Increasing Compliance of Early Sepsis Interventions at a Critical Access Hospital

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Abstract

Sepsis has been defined as the immune system's overwhelming response to an infection. Sepsis

has been recognized as the leading cause of death in non-coronary ICUs. More than 700 patients

die daily from sepsis in the United States. The purpose of this quality improvement project was

to improve the compliance with the early three-hour sepsis bundles in a critical access hospital.

To improve this compliance the goals were set to develop and implement a sepsis policy for the

facility, to develop stat standing orders for three-hour sepsis interventions and have these put into

place, and to administer a knowledge assessment for medical/surgical nurses to be followed up

with education and a post education knowledge assessment. The project used the Lewin Change

Model which determined the method of sepsis care, unfroze this method, created needed change,

then refroze the staff methods for sepsis care. The education improvement piece of this project

was analyzed using a paired t-test statistical analysis. This analysis found that education had a

positive impact upon the early intervention sepsis compliance. This project found improvement

in all categories excluding the proper administration of intravenous fluid administration in

patients with severe sepsis and septic shock. This area continues to require additional education

for both nursing and providers. The project has added a sense of urgency for expedient care for

sepsis patients to medical/surgical nurses that was lacking before this project. The quality

improvement project should continue to have an impact on the early care of patients with sepsis

in the immediate future.

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Increasing Compliance of Early Sepsis Interventions at a Critical Access Hospital

Introduction

Mortality from severe sepsis and septic shock has been a growing problem in healthcare

for many years. As our population has grown older, the occurrence of sepsis has increased.

According to the Center for Disease Control (CDC), the number of deaths with sepsis as the

cause in the years of 1999-2004 totaled 2,470,666. This number equals six percent of all total

deaths. (CDC, 2016) Healthcare providers began researching successful interventions to combat

the growing numbers of deaths from septic shock. At this time in the healthcare field, sepsis has

been brought to the forefront in the attempt to become proactive with treatments. The speed in

which treatments are provided can mean the difference in life or death with septic patients.

(Fitzpatrick, McKenna, Rooney, Beckett, & Pringle, 2014).

Sepsis is defined as a known or suspected infection with two or more signs of Systemic

Inflammatory Response Syndrome (SIRS). SIRS include a temperature greater than 38.3

degrees Celsius or less than 36 degree Celsius, elevated heart rate greater than 90 beats per

minute and systolic blood pressure less than 90 mm Hg. To progress to severe sepsis, these

occur with an added organ dysfunction. These include such things as increased need for oxygen,

altered mental status, decreased urine output, and elevated lactic acid levels. The worst stage of

sepsis is septic shock which includes all the previous symptoms with the addition of a systolic

blood pressure less than 90 mm Hg that does not respond to a fluid bolus equal to 30 milliliters

per kilogram of patient's body weight or a lactic acid level greater than 4 mmlo/L. (Dellinger et

al., 2013)

There are estimates that the number of patients that develop sepsis after admission to

medical surgical units is approximately 15% of all patients. Much time has been spent fine-

tuning recognition and early interventions in the emergency department and critical care units for

sepsis. This same level of recognition will be important in all units of the hospital. The goal is

to focus efforts on improving the compliance of the three-hour bundles in the medical surgical

setting as early identification of sepsis is key.

In 2015, the Center for Medicare and Medicaid Services (CMS) designated the three and

six-hour sepsis bundles as core measures. This is part of the Hospital IQR (Hospital Quality

Reporting). These specific interventions must be met promptly to accomplish these goals. The

number one priority is improving the patient's chances of recovery. Quality care of the patients

with sepsis is measured through compliance with core measure interventions. These core

measure interventions are monitored and audited from patient care records.   ("Process

improvements," 2015)

The three-hour bundles that are focused on are put into place after a positive sepsis screen

is determined. The patient must have a lactic acid level drawn, two blood cultures completed,

fluid resuscitation of 30 ml/kg of crystalloid fluid administered (if systolic blood pressure is less

than 90 or lactic acid is more than 4 mmol/L), and broad-spectrum antibiotics given within the

three hours from time zero. Time zero begins at presentation in the emergency department or at

the time that sepsis criteria is met on the medical surgical unit. (Dellinger et al., 2013)

Problem Statement

The problem that was occurring at RRMC was that some patients that are admitted to the

hospital fall out of sepsis core measures for a variety of reasons. These include not completing

interventions in a timely manner, not completing one or more of the interventions such as the

fluid resuscitation, and not using the sepsis tool in the way it was designed. The proposal for

solving this problem was to form a sepsis committee to identify the areas that were not being met

on these bundles and work to improve these areas. The comparison was to the past statistics for meeting the core measures versus statistics after the new interventions were put into place. The expected outcome was improved compliance with sepsis bundles core measures. The focus of this project was on the early interventions required for the three-hour bundles. Plans were to develop a hospital wide sepsis policy, take the presentation to the medical/executive board for standing orders for stat lactic acid levels and blood cultures, work with nurses on the medical surgical unit concerning sepsis screening tools and education of proper use of these, making changes to screening tools through information services as problems are identified, and evaluating the impact of these changes once initiated. The timeline will be to begin these interventions beginning March 1, 2017. The goal was to assess these improvements by September 30, 2017 for improvements. (Coleman & Jackson, 2014)

Purpose Statement

The purpose of this project was to see no patients fall out of core measures due to not completing an intervention on the sepsis three-hour bundles. The formation of a sepsis committee was headed by the sepsis coordinator whose role was filled by this nurse. The committee will include the Chief Nursing Officer, the Emergency Department Director, the Director of Pharmacy, the Director of Medical Surgical Nursing, the Director of Laboratory, the Special Coordinator that abstracts charts for meeting requirements, the information systems technician, and the Medical Director for the Emergency Department Physicians. Together this group of stakeholders identified where the core measures were not met, and what interventions were needed to correct these problems.

