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Improving the Identification, Delivery of Care, and Outcomes of Hospital-Acquired Sepsis

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Final DNP Project Report

Improving the Identification, Delivery of Care, and Outcomes of Hospital-Acquired Sepsis

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University of Kentucky

College of Nursing

Spring 2016

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Capstone Introduction:

This document represents the culmination of my journey towards obtaining a Doctorate of Nursing Practice. Here are three papers which I feel represent the enrichment that the doctoral process has provided; an quality improvement program evaluation, a literature review on an alternate vehicle for delivering therapy, and a paper addressing issues with end of life care in the critical care setting.

Manuscript one is a retrospective evaluation of a bedside nurse-driven sepsis screening that was implemented at my place of employment. This study evaluated the impact that the bedside screening process had on identifying the early development of sepsis, the initiation of sepsis treatment therapy, and if there was an impact on disease severity, mortality, and utilization of critical care facilities.

Manuscript two is a review of the literature to address what I feel is a potential solution to an identified clinical issue that stemmed from manuscript one; that of a deficiency in the provision of sepsis treatment therapy. In this manuscript I review if there is evidence in the literature that this specialized care could be better administered by a rapid response team, as these teams have the training and skillset to provide critical care in any clinical setting.

Manuscript three is a paper that focuses on the issue of end of life care administered by nurse practitioners in a critical care setting. This paper delves into the issues of what constitutes informed decision making on the part of the patient and their potential surrogates, ethical dilemmas, evidence based recommendations for

communication strategies, medication strategies, and the impact that the dying process can have on staff, patients, and their families.

These three manuscripts highlight what this doctoral journey has provided me; an ability to assess the evidence and synthesize from it solutions to issues on a systems level, to evaluate the impact of those solutions, and the ability to speak competently about issues facing the profession. I have gained a viewpoint that is elevated from the level of the individual to the level of systems and organizational. This elevated viewpoint is only made possible by the principles and advanced education that formulate the Doctorate of Nursing Practice degree. Sir Isaac Newton said "if I have seen further it is by standing on the shoulders of giants"; I would say that I see farther now, due to the giants that have come in the profession before me and what I have learned from them. It is my heartfelt hope that one day, I may be able to raise the awareness of others of our profession.

Manuscript One

A Retrospective Quality Improvement Evaluation of the Utilization and Impact of a Nurse-Driven Bedside Sepsis Screening Tool at Baptist Health Lexington from February 2015 through July 2015.

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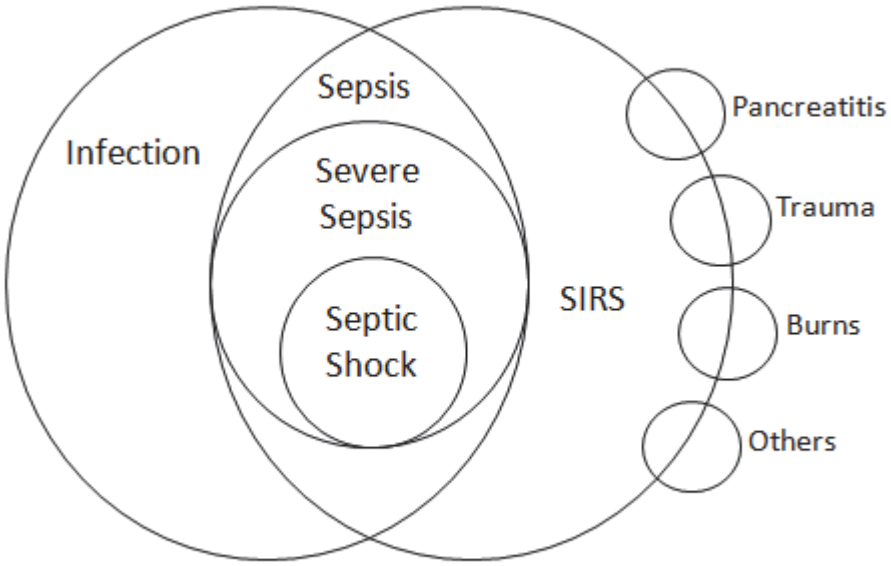
Introduction:

Traditionally, sepsis has been defined as a systematic inflammatory response syndrome (SIRS) to an infection, either localized or systemic in nature (Bone, 1992). The concept of sepsis has been imagined as existing on a continuum -- from sepsis, to severe sepsis, to septic shock -- with a steady progression to greater and greater severity of illness. Severe sepsis is when sepsis is associated organ dysfunction; septic shock is when there is organ dysfunction in the presence of hypotension that is refractory to volume resuscitation. For the purposes of this paper when referring to all forms of sepsis we will use the term “sepsis syndromes”.

Figure 1 - Venn Diagram of Relationship Between Infection, Sepsis Syndromes, and SIRS



Copied from Angus, et al., 2001

The initial stages of sepsis can be insidious and difficult to differentiate from

other disease processes that also invoke an inflammatory response (Sebat, 2007; Robson, Beavis, & Spittle, 2007). The inability to detect early sepsis is especially concerning when you consider that Sebat, et al (2005) found that 24 percent of sepsis syndrome cases initially developed on the medical-surgical floors where there is less access to critical care services in the event of a rapid decline in clinical condition.

In 2012, there were over a million in-hospital cases of which sepsis syndromes were the primary diagnosis (Celeste, 2013), with an annual increase of 6 percent in hospital cases of sepsis syndromes since 2001 (Elixhauser, 2011). A diagnosis of a sepsis syndrome is the most expensive condition treated in the United States for all payers at an aggregate cost of almost $20.3 billion annually (Celeste, 2013). Mortality can also be highly variable, with higher mortality rates being associated with higher severity of illness (Guidet, 2005), though the national average is 16 percent (Dellinger, 2013). This mortality rate is approximately eight times higher than the average mortality rates of in-patient hospital stays for other diagnoses (Elixhauser, 2011). Resource utilization and length-of-say (LOS) all increase in a "step wise" manner with severity of illness, with LOS almost doubling as patients moved from the 1st quartile of illness severity to the 4th (Adrie, 2005). Drieher and associates (2012) found there to be demographical differences that were directly independently linked with all-sepsis mortality; male gender, African-American ethnicity, and advancing age.

The Center for Medicare and Medicaid Services (CMS) identified sepsis syndromes as a major area for quality improvement in inpatient hospital care. CMS notified hospitals participating in the inpatient quality reporting program that data collection of the utilization of sepsis management bundles based off of the Surviving

Sepsis Campaign's 2012 guidelines (Dellinger, et al., 2013) would begin October 1st of 2015 (National Quality Forum, 2012). The quality improvement data reported for 2015 will be used for future payment determinations in 2017.

The treatment of sepsis syndromes has been codified into a bundle of evidence-supported guidelines by the Surviving Sepsis Campaign known as early goal directed therapy (EGDT) (Dellinger, 2013). EGDT has been shown to decrease mortality, cost of care, length of stay , and disease progression (Castellanos-Ortega, 2010; Zubrow, 2008; Shorr, 2007). EGDT is composed of several key interventions: prompt phlebotomy for blood cultures and perfusion markers, administration of intravenous antibiotics, and rapid fluid resuscitation (Dellinger, 2013). Completion of these interventions within the initial six hours of diagnosis provides the most dramatically significant improvements in outcomes; however even then mortality remains approximately 40 percent or greater (Guidet, 2005; Castellanos-Ortega, 2010) for septic shock. Guidet (2005) found unalterable characteristics such as age and comorbidities at roughly the same level in both severe sepsis and septic shock, leading the authors to propose that it is the alterable characteristics that are crucial in preventing disease progression, these being "prompt diagnosis and appropriate treatment." Despite knowledge of the importance of EGDT, implementation and compliance continues to be an issue for organizations, most often through an inability to coordinate the complex multidisciplinary care.

Local Problem:

Baptist Health Lexington identified they had a sepsis-related mortality rate consistent with the mortality rate found in other studies where there was no established

use of a sepsis care bundle (Castellanos-Ortega, 2010; Elixhauser, 2011; Nguyen, 2007). The Administration of BHL recognized that this was an actionable area of interest with a high level of impact on the institution and so began the process of instituting several initiatives with the goal of reducing inpatient sepsis syndrome mortality.

Setting:

Baptist Health Lexington (BHL) is a 383-bed, tertiary level hospital located in Lexington, Kentucky. The hospital has numerous specialty services for patients with advanced disease processes or high complexity due to multiple comorbidities. It has thrice been awarded Magnet status by the American Nurses Credentialing Center, is a Joint Commission-designated Primary Stroke Center, and was ranked as the #1 hospital in the Bluegrass region by ***U.S. News & World Report*** in 2014 and 2015.

BHL provides multiple medical and surgical services, leading to a wide variety of admitting diagnoses. In addition to the specialty services (i.e., cardiology, neurology, nephrology, etc) the hospital also has an in-house Hospitalist service for floor patients and mandatory Intensivist service involvement with all ICU patients. Baptist Health Lexington is one of seven hospitals that comprise the Baptist Health system and is often a destination for patients requiring a higher level of care either due to illness severity or availability of services than can be provided at other facilities.

Sepsis screening was rolled out incrementally across the organization: the Emergency Department (ED) in June, followed by the five intensive care units (ICUs) and eight medical-surgical floor areas in December. The screening in the Emergency Department was performed once upon initial patient presentation; the screenings in the

ICUs and floors were performed at the beginning of every nursing shift on all patients who did not previously have a positive sepsis screen or a known diagnosis of sepsis. Once a patient screened positive for sepsis, the nurse would document "no more screening needed". The Baptist Health Corporation established organization-wide goals focused on reducing sepsis mortality by 25 percent. For BHL, this meant reducing sepsis-related mortality from a baseline of 16.4 percent (based off of 2013 data) to 12.3 percent by fostering earlier detection and intervention of sepsis syndromes and increased compliance with EGDT.

The Sepsis Interventions:

Several initiatives were undertaken to reduce mortality; an evidence-based sepsis screening tool was developed and implemented on all patients who presented to the ED, a sepsis order bundle was developed based on the 2012 Surviving Sepsis Campaign guidelines, and a sepsis screening tool similar to that utilized by the ED was implemented in the ICUs and on the medical floors.

The sepsis screening initiative in the ED was launched in June 2014. During triage, nursing staff assessed patients for evidence of a known or suspected infection. If infection was known or suspected, then the nurse would look for evidence of a systemic inflammatory response. If the patient met two or more criteria, then that patient met the technical definition for a sepsis syndrome and the nurse was required to inform the ED physician, who would then either refute or confirm the diagnosis and begin therapy. If there was evidence of hypotension, then the patient met the criteria for severe sepsis, and the nurse was again required to inform the ED physician.

In keeping with the Surviving Sepsis recommendations on treating sepsis (Dellinger, et al., 2012), a sepsis order set was developed that "bundled" together all the different treatment modalities required for treating sepsis: diagnostic, pharmaceutical, nursing care, and laboratory orders. This order set was available for provider use in August of 2014. A computerized sepsis order set (SOS) was also implemented at the same time. The last initiative to be phased in was a screening tool for the ICUs and medical-surgical floors; this tool was based on the ED screening tool. This screening tool was initiated in December 2014. Each shift had to complete the screening tool on all patients who did not have a prior positive screening for sepsis or a known sepsis diagnosis. The purpose of this study was to evaluate the effectiveness of this nurse-driven bedside sepsis screening tool and to determine what impact it had on the patient outcomes of mortality and ICU utilization. As screenings were not performed on sepsis syndromes that were present upon admission, we analyzed patients with sepsis syndromes that developed after their first 24 hours of admission. The bedside sepsis screening process is shown in Figure 2.

Design Model:

For the purposes of this study we shall be utilizing the Donabedian quality-of-care framework (Donabedian, 1988). We shall analyze how the Structures component of staff knowledge and utilization of the bedside sepsis screening tool impacts the Process component of compliance with early goal directed therapy on the Outcomes of sepsis severity, mortality, and intensive care utilization. Donabedian (1988) defines Structure as "the attributes of the setting in which care occurs". These attributes include the material resources available for the provision of care, the individual human attributes of

those providing care, and the attributes of the organizational structure that frames the provision of care. Donabedian defines Process as "what is actually done in giving and receiving care"; processes such as determining a diagnosis through a screening tool or the provision of therapy fall under this designation. See Figure 3 for a visual representation of the model.

Study Questions:

1. What is the percentage of patients with sepsis syndromes identified through the bedside screening process?
2. What is the percentage of compliance with early goal directed therapy (EGDT)?
3. What impact did the bedside sepsis screening tool had on the outcomes of mortality, intensive care utilization and length of stay, and sepsis progression as measured by sepsis-to-advanced-sepsis ratios?

Ethical Issues:

This study was reviewed and approved by the Baptist Health Lexington Institutional Review Board.

