An Evaluation to the Adherence of a Sepsis Protocol at a Central Kentucky Community Hospital

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Final Practice Inquiry Project Report

An Evaluation to the Adherence of a Sepsis Protocol at a Central Kentucky Community Hospital

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University of Kentucky
College of Nursing
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Dedication

This project is dedicated to my family, whose support of my dream to complete this Doctorate of Nursing Practice degree was made possible. First, to my amazing, unselfish husband, who has been there through every step, coaching me on, encouraging me when I wanted to quit. To my parents, mother and father in law and sister, for their complete and total support during this time. Without their help with childcare and continuing words of encouragement, this degree completion would not have been possible. Also, to my friends and work family for believing in me and encouraging me along the way to reach this important step.
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Introduction to Final Practice Inquiry Project Report

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Sepsis has been defined as a host response to infection that can lead to severe sepsis and septic shock (Dellinger et al., 2013). Since 2003, the Surviving Sepsis Guidelines (SSG) has been utilized in patient care to “influence bedside healthcare practitioner behavior that will reduce the burden of sepsis worldwide” (Dellinger et al., 2013, p.583). In 2008 an estimated 727,000 patients were hospitalized with a diagnosis of sepsis, an increase from 326,000 in the year 2000 or a 55% increase in prevalence (Hall, Williams, DeFrances, & Golosinskiy, 2011).

The guidelines were initially published in 2004, with republication in 2008 and 2012 (Dellinger et al., 2013). The SSG have recommended the protocol resuscitation approach to managing patients with sepsis-induced tissue hypoperfusion and should be initiated as soon as it is recognized (Dellinger et al., 2013). The first manuscript is a literature review of studies published between 2000-2015 that evaluates the published literature on studies that have implemented sepsis protocols in emergency departments (ED) and the facilitators and barriers they have experienced. While completing the review, another theme emerged. Patients who were treated with early goal directed therapy (EGDT) were seeing more positive results with decreased mortality rates. The purpose of the second manuscript is to review the published evidence on EGDT for sepsis and how it can affect patient outcomes related to patient mortality and how bundle adherence is affected after EGDT is initiated. It has been noted, that if the appropriate therapies are started early for patient diagnosed with sepsis, positive outcomes are influenced (Dellinger et al., 2013).
The final manuscript consists of a description on the results of the adherence to a sepsis protocol initiated in a central Kentucky community hospital using a retrospective medical record review.
Sepsis protocols: What are the Facilitators and Barriers of Implementation?: A Literature Review

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Abstract

Background: Sepsis has been recognized as the leading cause of death in non-coronary intensive care units and the tenth overall leading cause of death in the hospital setting for patient’s age sixty-five and older (LaRosa, 2010). The sepsis “protocol” is an order set that guides the management of patients with sepsis and septic shock. These protocols have been implemented into practice to help guide the treatment of septic patients. There are multiple facilitators and barriers to the implementation of these sepsis protocols.

Objectives: The purpose of this manuscript is to review the published literature on studies that have implemented sepsis protocols in emergency departments (ED) and the facilitators and barriers they have experienced. A secondary purpose is a discussion of what this means for future research and further implementation of sepsis bundles and how processes can be altered to better improves patient outcomes.

Methods: A search was completed of published studies examining sepsis protocols that have been implemented in the ED and the facilitators and barriers they experienced during the implementation process. Databases used were Academic Search Premier, CINAHL, and MEDLINE, PubMed and Google Scholar. Google search was also utilized for sepsis statistics. Key words used for the search included sepsis, septic shock, adherence, facilitators and barriers to implementation, sepsis protocols, and emergency department. Fourteen studies met inclusion criteria and were included.

Results: Based on the review, it is suggested that obtaining feedback from all disciplines is very important when developing a protocol. The utilization of nurses to aide in the implementation process of sepsis protocol is important.
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**Conclusions:** The studies have presented facilitators and barriers to implementation of sepsis protocols and suggestions for improving those barriers. For future research, allowing nursing to be “change champions” and involved in the development and implementation of sepsis protocols and utilizing a multidisciplinary approach is the evidence-based approach to improve adherence to sepsis bundles/protocols.

**Background**

Sepsis has been recognized as the leading cause of death in non-coronary intensive care units and the tenth overall leading cause of death for patients age sixty-five and older in the hospital setting (LaRosa, 2010). Sepsis has been defined as a “systemic, deleterious host response to infection leading to severe sepsis (acute organ dysfunction secondary to documented or suspected infection), and septic shock (severe sepsis plus hypotension not reversed with fluid resuscitation)” (Dellinger et al., 2013, p. 583). In 2008, Hall, Williams, Defrances, and Golosinskiy (2011) estimated that 727,000 patients were hospitalized with a diagnosis of sepsis, an increase from 326,000 in the year 2000 or a 55% increase in prevalence. Patients with a diagnosis of sepsis have a 75% longer length of stay in the hospital than those diagnosed with other conditions (National Hospital Discharge Survey, 2008). Sepsis and septic shock not only carry a high mortality rate for patients, but costs for care are enormous. Patient mortality rates for severe sepsis is ranging from 30-50% and septic shock patients are 50-60% (Minino, AM. et al., 2004). The National Hospital Discharge Survey (2008) estimated that the cost associated with treating sepsis was $14.6 billion in 2008 and is continuing to rise.

In 2004, the European Society of Intensive Care Medicine, the International Sepsis Forum, and the Society of Critical Care Medicine published the Surviving Sepsis
Campaign guidelines (Dellinger et al., 2013). The guidelines were developed so that management of sepsis would be consistent across a continuum of care. The guidelines have been updated multiple times since 2008, and most recently in 2012.

Since sepsis and septic shock are associated with a high mortality rate, bundles or protocols have been developed in multiple emergency departments (EDs) to treat sepsis. Bundles or protocols (these will be used interchangeably in this paper) are guidelines implemented to make sure that all the recommendations outlined in the Surviving Sepsis Guidelines (SSG) are utilized as appropriate. Researchers have suggested multiple facilitators and barriers to the implementation of the protocols.

The purpose of this manuscript is to review the published literature on sepsis protocols/bundles implemented in emergency departments (EDs) with a specific focus on facilitators and barriers to successful implementation, and implications for practice and further research.

**Methods**

A search was completed of the published literature examining sepsis protocols or bundles that have been implemented in the ED. Databases used included Academic Search Premier, CINAHL, Google Scholar, MEDLINE, and PubMed. Google was also utilized for sepsis statistics. Key words used for the search included sepsis, adherence, compliance, sepsis protocols, facilitators and barriers to implementation and emergency departments. The following inclusion criteria were applied: only studies conducted on adult patients age 18 and above were included, and of these only full text articles published in English between 2000 and 2015 fit the requirements. Only articles that examined facilitators and barriers to implementation to sepsis protocols/bundles initiated
in the ED were included in the review. After looking at the inclusion criteria, 14 studies were chosen for the review. Of the 14 studies that met inclusion criteria, one was a cross-sectional design, two were prospective studies, one was a cohort study, one was a retrospective cohort study, one was a retrospective chart review, one was a 1-group pretest-posttest quasi-experimental design, one was quasi-experimental with a historical comparison group, 3 were process improvement initiatives, one was an observational study, 1 was a telephone survey with both quantitative and qualitative analysis, and one was a review article.

**Synthesis of the Literature**

Sepsis has been widely recognized as a major health problem, with one in four people dying each year worldwide (Dellinger et al., 2013). Efficient diagnosis and treatment of sepsis can decrease mortality significantly (MacRedmond et al., 2010).

Although the implementation of and adherence to the sepsis protocols have been widely examined in the literature, the purpose of this review is to examine the facilitators and barriers to implementation of sepsis protocols that the researchers have encountered and determine what this means for future research and practice. Discussion will focus on how to improve these implementation practices so that future protocol initiation can help improved patient outcomes.

**Barriers**

Sepsis is so widely acknowledged around the globe, and multiple studies have been conducted to try and decrease the mortality associated with this disease. When patient mortality is on the rise and ICU length of stay is at an all-time high, related to the
There were many barriers to implementation of the sepsis protocols mentioned throughout the literature. A number of researchers have suggested that barriers to sepsis protocol adherence among healthcare providers fall into three main categories: knowledge barriers, attitude barriers, and behavioral barriers (Rubenfeld 2004; Wang, Xiong, Schorr & Dellinger, 2013). The major barriers that were identified in the literature search fit into each of these categories that Rubenfeld, (2004) and Wang et al. (2013) identified.

**Knowledge.** The most important barrier identified was lack of knowledge related to identifying sepsis or the septic patient when they present to the ED (Carlbom & Rubenfeld, 2007) or the specific time frame in which to treat the patient with antibiotics from the staff nurses and physicians (Wang, Xiong, Schorr, & Dellinger, 2013). Most importantly, researchers noted that providers often had trouble with early identification of sepsis and lacked adequate training to place vascular access or mechanical ventilation (Singhi et al., 2009).