The PICOT question for this project was as follows:

For the problem of not meeting early intervention three-hour sepsis bundles, does the use of a hospital wide policy, the education of new nurses, the implementation of standing stat lab orders, and improving screening tool use reduce the risk of medical surgical patients developing severe sepsis compared with patients not receiving the proper early interventions?

Project Objectives

The foundational objectives of this were as follows:

1. Improve overall compliance of the three-hour sepsis bundle.

2. Develop a hospital-wide sepsis policy for this critical access facility.

3. Integrate a clinical decision support system into electronic health record.

4. Assure accurate weights obtained for appropriate fluid bolus orders.

5. Decrease number of patients advancing from severe sepsis to septic shock after admission to the medical surgical unit. This will be analyzed by information from chart abstractions from before and after new interventions put into place.

The clinical exemplar found in the text was the guideline in this section of the project. (Bemker & Schreiner, 2016)

There is a multitude of literature that supports the evidence-based practices that prove that early interventions provided in the first three hours of care. The evidence-based practices that were implemented resulted in improved patient outcomes.

The Project Question

The project question for this project is as follows: What evidence-based practice interventions will improve meeting core measure sepsis bundles at RRMC?

As this project moved forward, the sepsis committee determined where the problems were in meeting core measures and what interventions were needed to be put into place to have a positive impact on these statistics.

<div align="center">

Literature Review

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A review of literature has been performed for the problem of a critical care hospital not meeting core measures of three-hour sepsis bundles.   Subjects of evidence-based practice on sepsis definitions, screening tools, and the need for education for healthcare staff members were covered. The sources reviewed are current with most being published within the last five years. The databases used to search the literature include CINAHL, PubMed, Ovid, and Google Scholar.

Best Practices Identification

There are many articles that agree that sepsis is a leading cause of mortality in several patient populations. The consensus is that sepsis needs to be recognized in the early stages to decrease the mortality rate. It is also agreed upon that education for healthcare staff is paramount in reducing mortality rates. The adherence to the three and six-hour bundles has been proven by evidence-based practice to be the key in decreasing mortality rates.

Evidence Summary

The majority of the articles reviewed stress the importance of recognizing the signs and symptoms of sepsis in its early stages. The ground-breaking study by Dellinger et al (2013) laid out the key recommendations for surviving sepsis. The Surviving Sepsis Campaign Guidelines for Management of Severe Sepsis and Septic Shock was developed in 2008 and then was updated in 2012. (Dellinger et al., 2013) The evidence in this study and the other articles

reviewed agree that education of early signs and symptoms of sepsis and the importance of

quickly implementing care bundles will improve mortality rates related to sepsis.

Some literature reviewed defined the anatomy of sepsis, signs and symptoms of sepsis, as

well as strategies to manage sepsis. (McClelland & Moxon, 2014) Other studies have discussed

the presence of chronic medical conditions and how these relate to the patient's risk of

developing sepsis. (Wang, Shapiro, Griffin, Stafford, & Judd, 2012)

Included in the sepsis bundles are recommendations for interventions to reverse

hypotension. Many studies have been completed that show the improvement of patients'

condition with administration of large fluid boluses. According to Schorr et al. (2013), the use of

vasopressors has decreased due to more aggressive early fluid resuscitation. (Schorr et al., 2013)

Many other studies have shown the benefit of following this intervention. Other studies look at

the importance of early antibiotic administration as a life-saving intervention. (Vilella & Seifert,

2014) There are articles that discuss the outcomes of management of sepsis. (Schmidt &

Mandel, 2016) There is a plethora of evidence-based literature that supports these aggressive

treatments.

One study reviewed the poorly defined treatment of patients with intermediate lactate

levels (>=2 and < 4 mmol/L). Normally, the lactate level is not considered life threatening until

the level is > 4 mmol/L. This study showed that treatment bundles for patients with sepsis and

intermediate lactate values improved bundle compliance and decreased hospital mortality due to

increased fluid administration among patients with history of heart failure and/or chronic kidney

disease. (Lui et al., 2016)

Studies have been completed in diverse places in the world. One such study was

completed in Taiwan concerning the impact of a nationwide education program concerning the

clinical practices and the improvement of mortality rates. (Chen, Chang, Pu, & Tang, 2013)

Another study delves into the sepsis six clinical care bundle that has been implemented in

Scotland and the challenges that are faced. (Tarrant et al., 2016)

Articles have been published in multiple medium to inform the non-healthcare population

as well as health care providers on sepsis signs and symptoms and the importance of expedient

treatment to save lives. An example of a celebrity in the news that has succumbed to sepsis is