Method of Evaluation:

Baseline data was obtained on patients who had been admitted from July 1, 2014 to December 31, 2014 and were discharged with a diagnosis of a sepsis syndrome that developed after the first 24 hours period of hospital admission. This dataset was compiled based off of patient claims data obtained for the purpose of hospital billing.

Investigational data was collected on patients who were admitted from February 1, 2015 to July 31 of 2015 and had a discharge diagnosis of a sepsis syndrome that was not present within the first 24 hours after admission. Though the sepsis screening tool had been initiated in January, the decision was made to begin data collection in February to avoid bias due to unfamiliarity with the screening tool. The decision was made to exclude patients who had a "do not resuscitate" (DNR) order as there may have been other limitations on care options that would not be noted in the records. A total of 26 cases that met study criteria were identified. Patient demographical data including age, race, gender, were collected. Outcome data included initial sepsis severity, maximum sepsis severity, length of stay in an intensive care unit, and mortality.

All cases that were determined to have developed a sepsis syndrome within the study period had an electronic chart review which identified if the patients were appropriately screened for sepsis, the date and time of sepsis identification, by whom the sepsis syndrome was identified, were requisite laboratory tests performed within the prescribed timeframe, were antibiotics initiated within the prescribed timeframe, was the desired amount of intravenous fluids given within the prescribed timeframe, and were there signs of sepsis in the 24 hours prior to identification.

Analysis:

Descriptive statistics were collected on the 26 cases that met study criteria. The sample size lacked sufficient power to detect significant differences.

Figure 2 - Bedside Nurse-Driven Sepsis Screening Steps

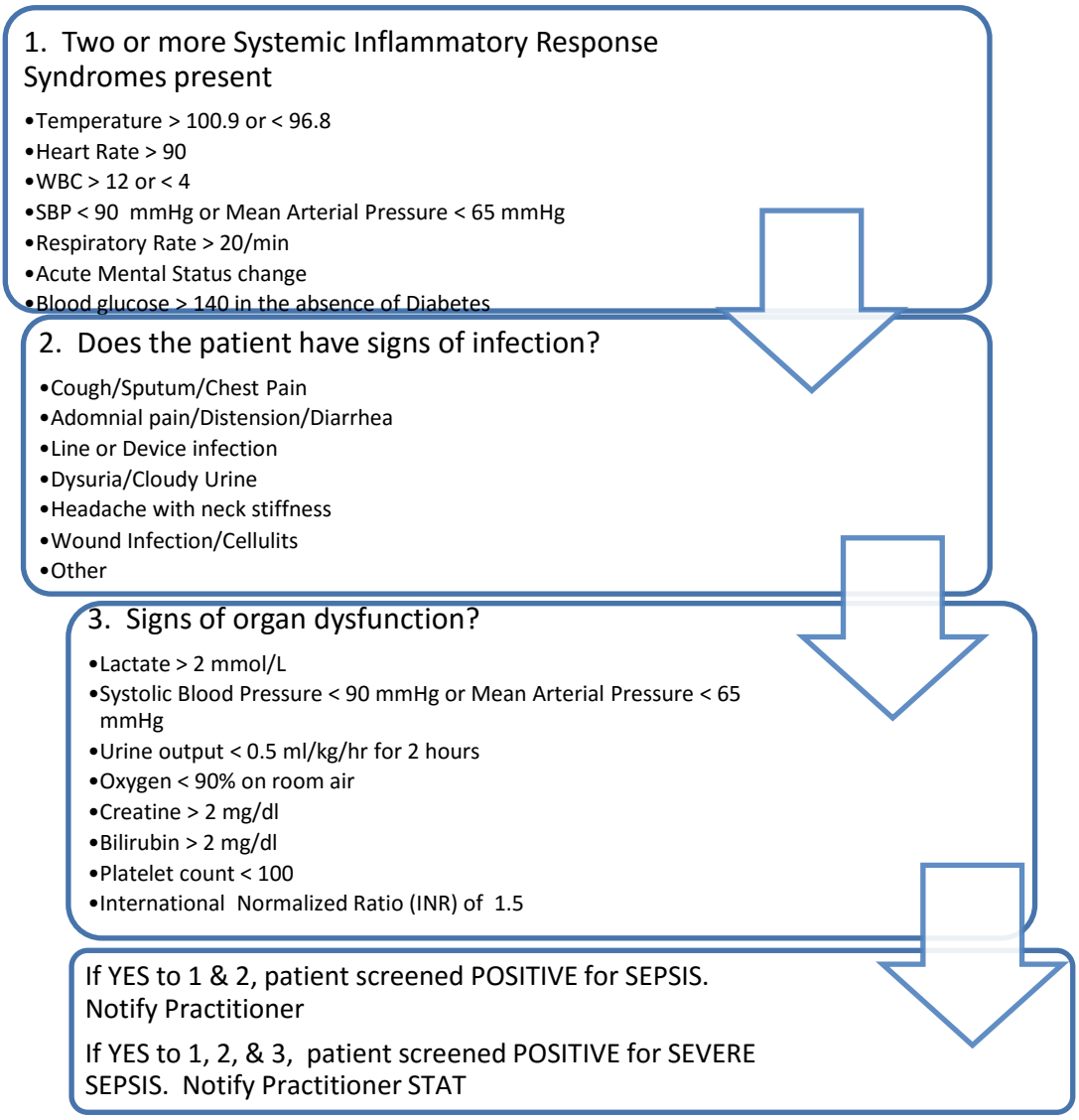
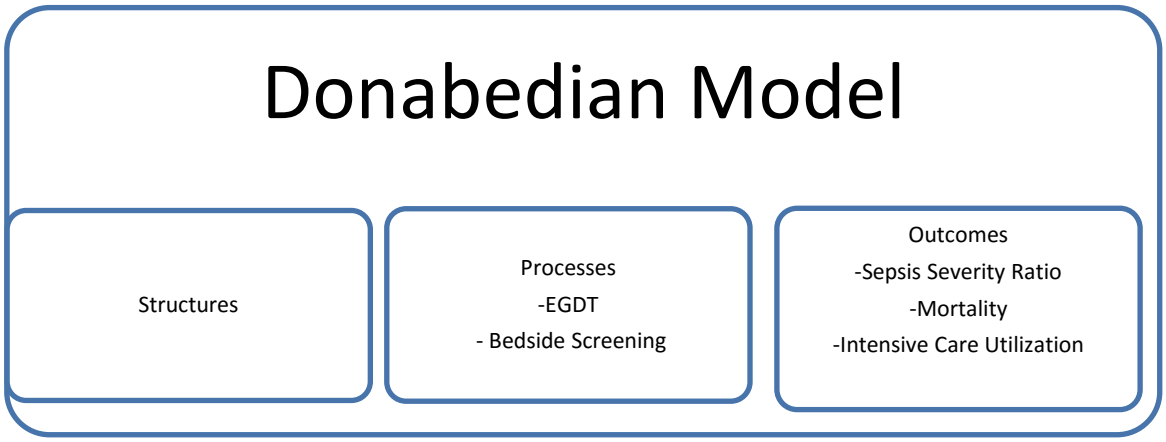


Figure 3 - Donabedian Quality-of-Care Framework



Results:

Between the months of February through July of 2015, twenty-six cases of sepsis were identified as having developed after the subjects had been hospitalized for more than 24 hours. The demographics for this group matched those of the baseline group which was obtained from July through December of 2014; predominantly Caucasian, an average age of 59.4, and a majority of males (See Table 3). Figure 4 shows the number of cases and if they were admitted to an ICU or medical floor upon time of diagnosis. Table 1 compares the findings for the baseline group of 24 patients in 2014 to the findings of the 26 patients who could have been screened in 2015.

Screening Compliance:

In 2015 all hospital inpatients that did not already have a known diagnosis of

sepsis present on admission were screened by nursing staff once a shift. Ideally, the sepsis screen should be the first to identify any development of hospital acquired sepsis. To evaluate the effectiveness of the screening at identifying sepsis syndromes, we analyzed the 26 cases of sepsis syndromes that developed while the subject was hospitalized between February and July of 2015.

Table 1- Demographics

	2014 Data (n=24)		2015 Data (n=26)	
	N	%	N	%
Sepsis	5	20.8%	10	38.5%
Severe Sepsis	12	50.0%	11	42.3%
Septic Shock	7	29.2%	5	19.2%
Severe Sepsis+ septic shock/sepsis ratio	3.8		1.6	
Mortality	6	25%	0	0%
Average ICU LOS (Days)	12.04		11.00	
Number of transfers to ICU	12	50%	11	42.3%
Average Age (years)	66.2		59.4	
Race	100 percent Caucasian		84.6 percent Caucasian	
Gender	75 percent Male		61.5 percent Male	

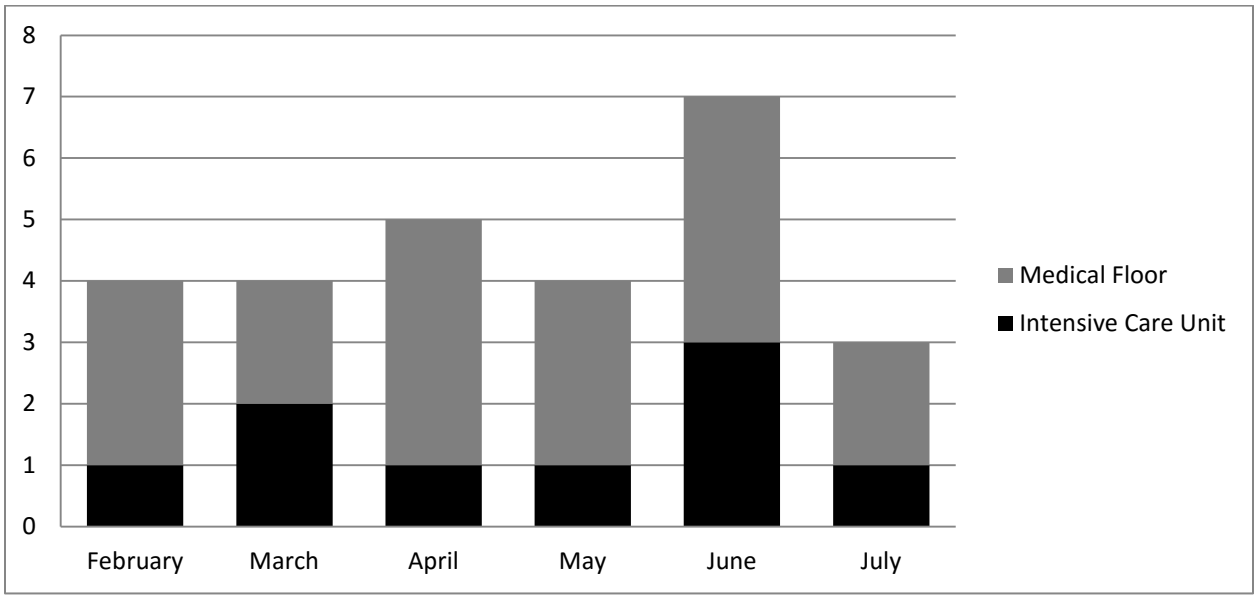
LOS = Length of stay, ICU = Intensive Care Unit

The screening tool succeeded in identifying only six (23.1 percent) of the 26 cases of sepsis syndromes that developed in hospital. The nursing staff were unable to identify evidence of sepsis syndromes as defined by the presence of two systemic inflammatory response syndromes with evidence of infection, within 24 hours of development in ten cases (38.5 percent).

In eight cases (30.7 percent) the nursing staff had inappropriately ceased performing sepsis screening prior to the patient developing a sepsis syndrome. Two patients (7.7 percent) did not meet screening criteria and were identified as having a

sepsis syndrome via other means. Eighteen patients (69.2 percent) met criteria for systemic inflammatory response within the 24 hour period preceding identification of their sepsis syndrome but were not documented.

Figure 4 - Monthly Number of Cases (n=26) and Location at Point of Sepsis Identification



Compliance with early goal directed therapy:

Early goal directed therapy (EGDT) is composed of several components; serial lactic acids, blood cultures, antibiotic administration, and volume resuscitation. Complete compliance with all EGDT components in the 26 cases of sepsis syndromes in hospitalized patients was extremely low at 7.7 percent (n=2). The components with the highest compliance were antibiotic administration within 3 hours of identification (57.7 percent, n=15) and blood culture obtainment within 1 hour of identification (57.7 percent, n=15). Initial obtainment of lactic acid within the first hour of identification occurred in

6 patients (23.1 percent), with a drop in compliance to 2 patients (7.7 percent). Only 7 patients (26.9 percent) received a minimum of 2 liters of intravenous fluid resuscitation in less than 3 hours. Seventeen patients were on the medical-surgical floors when their sepsis syndrome was identified, ten of which required transfer to the intensive care unit (58.8 percent). Nineteen of the 26 patients identified in this study had intensive care unit stays with an average length of 264 hours (11.0 days).

