0	0	13	17
10-MEWS co-relation	0	7	9	7	7
11-Automated reminders for early sepsis	0	0	6	12	12
12-Clinician alerts	0	0	0	11	19
13-Improves job performance	0	4	8	9	9
14-Assess immediately	0	5	10	7	8
15-Leadership	0	7	8	8	7
16-Mortality rates reduced	0	0	4	3	23
17-Dashboards	0	10	9	5	6
18-Early S/S	0	0	8	5	17
19-Early GDT improves outcomes	0	0	2	4	24
20-Real-time reminders and early goal tx.	0	0	0	9	21

As shown in Table 1, 37% (*n* =11), 7% (*n* =2), and 33% (*n* =10) of the participants indicated *neutral, agree,* and *strongly agree*, respectively, for the statement that they had received adequate training on sepsis. However, 23% (n =7) of the participants disagreed that they had received adequate training on sepsis. Based on Item 8, 17% (*n* =5), 20% (*n* =6), 20% (*n* =6), 20% (*n* =6), and 23% (*n* =7) of the participants strongly disagreed, disagreed, were neutral, agreed, and strongly agreed that they received weekly e-mailed updates on sepsis. Regarding Item 9 (initiation of sepsis codes), 57% (*n* =17) of the participants strongly agreed, while 43% (*n* =13) agreed that they understood how to initiate Code Sepsis. Based on the responses to Item 10, 20% (*n* =6) of the participants agreed, while 23% (*n* =7) strongly agreed that there is a relationship between MEWS scores and sepsis recognition. However, 27% (*n* =8) were not sure whether there is an association between MEWS scores and sepsis recognition. In addition, 30% (*n* =9) of the participants disagreed that there was a correlation between MEWS scores and sepsis recognition. Based on the responses, 23% (*n* =7) and 23% (*n* =7) of the participants agreed and strongly agreed, respectively, that there is a correlation between MEWS scores and sepsis recognition. However, 30% (*n* =9) of the participants were not sure, and 23% (*n* =7) disagreed that MEWS scores are correlated with sepsis recognition. Item 11 was meant to assess the participants' perceptions of the ability of automated reminders to improve early recognition of sepsis symptoms among hospitalized patients. Based on the responses, the percentages of participants who agreed and strongly agreed that automated alerts improved early sepsis recognition were 40% (*n* =12) and 40% (*n* =12), respectively. Only 20% (*n* =6) of the participants were still not sure whether automated reminders improved early sepsis recognition. Item 12 was

focused on the provision of sepsis alerts to clinicians by the automated reminders. As indicated in the Table 1, 37% (*n* =11) and 63% (*n* =19) of the participants agreed and strongly agreed, respectively, that automated reminders provide sepsis alerts to clinicians and nurses.

Item 13 was used to test the participants' perceptions regarding the effectiveness of automated reminders in improving job performance and patient outcomes. Based on the responses, 13% (*n* =4) of the participants disagreed, while 27% (*n* =8), 30% (*n* =9), and 30% (*n* =9) of the participants were neutral, agreed, and strongly agreed, respectively, that automated reminders improved job performance and enhanced patient outcomes. Item 15 was aimed at evaluating the participants' perceptions regarding the support provided by the leadership team to the nurses for assisting with sepsis when they were busy. The responses indicated that while 27% (*n* =8) of the participants were unsure, 23% (*n* =7) of the participants disagreed that they felt supported by the leadership when they assisted with sepsis responses when they were busy. However, 27% (*n* =8) and 23% (*n* =7) of the participants agreed and strongly agreed, respectively, that they felt support from the leadership when they assisted with sepsis symptoms despite being busy. Item 16 tested the participants' perceptions regarding the role of early recognition in reducing mortality rates and improving patient outcomes among hospitalized patients. Based on the responses, only 13% (*n* =7) of the participants were unsure of the impact of early sepsis recognition on patient outcomes and mortality of hospitalized patients. However, 10% (*n* =3) and 77% (*n* =23) of the participants agreed and strongly agreed, respectively, that early sepsis recognition improved patient outcomes and reduced the mortality rate of hospitalized patients.