Patty Duke. Her death from sepsis was well publicized and put sepsis in the headlines for some

time. (Bisbee, 2016)

The use of screening tools to determine if a patient is suffering from sepsis has been

explored in earlier studies. One study looked at the feasibility of using screening tools in an

intensive care unit to determine if a patient was becoming septic. (Coleman & Jackson, 2014)

There have also been studies that measure the effects of education on sepsis in intensive care

units.   This assessed the knowledge and attitudes of intensive care nurses. (Yousefi, Nahidian,

& Sabouhi, 2012)

Studies have also been done to determine the impact of screening tools used by emergency

service personnel prior to hospital presentation. (Fitzpatrick, McKenna, Rooney, Beckett, &

Pringle, 2014)

One of the main purposes of this literature review is the compliance with three-hour

bundle. An important study determines the correlation between compliance with sepsis bundles

and mortality. This study found an amazing 25 percent mortality reduction. (Levy et al., 2015)

There are other aspects to consider in this process. For example, a patient may not meet

core measures due to the physician not ordering the proper fluid resuscitation due to the patient

having a diagnosis of congestive heart failure. There is literature to support both the use of the

fluids with compensation with proper diuretics and literature that suggests that a fluid resuscitation may cause more harm than improvement. (Marik & Bellomo, 2015) Literature has been reviewed for both sides of this debate. (Larsen, Singh, Velocci, Nasser, & McCullough, 2016)

The review of literature conducted is just the tip of the iceberg of information pertaining to the definitions, treatment, and education on sepsis protocols. As the identified problem of the project was to improve the compliance of meeting the three-hour sepsis bundles, the evidence-based literature was needed to present policy and process changes in this facility. With the formation of the sepsis committee, the work of making these much-needed changes had begun.

Theoretical Framework

The aim of this quality improvement project is to increase the compliance of meeting the components of the three-hour sepsis bundle core measures. The framework used for this project was the Lewin's Change Theory.   This model has three stages that include unfreeze, change or move, then refreeze. Lewin realized that there are driving forces which promote change and resisting forces that go against change. These forces can cause conflict in attempting to develop an improvement change. The Lewin's Change Theory worked to cause a balance in these forces that caused the desired improvement in the compliance problems. (Sutherland, 2013)

The first stage of making the change was to unfreeze the attitude of confidence that the core measure bundles were being met. After working with the sepsis committee member that completes the abstraction of the charts required by the Centers for Medicare and Medicaid Services (CMS), the fact that the components of the bundles were not being met brings into perspective the need for further education. This data will be shared with the entire sepsis committee to address the steps needed to begin to unfreeze the current methods.

The next stage was making the change in behavior and making a move to an improved level. There were meetings with the multidisciplinary sepsis committee to determine the plan to educate and improve the systems already in place to become more compliant with the interventions. This education was provided to include all levels of stakeholders from emergency room physicians that make decisions concerning orders to all front-line staff putting the orders into place. The entire sepsis committee was needed to be on board to make this move a success.

The third stage of the theory is to refreeze the behaviors once all the changes have been made in order entry, re-education of staff, conference meetings, in-services and any other area that is presented to improve the quality of the sepsis bundle compliance. (Sutherland, 2013)

Witnessed forces of resistance include such problems as older physicians being reluctant to administer the required fluid resuscitation in some patient populations. Evidence-based studies were provided to these doctors that needed to make changes in their order sets. The same types of resistance remain in seasoned nurses who have not been away from their current position for more than twenty years.   The project had several layers of education that demonstrated the evidence of following the protocols as required to improve the mortality rate of these patients presenting with signs and symptoms of sepsis.

Description of Project Design

The following DNP project utilized a quality improvement design. It is based on the assumption that improvements in the early sepsis interventions will result in a decreased rate of falling out of core measures on the three-hour sepsis bundles. The primary purpose of this DNP evidence–based practice project was to improve current sepsis bundle processes. This project is a non-experimental design.

Non-experimental design is defined as, "the label given to a study when a researcher cannot control, manipulate, or alter the predictor variable or subjects, but instead, relies on interpretation, observations, or interactions to come to a conclusion. Typically, this means the non-experimental must rely on correlations, surveys, or case studies, and cannot demonstrate a true cause-and-effect relationship. Non-experimental research tends to have a high level of external validity, meaning it can be generalized to a larger population." (Kowalczyk, 2015, p. 1)

The population of interest in this project was patients that present with signs and symptoms of sepsis. The overall purpose of this project is to determine what a change in education concerning early sepsis interventions will do to improve knowledge levels in nurses and improvements in mortality rates in patients.

Population of Interest and Stakeholders

The population of interest were the medical surgical nurses that are responsible for managing patients on sepsis bundles. There were 27 medical/surgical nurses employed at the time of the education piece of the project. The stakeholders include the patients, as well as the staff that will be implementing the improved early sepsis interventions. The stakeholders that are members of the sepsis committee include the sepsis coordinator (this nurse), the medical/surgical director, the pharmacy director, the abstractor, the emergency room director, the emergency physician director, and the chief nursing officer.