Very rarely was complete compliance with every component of early goal directed therapy (EGDT) obtained. The majority of the patients received none (42.3 percent) or only one (30.8 percent) of the recommended therapy components, with only 7.7 percent receiving all EGDT components. We get a more nuanced viewpoint of compliance with EGDT when we look at compliance rates with the individual components of EGDT: phlebotomy, antibiotic administration, and volume resuscitation.

Compliance with the laboratory component (serial lactic acids and blood cultures) was variable. As previously noted, compliance was much higher with blood culture obtainment (57.7 percent) versus compliance with the initial lactic acid draw (23.1 percent) and the follow up lactic acid level (7.7 percent). Monthly compliance for blood culture obtainment varied from 33 to 100 percent.

Compliance with initial lactic acid obtainment varied from 50 percent to 0 percent, with obtainment of the second lactic acid level happening once in March and again in July. See figure 7 for a visual representation of monthly laboratory compliance. There does not appear to be a pattern to compliance with this component.

Figure 5 - Effectiveness of Bedside Screening at Identifying Hospital Acquired Sepsis Syndromes (n=26)

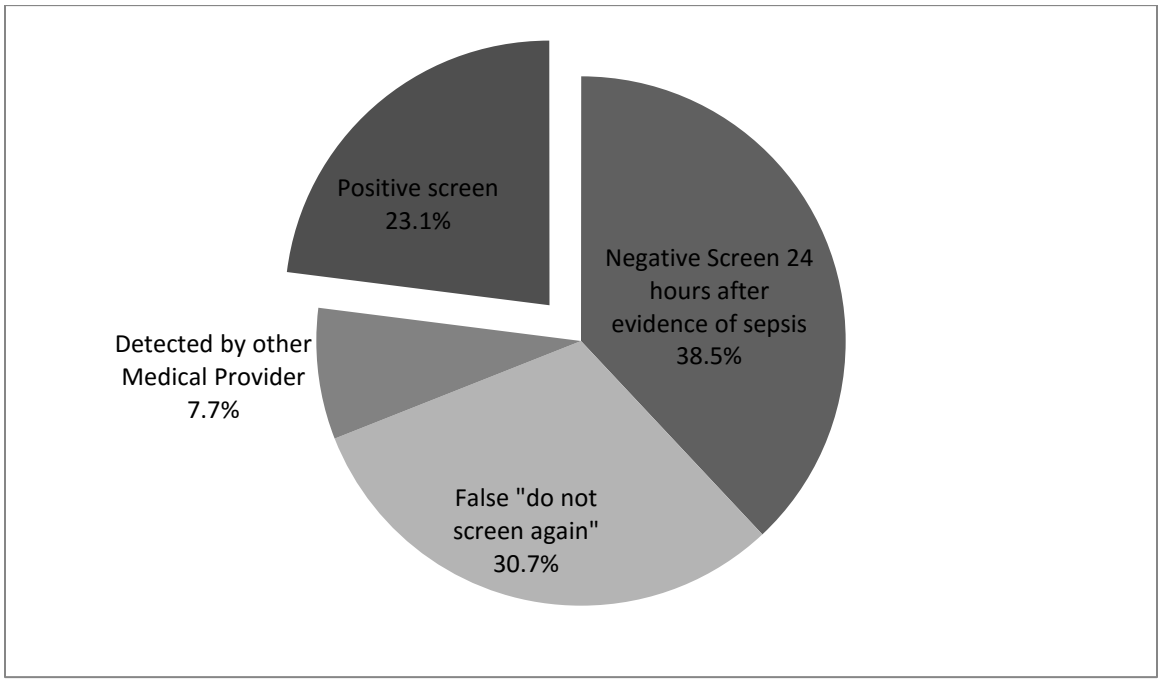


Table 2 - Early Goal Directed Therapy Compliance and Outcomes

	Hospital acquired sepsis syndrome cases (n=26)	
	N	%
Lactic acid level drawn within 1 hour of positive screening	6	23.1
2nd Lactic acid level drawn within 6 hours of 1st	2	7.7
Blood cultures drawn within 1 hour of positive screening	15	57.7
Empiric antibiotics given within 3 hours of positive screening	15	57.7
2000 ml of intravenous fluid given within 3 hour of positive screening	7	26.9
Located in Intensive Care Unit when identified	9	34.6
Patients moved to Intensive Care Unit after positive sepsis screening (n=17)	10	58.8
Average Intensive Care Unit time (days)	11.0	N/A

Antibiotic administration was one of the components with a consistently higher compliance rate of 57.7 percent. Monthly compliance (as seen in figure 8 below) varied without a discernable pattern between 33 and 80 percent. There was poor overall compliance (26.9 percent) with intravenous resuscitation with an infusion of a minimum of two liters of isotonic fluids. Monthly compliance with this component of therapy varies from 50 percent to zero percent, with no discernable pattern (see figure 9). It should be noted that achieving compliance with these components relies on other disciplines that nursing and could be a potential confounding factor.

Figure 6 - Laboratory Compliance with Early Goal Directed Therapy (n=26)

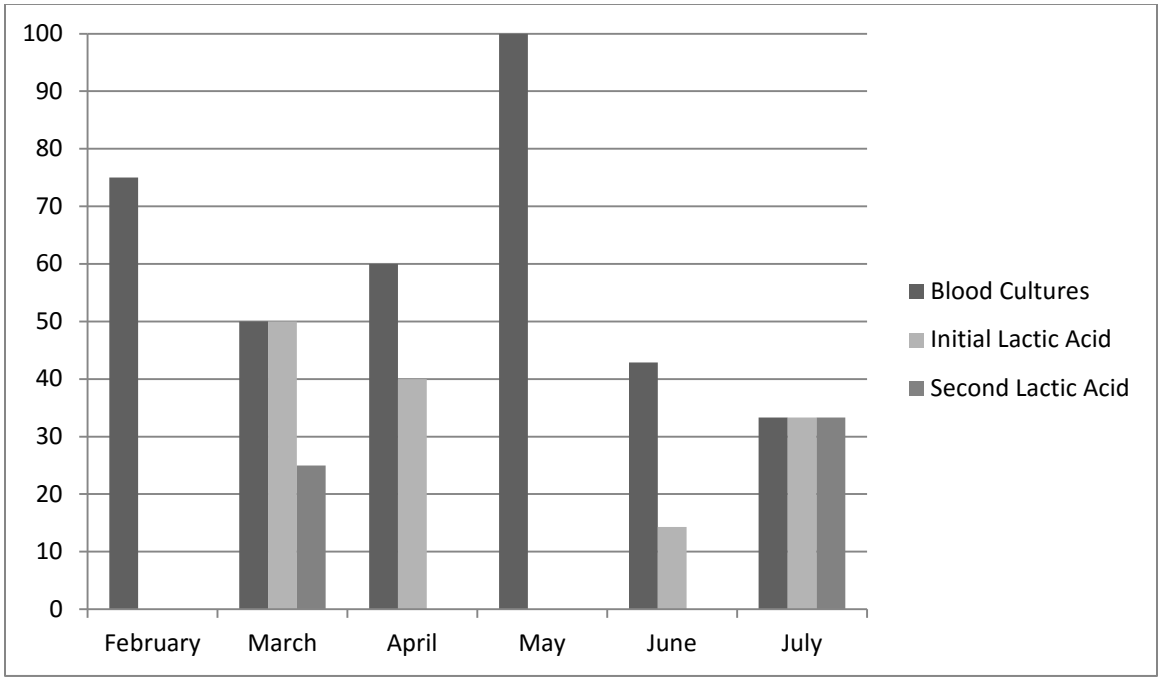


Figure 7 - Empiric Antibiotic Compliance (n=26)

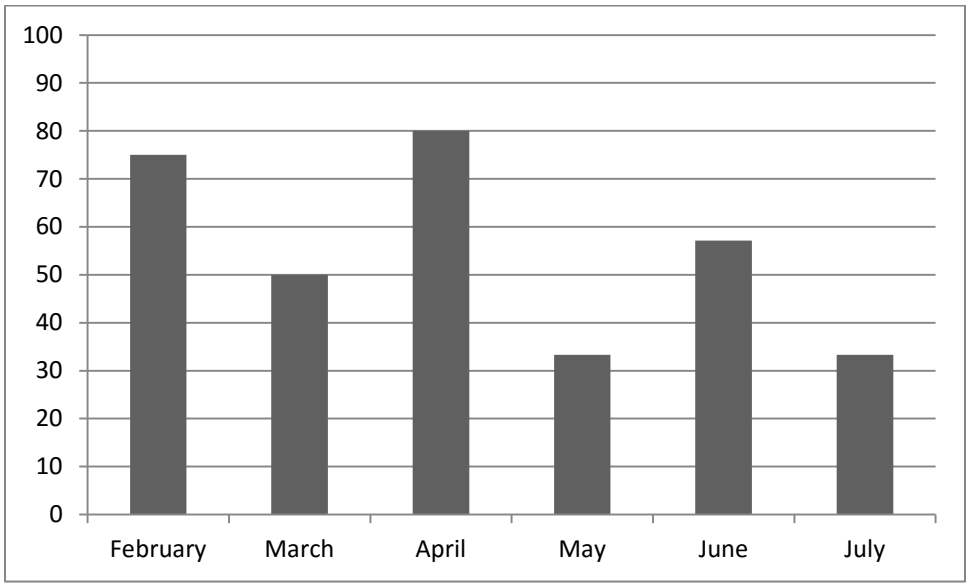
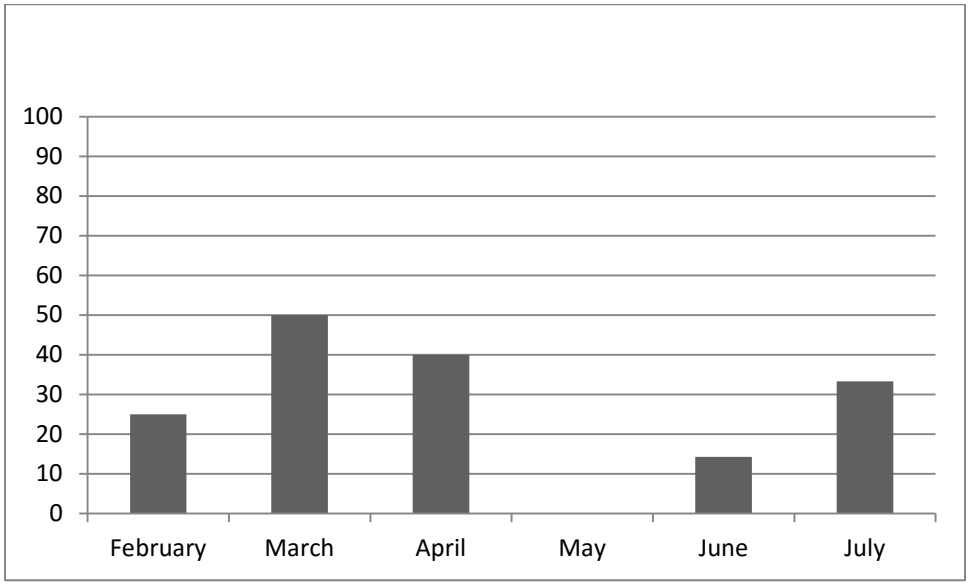


Figure 8 - Intravenous Hydration Compliance (n=26)



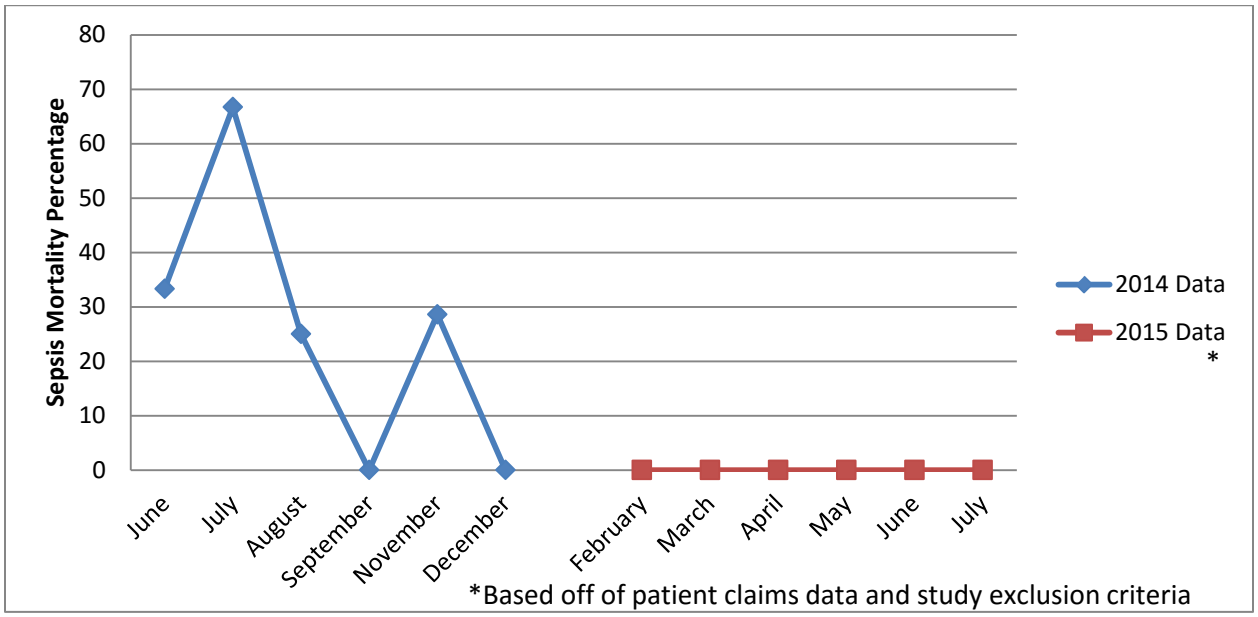
Mortality, intensive care utilization, sepsis syndrome ratios:

A comparison was made of the data from 2014 to 2015 and showed a lower number

of cases of mortality, a lower ratio of advanced sepsis (severe sepsis and septic shock)-to-sepsis ratios, and ICU length of stay (LOS). The patients studied in 2015 had similar demographic composition as those in 2014.