An article written by Carlbom and Rubenfeld (2007) found that the failure to the early identification of sepsis was one of the most important challenges ED physicians and nurses faced when trying to implement an EGDT protocol. Barriers to implementation of these sepsis protocols were overcome in the studies that were reviewed by Carlbom & Rubenfeld (2007), however all sepsis protocol initiations were done at large academic centers where there is significant resources available and motivation for change. For a change in practice to occur and the barriers to be overcome, education will be required
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for the ED staff and the prehospital providers for early identification of the sepsis. The researchers stated that education might need to be provided to the public, so they can identify early signs of systemic inflammation or infection (Carlbom & Rubenfeld, 2007). Wang, Xiong, Schorr, & Dellinger, (2013) conducted a before and after study to identify reasons why the sepsis protocol was not complied with. Antibiotic administration time was shown to be a barrier to the proper implementation of the sepsis protocol. It was found that ED physicians were unaware of the fact that patients should receive the medication within the first three hours of an ED admission. Because the physicians were not ordering the medication on time, this was causing further delay in treatment.

**Attitude.** A study written by Mikkelsen et al. (2010) describes attitude barriers that could potentially affect why facilities are not successfully implementing their protocols. Severity of the patients’ illness and the sex of the patient seem to be the ultimate barriers to implementation of the EGDT protocol in the study by Mikkelsen et al. (2010). EGDT was initiated at varying rates and the when the sex of the physician was female also played a role in whether the protocol was initiated. This study was a cohort study that examined factors associated with not initiating the EGDT protocol in the ED. The barriers listed above were identified and they realized that the EGDT protocol was underused in their hospital. The researchers stated that it was unclear how the barriers that they identified influenced the initiation of EGDT. In this particular study, assessment of the physician knowledge or attitude on the EGDT protocol was not complete. Those both could have been factors that weighed in. The facility did try to develop a consultation service to aid in the implementation of the EGDT protocol, however, over time it became underused (Mikkelsen et al., 2010).
Behavior. Lastly, behavior is the third barrier that can affect implementation of sepsis protocols. Findings from two studies suggest that potential barriers to the implementation of the sepsis protocols include the limited availability of hemodynamic monitoring equipment or technology and lab support (Burney et al., 2012 & Singhi et al., 2009). Findings from both studies also suggested that there was limited staff to be able to carry out the protocols (Burney et al., 2012 & Singhi et al., 2009). The cross sectional study conducted by Burney et al. (2012) described barriers to the implementation process of sepsis protocols; a survey was completed and results revealed that lack of access to central venous pressure and central venous oxygen saturation monitoring for physicians and lack of physical space in the ED for the nurses was the number one response (Burney et al., 2012). The survey results showed the second most common barrier to implementation of the sepsis protocols is the decreased nurse-staffing ration to carry out the resuscitation protocols. In order to identify those barriers and come up with a solution to the problem, a multidisciplinary program for education was developed. The program helped the nurses understand their role in identifying patients with sepsis when they are being triaged. Education also focused on physiology and management of sepsis and the importance of lactate measurement (Burney et al., 2012). This education targeted the nurses, physicians and respiratory therapists.

According to Singhi et al. (2009), a review written on potential barriers in resource-limited countries for sepsis patients, they also found limited availability of technology (monitoring equipment, lab support). As previously mentioned, further research should be done in these resource-limited areas to determine the benefit of the interventions in the sepsis guidelines (Singhi et al., 2009).
In other studies, findings suggested that there were barriers with the antibiotic timing process and patients were not receiving medication within a specified time frame (Wang et al., 2013). Mikkelsen et al. (2010) found that the EGDT protocol was not activated when their Severe Sepsis Service wasn’t initiated, this delayed patient in receiving appropriate blood draws and antibiotic administration. In order for patients that screen positive for sepsis to be treated with the EGDT protocol effectively, they developed a consultation service to be implemented to aide in the EGDT completion (Mikkelsen et al., 2010).

Antibiotic administration is critical in the Surviving Sepsis Campaign. Septic patients should have antibiotics administered within three hours of diagnosis of sepsis (Dellinger et al., 2013). Two studies (Tipler et al., 2013; Wang et al., 2013) found that timing processes to complete antibiotic administration presented barriers to the proper administration of the sepsis protocol. Tipler et al. (2013) conducted a retrospective study examining the time to first antibiotics after the diagnosis of sepsis. The biggest barrier to implementing their sepsis protocol successfully at this facility was the process in which they receive antibiotics from the pharmacy. The average time to first dose was 160 minutes. They found that there were exclusive prescribing privileges for certain antibiotics, a shortage of pharmacists which led to delayed processing of orders, and a requirement that the pharmacist receive verbal confirmation from the infectious disease consulting physician before the medication could be prescribed. The sepsis protocol initiated allowed an ease of access to antibiotics, decreasing their time to administration by 38% (Tipler et al., 2013). Being able to change this process and allow for faster antibiotic administration time helps the implementation process of sepsis protocols.
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greatly. Wang et al. (2013) also identified similar system issues with antibiotic administration times. In this particular facility in China, the patient must pay for the medication first before they can receive it in the ED. Second, if the antibiotic is placed at the bottom of the list of medications, that particular medication is given last. The researchers suggest, as mentioned previously that barriers to implementing sepsis guidelines similar to the U.S. are knowledge of the providers, attitude, and behavior of the staff involved in the implementation process (Wang et al., 2013). This study did not mention a particular solution to overcome these particular barriers.

**Resource Barriers.** Financial burdens can sometimes put a damper on small community hospitals with limited resources. With a lack of necessary supplies, educational materials or financial assistance to educate staff, implementation of these sepsis protocols can be difficult. Patel et al. (2010) and Singhi et al. (2009) discussed that because of the lack of financial and medical resources; early identification and aggressive management of patients can be difficult. It took collaboration with all disciplines to implement the care bundle for sepsis (Patel et al., 2010). The review article by Singhi et al. (2009) discussed potential barriers to implementing the sepsis guideline in resources limited areas. One of the major limitations mentioned was limited availability of equipment and laboratory support. Further research is needed in these areas to determine which components of the guidelines are most beneficial in these areas (Singhi et al., 2009).

Lastly, countries with limited resources and supplies are sure to experience multiple barriers for identifying and treating patient with sepsis. The study by Singhi et al. (2009), examined what the potential barriers may be to implementation of the
guidelines for treating patients with sepsis. The study is geared toward the pediatric population, but for implementation purposes only, the study was relevant. Barriers listed include, limited availability of technology such as hemodynamic monitoring equipment, heart monitors, IV pumps, and mechanical ventilators (Singhi et al., 2009).

Secondly, even though MacRedmond et al. (2010) found that hemodynamic monitoring was a potential barrier to their sepsis protocol initiation, a study by Focht et al. (2009) developed a procedure cart that can be utilized in the ED or ICU when the placement of invasive lines need to be done. This can facilitate time in which lines are placed and decrease the time in which the patient is waiting for treatment. Also in contrast, Sweet et al. (2010) found that hemodynamic monitoring was a facilitator to implementation of their sepsis protocol because it decreased time to delivery of antibiotics and the achievement of the variables of the protocol. With the obvious controversy about whether hemodynamic monitoring is a facilitator or a barrier, perhaps further research is needed to examine the potentials more closely.

Facilitators

In order for implementation of the sepsis protocol components to be successful it is important to examine the facilitators that the researchers encountered in this process. Multiple themes emerged from the literature regarding facilitators to implementation of sepsis protocols, including: education, development of multidisciplinary teams, and nurse driven protocols. Discussion will focus on each theme and what the researchers found during protocol implementation.

Education. Education is an important element when implementing new protocols in the healthcare setting. Education administered prior to the implementation of the sepsis
protocols was initiated in four studies. Of the four studies, findings suggest that significant improvement in identification of the septic patient occurred after the education was administered (Castellanos-Ortega et al., 2010; Focht et al., 2009; MacRedmond et al., 2010; Tromp et al., 2010). With these studies that incorporate education prior to implementation of their sepsis protocols, it has shown to increase the adherence rates to the sepsis protocol components.

Education about the signs and symptoms of sepsis can significantly improve nurses’ ability to identify sepsis early on. Four studies found that after receiving education prior to implementation of the sepsis protocol, nurses significantly improved their ability to recognize the signs and symptoms of sepsis. MacRedmond et al. (2010) and Tromp et al. (2010) completed a performance feedback test after their required education sessions were completed to measure the nurses understanding of the teaching. In the MacRedmond et al. study (2010), the education included 4 hour sessions that included early recognition of sepsis, the sepsis algorithm to be used in the protocol, practical instruction and hands on learning regarding hemodynamic monitoring setup. Trained ICU and ED physicians gave the lectures. There was 75% identification of sepsis signs and symptoms before the education and 92.3% improvement in the identification of sepsis after the education was complete (MacRedmond et al., 2010).

In the Tromp et al. study (2010) education prior to initiation of the sepsis protocol included early recognition and treatment of septic patients. Nurses were trained on the signs and symptoms of sepsis. Evaluation came as short interviews about the nurses’ experiences in applying the protocol in practice. Findings suggested that after the education sessions, 82% of patients were identified to have sepsis opposed to 71% pre
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education phase (Tromp et al., 2010). Although it was difficult to determine exactly which process was responsible for the reduction in mortality, it was noted that after the education sessions there was a significant improvement in early identification of septic patients and that the increased awareness of sepsis treatment was the main factor in facilitating successful implementation of the sepsis protocol (MacRedmond et al., 2010).