Recruitment Methods

With this project being a quality improvement undertaking, the nursing staff participated in the implementation of the early interventions of sepsis treatment on the medical surgical unit. The data required to complete this project did not require direct patient interaction. The sepsis screening tools that were completed on each shift by nursing staff were evaluated to determine

that the information was being completed timely and correctly. The data pertaining to the sepsis

screening tools was evaluated. Patient identifiers were not included in any part of the project.

The information that determined if the changes were making improvements came from the

abstraction of charts of the patients cared for on the medical surgical unit.

The other part of this project was to develop a questionnaire for the medical surgical

nurses to determine the level of knowledge in the new interventions after education and hands-on

in services are completed. All medical surgical nurses were asked to fill out the pre-education

survey and post-education survey. As this was not a research project, it did not require IRB

approval.

Tools/Instrumentation

There are two tools to be used in this project, the sepsis auditing tool and the sepsis

knowledge levels.

Sepsis Auditing Tool

The tools that were used were gathering the abstraction results from before and after the

implementation and education of the improved early sepsis interventions. The audit tool that

was used to analyze three-hour bundles is based on CMS guidelines for sepsis guideline

compliance. The three-hour sepsis early intervention bundles include the following: 1) Measure

lactate level, 2) Obtain two blood cultures before administration of antibiotics, 3) Administer

broad spectrum antibiotics, and 4) Administer 30ml/kg of crystalloid fluids for hypotension

(systolic blood pressure < 90) or lactic acid level <= 4 mmo/L. (Surviving Sepsis, n.d.)

Sepsis Knowledge Levels

A questionnaire was developed to assess the knowledge from the nursing staff on the

three-hour sepsis bundles. Permission was received from the Chief Nursing Officer at the facility

and the education department at the corporate level of the hospital to place the questionnaire on Healthstream. This is the method used for all clinical online education in the facility. The questionnaire was a 25-question multiple-choice test that covered information on all the three-hour bundle requirements, time zero, proper antibiotics, fluid bolus questions, and the difference in sepsis, severe sepsis, and septic shock.

An education presentation was also developed and placed in Healthstream that was administered after the initial knowledge testing. The medical surgical nurses were then assigned the same knowledge assessment test to be completed after the education. This was completed in conjunction with the live skills fair education for sepsis. (Moran, Burson, & Conrad, 2017).

Data Collection Procedures

As mentioned previously, the data from the improvements was collected from chart abstractions based on CMS sepsis guidelines for three-hour bundles. The number of charts that were abstracted were 33. Twenty-four of these charts were prior to quality improvement interventions with nine completed after the quality improvement tools were completed. Each variable (lactate level, blood cultures, fluid administration, and antibiotic administration) was analyzed individually with a yes or no response to determine if the sepsis bundle interventions were completed per sepsis bundle guidelines. As this is a critical care hospital, the number of septic patients admitted to the medical/surgical unit is small. The specific data that will be examined will be the compliance with the three-hour bundle early sepsis interventions for a determined time before nursing education of medical/surgical nurses and then the same data for a determined time period after the education took place. This data will then be examined to determine if this practice has improved the meeting of core measures before and after all interventions have been put into place and educated upon.

The questionnaire from the nurses was analyzed using statistical analysis to determine the

changes in knowledge levels. This questionnaire was administered prior to early sepsis

identification training to establish a baseline knowledge level for medical/surgical nurses.   This

initial questionnaire was then be compared with the nurses' knowledge level after a one-month

time period following education and in services were completed on the newest interventions. A

paired-samples t-test is one statistical test that is used to compare the mean scores for the same

group of people on two different occasions. The two requirements for a paired t –test is one

categorical independent variable (time) and one continuous, dependent variable (knowledge of

sepsis bundles) that is measured on two different occasions. (Pallant, 2013, p. 247) This test was

helpful in both looking at the patient's health-record information to determine improvement, as

well as the survey information from the nurses to determine their levels of sepsis education.

Intervention/Project Timeline

The timeline for the project was approximately three months.   The first phase included

the formal development of a sepsis committee. The sepsis committee was formed with this nurse

in the role of the sepsis coordinator. Stakeholders were identified in the emergency department,

pharmacy, administration, medical/surgical department, core measure coordinator, and

information services.

The next phase of the project was to attempt to have new interventions put into place.

This included having the medical/executive board approve the standing orders for stat labs and

the beginning of fluid boluses when sepsis is recognized. In addition, modifications of the

electronic record sepsis tool were coordinated with information systems. Early sepsis

identification training was developed and presented to the medical/surgical nurses during the

hospital skills fair that is held in early September of each year. Once this education was

initiated, a small group of "super users" were given extra education to assist other staff members

who are having trouble as well as new orienting nurses. Lastly, a sepsis policy was written by

this nurse and was submitted for approval to be added to the online policy program for the

hospital.

Prior to the skills fair, the pre-education knowledge questionnaire for nurses was

administered during the two weeks prior to the education fair. The post questionnaire was

administered in the two-week period following implementation of the education power point and

live education. The knowledge assessment questionnaire was administered to twenty-seven

medical surgical nurses.

The second part of the project was to determine if the new interventions have any impact

on improving the number of patients who met the three-hour bundle core measure. The chart

abstractor assisted in providing the information of the percentage of successful three-hour bundle

compliance in a defined period before and after the new interventions are initiated.