Based on Item 17, 33% (*n* =10) of the participants disagreed that they checked on the dashboards frequently during their shifts to note any physiological changes in the patients. In addition, 17% (*n* =5) and 20% (*n* =6) of the participants agreed and strongly agreed, respectively, that they checked on the dashboards frequently during their shifts to identify any physiological changes in the patients. However, 30% (*n* =9) were uncertain regarding whether they frequently checked the dashboards for physiological changes during their shifts. Item 18 was aimed at assessing whether early sepsis recognition and initiation of goal-oriented treatment reduced mortality rates among hospitalized patients. The responses indicated that 17% (*n* =5) and 57% (*n* =17) agreed and strongly agreed, respectively, that early sepsis recognition and initiation of goal-directed treatment reduced mortality rates among hospitalized patients. However, 27% (*n* =8) of the participants were still uncertain regarding whether early sepsis recognition and initiation of goal-directed treatment reduces mortality rates among hospitalized patients. Item 19 was specifically targeted at assessing the participant's perceptions on whether early goal-directed therapy after recognition of sepsis improved health outcomes among hospitalized patients. Based on the responses, only 7% (*n* =2) of the participants were uncertain, while 13% (*n* =4) and 80% (*n* =24) of the participants agreed and strongly agreed, respectively, that early goal-directed therapy after sepsis recognition improved patient outcomes among hospitalized patients. Item 20 addressed the participants' perceptions regarding whether automated real-time reminders for sepsis promoted early goal directed treatment. The responses indicated that 30% (*n* =9) and 70% (*n* =21) of the participants agreed and strongly agreed, respectively, that automated real-time reminders for sepsis recognition promoted early goal-directed treatment among hospitalized patients.

Based on the participants' responses, the implementation of automated reminders in acute care provided real-time alerts to nurses, facilitated timely initiation of Code Sepsis, promoted early recognition of sepsis, led to initiation of goal-directed therapy, and improved health outcomes. Table 2 provides the results of the project based on the observation.

Table 2

Results Based on the Observation Protocol

Observation	Scale				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1-All participants in OP	0	0	0	0	30
2-Initiate Code Sepsis	0	0	0	3	27
3-Assesses immediately for alert	0	8	1	11	10
4-Dashboards	0	10	7	7	6
5-Adhered to protocol	0	8	1	11	10

Based on the observations, all participants (n =30) were involved in the sepsis observation process. As shown in Table 2, all the participants understood how to initiate and call a Code Sepsis. However, there was no continuous assessment of the patients because nurses also provided care for other patients in the acute care setting or were engaged in communication with other nurses and physicians. Based on the observations, the nurses did not check the dashboards frequently for physiological changes in the patients. For example, in one acute care unit, the dashboard was disconnected for over 2

days without the awareness of the nurses. Overall, the nurses adhered to protocol-driven guidelines for sepsis treatment and management.

After the introduction of the automated alerts, there was a decrease in the frequency of sepsis-related deaths at the acute care community hospital. Based on the observations, the mortality rate at the hospital was 40.8% before the introduction of the automated alert systems. The sepsis-related mortality rate after the introduction of the automated alerts was 22%. This indicates a 17.2% reduction in the mortality rate, thus signifying the effectiveness of the automated reminders in reducing mortality. The rate of severe sepsis reduced from 16.8% to 5.7% after the introduction of the automated alerts. This result suggests that the introduction of automated alerts facilitated timely initiation of Code Sepsis and goal-directed treatment, thus preventing the transition of sepsis symptoms into severe sepsis. The overrides of the alarms were 38.2%. In addition, the average length of stay of the participants was reduced from 14.26 to 6.4 days. Table 3 provides the maximum and minimum lengths of stay at the hospital before and after introduction of the automated alerts.

Table 3

Length of Stay

		Before automated alerts	After automated alerts
Length of stay	Minimum	12	5
	Maximum	38	16

As shown in Table 3, the minimum length of stay was reduced by 7 days after the introduction of the automated alerts. Additionally, the maximum length of stay at the hospital was reduced by 22 days. The response time from the initial detection of sepsis symptoms to the commencement of goal-directed treatment averaged 25 minutes. After the initiation of the automated alerts, the average response time was reduced to 11 minutes. Table 4 shows the maximum and minimum response times before and after the introduction of the automated alerts.