The monthly percentages of sepsis-related mortality that met inclusion and exclusion criteria are shown below (figure 16). This chart shows what percentage of sepsis syndrome cases each month experienced mortality before and after the initiation of the bedside sepsis screening. It should be noted that a zero percent mortality does not reflect the clinical reality that some patients will die with a sepsis syndrome and the significance of these results must be carefully considered.

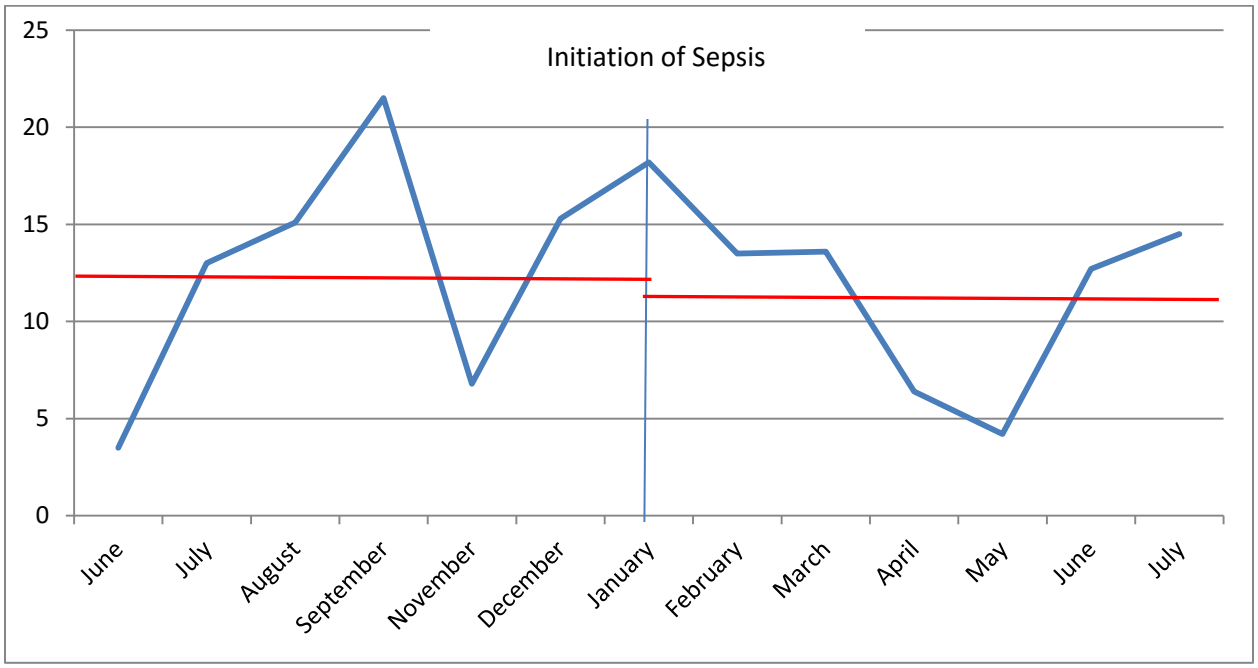
Figure 9 - Sepsis Related Mortality



Average intensive care unit (ICU) length of stay (LOS) decreased from 12.04 in 2014 to 11.00 in 2015. When the average monthly LOS is charted out (see figure 17) there does not appear to be a consistent pattern to the reduction in ICU LOS.

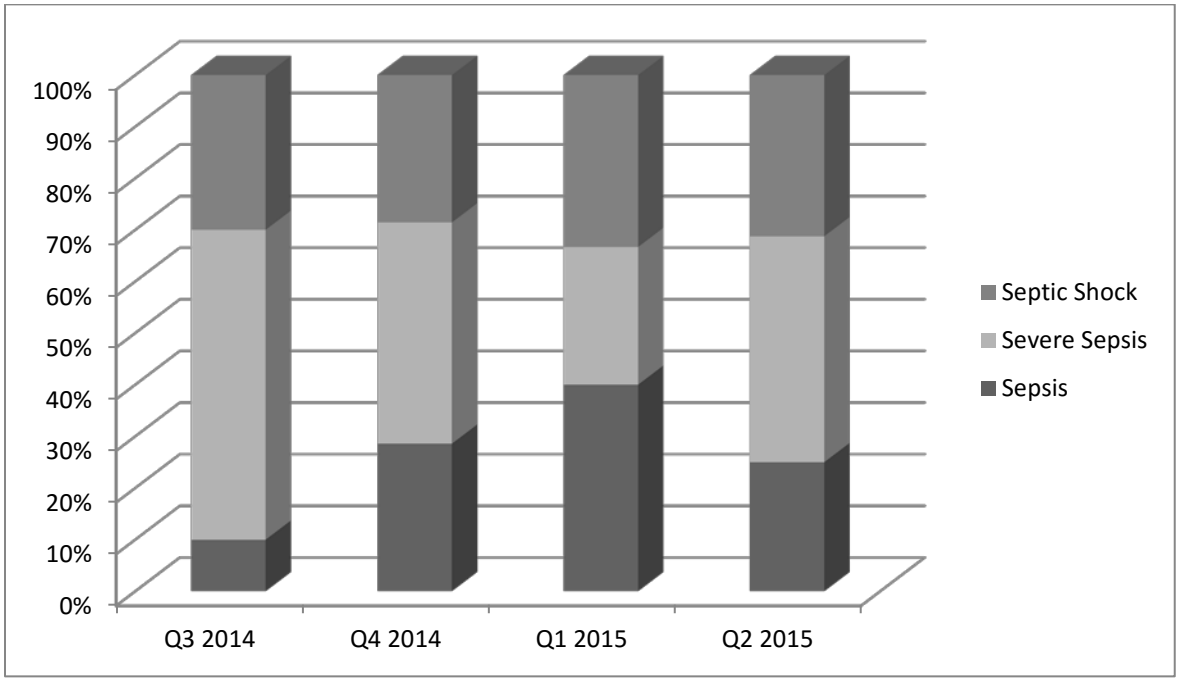
A ratio of advanced-sepsis-to-sepsis was utilized as a method of determining if the screening tool was identifying sepsis syndromes early and leading to a prevention of disease progression. If the screening process was identifying sepsis earlier and preventing the development of more advanced forms of sepsis (severe sepsis and septic shock), then we would see an increase in cases of sepsis and a decrease the cases of advanced sepsis. We could express this relation numerically by viewing it as a ratio; the cases of sepsis being the denominator and the cases of advanced sepsis (severe sepsis and septic shock) as the numerator. The ratio for 2014 was 3.8 (19 cases of advanced sepsis divided by 5 cases of sepsis) and 1.6 (16 cases of advanced sepsis divided by 10 cases of sepsis) in 2015. A visual representation of this relationship between sepsis syndromes and their frequency can be seen in figure 18 below.

Figure 10 - Intensive Care Unit Length of Stay (Days)



In 2015 there was a lower intensive care unit (ICU) length of stay (12.04 versus 11.00 days), fewer cases of mortality (25 versus 0 percent), a lower severe sepsis/septic shock-to-sepsis ratio (3.8 to 1.6) and percentage of patients requiring ICU admission (50.0 versus 42.3 percent) for patients with hospital-acquired sepsis syndromes over the time period after the bedside nursing screening was initiated. The data reflect early trends but are limited by the short time period of data collection. We need to monitor the data over time to see if the trends continue.

Figure 11 - Sepsis/Severe Sepsis/Septic Shock Ratio



Discussion:

This study is a retrospective review of sepsis outcomes at Baptist Health Lexington from February 2015 through July 2015 for the purposes of evaluating the effectiveness of a bedside nursing driven sepsis screening tool and identifying potential

quality improvement. An analysis on the effectiveness of the bedside nursing screening tool was performed by reviewing the 26 cases of sepsis syndromes that developed while the subjects were hospitalized; the cases the screening tool was specifically designed to identify. There were no significant variations in demographical composition.

Percent Identified by Screening:

There were multiple reasons for the failure of the screening process to identify sepsis syndromes at BHL; the two major reasons were a failure to recognize physiological changes that indicated the presence of a sepsis syndrome (38 percent) and a failure to utilize the tool properly, leading to an early cessation of screening (31 percent). It could be argued that the nurse may have recognized the presence of a sepsis syndrome at some point other than when the screening was performed, hence leading to the "prior screen positive, cease screening" option being chosen. If this were the case, however, the nurses still obviously did not understand how to appropriately document the change in condition. An additional possible cause for failing to capture sepsis diagnoses is that nurses may have felt uncomfortable with declaring that a patient had a "known/suspected" infection, or that the nurse lacked the knowledge to make that declaration. Several times the nurses noted a patient met SIRS criteria, but stopped the screening at the second phase question, "Does the patient have a suspected/known infection?" Another finding that was noted in the chart review was that "already on antibiotics" was given twice as a reasoning why the provider was not notified of the possibility of a sepsis syndrome; this in no way addresses if the antibiotics are appropriate or effectively dosed to treat sepsis. Further research is needed to determine the source of poor screening compliance amongst staff; examining staff attitudes about

the screening, understanding of the screening process, and identifying perceived and potential barriers to its utilization.

This is not the first study to find low compliance with sepsis screening methods. Nguyen and associates (2007) found low compliance with a sepsis screening initiative in their study that they were able to rectify through a 2 year program of continuous staff education and the utilization of a team specializing in sepsis identification and treatment. Mikkelsen and associates (2010) also found that lack of sufficient knowledge amongst staff lead to poor compliance with their study's screening protocols. It is possible the initial staff education given was not sufficient enough to foster effective screening compliance. It is also possible that what is needed is ongoing education with continuous feedback such as that described by Nguyen, et al (2007) to increase and maintain compliance. It is also possible that the lack of a pilot trial of the screening tool to prove utility and establish potential barriers to utilization lead to the poor utilization rates; the utilization of pilot studies to foster organizational change has been well established in change models such as the Stetler Model (National Collaborating Centre for Methods and Tools, 2011). The Stetler Model also suggests that the utilization of "change champions" is beneficial in fostering organizational change and adoption of new practices.

Early Goal Directed Therapy Compliance:

Overall compliance with early goal directed therapy (EGDT) was poor in this group of patients. The majority (42.3 percent) of patients did not receive any components of EGDT while only 7.7 percent had complete compliance with all EGDT components. The component that achieved highest compliance was prompt antibiotic initiation at 57.7

percent, with the phlebotomy component having the lowest compliance rate of 7.7 percent. As to be expected, failure to identify sepsis syndromes led to failure to treat sepsis syndromes. When sepsis syndromes were identified by the screening process, compliance with administration of antibiotics improved, although this finding must be viewed with extreme caution as this subgroup was only 6 patients. Compliance with the other components of the EGDT protocol for these 6 patients was comparable to the total sample.

The administration of empiric antibiotics within three hours of sepsis syndrome identification was the component with the highest compliance of 57.7 percent of all patients. In patients identified by the screening (n=6), the compliance with antibiotics was 100 percent versus 45 percent of those patients (n=20) whose sepsis syndromes were detected by other means. Further research needs to be done into nursing staff to determine what their level of understanding of the need for prompt antibiotic therapy in sepsis syndromes and identify potential barriers to that. Potential barriers to provider prescribing should be investigated as well; are they being notified, are they receptive of the information, do they foster open communication?