Ethics and Human Subjects Protection

This was a quality improvement project. The information that was used from the patient

charts was abstraction data related to CMS sepsis bundle compliance. There will be no direct

contact with patients concerning their care. No interviews were planned with actual patients or

family members. HIPAA compliance was followed per protocol with the abstraction of the

information from the charts of the patients. No patient identifiers were collected.

Plan for Analysis/Evaluation

As mentioned previously, the questionnaires will be analyzed using paired sample t-tests

for comparison of before and after education on how the nurses understand early sepsis

intervention. (Pallant, 2013). The paired-samples t-test will be used to compare the means for

the same group of people before and after the education was implemented. There were twenty-seven medical surgical nurses assigned the knowledge assessment pre-and post-education. This was implemented on two separate occasions. This test determined there was a statistically significant difference from the test at time one and time two. (Pallant, 2013) Examples of questions for the t-test included comparing the knowledge of what constitutes three-hour sepsis bundles, whether the nurses are aware of the sepsis tool, whether the nurse knows to chart the sepsis tool as soon as the assessment is completed, and whether the nurse knows to chart the volume of fluid bolus given before the education is completed. Also, there will be other questions after decisions are made on allowing the orders for lactic acid levels and blood cultures to become standing orders.

This same paired t-test sampling testing was used to determine the difference in compliance with the three-hour sepsis bundle before and after interventions were completed.

Significance/Implications for Nursing

The following QI project was an evidence based initiative focused on improving care of patients diagnosed with sepsis. The significance of the findings for the improvement of patient outcomes determined if the new interventions have an impact on the proper implementation of early interventions for the three-hour sepsis bundles. The questionnaire information determined if the nurses understand the education, felt comfortable with implementation, and the likelihood of continuing to implement the interventions. The anticipated outcome of this project was to see a decrease in mortality rates, quicker interventions that stop a septic patient from developing either severe sepsis or septic shock, and altogether better outcomes for the patients.

Analysis of Results

An important part of the improvement project was to implement an education program on early sepsis interventions. A pre-test was developed and administered to the medical/surgical nurses via Healthstream as an online testing module. After the pre-test was administered, an education presentation was presented over Healthstream with a post-test to determine if and how sepsis care knowledge had improved. This was completed in conjunction with the annual skills fair for educational purposes for the facility.

There was a total of twenty-seven medical/surgical nurses enrolled in the education project. The initial testing found the knowledge level average to be 90.89%. A portion of these nurses have had sepsis education in a previous skills fair. All the nurses hired since 2015 have received a small education piece as part of the orientation computer modules for new hires. The education for this project has been targeted for the medical/surgical nurses. After education was completed by using both the education tool Healthstream and in person using the skills fair venue, the knowledge level was tested again. The testing was found to have an improved sepsis bundle knowledge with an average score of 98.2%. This is a difference in 7.31%.

The following chart demonstrates the knowledge level improvement:

Chart 1. Knowledge levels.
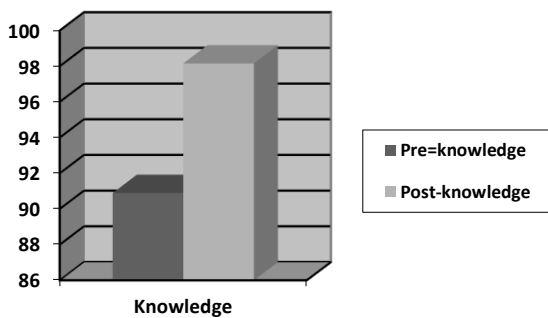
A paired-samples T-test was completed to determine the statistical significance of the

education on the knowledge of sepsis early interventions. According to Pallant (2013), "A

paired-samples t-test is used when you have only one group of people and you collect data from

them on two occasions or under two different conditions."

The variables in this analysis were the sepsis knowledge assessment Attempt 1 and

Attempt 2. Both scores for each of the 27 nurses were entered into the data area using the SPSS

program.

To determine the overall significance of this test, if the probability (p) value is less than

.05, the conclusion can be made that there is a significant difference between the two scores.

The value for this comparison was .000.

Table 1. Paired Samples Test.

Paired Samples Test

					Paired Differences				
						95% Confidence Interval of the Difference				
				Std. Error					
		Mean	Std. Deviation	Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	firstatt - secondatt	-7.25926	4.47723	.86164	-9.03039	-5.48813	-8.425	26	.000

Once it was determined that there was a significant difference in the two testing scores,

the mean of each test is examined to determine which attempt had the highest score. The second

test which was taken after education interventions showed to have the highest mean.

Table 2. Paired Sample Statistics.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	firstatt	90.8889	27	5.66591	1.09041
	secondatt	98.1481	27	2.41316	.46441

Table 3. Paired Sample Correlation.

		N	Correlation	Sig.
Pair 1	firstatt & secondatt	27	.654	.000

The results of the analysis conducted leads to this conclusion:

A paired-samples t-test was conducted to evaluate the impact of the intervention of education on medical/nurses scores on the early sepsis intervention bundles. There was a statistically significant increase in the sepsis knowledge assessment scores from Attempt 1 (Mean=90.89, Standard Deviation=5.67) to Attempt 2 (Mean=98.15, Standard Deviation=2.41), t (27) = -8.43, p < .001 (two-tailed). The mean increase in the scores was 7.23 with a 95% confidence interval ranging from -9.03 to -5.49. The eta squared statistic (0.73) indicates a large effect size. (Pallant, 2013, p. 256)

Sepsis Bundle Compliance Audits.