Table 4

Response Times

Response time	Before automated alerts	After automated alerts
Minimum	15	5
Maximum	40	16

As indicated in Table 4, the minimum response time was reduced by 10 minutes after the introduction of the automated alerts. In addition, the maximum response time was reduced by 24 minutes after the introduction of the automated alerts. Statistical analysis also involved the calculation of the sensitivity, PPV, specificity, and NPV based on the observations of sepsis among the patients. Because the NPV and PPV ratios are based on probabilities, they are not associated with the prevalence of a disease; sensitivity and specificity analysis is used to test the accuracy of a given diagnostic agent (Simon, 2015). The NPV describes the likelihood that a given patient with a negative test (normal) is actually disease free. Conversely, the PPV provides the probability that a

given patient with a positive test results actually has the disease. Table 5 shows the cross-tabulation for the sensitivity analysis of sepsis diagnosis in this DNP project.

Table 5

Comparison of Frequencies of Sepsis Diagnoses

Before automated alerts and After automated alerts Comparison				
		After automated alerts		Total
		Negative	Positive	
Before automated alerts	Negative	12	1	13
		75%	8%	46%
	Positive	4	11	15
		25%	92%	54%
Total		16	12	28

Based on the information in Table 5, the true positive automated alerts and false positive alert values were 11and 4, respectively. Also, the false negative and true negative values were 1 and 12, respectively. Using this information, the sensitivity of the diagnosis is: true positive/ (True Positive +False Negative) = 91.67%. Conversely, the specificity was: true negative (True Negative+ False Positive) =75%.

Other observations that were made during the implementation of the DNP project included the existence of many alerts in the system which may lead to alert fatigue. Responding immediately to real time alerts by nurses who were assigned 4-5 patients can be challenging since these alerts are on the computer. Incorrect MEWS scores that were caused by inaccurate information inputted by either nursing assistants or nurses can affect

triggers in the system; Inconsistency of nurses in completing sepsis screening in a timely manner can affect effectiveness of responding to changes especially since there is a rapid decline from sepsis to severe sepsis, and septic shock. Failure to utilize dashboards on the unit for a quick overview can result in a delay in recognition and treatment. Inconsistent hand off and communication can also contribute to a delay in identification. Nurses need to keep abreast of changes and updates by reading the weekly email updates that are sent to ensure that they are adhering to the latest information.

Discussion of Findings in the Context of Literature and Frameworks

The findings of this DNP project are consistent with Makam, Nguyen, and Auerbach (2015) who found that automated sepsis alerts that are developed from electronic health data can significantly improve nursing care. However, Makam et al. (2015) argued that automated sepsis reminders have poor PPV and do not affect the length of hospital stay or mortality among hospitalized patients. Chelkeba, Ahmadi, Abdollahi, Najafi, and Mojtahedzadeh (2015) found that the use of EGDT significantly minimized the likelihood of septic shock and reduced the mortality rate among hospitalized patients with sepsis. Hooper et al. (2012) also found that the use of SIRS-based real-time alerts is feasible but did not affect the clinical outcomes among hospitalized patients. Another study by Semler et al. (2015) found that a comprehensive tool for sepsis management and evaluation is safe and feasible, but there are no assurances on improvement of compliance and health outcomes.

Based on the findings of this project, the use of automated sepsis alerts improved the nurses' ability to initiate a Code Sepsis earlier than before there were automated reminders. Also, the participants indicated that the automated alert systemeffectively

provided sepsis alerts to clinicians and nurses. These findings are consistent with Nguyen et al. (2015) who found that the use of automated sepsis identification systems can significantly improve the detection of sepsis in the ED. Also, Alsolamy et al. (2014) argued that automated sepsis alert tools have high specificity and sensitivity in detecting severe signs of sepsis, thus, facilitating early recognition and goal-directed treatment.