Compliance with the sepsis bundle increased from 1% at baseline to 11.3% after an in depth education program conducted by Castellanos-Ortega et al. (2010). The educational program consisted of physician and nursing staff about early recognition of sepsis and septic shock and all the materials were readily available on the intranet when needed. Lastly, Focht et al. (2009) evaluated the implementation process of a sepsis protocol in their hospital. An educational session similar to Castellanos-Ortega et al. (2010) was developed. The education was through a physician conducted seminar and self-directed study materials. For nurses, a check off list for central venous oxygen saturation monitoring was included (Focht et al., 2009). The facility continues to comply with the protocol through education annually and all new hires are given the same education requirements. This ensures that they continue to adhere to the protocol requirements (Focht et al., 2009).

**Nurse driven protocols.** The nurse is the typically the first staff member who triages a patient when they present to the ED; this is where early identification of sepsis needs to occur. Nurses need to understand the signs and symptoms of sepsis. “Critical care nurses play a role in identifying patients with or potential to have sepsis and can aide in treatment (Campbell, 2008).
Three studies are conducted with nurses as the driving force behind implementation of the sepsis protocols. All three of the studies’ findings suggest that the use of nurse driven sepsis bundles improve significantly the compliance of the protocols in the ED (Bruce, Maiden, Fedullo, & Kim, 2015; Campbell, 2008; and Tromp et al., 2010). Bruce et al. (2015) conducted a retrospective chart review and found that critical care trained nurses played a role in identifying patients who had sepsis, beginning their work-up and starting antibiotic administration when needed. The nurses in the ED would initiate a diagnostic workup on the patient that presents with 2 or more criteria of infection (fever, hypothermia, tachycardia, or tachypnea). Because of the role of these nurses in the protocol implementation, compliance rates for lab studies were almost 100% in the post protocol group (Bruce et al., 2015). Echoing these results, Campbell, (2008) evaluated the effect nurse champions in the ICU and how that affected the sepsis protocol compliance. She goes on to explain that this facility promotes the use of nurse champions because it can facilitate an environment of safety (Campbell, 2008). “Nurse champions can lead efforts to create practice environments and systems that support and promote diffusion of innovation, safe practice, and an evidence-based approach to care delivery” (Campbell, 2008, p.253). Adopting a new policy or screening tool is more likely to catch on if the nurses are the ones advocating for the change. Her findings concluded that having a nurse champion to influence change and adopt a sepsis protocol and aide in compliance with documentation proved significant (Campbell, 2008).

Lastly, a before and after study conducted by Tromp et al. (2010), also utilized the nurse in the role of sepsis protocol initiation. Education was given to the ED nurses on signs and symptoms of septic patients. This specific study intervention included two
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parts: first a nurse-driven, care bundle based sepsis protocol was initiated, and second, training about sepsis and feedback regarding their performance, this according to the study was all done simultaneously. Findings suggest that utilizing a “nurse-driven, care bundle based, sepsis protocol followed by training and performance feedback results in improved early recognition and treatment of patients with sepsis who present to the ED” (Tromp et al., 2010, pg. 1469). Septic patients were diagnosed easier in period 2 and 3 of their protocol. Identification of septic patients increased from 71% to 82% from period 2 to period 3 (Tromp et al., 2010).

Multidisciplinary team implementation. The development of multidisciplinary teams is how many are implementing sepsis protocols. Multiple researchers (Bruce et al., 2015; Focht et al., 2009; MacRedmond et al., 2010; Patel et al., 2010; Tromp et al., 2010) have utilized the approach to care for the septic patient through the implementation of protocols. Multidisciplinary includes all disciplines that care for a patient, such as nursing, respiratory therapists, dieticians and pharmacists.

Collaboration through a multidisciplinary approach in the implementation of sepsis protocols is key to success. Four studies utilize multidisciplinary teams to help implement their sepsis protocols. As previously mentioned in the barriers section, MacRedmond et al. (2010) demonstrated that the use of a multidisciplinary approach is associated with improvements in the processes the care the septic patient receives. Disciplines included on their team consisted of physicians, nurse educators from the ED and ICU, members of the quality and utilization management teams (MacRedmond et al., 2010). A collaborative model was adopted which helped to empower the ED staff with the early identification and management of patients with sepsis. A commitment from the
ICU team was a big element of the collaborative effort. One of the biggest barriers they experienced was that the protocol would result in a delay in transferring patients to the ICU, but with the collaborative model and willingness from the ED and the ICU staffs, the resistance was overcome and the two units worked together to provide quality care for patients (MacRedmond et al., 2010).

Bruce et al. (2015) and Tromp et al. (2010) utilized nursing as the driving force for the sepsis protocol implementation. These two studies suggest that for elements of the sepsis bundle to have improved compliance, a multidisciplinary approach would also be necessary. Bruce et al. (2015) found that their 3-hour bundle elements were not within target, and therefore, with the help of a multidisciplinary team approach, between physicians, pharmacy and nurses, patients were more quickly identified and treated. In the study by Tromp et al. (2010) an improved quality of care was promoted by developing a more multidisciplinary approach to the care of the septic patient. The multidisciplinary team encompassed by an intensivist, ED internist, a surgeon, a medical microbiologist, a clinical pharmacist, ED nurses and a nurse practitioner (Tromp et al., 2010). The multidisciplinary team helped to develop the sepsis protocol based on the Surviving Sepsis Campaign Guidelines (Tromp et al., 2010). With this multidisciplinary approach, patients were recognized and treated quicker and more efficiently (Tromp et al., 2010).

Focht et al. (2009) and Patel et al. (2010) both utilized the multidisciplinary collaborative approach to implement a sepsis protocol at their facilities. The studies utilized different disciplines including ED physicians, infectious disease, pharmacy, and nursing staff. Focht et al. (2009) utilized respiratory therapy to help in increasing
compliance with their serum lactate level. By including other disciplines, it allowed the facility to foster “a better team effort attitude” by working together and encouraging improved compliance (Focht et al., 2009, pg. 191). The study by Patel et al. (2010) was conducted in a community hospital where limited resources were available. In order for the protocol to be adopted all disciplines to care for a septic patient were involved. Administration was also involved for financial and thoroughness of the development process (Patel et al., 2010). In order for the protocol implementation to go smoothly, collaboration was essential for success (Patel et al., 2010).

**Discussion**

With sepsis being so widespread and the mortality rate at an all-time high, there is a clear need for correct implementation of these sepsis protocols. Multiple barriers and facilitators have mentioned related to implementation and improved compliance of the protocols. The ability to implement sepsis protocols effectively ultimately plays a role in patient outcomes.

The barriers that were categorized by Rubenfeld, (2004) were knowledge, attitude, and behavior. All studies discussed were placed in one of the categories (Knowledge, attitude and behavior) and were examined. It seemed that the most important barrier and facilitator to the successful implementation of sepsis protocols is knowledge. We illustrated that the lack of knowledge when trying to treat patients with sepsis causes a barrier with implementation of theses protocols. However, in the studies that found education was a facilitator, from evidence we know that education prior to the implementation of these protocols suggests that it increases compliance and allows implementation to be more effective.
Implications for practice and future research

More attention should be placed on nurses being a part of the collaborative multidisciplinary team. They are the providers at the bedside caring for the patients and are typically the first ones to notice if there is a change in the patient. Although nurses are the first to see patients in the ED and therefore should have an active role in driving sepsis protocols the implementation of the collaborative model has shown to be very beneficial in facilitating the implementation process.

Multiple studies mentioned in this literature review have suggested that nurses being a part of the implementation process aid in the increase in patient diagnosis and treatment. Nurse champions that lead the way to implementing sepsis protocols help to increase nurse compliance with sepsis documentation (Campbell, 2008). She states that when there are other nurses modeling what needs to be done, adherence is more likely (Campbell, 2008).

Campbell, (2008) describes how Rogers’ Diffusion of Innovations theory can be used in the process of communicating and implementing changes into practice. She describes how the effect nurse champions may have on compliance with the Keystone ICU sepsis screening protocol implemented. The nurse champion is the early adopter, and can affect the rate and extent of the change (Campbell, 2008). Future studies should examine the impact nurse leaders/champions have on the implementation process of sepsis protocols and what effect it has on compliance with the protocol components.
Conclusion

When implementing new protocols, examining the facilitators and barriers to the implementation process is very important. In order for patient outcomes to improve, protocols set forth need to be followed in a specific manner.

This review of the literature presents facilitators and barriers to the implementation of sepsis protocols and suggestions for mitigating barriers have been included. Getting feedback from all disciplines is very important when developing a protocol and utilizing nurses to help implement sepsis protocols. For future research, allowing nursing to be “change champions” and involved in the development and implementation of sepsis protocols and utilizing a multidisciplinary approach is the evidence-based approach to improve adherence to sepsis bundles/protocols.
References


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*The Journal of Emergency Medicine, 44, 735-741.*
Literature Review: Does Early Goal Directed Therapy for Sepsis Effect Patient Outcomes?

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Abstract

Background: Sepsis has been linked to killing one in four people not only in the U.S. but also around the world and this number increases daily (Dellinger et al., 2013). Improved patient outcomes have been linked to early identification of sepsis and implementation of the sepsis protocols Dellinger et al., 2013).

Methods: A search was completed of published studies examining the patients diagnosed with sepsis and septic shock that were treated in the emergency department (ED) with early goal directed therapy (EGDT). Databases used were Academic Search Premier, CINAHL, MEDLINE and Google Scholar. Key words used for the search included, sepsis protocols, septic shock, EGDT, adherence, mortality and Emergency department. Initially 176 articles were resulted; the search was then narrowed to twelve after only specific articles related to sepsis protocols with EGDT initiated in the emergency department were used.