When participating in the abstraction of charts, there have been found to be thirty-three cases of sepsis diagnosed at RRMC from January 1, 2017 through August 31, 2017.

Data Collection Methods

The charts that were reviewed were tagged with a diagnosis of sepsis at any stage. Each of these charts were reviewed for proper use of the appropriate screening tool. If the patient had any two SIRS and a possible infection, the screening tool should have been charted as positive and reported to the provider. If this screening was incorrect, then the patient fell out of sepsis core measures. The next area to abstract is whether a lactic acid level was drawn for a positive sepsis screening. If not, the chart does not meet core measures and falls out. Blood cultures x 2 must be drawn as well as a CBC to determine the white blood cell count if the screening is

positive. This information was also abstracted. If the patient had either a lactic acid level greater

than 4 mmol/L or hypotension with systolic blood pressure less than 90 mmHg and a fluid bolus

of 30 ml/kg was not administered within the first three hours of recognition of two or more SIRS,

then the patient did not meet core measures. If a broad-spectrum antibiotic was not administered

within three hours of recognition of possible sepsis, then the patient fell out of core measures. If

all interventions are met during the three-hour time frame, then the chart was considered to have

met core measure requirements.

Sepsis bundle compliance

There was a total of 24 cases during this time-period with 18 of these meeting the core

measure three-hour bundle requirements. This left six patients that did not receive proper

treatment in the first three hours. This is a 75% success rate. During the second half of this year,

there has been a total of nine cases of sepsis with two cases falling out of core measures. This is

an 81.8% success rate so far into the second half of this year. This was a significant

improvement over the earlier part of the year.

**Chart 2. Sepsis Bundle Compliance.**
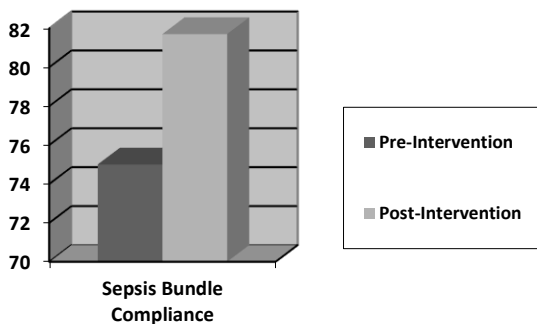
Each component of the three-hour sepsis bundle was abstracted to find what interventions

were not being met. The abstraction tool COMET was used by the char abstractor to determine

what areas did not meet core measure requirements. COMET is an acronym that stands for

Clinical Outcome Measure Evaluation and Transmission. COMET is a web-based application that is used to submit core measure data to external organizations such as the Joint Commission, CMS, and third-party payors such as the hospital. COMET populates patients who meet inclusion criteria for core measure reporting. This information can lead to further improvements if each are investigated as to why the intervention was not met.

Lactic acid. The first area that was examined was if a lactic acid level was drawn on a patient with a diagnosis of sepsis. Pre-intervention charts found one chart that did not meet this requirement. The patient had an actual positive screening of two SIRS with a possible infection, but was marked as negative by the assessing nurse. After the patient's condition worsened, the lactic acid level was drawn, but did not meet the three-hour time requirement.

Lactic acid levels were drawn on 100 percent of the patients with a sepsis diagnosis after the education interventions were completed.

Chart 3. Lactic Acid Level.
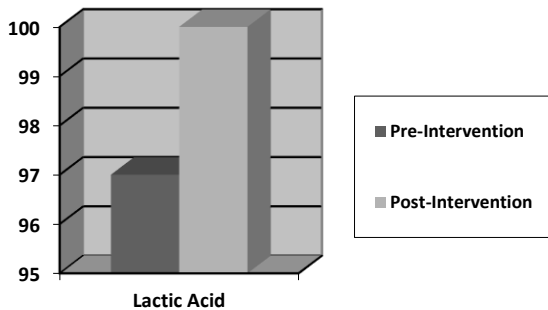
Broad spectrum antibiotics. The second area abstracted was whether all patients with a sepsis diagnosis were treated with at least one broad spectrum antibiotic during the three-hour time frame from recognition of sepsis symptoms. This intervention was found to be completed 100% of the time in these charts. All patients had diagnoses of some form of infectious process such as pneumonia, urinary tract infection, and cellulitis.

Chart 4. Antibiotic Administration.
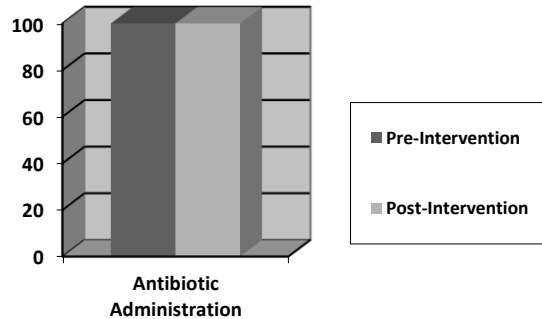
Blood cultures. Drawing of blood cultures on the patients with a sepsis diagnosis was completed 100% of the time on both pre- and post-intervention charts. Even though blood cultures were drawn 100% of the time on septic patients, two charts were found to have the broad-spectrum antibiotic started before the blood culture was charted. After further investigation into these charts, it was found that the antibiotics were ran correctly, however the lab did not chart the time drawn but instead the time the lab was initiated. Training was completed to ensure that these times were charted as to the correct time of the draw.