Total compliance with medication administration is a multi-step process that relies on several different departments and providers, any one of which could cause a delay or failure in treatment. Medical providers may not have been notified or the presence of a sepsis syndrome or lacked sufficient knowledge as to what is appropriate antibiotic therapy for the patient's sepsis syndrome. It is possible that the compliance failures may be the result of process failures in other areas such as pharmacy. Potential causes for delays could be; lack of pre-mixed antibiotics, understaffing of pharmacy

personnel resulting in delays in processing orders and delivering them to the requisite clinical area, a failure in the process of delivering the medication into the hands of the nurse as quickly as possible. The data were analyzed for compliance to the standard of having antibiotics administered within a three hour timeframe. It is possible that they were ordered but not administered within the time period. Further analysis is warranted to identify the source of the delay.

When the phlebotomy component is broken down we find higher compliance with the obtaining of blood cultures (57.7 percent) than we do with obtaining the first serum lactic acid level (23.1 percent) and the second serum lactic acid level (7.7 percent). It is possible that, since phlebotomy is undertaken by laboratory technicians versus nursing staff, there is a lack of understanding of the significance of drawing the second lactic acid within a specific timeframe. An additional reason may be that, since the timing of the second lactic acid is conditional on when the first lactic acid was drawn, that uncertainty may have caused delay in ordering the second lactic acid level leading to further delays in obtaining the specimen. Finally, as previously stated, lack of prompt detection of sepsis syndromes may have led to lack of EGDT initiation. Compliance with obtaining blood cultures was 100 percent in the 6 patients whose sepsis syndromes were detected by the screening process versus the 45 percent in the group detected by other means (n=20), although the number of cases precludes the ability to determine the significance of that definitively. Follow up with members of the lab department is warranted to better understand their processes.

The administration of intravenous (IV) fluid resuscitation is the third component of EGDT. This study found that only 7 cases (26.9 percent) received aggressive fluid

resuscitation of a minimum of two liters of IV fluids within three hours or less as per the Surviving Sepsis Campaign guidelines. Reasons for failure to comply with this component can be complex as rapid volume resuscitation may not always be appropriate, depending on patients' existing volume status and other disease processes such as renal or heart failure. The rapid administration of intravenous fluids could also be delayed due to lack of access or insufficient access to provide both intravenous antibiotics and intravenous fluids at the same time. A variety of individual clinical factors could delay achievement of this component; such as lack of sufficient intravenous access, the patient's individual volume status, or the presence of a comorbidity which precludes rapid volume resuscitation.

Overall, compliance with early goal directed therapy (EGDT) was quite low. Additional research as to the root source of this failure to comply is needed. It is possible that the source of the issue is a lack of staff understanding about sepsis and its treatment. It is also possible that there are a lack of established hospital processes that foster compliance with EGDT. Studies by Nguyen, et al (2007) and Mikkelsen, et al (2010) found that continuous education and feedback improved staff understanding and compliance with EGDT. Mikkelsen and associates (2010) also utilized a team of "sepsis specialists" who were deeply familiar with EGDT as a resource for staff, thereby improving compliance even more.

Outcomes of Severity of Sepsis, Mortality and Intensive Care Utilization:

There was a potential improvement in sepsis related mortality from 25 percent (n=6) to 0 percent, though it is unclear that utilization of the bedside sepsis screening had

an individual impact on this due to the small number of patients. It is also conceivable that the perceived mortality benefit is the result of some other cofounding variable such as the other sepsis reduction initiatives undertaken during this time period. For example, during this time period, there was a heightened awareness of sepsis management throughout the organization. Given that the data collection time period was limited to six months following the intervention and the number of cases is small, the trend is promising but may not accurately reflect an improvement. Thus, ongoing monitoring is needed to see if this trend continues.

As this is a study on an intervention to detect the early onset of sepsis, the most desirable outcome would be to identify sepsis in nascence and intervene before it has had the opportunity to advance on to severe sepsis or septic shock. To study this, we looked at several pieces of data; the ratio of advanced sepsis syndromes to sepsis, the number of cases that advanced in sepsis severity after the point of diagnosis, and the presence of systemic inflammatory response syndromes (SIRS) within 24 hours prior to the diagnosis of a sepsis syndrome being made.

The literature suggests that early identification and treatment are able to diminish the chance of progression from sepsis to severe sepsis or septic shock. We would see that the ratio of advanced-sepsis (defined as severe sepsis and septic shock) to sepsis ratio would decrease due to the increased discovery of cases of sepsis (the denominator) and the decreased cases of advanced sepsis syndromes (the numerator). We find this to be the case as the advanced-sepsis-to-sepsis ratio in 2014 was 3.8 and decreased to 1.6 in 2015, although these results are too preliminary to establish a trend. The main reason for the decrease was that the cases of sepsis increased from 20.8 percent of all sepsis syndromes

in the study period of 2014 to 38.5 percent for the study period of 2015. The cases of severe sepsis and septic shock also decreased. Due to the small number of cases in the study it is possible that small variations such as 3 less cases of advanced sepsis in 2015 could have a deceptively large impact, ergo further investigation will be required.

A reduction in the severity of sepsis should, hypothetically, lead to a reduction in intensive care unit (ICU) utilization; ICU length of stay (LOS) and transfers from medical floors to the ICU. This study did find an average reduction in ICU LOS from 12.04 days in 2014 to 11.00 days in 2015. If this trend continues and is not offset by a longer overall hospital stay, each ICU day avoided has the potential to save the hospital approximately $5,000 per patient.

An important aspect of any screening tool is that it detects the presence of what it is looking for as soon as possible. To assess if this was the case with the bedside screening tool we examined if the nurse had documented that the patient had evidence of systemic inflammatory response syndromes (SIRS) criteria within the 24 hours preceding the diagnosis of a sepsis syndrome, which is phase one of the screening protocol. It does not appear that the bedside screening tool was effective in detecting the development of sepsis in a timely manner. When the nurse is performing the sepsis screening, they are to document in stage one of the screening process if SIRS criteria are present. This study found that, of the 26 cases in 2015, 18 (69.2 percent) had the undocumented presence of two SIRS criteria within the 24 hour period prior to them being identified as having developed a sepsis syndrome. This is to be expected given the previously stated findings that there was low compliance with the screening process on the part of nursing staff. A possible cause for this may be that it is no uncommon to find patients with SIRS in the

hospital population as it is a component of numerous other disease processes, such as in the post-surgical patient, which comprised 73.1 percent (19 cases) of the study population. Since some SIRS criteria are to be expected, the nurse may not investigate if the patient has multiple criteria that may suggest the presence of a sepsis syndrome. If the patient does meet SIRS criteria, it is then left up to the nurse to make the subjective determination as to if an infection is suspected or the presence of SIRS criteria is related to the primary reason for the patient's hospitalization or the development of an additional sepsis syndrome. This reliance on SIRS criteria as part of the screening process should be considered as a potential root cause of the problems with sepsis identification. Recent research by Seymour and associates (2016) found SIRS criteria too ubiquitous in the hospital population to be of much utility for identifying the development of sepsis.

Relation to other evidence:

The finding of this retrospective quality improvement evaluation both agrees and differs with other evidence on this topic. The evaluation did not show a variation in mortality between patients whose hospital acquired sepsis syndrome was identified via the nurse-driven sepsis screening tool and other means of identification. Mortality in both groups was lower than that in 2014, which is consistent with a generalized downward trend in all-sepsis mortality noted by Moore and associates (2011). This could be reflective of an incorporation of the principles of early goal directed therapy into the standard of care while not adopting strict adherence to the goals of the guidelines. The patients studied had shorter ICU LOS as had been seen in previous studies (Zubrow, 2008; Castellanos-Ortega, 2010, Shorr, 2007; & Levy, 2010).

Limitations:

There are several limitations that must be acknowledged with this study. Electronic chart review ensured that no false cases were included, but there is no way to determine if there were cases of sepsis syndromes not included in this study due to miscoding. That the study was performed at a single facility may indicate that the results would not be generalizable. The limitation of the time frame to just one calendar year may have influenced by the other sepsis reduction strategies implemented. The decision to exclude patients with Do Not Resuscitate orders may have introduced bias and lead to an underreporting of mortality. The study is limited due to the small sample size which precludes the ability to achieve statistical power; however, continued data collection over time will yield sufficient power. The narrow inclusion and exclusion criteria raises questions about the generalizability of the findings.

Interpretations:

There appears to have been an improvement in mortality between 2014 and 2015. Although there were few cases experiencing mortality in 2014, the further reduction to zero cases in the first six months of 2015 suggests that there was an improvement. Given the poor compliance with nurse screening and the EGDT protocol, the improvement does not seem to result from the screening process. As it is highly unlikely that all sepsis mortality was reduced to zero, this improvement must be viewed as suspect and potentially the result of the very narrow focus of the study.

The apparent lack of impact of the sepsis screening process is at odds with the conclusions of Moore and associates (2009) who found that a sepsis screening tool was

able to directly reduce their mortality by a third. Key variances between their study and the experience at BHL may lie in their much higher compliance rates (consistently >70 percent) and that they utilized a three-step process that involved a "midlevel practitioner" to do an additional assessment of the patient. While that additional assessment may aid with confirming sepsis, it does not seem to be the issue here, as the nurse did not catch the sepsis diagnosis 73 percent of the time.

Of the 26 cases of sepsis that developed while the patient was hospitalized, only 23.1 percent were identified via the bedside sepsis screening; this represents a significant failing on the part of the screening process. Further work needs to be done on identifying the root causes of the nurses failing to utilize the screening process appropriately. Compliance with early goal directed therapy (EGDT) for sepsis syndromes was very poor, with 42.3 percent receiving none of the components of EGDT and only 7.7 percent being completely compliant. There was a reduction in advanced-sepsis-to –sepsis ratios; however this seems to be the result of a greater identification of sepsis rather than a reduction in the advancement of sepsis to its more severe incarnations. The presence of a sepsis screening tool failed to aid identification of evidence of SIRS criteria in 69.2 percent (n=18) of subjects within the 24 hours prior to diagnosis of a sepsis syndrome. There was a reduction in intensive care unit length of stay (ICU LOS) of 1.04 days but the small size of the study does not allow us to definitively state that this is due to the intervention and not either due to some other confounding factor or simple chance. That being said, we do have a clinically significant improvement in the outcome of ICU LOS with a potential cost savings of over 4000 dollars for that one ICU day saved (Chalupka, 2012).

Recently released evidence has called in to question the effectiveness of EGDT as a means of reducing mortality versus standard care, although these results may reflect that the standard of care has finally incorporated the key components of EGDT that impacted mortality, such as prompt empiric antibiotic administration and utilization of appropriate biomarkers to guide therapy. New evidence has just come out in late February of this year that our traditional definition of sepsis, that of a systemic inflammatory response in the presence of infection, is not specific enough, requiring a new definition focusing on the presence of organ dysfunction with concomitant infection (Abraham, 2016). It is too soon to know how this new evidence and definition will shape the conversation and treatment of sepsis syndromes, but it is certain to alter how patients are identified and what future goals of effective evidence-based therapy will look like.

Finally, it should be noted that, while it is a significant cause for concern when a patient develops a sepsis syndrome while they are hospitalized, the fact remains that this is not a significant proportion (4.8 percent) of the overall incidence of sepsis within the hospital (n=542). The institution may be better off investing its energy into other means of reducing sepsis within the hospital setting such as improving hand hygiene amongst staff, adherence to aseptic technique, and fostering processes that enhance and empower nursing clinical judgement.

Recommendations:

The impact of the screening tool was limited due to poor utilization rates. Further study is needed on analyzing potential causes for nursing staff failing to appropriately utilize the screening tool. More information is needed about the bedside nurse's experience

utilizing and interacting with the screening process to identify potential issues leading to poor screening compliance. Some potential causes for poor screening compliance could include; an insufficient initial educational experience, potential lack of feedback, unidentified barriers to utilizing the screening tool, lack of clarity in the construction of the screening tool, an over-reliance on the subjective "suspicion of infection," a lack of empowerment on the part of nursing to diagnose a patient as having a sepsis syndrome. The nursing staff should be approached to identify potential barriers to compliance with early goal directed therapy such as lack of established supportive processes, insufficient manpower available, or possibly delays within other disciplines. Several other recommendations as to how to improve compliance and EGDT administration are:

1. BHL should explore the reasons for nurses' inability to utilize the bedside screening tool and target an educational investment to improve staff understanding of the tool, signs and symptoms of sepsis syndromes and, if need be, what constitutes a "suspected" infection.
2. Evaluate continued use of the "no more screening required" option to reduce missed cases.
3. Repeat staff education about the sepsis screening tool and reinforce education on a frequent basis.
4. Root cause analysis should be conducted so as to identify potential barriers to compliance with all components of early goal directed therapy for every discipline involved.
5. Initiate monitoring of sepsis screening compliance and provide nursing feedback on compliance rates in a timely manner so as to impact behavior.