Results: It is suggested that sepsis protocols implemented in the ED have significantly reduced patient mortality in the hospital setting (El Solh et al., 2007; MacRedmond et al., 2010; Nguyen et al., 2007; Patel et al., 2010; Puskarich et al., 2009; and Wang et al., 2012). Adherence to the sepsis protocols showed significant improvement after the sepsis protocol implementation (Bruce et al., 2007; Crowe et al., 2010; Nguyen et al., 2007; Patel et al., 2010; Sweet et al., 2010; Tromp et al., 2010 & Wang et al., 2012).

Conclusion: Adherence to the sepsis protocols showed significant improvement as well after the implementation of these protocols. When looking at these specific elements, including blood culture collection, lactate collection, antibiotic administration, and fluid resuscitation independently of each other; it is unclear how they affect patient mortality.
We do know from research, that sepsis bundles or protocols implemented as a whole have significantly reduce patient mortality in the hospital setting, and in turn, have positive patient outcomes including a shorter length of stay in the ICU, decreased ventilator days.

**Background**

Sepsis has been recognized as the leading cause of death in non-coronary intensive care units and the tenth overall leading cause of death for patients age sixty five and older in the hospital setting (LaRosa, 2010). It has been linked as the cause of death in one of four people not only in the U.S. but also around the world (Dellinger et al., 2013). Sepsis is defined as a “systemic response to an active infectious process in the host” and “represents the systemic inflammatory response to the presence of infection” (American College of Chest Physicians/Society of Critical Care Medicine Consensus Conference, 1992, p.865).

In 2004, the European Society of Intensive Care Medicine, the International Sepsis Forum, and the Society of Critical Care Medicine have published the Surviving Sepsis Campaign guidelines (SSG) (Dellinger et al., 2013). The guidelines were developed so that management of sepsis would be consistent across a continuum of care. The guidelines have been updated multiple times since 2004, and most recently in 2012 (Dellinger et al., 2013). Diagnostic criteria for sepsis include: fever >38.3°C or < 36°C; heart rate >90/minute; tachypnea (respiratory rate > 26 per minute); altered mental status; significant edema or positive fluid balance; and hyperglycemia (plasma glucose >140mg/dl) (Dellinger et al., 2013).
Dellinger et al. (2013) presented the EGDT in septic patients in the SSG. Patients with sepsis-induced tissue hypoperfusion, (defined as low blood pressure or hypotension persisting after an initial fluid challenge or if a patient has a blood lactate level of ≥ 4 mmol/L) should be treated as soon as hypoperfusion is recognized. Initial EGDT in a patient with sepsis-induced tissue hypoperfusion targets the following parameters: CVP 8-12 mm Hg, MAP ≥ 65 mm Hg, Urine output ≥ 0.5 ml/kg/hr., and superior vena cava oxygenation saturation (Scv02) of 70% or mixed venous oxygen saturation (Svo2) 65%” (Dellinger et al., 2013, p. 587). The SSC guidelines recommend maintaining these parameter targets as soon as a patient has been identified to have sepsis (Dellinger et al., 2013). The goals of the initial EGDT resuscitation are to have all components completed within the first six hours of diagnosis. (Refer to tables 1 and 2 for Sepsis protocol components to be completed within 3 hours and 6 hours)

Adherence to these EGDT protocols is very important. Without adherence, the protocols would not be implemented appropriately thus; the protocol components would not be initiated correctly. Protocols are guidelines implemented to make sure that all the recommendations outlined in the SSG are utilized as appropriate. Several hospital EDs have initiated sepsis protocols to decrease the time to initiation of EGDT. Being able to reduce the time to diagnosis of sepsis and begin treatment is critical in reducing mortality from multiple organ dysfunction related to sepsis (Dellinger et al., 2013).

The purposes of this literature review is to examine the studies that have implemented early goal directed therapy (EGDT) protocols for sepsis in emergency departments (ED) and evaluate how the protocols have affected patient outcomes including patient mortality. A second purpose of this literature review is to examine how
well sepsis protocols that were implemented in the ED were adhered to after EGDT was initiated.

**Methods**

A search was completed of published literature examining patients diagnosed with sepsis and septic shock who were treated in the ED with EGDT. Databases used were Academic Search Premier, CINAHL, and MEDLINE. The search was limited to full text articles published in English from 2005-2015. Search terms included sepsis, septic shock, EGDT, emergency department, and nurse-driven, compliance and adherence. Inclusion criteria for determining which studies to include in the review were studies that implemented the EGDT sepsis protocols in the emergency department. All patients were diagnosed with sepsis, severe sepsis or septic shock. The studies primarily evaluated patient outcomes related to mortality and the adherence to the protocols within the specified time frame. Studies of adult patients, age greater than 18 were included. Initially 176 articles were resulted; the search was then narrowed to nine after only specific articles related to sepsis protocols with EGDT initiated in the emergency department were used.

**Synthesis of the Literature**

**Patient Outcomes Related to Mortality**

Patients who are treated with EGDT are initially seen in the ED, warranting the importance of early ED diagnosis and intervention of these septic patients (Puskarich et al., 2009). After implementation of all the studies EGDT sepsis protocols the researchers found a decrease in patient mortality (El Solh et al., 2007; MacRedmond et al., 2010; Nguyen et al., 2007; Patel, Roderman, Gehring, Saad, & Bartek, 2010; Puskarich,
Marchick, Kline, Steuerwald, & Jones, 2009; and Wang et al., 2012). There were three studies that the results revealed a decrease in patient mortality, however the results were not statistically significant (Bruce et al., 2015; Crowe et al., 2010 and Focht et al., 2009 & Sweet et al., 2010;).

El Solh el al. (2007) conducted an observational prospective study with a historical control group examining the “older” adult, age 65 and older and how implementation of a sepsis protocol would affect 28-day mortality. After the implementation of the EGDT protocol, patients had an absolute risk reduction of 16% (P=0.01). This study was one of the only study that examines the older adult and researchers suggests that further research may beneficial for the older adult to achieve a decrease in mechanical ventilation and ICU length of stay (El Solh et al., 2007).

A study conducted by MacRedmond et al. (2010) also evaluated the impact of EGDT for sepsis on mortality. They developed a sepsis algorithm for EGDT and focused on improving the process flow to care for these patients diagnosed with sepsis. Significant improvements were found after the implementation of the EGDT sepsis protocol. Crude hospital mortality was 51.4% decreased to 27% (P=0.02) after the EGDT protocol initiation (MacRedmond et al., 2010). Similarly, Nguyen et al. (2007) conducted a two-year prospective observational study that looked at the outcomes of implementing a sepsis protocol in the ED. The in-hospital patient mortality decreased from 39.5% to 20.8% (P=0.01) in patients that were treated with the protocol versus those that did not (Nguyen et al., 2007).

A 2-part sepsis protocol was implemented by Patel et al. (2010) to evaluate patient outcomes and mortality. The first part of the protocol was a sepsis treatment
algorithm that was a screening tool that helped the nurses and physicians to identify and treat the patient within the first 6 hours. The second part of the protocol was directed at the ICU and for the continuation of care. After the implementation of the EGDT protocol, results revealed a reduction in mortality from 61.1% to 20% (P=0.001; Patel et al., 2010).

Puskarich et al. (2009); Wang et al. (2012) both conducted before and after intervention studies that examined the mortality rates of patients in the two groups after the implementation of an EGDT sepsis protocol. Puskarich et al. (2009) examined mortality at one year after the implementation of the sepsis protocol. Mortality decreased from 49% to 37% (P=0.04; Puskarich et al., 2009). Wang et al. (2012) found a reduction in mortality as well, from 44.8% to 31.6% (P=0.05).

Four studies did find a reduction in patient mortality; however the results were not statistically significant (Bruce et al., 2015; Crowe et al., 2010; Focht et al., 2009; & Sweet et al., 2010). Bruce et al. (2015) evaluated the impact of nurse driven sepsis protocol on antibiotic administration, adherence to the sepsis protocol and patient mortality. Results revealed that mortality decreased from 24.2% prior to implementation of the protocol to 21.3% afterwards, however not statistically significant (P=0.838; Bruce et al., 2015). Interestingly, Crowe et al., (2010) began to see a trend toward a decrease in patient mortality treated with EGDT, with 43.1% prior to implementation of the EGDT protocol and 34.4% after with a P=0.22. The researchers suggested that with a larger sample size, implementation of EGDT sepsis protocol might show a reduction in mortality (Crowe et al., 2010).

Focht et al. (2009) implemented an EGDT protocol to treat patient with sepsis in their emergency departments. Their sepsis protocol encompassed an algorithm to follow,
a treatment protocol, physician order sheet, nursing flow sheet and code sepsis response team. After their implementation process, there was a decrease in mortality from 27% prior to the protocol to 19% after the sepsis protocol implementation, however not statistically significant (P=0.2138; Focht et al., 2009). Lastly, a study conducted by Sweet et al. (2010) also implemented a sepsis protocol in an ED in Canada. There were no statistical significant differences in patient mortality 20.7% to 16.7% after the implementation (Sweet et al., 2010).

Each study implemented an EGDT protocol and evaluated outcomes based on patient outcomes related to mortality. All of the studies have suggested that with the implementation of EGDT sepsis protocols, patient mortality can be decreased.