The impact of automated sepsis alert system on the imitation of early goal-directed therapy is also supported by various studies (Alsolamy et al., 2014; Amland, Lyons, Greene, & Haley, 2015; Smyth, Daniels, & Perkins, 2015; Umscheid et al., 2015; Zaragoza et al., 2015). According to Umscheid et al. (2015), automated sepsis alert systems effectively predict the patients' risk of sepsis, thus, prompting bedside evaluation by the nurses. In addition, Umscheid et al. (2015) argued that the early goal-directed therapy significantly reduced the mortality rate among hospitalized patients.

Implications

This quality improvement project has various implications to nurses, hospitals, the community, the healthcare system, and population health. Sepsis is a costly public health problem.

Implications for Practice/Action

The findings of this DNP project can lead to various recommendations for nursing practice. First, the results of this project indicate that proper preparation and continuous education is necessary before the implementation of electronic warning systems in acute care settings. In addition, the education and training of acute care nurses on effective use of automated alerts can improve the quality of care for sepsis patients through early recognition of signs of sepsis and initiation of policy-driven care practices (Guidi et al.,

2015). The use of automated alert systems also helps with nurses' workflow in care settings and improves their decision-making skills, thus, reducing the mortality rate among hospitalized patients who are at a high risk of sepsis.

At the unit level of nursing, nurse engagement is directly associated with decisional involvement (Jaafarpour & Khani, 2011). Therefore, improvement in nurses' decision-making skills will enhance their engagement, thus, improving the perceptions of the quality of nursing care. In addition, an increase in nurses' decisional involvement in care improves the nurses working environment which is key to retention of nurses (Jaafarpour & Khani, 2011). Based on the findings of this DNP project, the use of automation alerts in acute care settings have various advantages to the nurses and patients including improved decision making process, improvement of clinical decision-making, and reduction of sepsis-related mortality.

Implications for Future Research

The main purpose of research is to address gaps in literature and to introduce new knowledge. Therefore, to contribute to the growing body of knowledge on the use of electronic warning systems in healthcare, nurses should continue to develop and implement quality improvement interventions and also participate in research (Jaafarpour & Khani, 2011). Because more institutions continue to adopt the use of automated alerts to manage sepsis, future studies on sepsis should focus on the impacts of sepsis on healthcare costs and length of stays in hospitals.

Implications for Social Change

The application of evidence-based interventions in nursing care is mainly aimed at improving patient and organizational outcomes. Social change implies that there is a

need for change to address public health issues in an effort to improve outcomes. Sepsis is a major public health issue that affects healthcare utilization, costs, morbidity, mortality, and patient outcomes. According to Bruce et al. (2015), the implementation of evidence-based interventions in healthcare institutions to improve patient outcomes is an evolving process. To ensure that the interventions produce the desired results, there is need for a multi-disciplinary approach by clinicians. Due to their proximity and constancy to the patients, nurses are strategically positioned to recognize early sepsis changes and initiate goal directed treatment to prevent further decline that can lead to increased morbidity and mortality rates. Quality improvement initiatives provide an alternative for healthcare institutions and clinicians to effect change in nursing care and to improve patient outcomes (Palleschi, Sirianni, O'Connor, Dunn, & Hasenau, 2014).

Continuous improvement of care for hospitalized patients with sepsis can improve outcomes including reduction in the number of hospitalizations, readmissions, and reduction in mortality rates. In addition to reducing the mortality rates among hospitalized patients, automated sepsis alerts can lead to improved management of sepsis and a reduction in the cost of healthcare and improve healthcare utilization. Potential implications of social change include effective utilization of clinical decision support tools to assist in identification of early sepsis changes in an effort to initiate early goal directed treatment. Early identification will impact healthcare utilization, cost, improve outcomes, and save lives not only at the organizational level but also at the local level, the community level, and the population level.