6. Baptist Health Lexington should consider whether they wish to increase the specificity of the screening tool for identifying sepsis by increasing the requisite number of Systemic Inflammatory Response Syndrome (SIRS) criteria with their current screening tool or transition to a different sepsis screening tool such as qSOFA so as to more accurately capture sepsis syndromes when they occur.

Conclusions:

A retrospective quality improvement review was performed of the 26 cases that met criteria between the time period of February and July of 2015. This review found that the screening tool only succeeded in identifying 23.1 percent of the cases; the two main reasons for failure being an inappropriate cessation of screening and a failure to identify the physiological signs of sepsis development. The presence of SIRS criteria 24 hours prior to identification of sepsis was undocumented in 69.2 percent of patients. Overall compliance with early goal directed therapy (EGDT) was only 7.7 percent with 42.3 percent of patients receiving no EGDT within the proscribed timeframe. There was a reduction in average length of stay within the intensive care units of 25 hours (1.04 days). Mortality was lower in 2015 than it had been in 2014 (zero percent versus 25 percent), but such a profound reduction is incongruous with the fact that there was still mortality related to sepsis at Baptist Health Lexington during this timeframe. It is more likely that, even if there was a reduction in mortality, the small sample size and the decision to exclude all patients with DNR orders underrepresented patients who died. Further sepsis research utilizing mortality as an outcome should Further investigation needs to be done to identify the nurses' experience in utilizing the screening tool and determine possible barriers to its effective utilization. Identification and removal of

barriers to sepsis identification may or may not have a positive impact on EGDT compliance and further investigation into changes in processes to foster EGDT compliance may also be warranted.

Manuscript Two

Review of Evidence on Feasibility of a Rapid Response Team as a Conduit for Providing Early Goal Directed Therapy in Sepsis

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Background:

Sepsis is a systemic inflammatory response syndrome (SIRS) to an infection, resulting in a wide variety of physiological abnormalities (Bone, 1992). Sepsis can be imagined as existing on a continuum: from sepsis, to severe sepsis, to septic shock, with a steady progression to greater and greater severity of illness. Severe sepsis is sepsis with associated organ dysfunction; septic shock is organ dysfunction in the presence of hypotension that is refractory to volume resuscitation. This progressive disorder of body systems leads to a "point of no return," where the organ damage from the shock state is irreversible and will lead to inevitable decline and death (Funk, Sebat, & Kumar, 2009).

The incidence of severe sepsis in 2001 was approximately 750,000 cases annually (Angus, 2001) with an average increase of approximately six percent (Martin, 2003) to over a million cases in which septicemia was the primary diagnosis in 2012 (Celeste, 2013). The steadily increasing rate in cases is felt to be due to multiple factors: the aging of the population, more utilization of invasive procedures, high rates of comorbidities in the population, immunosuppressive therapies, and the growing burden of antibiotic resistant organisms (Martin, 2003). The mortality rates for sepsis also increases in the presence of additional co-morbidities and as patient age increases (Yang, 2010). Considering that there are unalterable drivers such as age and comorbidities, the clinical importance of sepsis will only increase as the population ages.

Significance:

The mortality rate of sepsis is highly variable and ranges from 28% to 40% (Angus, 2001; Estaban, 2007), depending on alterable and unalterable patient

characteristics; age, comorbidity status, type of infection, level of organ dysfunction, and alacrity of appropriately directed therapy. Mortality also increases with each advancement a patient makes in the continuum from sepsis, to severe sepsis, to the highest mortality being in patients with septic shock (Guidet, 2005). Adrie (2005) found a similar "step-wise" increase in the cost of care associated with the progression of illness severity, the higher the age, and the presence of co-morbidities.

Sepsis is the most expensive condition treated in the United States for all payers (Celeste, 2013) at an aggregate cost of almost 20.3 billion (Elixhauser, 2011) dollars annually. A root-cost analysis study (Merritt, 2011) found that the care of sepsis patients already comprised 40% of total institutional costs of Intensive Care Unit (ICU) admission, with the care of a patient with sepsis costing six times more than the care of an equivalent ICU patient. Shorr, et al. (2007) found the direct costs of care for a patient with sepsis to be highly variable but with a median cost of $21,956, partially due to a longer hospital length of stay (LOS). Teres, et al. (2002) found that resource utilization and LOS increased with severity of illness, with LOS almost doubling as patients moved from the 1st quartile of illness severity to the 4th quartile.

Early Goal-Directed Therapy:

The standard of care for sepsis has been codified into an evidence-based bundle of interventions called Early Goal Directed Therapy (EGDT). This bundle was developed for the Surviving Sepsis Campaign (Dellinger, 2013) and has been shown to decrease mortality, cost of care, length of stay, and disease progression (Castellanos-Ortega, 2010; Zubrow, 2008; Shorr, 2007).

EGDT is focused initially around several central interventions; prompt phlebotomy for blood cultures and perfusion markers, administration of intravenous antibiotics (ideally within the first hour of therapy), and rapid fluid resuscitation (Dellinger, 2013). Completion of these interventions within the initial 6 hours provides the most statistically significant improvements in outcomes; however even then mortality remains approximately 40% or greater for those with septic shock (Guidet, 2005; Castellanos-Ortega, 2010). Guidet (2005) found that unalterable characteristics such as age and comorbidities did not have an impact on sepsis severity, leading the authors to propose that it is the alterable characteristics that are crucial in preventing disease progression, these being "prompt diagnosis and appropriate treatment." Kumar, et al (2006) supports the need for rapid identification and treatment by showing that for every hour past identification of severe sepsis, mortality increases 7%. Obviously, elimination of the pathogenic organism is just as vital in the early treatment of sepsis as volume resuscitation.

If mortality remains high even with appropriate treatment, greater steps need to be taken to promote prompt and earlier diagnosis. The majority of the literature has focused primarily on improving the timeliness and quality of interventions after sepsis is already present, most often in its more severe forms. What evidence does exist about surveillance and screening for sepsis is focused predominantly on screening protocols developed for the Emergency Department upon initial patient presentation, which ignores the population of patients that are already admitted to the hospital.

Sebat, et al (2005) found that approximately 24% of patients who developed severe sepsis or septic shock originally did so while on a medical-surgical unit, therefore

efforts to increase surveillance and early identification in this setting are highly desirable. By identifying sepsis in its early stages, it can be presumed that staff will be able to institute standing policies early in the disease course, when it is most responsive to EGDT. Strong evidence suggests that the speed at which appropriate EGDT therapies are initiated following the recognition of hypotension may be the single strongest predictor of survival (Kumar, et al, 2006; Lundberg, et al, 1998). It is evident that it is not just *if* EGDT is initiated, but *when* that is crucial in preventing irreversible shock and subsequent organ damage and failure. An analogy would be that is it is better to have active surveillance with a smoke detector than to wait until your house is visibly on fire to start intervening. Keeping within that analogy: the longer you delay intervening, the less likely your house is to survive, even if you eventually get the fire under control. Appropriate care for the septic patient requires both quick identification and swift initiation and coordination of multidisciplinary treatments.

Rapid Response Teams:

The Rapid Response Team (RRT) or Medical Emergency Team (MET) was developed to intervene in patients experiencing deterioration despite the presence of existing clinical services (Devita, 2006). In accordance with the "100,000 lives" campaign, RRTs can be initiated by staff, patients, or family members whenever there is subjective or objective evidence of an acute change in the patient's health status. The guiding premise is that certain objective and subjective triggers can be utilized in alerting a multidisciplinary team to the clinical deterioration of a patient.

The composition of these teams can vary widely, but the core staff is traditionally composed of one or more nurses with critical care background and representatives from other ancillary services such as radiology, phlebotomy, and respiratory therapy. They may or may not have a pharmacist, physician, or other advanced practice provider (Benson, Hasenau, O'Conner, & Burgermeister, 2014). These teams often have protocols that are utilized to guide team members' actions and empower them to initiate a limited scope of appropriate interventions without physician oversight (Lienhop, Kaplan, & Gray, 2008).

The goal of an RRT, regardless of the composition, is to swiftly provide a higher level of care to patients outside of traditional intensive care areas, such as the medical wards, hospital grounds, and associated hospital environs such as offices or imaging areas. The intention of a RRT is to stabilize the patient where they are and evaluate if the patient can safely remain at their current level of care or requires transition to a higher level of care such as an ICU.

Rapid Response Teams usually follow established protocols based on disease processes that are best treated within the narrow window of time in which specific care is required to avoid a negative outcome such as trauma, cerebral vascular accident, myocardial infarction, and shock syndromes (Devita, 2006). Unlike these other syndromes, however, the signs of sepsis can be subtle, easily missed, and difficult to diagnose, requiring specifically tailored education and protocols (Funk, Sebat, & Kumar. 2009). These protocols are commonly evidence-based, but are institution specific and may vary in what disease processes they cover, and the available testing and interventions that may be initiated without input from additional non-RRT providers.

The concept of bringing additional expertise and resources to patients in crisis so as to avoid a worsening of a patients' clinical situation is consistent with the core concepts of the Surviving Sepsis Campaign (Dellinger, 2013). A RRT provides the multidisciplinary knowledge and competencies that allow for prompt identification of patients with sepsis, and initiation of EGDT as soon as possible so as to be able to complete it within the target window of 6 hours. The purpose of this review of literature is to explore the utilization of a rapid response team as a vehicle for providing early goal directed therapy as quickly and completely as possible and determine what impact it may have on the outcomes of hospitalized patients who develop sepsis.

Inclusion and Exclusion Criteria:

A search of the CINAHL and PUBMED databases was performed utilizing the keywords "systemic inflammatory response syndrome," "sepsis," "severe sepsis," "septic shock," "sepsis syndromes," "rapid response teams," "rapid response systems," "medical emergency teams," "early goal directed therapy." The following filters were used: articles had to be published within the last 15 years, available in English, and dealt with an adult population exclusively. This resulted in a total of 43 articles in CINAHL and 35 articles in PUBMED. A secondary review was performed utilizing the bibliography of relevant articles identified an additional 5 articles that had fallen out of the inclusion parameters that were deemed eligible.

Screening Process of Study Eligibility:

The total results of the database searches were compiled and repeat articles were removed (n =20). Twelve articles that did not separate sepsis out as an identified source

of shock were excluded. Twenty-four articles where the responding RRT did not identify if interventions provided to septic patients were compliant with EGDT were excluded as well so we could be certain to be comparing interventions. Fourteen articles were excluded where it was not identified if there was a method of screening/identifying sepsis upon initiation of RRT so as to not include articles treating other sources of hypotension such as cardiogenic shock. This left a total of 9 articles.

Results:

Evidence has shown that the earlier you identify and initiate treatment on septic patients, the lower the mortality, length of stay (LOS), and cost of care (COC) (Dellinger, 2013). The wider sepsis literature has found that there can be a disconnect between ordering and initiating EGDT and its completion within the prescribed time frame, leading to negative outcomes for patients in severe sepsis (Berg, 2011).

The review of literature has found that, for the most part, a RRT response has a positive effect on patient outcomes. Several major themes have repeatedly been found across these studies; the use of a rapid response team to identify sepsis and initiate EGDT provides quicker and more complete EGDT implementation, decreased mortality, decreased ICU utilization, decreased LOS, quicker sepsis identification, and an increase in patients who are discharged to home as opposed to standard care methods.

Mortality:

Every article that analyzed the impact of a RRT on the initiation of EGDT found a statistically significant positive impact. Blumstein and Jones (2013) found a reduction in their "risk-adjusted mortality index from 1.8 to less than 1.25". Lienhop, Kaplan, and

Gray (2008) found a 16% decrease in their sepsis mortality over 6 months, which is on par with the results of Sebat, et al (2007) which found a 18.6% absolute reduction in mortality, with a relative reduction of 46.6%. This built on the authors' earlier work (Sebat, et al., 2005) which at that point only showed a 12.5% absolute reduction in mortality with a relative reduction of 31%. These reductions are not to the same scale as that found by Zubrow, et al (2008) who found a 49.4% reduction in mortality in their severely septic patient population! These results are in contrast with the work of Benson, Hasenau, O'Conner, and Burgermeister (2014) which found no impact on patient mortality.

Resource Utilization:

Several studies showed that the incorporation of a RRT into providing EGDT lead to a decrease in overall resource utilization. Benson, et al (2014) and Sebat, et al (2007) both showed a trend towards a decrease in ICU utilization, although Sebat, et al (2007) also showed a trend toward longer overall hospitalization stays. Umscheid, et al (2015)did not find an impact on ICU utilization. Zubrow, et al (2008) is the only study that found a significant decrease in hospital LOS by 34%.

Disposition:

Very few studies reviewed the impact on RRT involvement in post-discharge disposition beyond that of mortality. Umscheid, et al (2015) found a trend towards an increase in discharges to home. Sebat, et al (2005) did find a significantly increased likelihood of discharge to home with Zubrow, et al (2008) showing a 188.2% increase in home discharges in patients that had a RRT based intervention.