**Adherence to the Sepsis Protocols**

Seven studies demonstrated an increase in adherence to the specific components of the sepsis protocols implemented (Blood culture administration, antibiotic administration, lactate collection, and fluid resuscitation) (Bruce et al., 2015; Crowe et al., 2010; Nguyen et al., 2007; Patel et al., 2010; Sweet et al., 2010; & Tromp et al., 2010; Wang et al., 2012).

The studies by Bruce et al. (2015); Crowe et al. (2010); Patel et al. (2010); Tromp et al. (2010) and Wang et al. (2011) all revealed increased adherence to the sepsis protocol components including (Blood culture administration, antibiotic administration, lactate collection, and fluid resuscitation). Bruce et al. (2015) conducted a study to evaluate the impact of a nurse driven sepsis protocol and examined adherence to the sepsis protocol components. The results revealed that the lactate components were being adhered to 98.7% of the time as compared to 83.9% before the protocol implementation.
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(P=0.003; Bruce et al., 2015). The other three protocol components including blood culture collection, antibiotic administration and fluid resuscitation were not statistically significant (Bruce et al., 2015).

Of the other three studies, Patel et al. (2010) found a statistical significance with all four-protocol components after implementation of EGDT sepsis protocols. Blood culture prior to antibiotic administration increased from 60.4% to 79.7% (P=0.08); Lactate collection increased from 9.4% to 84.7% (P=<0.0001); Fluid administration increased from 2200 ml to 7143 ml (P=<0.001); Antibiotic administration time decreased from 85 minutes to 75 minutes (P=0.001; Patel et al., 2010). With these studies suggesting that with the implementation of the EGDT sepsis protocols, provider adherence to the protocols can increase, thus effecting patient outcomes in reducing patient mortality.

Lastly, two studies implemented EGDT sepsis protocols, however they monitored other components of the sepsis protocol outlined by the Surviving Sepsis Campaign Guidelines (Dellinger et al., 2013). Sweet et al. (2010) and Nguyen et al. (2007) implemented sepsis protocols and evaluated adherence to other components. Sweet et al. (2010) evaluated adherence to time to antibiotic administration (decreased from 4.2 hours to 1.0 hours); time to Central line placement (decreased from 11.6 hours to 3.2 hours); time to arterial line insertion (decreased from 7.5 hours to 2.3 hours); and achievement of central venous pressure (CVP) (decreased from 11.1 hours to 5.1 hours). We know that these patients were able to reach physiologic goals of CVP quicker and this helps to improve patient mortality (Sweet et al., 2010).
Nguyen et al. (2007) conducted a two-year prospective observational study that examined outcomes of implementing a severe sepsis protocol in the ED. They used five quality indicators for the bundle to evaluate including (initiation of CVP/central venous oxygen saturation monitoring within 2 hours; give broad-spectrum antibiotics within 4 hours; complete early goal-directed therapy at 6 hours; give corticosteroid if the patient is on vasopressor or if adrenal insufficiency is suspected; monitor for lactate clearance; Nguyen et al., 2007). Adherence to the protocol components increased from 0% to 51.2%.

Of the seven studies, all suggested increased adherence with the sepsis protocol components after the implementation of the protocol. Although some results were not statistically different, perhaps with a larger sample results may reveal a more statistical significant difference in adherence.

**Discussion**

This purpose of this manuscript was to examine the patient outcomes related to mortality after implementation of EGDT sepsis protocols administered in the ED and examine adherence to the EGDT sepsis protocols. EGDT has been found to be the cornerstone of therapy for the septic patient in decreasing mortality (Patel et al., 2010).

Mortality reduction from EGDT protocols were found in the studies evaluated with exception of one by Crowe et al. (2010), who began to demonstrate a trend towards a decrease that was not statistically significant. In a study by Crowe et al. (2010) the sample was only conducted at a single center institution and could not be generalizable to their institution. For future research, expanding the EGDT sepsis protocol implementation to other facilities in the area would allow the studies to relate their
findings to other populations and patient demographics. This would also increase sample size and provide a strong support for sepsis patients in healthcare in general.

Adherence to these sepsis protocols plays an important role in the patient outcomes related to mortality. Although all studies found a reduction in patient mortality there limitations that were mentioned. A major limitation noted by Crowe et al., (2010) was the method of identifying patients. The EGDT group was composed of larger portion of patients with systemic inflammatory response syndrome criteria (SIRS) than those in the control group (Crowe et al., 2010). The study by Puskarich et al., (2009) included SIRS criteria for pre and post implementation. This allowed for a larger sample size. An interesting limitation or “difficulty” noted by Focht et al. (2009) was the lack of 100% compliance with lactate measurement. As outlined in the SSC guidelines by Dellinger et al., (2013), serum lactate should be measured within the first three hours of diagnosis and to be repeated within six hours if the initial serum lactate was elevated. Resuscitation should be targeted to normalize the serum lactate level (Dellinger et al., 2013). So, in response to the decreased compliance of serum lactate, Focht et al. (2009) decided that the respiratory therapist would draw the serum lactate level. Respiratory therapists typically draw the arterial blood gas levels and the serum lactate can be drawn at the same time. This increased the hospitals lactate measurement compliance to almost 100% (Focht et al., 2009).

Implications for Practice

With sepsis being so widespread and the mortality rate at an all-time high, there is a clear indication that there is a need for evidence-based change. According to the literature review, all studies found a significant decrease in patient mortality related the
developed of EGDT protocols and the adherence to the protocols improved after implementation of the protocols as well.

It was noted by Tromp et al. (2010) that the use of a nurse-driven sepsis bundle and includes feedback on the performance before and after implementation shows that compliance to the six-bundle elements were significantly better when the nurses were involved. For future practice and implementation of future sepsis protocols, allowing the nursing staff to drive the protocols and sit on the committees of the protocol teams will ensure that compliance with bundle components will increase allowing which will increase patient mortality.

Facilities should adopt the SSC guidelines and adopt the EGDT protocol to implement in their facility. Because nurses are at the forefront and usually the first to triage a patient, it is ultimately important for them to understand and recognize the signs and symptoms of sepsis and septic shock (Tromp et al., 2010). Education should be conducted on the signs and symptoms of sepsis and septic shock and what to look for in early warning signs so that the EGDT protocol can be initiated.

**Conclusion**

When implementing new protocols, monitoring adherence is very important. This review has focused on EGDT sepsis protocols that have shown to improve outcomes related to patient mortality. Adherence to the sepsis protocols showed significant improvement as well after the implementation of these protocols. When looking at these specific elements, including blood culture collection, lactate collection, antibiotic administration, and fluid resuscitation independently of each other; it is unclear how they affect patient mortality. We do know from research, that sepsis bundles or protocols
implemented as a whole have significantly reduce patient mortality in the hospital setting, and in turn, have positive patient outcomes including a shorter length of stay in the ICU, decreased ventilator days. Castellanos-Ortega et al. (2010) stated that patients with the highest success rate of survival were the patients that received six or more interventions within the first six hours of the protocol. Future research can focus on specific elements of the bundle that could potentially make more or less of an impact on the outcomes.
References


An Evaluation to the Adherence of a Sepsis Protocol at a Central Kentucky Community Hospital

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Abstract

**Background:** Sepsis is defined as a “systemic response to an active infectious process in the host” and “represents the systemic inflammatory response to the presence of infection” (American College of Chest Physicians/Society of Critical Care Medicine Consensus Conference, 1992, p.865). In 2008, an estimated 727,000 patients were hospitalized with a diagnosis of sepsis, an increase from 326,000 in 2000, or a 55% increase in prevalence over the eight-year period (Hall, Williams, DeFrances, & Golosinskiy, 2011). Early identification of sepsis with early and effective management strategies has been shown to improve patient outcomes and decrease mortality and prevent organ dysfunction (Levy et al., 2010). Outcomes related to gender differences have not been widely examined in the septic patient; however, women with sepsis managed in the emergency department received less early goal directed therapy when compared to men (Mikkelsen et al., 2010).

**Purpose:** The purpose of this project was to evaluate adherence to four components of the sepsis protocol in the emergency department and intensive care unit at a central Kentucky community hospital. The four components were based on the 2012 revisions of the Surviving Sepsis Campaign Guidelines (Dellinger, 2013) and included antibiotic administration time, blood culture collection, serum lactate measurement, and fluid resuscitation. Mortality and adherence to the 4 sepsis protocol components was analyzed between genders.

**Setting:** The study took place at a 173-bed central Kentucky community hospital; data were extracted from the medical records of patients who were admitted through the
emergency department (ED) and transferred to the intensive care unit for actual or potential sepsis/septic shock.

**Population:** Men and women aged 18 years of age (n = 32) and older, with an ICD-9 diagnosis code of sepsis (995.91), septic shock (785.52) or severe sepsis (995.92) on admission or during the ICU stay, and who were admitted through the ED into the ICU, or directly admitted to the ICU from the ED were included.

**Design and Methods:** A retrospective, descriptive comparative design was used for this practice inquiry. The medical record review included records from the date the sepsis protocol began on March 6th, 2014 through October 10th, 2014; 32 patients met inclusion criteria and data were extracted from those medical records.

**Results:** Patients were Caucasian (100%) aged 77 ± 12 years; half were male. A majority of patients died during their hospital stay (59%); on average, patients were hospitalized for 7.3 ± 6.3 days. Only 34% of patients correctly received all four components of the sepsis protocol. Adherence was highest for antibiotic administration (91% adherent) and blood culture (94% adherent); approximately half of patients had serum lactate measured and received appropriate fluid resuscitation (53%). There were no differences in adherence based on patient gender (p > 0.05).