Chart 5. Blood Cultures.
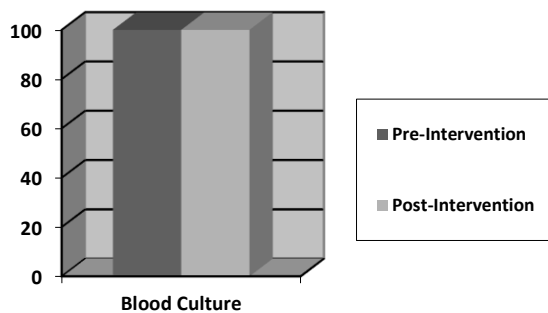
Fluid resuscitation. The area that is found to have the largest number of chart abstract fall outs is the fluid resuscitation of 30 ml/kg of crystalloid fluids for a lactic acid great than 4

mmol/L or a systolic blood pressure of less than 90 mmHg. The pre-intervention charts were

found to have six of twenty-four that did not meet the fluid requirement which is a total of 75%

being treated correctly. Post-intervention charts have two of nine charts not meeting

requirements which equals a total of 77.8% of correct interventions. This area of defined as the

most needed area for improvement.

Chart 6. Intravenous Fluid Resuscitation.
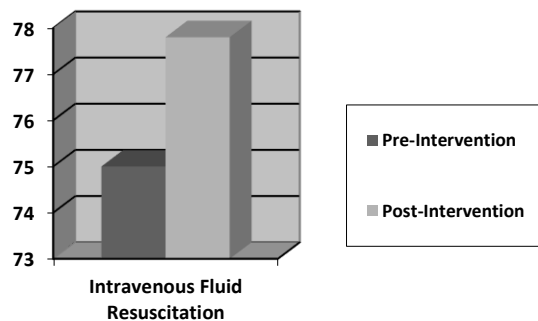
Discussion and Significance

 The results of the quality improvement project show an improvement in the number of

patients with a sepsis diagnosis meeting early sepsis bundle intervention core measures.

The original goals of this quality improvement project were to be able to measure

improvements in compliance of the three- hour sepsis bundles by improving knowledge levels of

nurses in the medical surgical setting.   One goal was to develop and implement a sepsis policy

for the hospital to be placed in the online policy and procedure manual. This policy was written

by this nurse using the Surviving Sepsis Campaign guidelines and closely following the sepsis

policy from CRMC. This hospital was one of the first in the area to implement a sepsis program

in 2010. The progress of the hospital becoming a certified sepsis care hospital by the Joint

Commission is explained by Craig (2016). The project lead was fortunate to interview and have

contact with this sepsis facilitator on several occasions throughout this project. (Craig, 2016) The

policy for RRMC has been put into place as a result of this DNP project. The policy details for

nurses and physicians the definitions and components of the three and six-hour sepsis bundles.

There is ease of access as this is now part of the list of other hospital policies.

The Sepsis Survival Rate at RRMC report was received at the completion of this project.

The mortality rate for the first two quarters of the year was four patients from 31 or 12.9%. For

the quarter that started after the implementation of this project, there have been no deaths from

11 patients. This is a 0% mortality rate for the most current period.

Limitations and Dissemination

Even though there were successes with this quality improvement project, there were

several limitations met. One of the goals of the project was to establish standing orders for all

nurses to be able to initiate expedient treatment of possible sepsis patients. These orders would

be placed in the event that a patient develops two or more SIRS with a documented or suspected

infection. The orders would include a lactic acid level, two blood cultures, a complete blood

count (CBC) and initiation of a fluid bolus if systolic blood pressure is less than 90 mmHg.

Once the labs are resulted, the provider would be notified for additional orders. This would

allow for treatments to begin more quickly.

The following project was presented to both the CNO and Director of Quality

Management. Each stated that this proposal should be presented before the medical/executive

board but the proposal never went any further than this level.   This is an area that will continue

to be addressed in the future.

As mentioned in the findings, the proper administration of intravenous fluid boluses for

severe and septic shock patients remains an area that needs improvement. There are several

reasons that this remains a problem. One area that has been addressed was that elevated lactic

acid levels were not being reported to nursing in a timely manner. Since the beginning of this

project, lactic acid levels of greater than 4 mmol/L are now reported to charge nurses as critical

values. These must be reported to providers within 30 minutes of time of notification. Another

issue is that some physicians remain reluctant to administer fluid boluses to patients with

comorbidities such as congestive heart failure for fear of fluid overload. Scholarly articles that

address this topic have been printed and distributed to these physicians by this nurse. The

evidence based practice articles have been taken into consideration by these physicians. Another

problem hampering the fluid resuscitation being completed on time is that some physicians feel

that the lab procalcitonin is a better marker for sepsis than is lactic acid. These physicians have

been strongly encouraged to order lactic acid levels along with the procalcitonin levels to ensure

that proper early interventions can be completed on these patients.