Strengths and Limitations of the Project

Strengths

One of the strengths of this DNP project is that the acute care nurses at the hospital were already trained on the use of automated alerts for identification of the signs of sepsis among high risk patients. The mortality rates decreased significantly since the introduction of automated reminders. In compliance with the recent Surviving Sepsis Training recommendations, the nurses at the hospital had received mandatory training on monitoring of sepsis in an acute care setting. Therefore, the nurses were more familiar with the automated alerts and 84% agreed that they received adequate training for sepsis. 70% of nurses agreed that automated reminders assist in early sepsis recognition. 87% of the nurses agreed and were aware that early sepsis recognition and treatment reduces mortality rates and improves outcomes.

This project was able to evaluate nurses' perceptions and awareness of sepsis since these are variables that can affect the effectiveness of quality improvement initiatives in a practice setting. The location of the automated alerts and the newly introduced dashboards are conveniently placed. I was able to examine this issue in detail through observations, questionnaires, and retrospective chart reviews. Complexities of systemic factors were discovered that may have been missed by positivistic research. The findings can be transferable to another practice setting. The electronic health system captured early physiologic changes and provided real-time data that will assist in early identification of sepsis. Details were noted in human behavior and therefore trends were noted in the practice setting. Mortality rates decreased since the introduction of automated alerts and the time from early physiologic changes to the initiation of goal

directed therapy improved. I was able to use publicly reported data to compare findings. Data were easily accessible not only for me but also for the nurses.

Limitations

Although this quality improvement project has numerous strengths, it also has a few limitations. First, the use of a small sample size reduced the accuracy of the results and significantly limited the generalizability of the findings of the DNP project. It was very time consuming to analyze and interpret data from observations and questionnaires and I had to ensure that there was no influence by personal bias during the interpretation. The exclusion of nurses might have affected the findings of the project. The presence of the researcher during the gathering of data or the researcher returning before the completion of the questionnaire may affect the participants' responses. Self -reported data could contain potential sources of bias. The time frame of this project limited the ability to note or trend reasons for lack of immediate response to alerts.

There are not many studies that have been conducted on early sepsis recognition on medical surgical units. Most sepsis studies have focused on the ICU where nurses are assigned 2 patients. On the medical surgical units' nurses are assigned 4-5 patients and may not be able to capture the alerts immediately if they are away from the computer or if they are busy with a patient.

Recommendations for Remediation of Limitations

This evaluation of a quality improvement initiative was conducted over a few months and used a small sample size of 30 RNs to assess the effectiveness of automated sepsis alerts on early recognition of sepsis and initiation of protocol-directed care in an acute care setting. However, the project can be replicated using a larger sample size and a

prolonged duration to increase the amount of evidence for analysis purposes. The researcher could have left the units for longer times when the questionnaire was administered. Assessing workflow gaps is essential to further drill down the reason for delayed responses to automated alerts on medical surgical units. More studies need to be conducted on medical surgical units since these patients are at high risk for developing sepsis while hospitalized. Section 5 will present the dissemination plan, analysis of self, the meaning of the project for future professional development, and the summary, and the conclusion.

Section 5: Dissemination Plan

Introduction

After completion of the DNP project, my plan is to disseminate the results to the stakeholders at the organization using a PowerPoint presentation. Other avenues considered for dissemination include publication in academic journals and presentation through websites, professional associations, workshops, conferences, and two-way communications. The target audience includes end users, clinicians, Accountable Care Organizations, policymakers, state representatives, and professional organizations.

The immediate dissemination plan is to disseminate this research in the *Journal of Professional Nursing* published by Elsevier for the American Association of Colleges of Nursing (AACN).This journal was chosen because it is a scholarly nursing journal that accepts articles from nurses with higher education degrees on educational research as well as policies related to education and practice partnerships. The articles that are published in this journal address clinical, legislative, and regulatory concerns in reference to quality improvement, program evaluation, and evidence-based guidelines for researchers, educators, and practitioners (AACN, 2016). Additional venues that would provide a valuable forum for disseminating results include professional conferences, where the research could be shared within a presentation.