**Conclusion:** Only around one third of patients received all 4 components of the protocol. Additional strategies are required to ensure adherence with all components of this protocol, as prior data demonstrate that patient outcomes are significantly improved with protocol adherence.
Introduction

Sepsis is defined as a “systemic response to an active infectious process in the host” and “represents the systemic inflammatory response to the presence of infection” (American College of Chest Physicians/Society of Critical Care Medicine Consensus Conference, 1992, p.865). Patients may develop signs and symptoms of systemic inflammatory response syndrome (SIRS) before fully developing sepsis. When patients are admitted to the emergency department a diagnosis is made based on specific criteria.

A diagnosis of SIRS requires two of four criteria, which include abnormal temperature (either high or low), elevated heart rate, elevated respiratory rate or a decrease in PaCO₂, and an abnormal leukocyte count (either high or low) (Kaukonen, K. et al., 2015). There are two types of SIRS criteria. Patients can have SIRS-positive severe sepsis, defined as the patient meeting two or more SIRS criteria, or a SIRS-negative severe sepsis, defined as less than 2 criteria (Kaukonen, K., et al., 2015). Kaukonen and colleagues (2015) found that a patient that was SIRS-positive had a 26% greater odds of mortality than the patient being SIRS. They also found that there was a 13% increase in likelihood of mortality with each additional criterion met.

In 2008, an estimated 727,000 patients were hospitalized with a diagnosis of sepsis, an increase from 326,000 in 2000, or a 55% increase in prevalence over the eight-year period (Hall, Williams, DeFrances, & Golosinskiy, 2011). It is estimated that in the year 2020, 1,110,000 cases will be affected by sepsis up from 934,000 cases in 2010 in the United States (Schramm, Kashyap, Mullon, Gajic, & Afessa, 2011).

Overall, sepsis is a widespread problem in the adult intensive care unit setting. However, patients are most often screened for sepsis in the emergency department (ED).
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(Wang, Shapiro, & Angus, 2007). Patients initially seen in the ED with the diagnosis of sepsis or septic shock have accounted for more than 500,000 patients annually (Crowe, Mistry, Rzechula, & Kulstad, 2010). Patient mortality rates for severe sepsis is ranging from 30-50% and septic shock patients is 50-60% (Minino, AM. et al., 2004).

Patients with a diagnosis of sepsis have a 75% longer length of hospital stay compared with those with other diagnoses (National Hospital Discharge Survey, 2008). Sepsis and septic shock not only carry a high mortality rate for patients, but also are associated with a huge financial cost. Costs associated with treating sepsis were $14.6 billion in 2008 (National Hospital Discharge Survey, 2008).

In 2004, the European Society of Intensive Care Medicine, the International Sepsis Forum, and the Society of Critical Care Medicine published the Surviving Sepsis Campaign (SSC) guidelines (Dellinger, Carlet, & Masur, 2004). The guidelines were developed so that management of sepsis would be consistent across a continuum of care. The guidelines have been updated multiple times since 2008, and most recently in 2012 (Dellinger et al., 2013).

All patients admitted through the emergency department are to be screened for sepsis when they arrive. Diagnostic criteria include: Fever $>38.3^\circ$ C; heart rate $>90$/minute; tachypnea; leukocytosis (white blood cell (WBC) count $>12,000$); source of documented infection; or organ dysfunction. (Dellinger et al., 2013). Organ dysfunction is characterized by a decreased urine output $<0.5$mL/kg/hour for more than 2 hours despite fluid resuscitation; acute lung injury with PaO$_2$/FiO$_2$ $< 250$ in the absence of pneumonia; creatinine $> 2.0$mg/dL; bilirubin $>2$ mg/dL; platelet count $< 100,000$ µL; or coagulopathy (international normalized ration $> 1.5$) (Dellinger et al., 2013, p.586).
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Early identification of sepsis with early and effective management strategies has been shown to improve patient outcomes and decrease mortality from 37% to 30.8% over a year time period (Levy et al., 2010). The sepsis guidelines include early goal directed therapy (EGDT). The initial EGDT resuscitation is to have all components completed within the first six hours of diagnosis. (Table 1) There is also bundle components that should be completed within the first 3 hours of diagnosis (Table 2).

Outcomes related to gender differences have not been widely examined in the septic patient. Examination of gender differences was evaluated to determine if there were gender differences in mortality. One study by Madsen et al. (2014) hypothesized that sex hormones could have a protective effect on females. Those female patients, however, diagnosed with sepsis in the emergency department received less early goal directed therapy than men in one study (Mikkelsen et al., 2010). The study by Madsen et al. (2014) examined whether women did have lower SSC protocol completion rates than men. In the study 44.8% of patients were women; only 60.5% of women compared to 68.8% of men did not receive the antibiotics within three hours. There were not any gender differences in outcomes. Madsen et al. (2014) concluded, “further research is needed to examine individual bundle elements and gender specific factors that may affect bundle completion and mortality” (pg. 473.e7). In this practice inquiry project, mortality and adherence to the sepsis protocol components was analyzed between genders to identify associations between gender and adherence and mortality.

Description of the Practice Inquiry Project

The purpose of this practice inquiry project was to evaluate the adherence to four components of the sepsis protocol implemented in the emergency department and
intensive care unit (ICU) at a central Kentucky community hospital consistent with what is recommend by the SSC guidelines. The specific aims were: 1) to evaluate adherence to the four components of the protocol (blood culture collection time; time to antibiotic; fluid resuscitation; and serum lactate measurement; and 2) to evaluate whether there are differences in protocol adherence based on patient gender.

Methods

Study Design

A retrospective, descriptive comparative design was used for this practice inquiry. The patients were triaged in the ED, and when the patient met protocol criteria for sepsis, (fever >38.3° C; heart rate >90/minute; tachypnea; leukocytosis (white blood cell (WBC) count >12,000 $\mu$L) source of or documented infection; or organ dysfunction (Dellinger et al., 2013) the sepsis protocol was then initiated. The data for this practice inquiry project were obtained through a retrospective medical record review conducted after patient discharge from the hospital.

Sample

Only 32 patients met the inclusion criteria during the initial 6 months of protocol use. Thus, the actual sample size was 32. Patients were included in this study if they were: 1) aged 18 years of age; 2) were assigned an IDC-9 diagnosis code for sepsis (995.91), septic shock (785.52) or severe sepsis (995.92) on admission or during the ICU stay; and 3) were admitted through the ED into the ICU or directly admitted to the ICU from home. Patients were excluded when: 1) they were transferred to the ICU for comfort care only (not to be treated aggressively); 2) were diagnosed with sepsis on a general unit and transferred to the ICU; or 3) were transferred out of the ED to another facility,
because adherence to the 4 components of the protocol could not be determined, and patient outcome was not available.

**Study Setting**

The 10-bed ICU patient population at Frankfort Regional Medical Center consists of critically ill patients older than 18 years of age. Patients were initially managed using the sepsis protocol in ED, and then transferred to the ICU. For this 10-bed ICU, the average daily census was 8.2 for 2014; mean length of stay was 3.6 days; the nurse to patient ratio was either 1:2 or 1:3 depending on patient acuity; average days on the ventilator per patient was 3.7 days; the average number of ventilators in the unit on a daily basis was 2.4. There were 24-hour respiratory therapy services for this unit, and on-call dialysis services as needed. There was also a 24-hour hospitalist service at this facility, but none were trained as an intensivist.

**Measures**

**Demographic Variables**

The demographic variables that were included in the study included gender, age, race/ethnicity (African American, Caucasian, Hispanic, and other), and primary diagnosis. Health history variables abstracted from the medical record included a diagnosis of diabetes, hypertension, cerebral vascular accident, coronary artery disease, and prior urinary tract infection.

**Protocol Variables**

Included: (1) Order for blood culture (a) Blood culture completed within the required time frame (b) blood culture completed prior to antibiotic administration (2) Antibiotic order (a) antibiotic administered within three hours of sepsis diagnosis and
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after blood cultures were collected (3) Lactate order (a) lactate complete (b) was lactate complete within three hours of sepsis diagnosis (4) fluid resuscitation prescribed (a) fluid resuscitation complete or the rational for lack of fluid resuscitation documented (b) fluid resuscitation complete within three hours of sepsis diagnosis.

Patient Outcomes:

Patient disposition was included in this study. Data was collected regarding whether patient was discharged to home, a rehabilitation facility, or transferred to other hospital, and whether the patient died during the hospitalization.

Study Procedure

I received approval to conduct this medical record review from my capstone committee members, the University of Kentucky IRB with an expedited review and Frankfort Regional Medical Center. The hospital sepsis coordinator provided a list of patients with a diagnosis of sepsis (ICD-9 995.91), septic shock (ICD-9 785.52), or severe sepsis (ICD-9 995.92) during the 6 month period after implementation of the protocol March 6th, 2014 through October 6th, 2014). The list included the medical record number, diagnosis, date of admission and discharge date from the hospital. Patients were initially excluded from the list if they were admitted to a general nursing unit and had a later diagnosis of sepsis. Data were extracted from the electronic medical record (EMR) using a data collection form (See appendix C).