EGDT implementation and timing:

Only two studies analyzed if the action of initiating a screening process so as to trigger an RRT would have an impact on earlier sepsis detection. Linehop, Kaplan, and Gray (2008) and Umscheid, et al (2015) both showed that there was an increase in sepsis detection through the implementation of a standardized sepsis screening process for staff nurses.

For the majority of the studies that assessed RRT impact on EGDT implementation, they showed a statistically significant improvement in some if not all EGDT therapy components. Miano, et al (2012) found that a protocol for antibiotic administration provided a 32% increase in appropriate bacterial coverage over provider preference. Sarani, Brenner, Gabel, Myers, Gibson, and Fuchs (2008) showed that a RRT decreased the average time to administration of antibiotics by 102 minutes, mirroring the finding of Blumstein and Jones (2013) which showed a 60% increase in antibiotic administration compliance. Sebat, et al (2005) showed a trend towards improvement in antibiotic administration times but did find a 50% improvement in intravenous fluid administration times.

Umscheid, et al (2015), Zubrow, et al (2008), and Sebat, et al (2007) all found that a rapid response system for sepsis lead to a decrease in EGDT implementation times and an increase in compliance with all EGDT components. Benson, et al (2014) also found an increase in all EGDT components, but did not analyze implementation times. These results are countered by the work of Berg, Vasquez, Hale, Nyberg, and Moran (2011) which showed that implementing a RRT specifically to identify and treat sepsis

with EGDT did not lead to an significant differences in compliance rates. Berg, et al (2011) did find that the root causes of compliance failure was significantly different, with the RRT being more likely to implement therapy then in standard care, but failing to complete it within the prescribed time period.

Table 3- Summation of Evidence

Article	Findings
Benson (2014)	-No change in mortality. - Significant increase in compliance with EGDT. -Trend towards decreased ICU use.
Berg (2011)	-No difference between RRT and standard of care in EGDT implementation
Blumstein (2013)	-Decreased mortality -A 60% decrease in time-to-treat with 1st antibiotic
Lienhop (2008)	-Sepsis screening associated with a reduction in Mortality
Sarani (2008)	-Antibiotics were administered 3 times faster
Sebat (2005)	-Decrease in time-to-treat with IV fluids, transfer time to ICU, and likelihood of discharge to home -Trend to decreased mortality and decreased time-to-treat with 1st antibiotic
Sebat (2007)	-decreased time-to-treat with all EGDT -decreased mortality by 18.6% -showed association between EGDT compliance and mortality -number needed to treat (NNT) to avoid a negative patient outcome was 3

	-trend towards decreased ICU utilization
Umscheid (2015)	-Increased early identification of sepsis - increased compliance and time to complete with all EGDT therapies -Trend towards decreased mortality and increased discharge to home
Zubrow (2008)	-Decreased mortality by 49.4% -Decreased LOS by 34% - Increased discharges to home by 188%

Limitations and Gaps in the Literature:

One of the largest gaps in the literature is that there is a dearth of high-grade evidence specifically relating to RRTs and their treatment of sepsis syndromes. By their design, RRTs are intended to respond to a wide variety of critical situations, and so most studies focused on outcomes of RRTs are dealing with a population with a wide variety of medical issues. The nature of a RRT incident does not lend itself to being able to perform a blinded randomized control trial. There is a rather extensive body of knowledge focused on RRTs and their impact on hospitalized patients, but little evidence specifically detailing their interaction with septic patients and their ability to appropriately treat these patients.

Of the articles reviewed, there were nine that specifically evaluated the compliance of EGDT, either as a whole or by the individual components. Several articles looked specifically at compliance (Benson, 2014; Miano, 2012), while others focused on intervention time (Sebat, 2005; Sarani, 2008; Sebat, 2007) or both (Berg, 2011; Zubrow,

2008; Umscheid, 2015). The impact of increased compliance and decreased intervention time in this review of literature has shown either associated improvement in outcomes (Sebat, 2005; Sebat, 2007; Zubrow, 2008) or no significant impact on outcomes (Benson, 2014, Umscheid, 2015). The results of Benson, et al (2014) and Umscheid (2015) are in contrast to the preponderance of sepsis literature which has found a strong inverse association between increased compliance with EGDT and shortened intervention times and mortality in the rest of the sepsis literature (Dellinger, 2013; Kumar, 2006).

There were some inconsistencies with the broader sepsis literature. Of the nine articles in this review, only three (Sebat, 2005; Sebat, 2007; Zubrow, 2008) showed the beneficial impact of effects of EGDT: a positive change in mortality, decreased LOS, and decreased ICU days. Several of the articles were only intended to validate their specific intervention tool, and so focused more on proving the intervention could be done, not that it was effective or best practice. Six of the ten (Blumstein, 2013; Linehop, 2008; Sebat, 2005; Sebat, 2007; Umscheid, 2015; and Zubrow, 2008) measured mortality as the primary outcome measurement, with three of those six also taking LOS into consideration, with only three differentiating between ICU LOS and total hospital LOS (Sebat, 2007). The results of those three studies were inconsistent; Umscheid (2015) and Sebat (2007) found no change in hospital LOS, while Zubrow (2008) found a significant decrease in LOS. With the conflicting results, there are still questions about the true impact of RRT initiated EGDT on hospital LOS, though its benefits to mortality well supported. Sebat, et al (2005) and Zubrow, et al (2008) were the only studies that analyzed discharge destination, though their results concurred that there was a greater propensity for discharge to home or to a rehab facility then a nursing home. None of the

articles reviewed addressed the positive impact the intervention could have on reducing cost-of-care that has been shown in the wider sepsis literature (Shorr, et al., 2007 and Teres, et al, 2002).

One challenge associated with testing the impact of interventions performed by an RRT is that there is variation in criteria for initiating the rapid response system. SIRS criteria are part of the defining characteristics of sepsis (Bone, 1992), but it was not used exclusively as the triggering criteria in all studies. Meeting SIRS criteria was cited as being the trigger for a rapid response call in six of the ten studies cited (Benson, 2014; Blumstein, 2013; Linehop, 2008; Sebat, et al, 2005; Sebat, et al, 2007; Umscheid, et al, 2015), with half of those having an additional qualifier, such as anion gap acidosis (Benson, 2014) and hypotension (Sebat, 2005; Umscheid, 2015). Different triggering criteria for RRT initiation means that you may be comparing studies that may have a different triggering situation: sepsis versus severe sepsis versus septic shock.

Discussion:

Based on this review of evidence, use of a rapid response system for prompt initiation of EGDT in non-critical-care areas of the hospital should improve patient outcomes. Patients in these areas could face treatment delays due to staff unfamiliarity with EGDT protocol, as well as logistic delays due to unit staffing, unavailable resources, and therapy delayed while transferring the patient to a critical-care area.

A benefit to utilizing an RRT as a means of delivery of EGDT to patients identified as septic on the hospital wards is that it is easier to focus therapy education to a select few who can then have a hospital-wide impact. Jaderling, et al. (2013) found that

critical-care trained nurses on an RRT can be more effective at identifying severe sepsis and the requisite need for transferring the patient to a higher level of care. While sepsis identification can be made just as well by the primary medical team if they personally assess the patient (Quach, 2008), the consistent availability and level of expertise that a well-trained RRT provides would allow for continuity of care.

Based on the review of these nine studies, RRTs appear to be an effective method of delivering EGDT to septic patients in non-critical areas. These studies suggest that, regardless of team composition, by empowering and educating the RRT to identify sepsis and initiate the appropriate EGDT, they can improve the accuracy of EGDT and the efficacy with which it is initiated. Sebat, et al (2005; 2007) and Zubrow, et al (2008) consistently found that these improvements in decreased initiation time and increased compliance were associated with a decrease in mortality, ICU usage, and either a decrease in LOS, or at worse no change. RRT EGDT was found in several articles to lead to an increase in likelihood of the patient being discharged to home (Zubrow, 2008; Sebat, 2005; Umscheid, 2015), an improvement in patient quality of life on discharge (Sebat, 2005; Zubrow, 2008), and a decrease in end-organ damage (Zubrow, 2008).

It is unclear as to what is the optimal composition of a rapid response team. A team that included an APP would have the benefit of having a member who could order additional therapies and testing that may not be covered by existing protocols. A noted flaw of most of the non-APP RRTs is that they did not have the ability to provide one of the most crucial aspects of EGDT, the antibiotics. A counter strategy for addressing this gap would be by empowering your RRT to order patient-specific antibiotics based off an

algorithm reflecting local antibiograms, resistance patterns, and hospital formulary (Miano, 2012).

Another aspect of logistics to consider is the criteria required to trigger a rapid response system. Throughout the literature, there were varying triggers utilized for rapid response system initiation, from SIRS criteria (Funk, Sebat, & Kumar, 2009) to specific abnormalities such as hypotension (Sebat, et al. 2007). While a focus on a specific trigger criterion, such as hypotension, will increase the specificity of the screening process, it will lead to a subsequent decrease in sensitivity that could delay identification and intervention and potentially result in a worse outcome for the patient. A concern is that, by treating patients who are not septic as if they were, you are overusing resources. This is countered by Sebat, et al (2007), who showed that the number needed to treat (NNT) to avoid a negative outcome was 3, a far lower NNT for other critical illnesses such as stroke or myocardial infarction. In fact, Funk, Sebat, & Kumar (2009) suggest that simply focusing on the SIRS criteria as a trigger is insufficient and utilized a broader set of criteria. It is uncertain if using additional criteria, and the requisite testing to acquire the data, provides a significant improvement to care to offset any negative iatrogenic consequences. Having a higher threshold for triggering an RRT could potentially lead to a delay in treatment, which has been shown to be associated with a three-fold increase in mortality in decompensating patients (Quach, 2008). Most of the literature reviewed utilized the starting point of severe sepsis, which seems a reasonable compromise; the patients will have identifiable abnormalities that can increase specificity of treatment while hopefully being caught early enough so as to avoid the progression to irreversible septic shock.

In closing, this paper reviewed the literature to determine if it would be beneficial and feasible to utilize an RRT as a conduit for EGDT in non-critical care areas. The review found that, regardless of the team member composition, an RRT was able to provide EGDT to identified septic patients more efficiently, which was associated with a decrease in mortality, ICU usage and LOS, and a reduction in hospital LOS. These patients appeared to have lower rates of morbidity, fewer cases of end-organ insufficiency, a higher quality of life and more frequent discharges to home or rehab versus a skilled nursing facility. An RRT that included an APP such as a physician or NP could initiate antibiotics immediately, but other options existed such as a pre-determined patient-specific antibiotic algorithm for use. In fact, broader and more appropriate antibiotic coverage may be obtainable with a protocol-driven antibiotic prescription then is potentially prescribed by individual provider preference (Miano, 2012). It is imperative that organizational logistics such as hospital wide screening education and tools be developed and in place to promote triggering the RRT as soon as a case of sepsis can be identified in a non-critical area. It is also crucial that, after the RRT has identified a need of a stabilization effort for the patient, that there are organizational processes to provide the team with requisite medications, equipment, and transfer to a critical care area in as efficient a manner as possible without causing further delays in therapy.

Manuscript Three

Issues Confronting Acute Care Nurse Practitioners when Dealing with Patients at End-of-Life while in Intensive Care Units

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Background:

There is a growing demand for critical care services in the United States that has outpaced the supply of physicians with Intensivist training (US Department of Health and Human Services, 2006). This has led to a growing number of Acute Care Nurse Practitioners (ACNP) filling roles that were traditionally the purview of our physician colleagues (Howie-Esquivel, J. & Fontaine, D. K. 2006). Given that, in the United States, 15.6% of all deaths occur in the intensive care unit (ICU) (The Dartmouth Atlas for Health Care, 2012), ACNPs are increasingly being called upon to initiate and address end of life (EOL) issues and concerns. This paper will explore issues and provide recommendations for aiding the ACNP to negotiate the delicate process of supporting inpatients and their families dealing with this tumultuous time.

How Americans Die:

The primary goal of critical care medicine is to support patients in recovering from life-threatening illness while maximizing their quality of life and return to functionality. This goal is not achieved without sacrifice as critical care medicine entails aggressive, sometimes painful, therapies that are nevertheless requisite to provide the patient the greatest chance of recovery. Eventually though, recovery is not a viable option, and one in five Americans dies in the ICU after long, and sometimes futile, efforts (Angus, et al., 2004). This issue was first addressed in 1995 in the SUPPORT study, a multimillion dollar, multisite, randomized control trial that found a lack of awareness on the part of providers as to patient wishes and a high rate of patient deaths in “undesirable states” of pain and suffering. Despite awareness of the issue, our healthcare system

continues to inadequately provide for the needs of this vulnerable population, leading to higher dissatisfaction scores with care for patients and their families, increased use of emergency services, poor symptom and pain management, and institutionalized death as opposed to home-based dying (Aziz, Miller, & Curtis, 2012; Giovanni, 2012).