Arrangements have already been made to present at the Magnet conference next year, as well as the ANA's annual conference. The next ANA conference is scheduled for March 8-10, 2017, in Tampa, Florida. The theme is "Translating Quality into Practice" (ANA, 2016). For nurses, networking and being an active member of a professional organization is extremely important for sharing and obtaining vital information. My

project certainly is relevant to the theme of translating evidence into practice, given that it involved an evaluation of best practices in order to improve outcomes. The audience at the ANA conference consists of nurse leaders, policy makers, and other key decision makers, as well as staff nurses. This capstone project is relevant because variables were examined to note how they may affect the effectiveness of automated reminders and discussing this strategy that was designed to improve patient outcomes.

By presenting at conferences, a researcher can reach more professionals and disseminate findings on a large-scale platform to professional peers. Additionally, researchers at conferences have the opportunity to network and address issues face to face with a specific target audience. A limitation of this mode of dissemination is that conference participation can be costly and time-consuming, especially in terms of organizing the presentation.

Analysis of Self

As Scholar

The implementation of positive change in the healthcare sector requires the adoption of effective evidence-based interventions. As a scholar, I have learned and applied the foundational core competencies necessary to identify, assess, implement, evaluate, and translate evidence-based practice into the practice setting. Advanced nursing degrees instill an ethos in nurses and healthcare institutions for the purpose of improving care quality and ensuring advancement of the nursing profession (Zaccagnini & White, 2015). This degree program has provided me with the necessary advanced skills and knowledge to be a social change agent and a lifelong learner. As a scholar, I showed that an evaluation of quality improvement initiatives is essential in healthcare

settings to note whether there is a need for modification, revision, and /or further education. Through this project, I also showed my ability to integrate, translate, and synthesize clinical knowledge into the practice setting. With my dedication to the profession, the alignment of my personal and professional goals, and my intent to disseminate information, I feel that I am poised to be an effective change agent and a transformational leader during this health-care restructuring era.

As Practitioner

As a healthcare practitioner, I gained vital experience during the implementation of the DNP project. I was able to communicate effectively with nurses in the acute care setting while evaluating the use of automated alerts for early sepsis identification. I have gained a deeper understanding of the importance of altruism and the dire need to bridge the quality chasm by ensuring that evidence is translated into the practice setting.

As a dedicated scholar-practitioner and lifelong learner, I am more prepared for, confident in, and committed to the goal of being a social change agent. I have been provided with foundational knowledge and skills to promote positive outcomes through translation of evidence into practice settings. Applying the core competencies outlined in the DNP essentials guided me throughout the project, and I am now more competent in applications of systems thinking, analytical thinking, leadership, and advocacy. I have been a project manager and transformational leader in the hospital setting for over 10 years; however, this was my first time as a project manager with a DNP school project. The project required me to synthesize literature and use theoretical, conceptual, methodological, and practical tools for inquiry.

The goals and objectives of a practice-focused degree were aligned with my personal and professional goals, and I made a conscientious effort to ensure that the university I chose to complete this degree also had aligned goals—thus my choice of Walden University. The project experience assisted me in ensuring that an analysis was done of the micro-, meso-, and macro systems that can affect the effectiveness of performance improvement projects. I have always been an active political activist, and this program has provided me with foundational competencies to continue my advocacy for healthcare needs. In ensuring that evidence-based practice is translated into the practice setting, I hope to assist in bridging the gap that currently exists in quality outcomes in patient-centered care and population health. Completing dynamic modules, discussions, assignments, and this capstone project has greatly impacted my ability to apply scholarly skills and knowledge to the field of nursing practice. This is really just the beginning; my commitment to quality and my determination to be a social change agent will continue to propel me to ensure that evidence-based practice is translated into practice settings to improve outcomes, enhance systems of care, and measure outcomes.

I am more prepared for clinical leadership, public policy advocacy, addressing/identifying public health needs, and systems leadership. Conducting research in a practice setting requires mastery of the eight DNP essential core competencies, and focus on a specific topic provides additional skills that are needed by innovative, transformational, and evidence-driven nursing experts who complete a terminal, practice-focused degree in nursing. My professional communication and writing skills greatly improved during this journey, and I will use these enhancements for future research and professional growth.