Data were then entered into a statistical spreadsheet for inspection and analysis (SPSS, version 22, IBM, Amonk, NY). An evaluation of accuracy was completed by reexamining all data inputs and spreadsheet, assessing for missing information and errors in numbers. No data errors were made.
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Prior to the initiation of the sepsis protocol staff nurses from the ED, ICU and medical units received education about the pathophysiology of sepsis, the importance of quick and effective treatment of sepsis, and then an educational assignment was given to all nursing staff that explained the sepsis protocol implementation, and the nursing role in protocol use. The sepsis protocol initiated at Frankfort Regional Medical Center included a sepsis assessment during triage. The physicians in the ED received only education about how to enter a request for the initiation of the sepsis protocol in the computer system.

Data Analysis

Descriptive statistics were used to characterize the participants. Participants were categorized by gender, and demographic and clinical variables were compared with independent t-tests and Chi-square tests based on the level of measurement. To respond to the first aim, we evaluated the adherence to four protocol components by calculating the proportion of patients who received each of the 4 components in the protocol evaluated. We also calculated the proportion of patients who received all four components appropriately. To respond to the second aim, we determined the association of adherence to all four evaluated components of the protocol by gender with Chi square analysis. All analyses were performed with SPSS (version 22, IBM, Amonk, NY). A prior significance level of 0.05 was used to determine significance. (See Table 1)

Results

Sample Characteristics

Participants were Caucasians; half were male (Table 1). On average patients were 77 ± 12 years of age. More than half of patients (59%) died during their hospitalization.
Significantly more women died compared with men (men 56%, women 63%, p = 0.03). On average, these patients were hospitalized 7.3 + 6.3 days. Nearly one third of patients (28%) received a diagnosis of sepsis on admission to the intensive care unit. Men were more often diagnosed with sepsis in the ED compared with women (men 44%, women 13%, p = 0.05). Other diagnoses included respiratory failure (6.3%), urinary tract infections (3.1%) and pneumonia (28.1%).

**Adherence to the Sepsis Protocol**

Overall adherence to the sepsis protocol was only 34%. Blood cultures obtained prior to antibiotic administration (94%) and antibiotics administered within 3 hours of diagnosis was (91%). Serum lactate measurement was obtained in only 53% of patients. Fluid resuscitation was prescribed for 17 patients (53%), but seven patients (22%) did not have fluid resuscitation ordered.

**Adherence by Gender**

We compared the adherence to protocol by gender to determine whether patient gender influenced protocol use. There was no association between protocol component adherence and gender. Approximately two thirds (64%) of women met the criteria for adherence to the four sepsis protocol components; only 36% of men demonstrated adherence to the four components. However, these proportions were not statistically different from predicted (p = 0.23).

**Discussion**

This practice inquiry project was developed to evaluate adherence to the sepsis protocol at a central Kentucky community hospital during the first 6 months of use. We found that adherence to all 4 components of the protocol was poor; only 34% of patient
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medical records evaluated had documented evidence of adherence to the 4 components of the sepsis protocol. When evaluated separately, adherence to the 4 components ranged from 53% to 94%; the 2 components with the lowest adherence proportion were measurement of serum lactate and administration of fluid. In the study, there was no statistical significant difference between males and females that received blood cultures within the appropriate time frame (male 100% female 88%, p=.14).

These study results suggest that provider adherence increases with the implementation of sepsis protocols and is related to a decrease in patient mortality. After implementation of all the studies EGDT sepsis protocols the researchers found a decrease in patient mortality (El Solh et al., 2007; MacRedmond et al., 2010; Nguyen et al., 2007; Patel, Roderman, Gehring, Saad, & Bartek, 2010; Puskarich, Marchick, Kline, Steuerwald, & Jones, 2009; and Wang et al., 2012).

Few studies have examined gender differences in mortality and adherence to the sepsis protocols. Pietropaoli, Glance, Oakes, & Fisher, (2010) examined whether the mortality in hospitals was higher for males than females diagnosed with sepsis. Results showed that actually females who were diagnosed with severe sepsis or septic shock were more likely to die in the hospital than males (35% vs. 33%; P=0.006). Future research examining the causes of the gender differences and why mortality seems to be higher in the female population than males is warranted. Madsen et al. (2014) hypothesized that sex hormones could have a protective effect on females. In this study, there was a greater proportion of women who died (male 56% female 63%, p=0.03). However, this was not clinically significant as it was only a difference of one patient. There is a lack of evidence
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that has demonstrated any comparisons of genders related to the adherence of sepsis protocols. There was insufficient statistical power to demonstrate gender differences.

The findings from the study demonstrate that there is a poor overall adherence to the sepsis protocol at this central Kentucky community hospital. There is a need for an intervention at this facility to improve overall adherence and specifically to target the measurement of serum lactate, and either administration of fluid for those who meet criteria, or for improved documentation about these criteria for each patient. Accurate documentation is important to determine adherence to the sepsis protocol.

Education for the physicians and nurses could be an important factor affecting the results of this study. Physicians were only educated about how to enter a prescription for the protocol. Based on the poor adherence to these four components, physician education may be required to improve understanding of the protocol components (blood culture collection, antibiotic administration, serum lactate draw and fluid resuscitation within 3 hours of diagnosis) and their importance to patient outcomes. Interestingly, Castellanos-Ortega et al. (2010) conducted an extensive education program for the physicians and nursing staff prior to implementation of a sepsis protocol. The education included conferences on sepsis, teaching sessions, posters, and pocket cards. The teaching materials were also readily available on the intranet for later reference. After the first study year, an educational refresher program was given and this included a daily visit from the intensivist research specialist for educational needs. The investigators found a significant increase in sepsis bundle adherence after the educational programs from 1% at baseline to 11.3% (Castellanos-Ortega et al., 2010). This study shows that after intense educational sessions that included the implementation process and signs and symptoms of
AN EVALUATION TO THE ADHERENCE OF A SEPSIS PROTOCOL

sepsis, overall bundle adherence can be increased. Perhaps, this facility should develop an educational program that focused on physician and nurses mainly in how to evaluate and treat sepsis patients.

Limitations

The limitations of this study include the retrospective nature of the data. It was not possible to ascertain the validity of the medical record data abstracted. This is a primary limitation of medical record reviews. The small sample size provided inadequate statistical power. However, we included all patients who met inclusion criteria during the identified 6-month time period. Because this study was limited to a single institution and a 10-bed ICU, results cannot be generalizable to other facilities. Patients were not included if they had transferred from the floor to the ICU. All of these factors could have played a role in the small sample size. Provider education or understanding of sepsis could be another confounding factor in this study.

Clinical Implications

There was poor overall adherence with all 4 components of the sepsis protocol in this study. Specifically, the serum lactate measurement adherence was low at only 53%. Focht et al., (2009) found that one of the barriers they faced was being able to obtain 100% adherence with the serum lactate collection. The multidisciplinary team decided to make a change in who performs the serum lactate draw. The respiratory therapist was chosen to collect and record the serum lactate levels because the nurse was not drawing the serum lactate or missing the order. Respiratory therapists typically draw the arterial blood gases and they can run a lactate level on their arterial blood gas machine from arterial blood. Future research at this facility could examine the barriers to the adherence
of the protocol components and why adherence to measurement of the serum lactate level was only 53%. An examination of why the physicians are not ordering the serum lactates and potential barriers they are facing should be addressed. Also another variable could be that the lactate is being ordered but not being complete. This facility could benefit from a standard set of laboratory orders that automatically includes a lactate level when a sepsis patient is identified. If a sepsis protocol is initiated, this protocol should include the serum lactate.

Fluid resuscitation was also noted to be the other component of the protocol where adherence to resuscitation protocol was poor. Seventeen out of 24 patients received fluid resuscitation. For future research, obtaining the information as to why those seven subjects did not receive the fluid resuscitation would be beneficial. Per the fluid resuscitation protocol patients that have an elevated serum lactate level > 4mmol/L should receive fluid resuscitation or if their systolic blood pressure is below 95 mm Hg. However, the lack of serum lactate measurement precluded determination of need for fluid administration. Further studies should identify barriers to adherence to the components of the sepsis protocol.

This facility should assess the educational level of the staff and physicians. A one-time education program was administered to the nursing staff. The physicians only received education about how to input orders into the electronic medical record. With this life-threatening disease process, more attention should be given to the education process and making sure that the nurses, physicians or advanced practice providers understand the implications of the importance of identifying sepsis early and beginning treatment immediately after diagnosis.
AN EVALUATION TO THE ADHERENCE OF A SEPSIS PROTOCOL

Conclusion

In the first 6 months after protocol implementation at FRMC, adherence to the 4 components of the protocol was poor. The barriers to adherence were not identified in this project, but will be important in the future to determine so that the adherence can be improved. Subsequent patient outcomes should be routinely and systematically evaluated to improve the likelihood that patient outcomes will be optimal.
References


sepsis is associated with sustained improvements in timeliness of care and survival. *Quality Improvement Report, 19.*


AN EVALUATION TO THE ADHERENCE OF A SEPSIS PROTOCOL

based early goal directed therapy protocol for severe sepsis and septic shock: a before and after study. *Critical Care, 13*, 1-7.