After all the project results have been completed, a presentation to the stakeholders will

be presented in a power point form. The above-mentioned areas of concern will be addressed

with some possible solutions. Also, the improvements that have been noted will be presented as

well. This information will be passed on to the medical/surgical nursing staff as well to praise

them on improvements and to create awareness of areas that require further work.

Nurses have been provided name badge attachments that have the three and six-hour

sepsis bundles at their fingertips at all times. Community education has been implemented to

spread knowledge about signs and symptoms of sepsis to patients in such areas as the local

senior citizen center. Plans are to provide sepsis education to the local long-term care facility is

in the works. This will hopefully raise awareness of sepsis symptoms to these nurses who can

get the residents to the hospital in a more timely manner if sepsis becomes a concern.

There are many opportunities to disseminate sepsis knowledge to more nurses and people in the community that remain at the end of this project. The goal of this DNP student is to continue to spread the education of sepsis to the community, and to continue to work to improve the compliance of early sepsis interventions in the critical access hospital.

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Appendix A: Knowledge Assessment for Pre- and Post-Intervention

Sepsis Knowledge Assessment
Dolores Bowman, MSN-Ed, RN
Touro University DNP Project III

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

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

3) What is the normal lactic acid level?
   a) 0.4-2.0
   b) 0.1-1.0
   c) 3.0-5.1
   d) 2.0-4.0

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

5) At what point should blood cultures be drawn on a patient with possible sepsis?
   a) After administration of antibiotics
   b) Upon admission to the hospital
   c)   After lactic acid is completed
   d) Before administration of antibiotic

6) Broad spectrum antibiotics should be administered with the first three hours after recognition of sepsis, preferably within the first hour.
   a) True
   b) False

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

8) When does the clock start for time zero in measuring sepsis three and six-hour bundles on the med/surg unit?
    a) one hour after 2 SIRS are identified
    b)   when patient is admitted
    c)   after antibiotics are administered

9) If initial lactate level is elevated, in what time period should the second lactate level be drawn?
    a) 2 hours after first lactate level is > 2
    b) 1 hour after first lactate level is > 4
    c)   4 hours after first lactate level is > 2
    d)   3 hours after first lactate level is > 4

10) When is the use of a vasopressor required in caring for a patient in septic shock?
    a) When the systolic BP falls below 90
    b) When the systolic BP falls below 50
    c) When the systolic BP falls below 90 after patient has received fluid bolus requirement
    d) When patient has lactic acid level > 2

11) What is the recommended vasopressor for persistent hypotension in septic patients?
    a) Dobutamine
    b) Levophed
    c) Dopamine
    d) Epinephrine

12) Which temperature qualifies as SIRS criteria?
    a) 102.4 F
    b) 98.6
    c) 96.4
    d) Both A & C

13) What heart rate qualifies as SIRS criteria?
    a) 68
    b) 92
    c) 74
    d) 89

14) What respiratory rate qualifies as SIRS criteria?
   a) 16
   b) 18
   c) 8
   d) 26

15) What WBC levels qualifies as SIRS criteria?
   a) 13,000
   b) 3,000
   c) 6,000
   d) Both A & B
   e) Both B & C

16) What are indicators of septic shock?
   a) Systolic BP > 90 after fluid resuscitation
   b) Temperature of 100.8
   c) Lactic acid > 4
   d) Both A & C

17) What is the mortality rate of patients with sepsis?
   a) 50%
   b) 28%
   c) 8%
   d) 19%

18) What are the first signs of sepsis in most cases?
   a) Fever
   b) Hypotension
   c) Tachycardia
   d) Both A and B

19) Which populations of patients are more likely to develop sepsis?
   a) Elderly
   b) Infants
   c) Pediatrics
   d) Immunocompromised patients
   e) All the above

20) What are two common findings associated with sepsis?
   a) Infection
   b) Hypotension
   c) Both A & B
   d) None of the above

21) What are the two most common etiologies of sepsis?
    a) Pneumonia and UTI
    b) H pylori and colitis
    c) Cellulitis and otitis media
    d) Strep throat and influenza

22) Sepsis + associated sepsis-induced organ dysfunction is:
    a) Septic shock
    b) Severe sepsis
    c) Both A & B
    d) None of the above

23) Which of the following is NOT part of the routine approach to all patients with sepsis?
    a) Antibiotics
    b) Fluids
    c) Steroids
    d) Measuring lactic acid

24) What is the number 1 intervention that hospitals fall out on with sepsis core measures?
    a) Antibiotic administration
    b) Drawing blood cultures x 2
    c) Measuring lactic acid
    d) Fluid resuscitation

25) What is the proper fluid requirement for patients with septic shock?
    a) 20 ml/kg of crystalloid fluid
    b) 30 ml/kg of crystalloid fluid
    c) 30 ml/kg of colloid fluid
    d) 40 ml/kg of colloid fluid

Answers:

1) A
2) D
3) A
4) C
5) D
6) A
7) D
8) A
9) C
10) C
11) B
12) D
13) B
14) D
15) D
16) D
17) B
18) D
19) E
20) C
21) A
22) B
23) C
24) D
25) B