As Project Developer

The process of identifying, planning, designing, translating, leading, and evaluating a project is complex. First, successful evaluation of a project requires advanced skills to synthesize literature, appraise systems, apply clinical scholarship, analyze systems thinking, work collaboratively with other professionals, and advocate for healthcare (American Association of Colleges of Nursing, 2008). The development of this quality improvement project on sepsis management among hospitalized patients in acute care was an experience that increased my ability to focus on legal and ethical guidelines to ensure that there would be anonymity and confidentiality at all times. Identifying gaps in practice and being a social change agent in the translation of evidence to the practice setting is necessary for population health. I realized the importance of analyzing all aspects of the system to note how micro, meso, and macro factors can affect effectiveness and outcomes as I worked as a project developer.

For a project developer, it is essential to identify gaps, initiate and guide plans, be an ardent health care policy advocate, lead change initiatives, sustain development, influence changes, disseminate information, and network. In completing this practice-focused degree, I had the golden opportunity to apply these concepts as I worked on class assignments, discussions, and most importantly, this capstone project.

What Does This Project Mean for Future Professional Development?

According to Hall et al. (2011), constantly increasing rates of hospitalization and the aging population imply that more patients are at increased risk of sepsis. Thus, the costs of healthcare and sepsis-related deaths also continue to rise. The use of automated alerts can facilitate early recognition of sepsis and timely initiation of policy-driven care,

hence decreasing the mortality rate and related healthcare costs among patients with sepsis (Kleinpell & Schorr, 2014). Currently, nurses as frontline caregivers play a vital role in the management and treatment of sepsis among hospitalized patients. In addition, recent mandatory training and education of nurses through the Surviving Sepsis program and their engagement in care can improve nurses' decision-making skills, thus promoting positive health outcomes among hospitalized patients. Sepsis is a global health problem, and identification of a gap in practice related to sepsis has been essential to my growth as a healthcare professional with a terminal degree. This project is just a stepping stone that has provided me with the foundational core competencies needed to be a social change agent, a lifelong learner, a health policy advocate, a transformational leader, and a public health promoter.

In applying the advanced skills and knowledge necessary to conduct this capstone project and developing the core competencies outlined for the Doctor of Nursing practice degree, I gained foundational skills and necessary tools for further professional development through the curriculum offered at Walden University.

Summary and Conclusions

A retrospective review of 30 charts that were used before the introduction of the automated alert system was conducted, and it was noted that response to physiologic changes for early sepsis identification greatly improved after automated reminders were introduced. The average response time from the initial detection of sepsis symptoms to the commencement of goal-directed treatment reduced from 25 minutes to 11 minutes after the introduction of the automated alerts.

A questionnaire was provided to nurses to assess their perceptions regarding the use of automated reminders in sepsis treatment in the acute care setting. This was done because nurses' attitudes, perceptions, and ability to apply knowledge may influence the effectiveness of a tool that was designed to assist in the clinical decision-making process. This quality improvement evaluation project was aimed to evaluate automated reminders for early sepsis recognition to reduce mortality rates. The sepsis-related mortality rate at the hospital decreased from 40.8% to 22% after the introduction of the automated alerts. Overrides of the alarms were 38.2%. In addition, the average length of stay was reduced from 14.26 to 6.4 days. These results are supportive of the hypothesis that automated reminders are effective for early sepsis recognition and reduction of mortality rates.

Previous research evidence has indicated the importance and efficiency of early warning systems in the recognition of deteriorating patient conditions in various healthcare settings (Palleschi et al., 2014). The major strength of this DNP project is that nurses perceived that they were adequately trained on sepsis before the implementation of the automated alert systems and were aware of the relationship between early recognition and mortality rates. However, the small sample size and the use of only three medical-surgical units at the acute care facility significantly limited the generalizability of the project. Evaluation for this DNP project indicated that there is support for the notion that automated reminders are effective for early recognition of sepsis to reduce mortality rates for hospitalized patients. Automated alerts are designed as supportive clinical decision tools for early recognition of sepsis to prevent the rapid decline of sepsis to severe sepsis, septic shock, and death, and the thesis is supported by improved mortality rates in this practice setting.

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