Table 1

The Surviving Sepsis Guidelines recommendations for the first six hours of the resuscitation phase

<table>
<thead>
<tr>
<th>Protocolized quantitative resuscitation of patients with sepsis induced tissue hypoperfusion (defined as hypotension persisting after initial fluid challenge or blood lactate concentration ≥ 4 mmol/L)</th>
<th>Criteria for hypoperfusion:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dellinger et al. (2013) recommends targeting fluid resuscitation to normalize lactate with an initial elevated lactate level</td>
<td>(a) central venous pressure 8-12 mm Hg</td>
</tr>
<tr>
<td>Cultures should be obtained before any antimicrobial therapy and without significant delay</td>
<td>(b) mean arterial pressure (MAP) ≥ 65 mm Hg</td>
</tr>
<tr>
<td>Administration of antimicrobials within the first hour of diagnosis of septic shock and severe sepsis without septic shock</td>
<td>(c) urine output ≥ 0.5 mL/kg/hr</td>
</tr>
<tr>
<td></td>
<td>(d) Central venous (superior vena cava) or mixed venous oxygen saturation 70% or 65%, respectively</td>
</tr>
</tbody>
</table>

(Dellinger et al., 2013, pg.588).
Table 2

The Surviving Sepsis Guidelines Protocol components to be performed within the first three hours of a sepsis diagnosis.

<table>
<thead>
<tr>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure a serum lactate level</td>
</tr>
<tr>
<td>Obtain blood cultures prior to administration of antibiotics</td>
</tr>
<tr>
<td>Administer broad spectrum antibiotics after cultures obtained</td>
</tr>
<tr>
<td>Administer 30mL/kg crystalloid (normal saline) for hypotension or lactate ≥ 4mmol/L within 3 hours</td>
</tr>
</tbody>
</table>

(Dellinger et al., 2013, p. 591)
Table 3

*Characteristics of the participants (n = 32)*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Total patients (n = 32)</th>
<th>Male patients (n = 16)</th>
<th>Female patients (n = 16)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years</td>
<td>77 ± 12</td>
<td>76 ± 10</td>
<td>78 ± 15</td>
<td>0.61</td>
</tr>
<tr>
<td>Caucasian ethnicity</td>
<td>32 (100%)</td>
<td>16 (100%)</td>
<td>16 (100%)</td>
<td>1.0</td>
</tr>
<tr>
<td>Hospital length of stay</td>
<td>7.3 ± 6.3</td>
<td>6.9 ± 5.0</td>
<td>7.7 ± 7.5</td>
<td>0.74</td>
</tr>
<tr>
<td>Mortality</td>
<td>19 (59%)</td>
<td>9 (56%)</td>
<td>10 (63%)</td>
<td><strong>0.03</strong></td>
</tr>
<tr>
<td>Initial sepsis diagnosis in ED</td>
<td>9 (28%)</td>
<td>7 (44%)</td>
<td>2 (13%)</td>
<td><strong>0.05</strong></td>
</tr>
</tbody>
</table>

**Sepsis Protocol Adherence**

| Adherent to all 4 components     | 11 (34%)               | 4 (36%)                | 7 (64%)                  | 0.23    |
| Adherent to blood Culture component | 30 (94%)              | 16 (100%)              | 14 (88%)                 | 0.14    |
| Adherent to lactate measurement component | 17 (53%)              | 7 (44%)                | 10 (63%)                 | 0.29    |
| Adherent to antibiotic component | 29 (91%)               | 15 (94%)               | 14 (88%)                 | 0.54    |
| Adherent to fluid administration component | 17 (53%)              | 7 (44%)                | 10 (63%)                 | 0.40    |

*Note.* Cells contain mean + standard deviation or frequency (%)

Gender comparisons made with independent t test or Chi square analyses based on the level of measurement.
Conclusion to Final Practice Inquiry Project Report

Somer Robinson BSN, RN

University of Kentucky
The SSG has been recommending protocols for identified patients since the initial guidelines were introduced in 2004 (Dellinger et al., 2013). The first manuscript discussed the barriers and facilitators to implementation of sepsis protocols in the ED. Getting feedback from all disciplines is very important when developing a protocol and utilizing nurses to help implement sepsis protocols. For future research, allowing nursing to be involved/champion or implement the sepsis protocols and utilizing a multidisciplinary approach is an evidence-based way to approach protocol implementation citation is needed.

The second manuscript found that the implementation of the EGDT sepsis protocols have been found to decrease patient mortality and can also increase provider adherence to the sepsis protocol components outlined by the SSC guidelines previously described in Table 2. The third manuscript discussed the practice inquiry project in which a retrospective medical record review was conducted to see if the nurses and providers at the central Kentucky community hospital were adhering to the sepsis protocol initiated. There was poor overall adherence with all 4 components of the sepsis protocol in this study. The sample size was very small due to time constraint. A future study would be very beneficial with a larger sample size that included all patients admitted throughout the hospital that was affected by sepsis and how using the EGDT protocol made an impact on patient mortality.
Appendix A

Letter of Approval from Frankfort Regional Medical Center

From: Michelle England RN, MSN, CCRN
Frankfort Regional Medical Center
299 Kings Daughters Drive
Frankfort, KY 40601

July 30, 2014

To Whom It May Concern,

Upon receipt of IRB approval, Somer Robinson BSN has approval to perform her research study “An Evaluation to the Adherence of a Sepsis Protocol at a Central Kentucky Community Hospital” at Frankfort Regional Medical Center.

Sincerely,

Michelle England RN, MSN CCRN
Chief Nursing Officer
Appendix B-

Institutional Review Board Approval

Initial Review

TO: Somer Robinson, RN, BSN
College of Nursing
1121 Hammond Road
Lawrenceburg, Kentucky 40342
Ph phone #: (502)600-0046

FROM: Chairperson/Vice Chairperson
Medical Institutional Review Board (IRB)

SUBJECT: Approval of Protocol Number 14-0680-P6H

DATE: October 24, 2014

On October 24, 2014, the Medical Institutional Review Board approved your protocol entitled:

UK/O An Evaluation to the Adherence of a Sepsis Protocol at a Central Kentucky Community Hospital

Approval is effective from October 24, 2014 until October 23, 2015 and extends to any consent/assent form, cover letter, and/or phone script. If applicable, attached is the IRB approved consent/assent document(s) to be used when enrolling subjects. [Note, subjects can only be enrolled using consent/assent forms which have a valid "IRB Approval" stamp unless special waiver has been obtained from the IRB.] Prior to the end of this period, you will be sent a Continuation Review Report Form which must be completed and returned to the Office of Research Integrity so that the protocol can be reviewed and approved for the next period.

NOTE: Please be reminded UK HIPAA regulations do not apply at Frankfort Regional Medical Center. You will need to follow their HIPAA rules and regulations. ORI staff updated Form A. question 17a from "Other" to "Other Hospitals and Medical Centers".

In implementing the research activities, you are responsible for complying with IRB decisions, conditions and requirements. The research procedures should be implemented as approved in the IRB protocol. It is the principal investigators responsibility to ensure any changes planned for the research are submitted for review and approval by the IRB prior to implementation. Protocol changes made without prior IRB approval to eliminate apparent hazards to the subject(s) should be reported in writing immediately to the IRB. Furthermore, discontinuing a study or completion of a study is considered a change in the protocol’s status and therefore the IRB should be promptly notified in writing.

For information describing investigator responsibilities after obtaining IRB approval, download and read the document "PI Guidance to Responsibilities, Qualifications, Records and Documentation of Human Subjects Research" from the Office of Research Integrity's IRB Survival Handbook web page [http://www.research.uky.edu/ori/IRB-Survival-Handbook.html#IPIresponsibilities]. Additional information regarding IRB review, federal regulations, and institutional policies may be found through ORI's web site [http://www.research.uky.edu/ori]. If you have questions, need additional information, or would like a paper copy of the above mentioned document, contact the Office of Research Integrity at (859) 257-9428.

Chairperson/Vice Chairperson

Linda Rice, RN/LPN

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Appendix C -

Data Collection Tool

ID: 
Record: 
Date/Time: 

1. Location:
   1. Emergency Department

2.  
   a. Was blood culture ordered  
      No 1 
   b. Was blood culture done  
      0 1

2c. Date/time blood culture was done: 

2d. Blood culture done in proper time frame?  
    0. No 1. Yes

3.  
   a. Was antibiotic ordered  
      0 1 
   b. Was antibiotic given  
      0 1

3c. Date/time antibiotic was given: 

3d. Antibiotic given in proper time frame?  
    0. No 1. Yes

3e. Number of antibiotics noted: 

3f. Antibiotic #1 
   name/class: 

3g. Antibiotic #2 
   name/class: 

3h. Antibiotic #3 
   name/class: 

4.  
   a. Was lactate ordered  
      0 1 
   b. Was lactate done  
      0 1

4c. Date/time lactate was done: 

4d. Lactate done in proper time frame?  
    0. No 1. Yes
<table>
<thead>
<tr>
<th>5.</th>
<th>Was fluid resuscitation ordered</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a. Was fluid resuscitation ordered</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>b. Was fluid resuscitation done</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

| 5c. | Date/time fluid resuscitation was done: |

<table>
<thead>
<tr>
<th>5d.</th>
<th>Fluid resuscitation done in proper time frame?</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0. No</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6.</th>
<th>Gender:</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.</td>
<td>Male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Female</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 7.  | Race: |

1. African American  
2. Caucasian  
3. Hispanic  
4. Other (specify) __________________

| 8.  | Primary diagnosis: |

| 9.  | History of: |

| 70 |

| 10. Disposition | |

11. Origin: __________________
References