It is reasonable to understand why patients, when faced with the realistic possibility of death, would choose not to go gently into that good night. The desire to survive is inherent in all creatures and there is difficulty in providing patients with specific and exact prognostication as to if or when death will come or if the patient will be left with profound debilitation (Barnato, Albert, Angus, Lave, & Degenholtz, 2011). These two truths are why many patients, who may have professed a desire for a quiet and dignified death, are willing to pay a high price to maintain the struggle. This bears out the dissonance noted between people's expressed desire to die at home versus the actual state of things. While 7 out of 10 Americans express a desire to die at home (Pew Research Center, 2006) only 27% do so (CDC, 2013).

This natural unwillingness to confront an unpleasant truth of life, that we are mortal, lends itself to patients avoiding making advance directives to guide their EOL care. A recent report by the Institute of Medicine (2014) found that only 47% of Americans over the age of 40 had an advance directive (AD), although this percentage was higher in hospice patients (88%) and those who resided in a nursing home (66%). This unwillingness is also reflected in healthcare professionals who can be uncomfortable discussing poor prognoses, patient values, or treatment preferences in a terminal setting (Scheunemann, Cunningham, Arnold, Buddadhumaruk, & White, 2015). This unwillingness may stem in part as physicians often feel there just is not enough time to

discuss EOL issues adequately with patients (Tunzi, M., 2011), letting these discussions fall on other staff members (nurses, social workers, chaplains), which then leads to elevated distress and confusion for staff and patients (Burgess, Cha, & Tung., 2011).

End of Life (EOL) Decision Making:

End of Life (EOL) decision making is the process whereby patients, their families, and healthcare providers address what therapies and procedures are to be utilized when facing a life-threatening disease process. With the exception of advance directives, most EOL decision-making occurs as the patient approaches death (Teno, Lynn, Wenger, Phillips, Murphy, and Knaus, et al. 1997). EOL decisions can be viewed as addressing three key components; the limitation of additional care, the removal of existing care, and transitioning from curative care to comfort care.

Limitation of care establishes what therapies the patient would or would not want, such as hemodialysis or mechanical ventilation and, if they are desired, for how long of a period. Limitation of care does not preclude the pursuit of curative care, but rather, simply places boundaries on how far that pursuit is to be taken.

Removal of care focuses on reducing therapies that no longer provide a sufficient benefit-cost ratio. This may entail the removal of uncomfortable therapies such as tubes or the discontinuation of medications that, while not causing discomfort, are not promoting wellness, only prolonging the dying process.

Finally, “comfort care” is composed only of therapies that are meant to alleviate the symptomology of the dying process. The focus of these therapies is not to hasten

death, though that may be a foreseeable side effect, but rather to ensure that the patient is not in distress in their final moments.

These three components of EOL care are not mutually exclusive and individual patients will have varying levels of each based on clinical presentation and patient/family comfort. It is not uncommon for individuals to be unwilling to discontinue one life-prolonging therapy, such as mechanical ventilation, while stopping medications that are just as life-prolonging. Other clinical issues such as the use of paralytics and an intention for organ donation can impact what therapies the patient may receive towards the end of their life.

End of Life (EOL) Decision making:

Ideally, long before the patient is being faced with a life-threatening crisis, there has been a conversation between the patient, their medical provider, and their family which resulted in clear guidelines for going forward. One form of those guidelines is called an Advanced Medical Directive or "living will," a document that expresses what everyone agrees is the patient's goals for care. An Advanced Medical Directive does not necessarily limit the provision of care, merely clarifies the patient's wishes in event that they are not able to express them. A similar document that is not as extensive is a Do Not Resuscitate/Do Not Intubate (DNR/DNI) order, which does limit the patient's care in accordance with the patient's wishes in the event of a cardiac/pulmonary arrest, but does not limit the care preceding such an event. Neither of these documents precludes the other. Unfortunately, these documents are often too static and generic to address every

possible scenario of EOL care and so it is preferable that there be a person who can accurately represent the wishes of the patient when they are no longer able.

Patients are often not capable of being involved in their own EOL decisions whether due to illness or medications (Baggs and Schmitt, 2000). For this reason the patient should specify someone as their "medical decision surrogate." Commonly, this person is their spouse or their next of kin who is legally allowed to make medical decisions, although that need not necessarily be so. It is possible to elect someone as your durable power of attorney (POA) for all medical decisions, though this does require some provenance of documentation. Failing a previous designation of a POA, then medical decision making capacity passes to the next person legally empowered to make decisions for the patient; their spouse, their adult children, their parents, their extended family members in descending order, though this chain of empowerment can vary according to state law.

Research has shown that, traditionally, family members move along a continuum when making EOL decisions (Tilden, Tolle, Nelson, Thompson, & Eggman, 1999; Swigart, Lidz, Butterworth, & Arnold, 1996). As the patient fails to improve, the surrogate will gather information related to potential outcomes and prognosis. When the reality that their loved one will not improve crystalizes for them, they then begin to imagine what that person would want, based off of expressed intent or known values. Once they have an impression of what the patient would want, they next need to develop comfort with the role and responsibility of acting as the surrogate and what impact that will have on themselves and the extended family dynamic. When they are at this point,

they are fully capable of acting as the patient's healthcare surrogate. Unfortunately, research shows that this ideal situation is often far from reality.

Less than half of all patients have advance directives (IOM, 2014), and those that do were followed only 50% of the time due to dissonance between the patient's stated wishes and the wishes of their next of kin or the medical team (Teno, Licks, Lynn, Wenger, Connors, and Knaus, et al., 1997) as relates to EOL care. Additionally, there is the risk that members of the medical team may supplant the wishes of patients and their designated surrogates for their own judgement of what EOL care should entail (Cassel, Buchman, Streat, & Stewart, 2003) either because of thoughts of superior knowledge, misunderstanding of the viewpoint of the layperson, personal viewpoints, or as a misguided attempt to alleviate guilt for the surrogate. Sometimes, the issue is simply that there is not a copy of the AD available to the medical team at the moment of crisis (Guiterrez, 2012). When a decision finally is reached to proceed with comfort care measures, on average this occurs 2 days prior to death, suggesting an avoidable delay in appropriate EOL care (Teno, Licks, Lynn, Wenger, Connors, and Knaus, et al., 1997).

The State of NP Preparation to provide End-of-Life Care:

There is a lack of knowledge and undergraduate didactic preparation for nurses related to end-of-life care (Shea, Grossman, Wallace, & Lange, 2010; Iglesias, Pascual, Vallejo, 2013). The Institute of Medicine recommended as far back as 1997 that end-of-life care be incorporated into nurse practitioner education and that specially prepared programs be available for interested practitioners. Given the limited preparation

undergraduate nurses receive, it is vital that advance practice nurses gain knowledge and confidence on caring for this patient population.

The *End-of-life Nursing Education Consortium* (ELNEC) program that was created by the Robert Wood Johnson Foundation as a means to educate nurse practitioners on how to provide appropriate end-of-life care (Grant, Wiencek, Virani, Uman, Munevar, & Ferrell, 2013). Shea and colleagues (2010) found that, though APRN students did not start out with a strong understanding of palliative care principles prior to receiving ELNEC training, they afterwards recognized the necessity of EOL education, expressed a desire to gain that understanding, and felt that incorporating ELNEC modules into graduate level education would be a benefit.

Patient Experiences:

An ICU is not a peaceful place by nature, and so it may not provide the best venue for patients undergoing the dying process. Spiritual care is infrequently provided in intensive care for patients receiving EOL care despite stated patient preferences (Balboni, Sullivan, Amobi, Phelps, Gorman, & Balboni, et al., 2013). Balboni, et al. (2013) found that, while the nurses and physicians they studied felt that providing spiritual care was important and appropriate, they did not have adequate training to do so. Patients undergoing the end-of-life stages of their medical illnesses are more vulnerable than other patients dealing with those same illnesses as they are more prone to higher levels of pain and anxiety (Denny & Guido, 2012; Wilkie & Ezenwa, 2012). While experiencing higher levels of pain and or anxiety, these patients will often have limitations in their ability to clearly express these sensations to others due to the severity of their illness.

Family Impact:

Families do not exist in a vacuum, nor does the impact of their decisions cease with the death of their loved one. Tilden, et al (1999) found high levels of stress in family members 1 and 6 months after withdrawal of care. The authors also found high levels of guilt being reported due to selfish delays in decision making. Norton and Bowers (2000) reported that some family members found the impact of making these decisions "devastating," while others were proud they were able to honor the wishes of their loved one. A literature review by Gardiner and associates (2014) found that the economic impact on families to be poorly researched, but likely to be significant.

Impact on Staff:

End-of-life decision making has been identified as the most common ethical dilemma for both nurses and physicians (Oberle, & Hughes, 2001). Oberle and Hughes (2001) found that physicians often felt responsible considering they were the ones writing the palliative orders. Involvement in end-of-life care has been shown to be a source for moral distress amongst critical care nurses (American Association of Critical-Care Nurses, 2012), most commonly due to nurses providing what they feel as being futile care (Meltzer & Muckabay, 2007). This distress has been shown to be negatively correlated with the nurses' level of collaboration in discussing therapy and end-of-life-care education. By empowering staff to feel involved and seeking their collaboration in decision-making, there is a reduction in the frequency of moral distress (Browning, 2013). This involvement and empowerment is crucial, as the nursing staff are the healthcare members most likely to have built a relationship with the patient and their

family. Staff who work in critical care areas are traditionally focused on curing disease and prolonging life, so there may be distress when moving to a palliative model of care.

Resource Utilization:

There is no fiscally responsible reasoning behind providing expensive, yet useless, intensive care to patients in terminal illness, yet that is the fate for 1 in 5 of Americans. Forty percent of Medicare decedents are admitted to the ICU during their terminal illness and 25% of all Medicare spending is in the last year of life due to the high cost of intensive care (Marik, 2006; Hupcey, Penrod, & Fogg, 2009). Patients who die in the hospital have overall higher length-of-stay (12.9 days vs. 8.9 days) and cost-of-care ($24,541 vs. $8,548) than non-ICU terminal hospitalizations (Angus, Barnato, Linde-Zwirble, Weissfeld, Watson, & Rubenfeld, et al. 2004) and a higher overall cost than ICU survivors (Scitovsky, 2005). This higher cost of care does not appear to relate to having a higher quality of death (Khandewal, Engelberg, Benkeser, Coe, & Curtis, 2014). A possible reason for this was shown in a study by Khandewal, et al (2014) that found a positive correlation between family-satisfaction with care and quality of death and healthcare expenditures in patients that were underinsured; this creates a toxic environment where families expect expensive therapies that the hospital will not be reimbursed for and that will invariably not translate to any actual impact for the patient.

Ethical/Legal Concerns:

A series of legal decisions have concluded that it is legal and justified for a competent person to refuse, at any point, any medical therapy, whether it is life-sustaining or not (McGowan, 2011). This right is limited only in prevention of suicide

and in protection of third parties (such as children). If a person becomes incompetent through either debility or disease, but had a previously detailed advance directive, then that advance directive is to be carried out on the patient's behalf. These can be difficult situations where there is disagreement as to a patient's competency and such determination would need to be reached by a judge, although this is rarely the case in end-of-life situations.

As previously stated, if the patient becomes unable to make their own decisions, a surrogate decision maker must be identified. If the patient had previously identified someone in their advance directives, then they have ultimate authority. Failing a prior designation, then authority passes to a relative. The exact order varies by state, but commonly it is (in descending priority); spouse, adult child, parents, adult sibling, and finally other adult relatives.

End-of-life decision making processes usually follow the ethical principles of autonomy and beneficence. These ethical principles are represented in the "substituted judgement standard" and the "best interest standard." The "substituted judgement standard" means that the surrogate is asked to take what they know of the patient's values and previous statements and attempt to determine what they would have wanted in the situation. The "best interest standard" means that the surrogate assesses the benefit/risk ratio for therapy to the patient and selects those therapies for which the benefit outweighs the burden of care. In this standard, there is an additional aspect of objectivity as the decision is based off of known success and failure rates of therapies, though there is the risk of supplanting the patient's perceived autonomous values with those of the surrogate.

When treatment carries no appreciable benefit to the patient, it is considered to be medically futile. Futility of care carries significant personnel and cost of care ramifications, which have been discussed previously (Gardiner, et al., 2013; AACN 2012). Conflict between the healthcare team and families about providing medically futile care are uncommon, but can occur. Ideally, this conflict can be resolved without legal intervention, either through improving communication or developing joint decision making so as to resolve disputes. If the dispute cannot be resolved, then it is advisable to involve an interested third party, such as the institution's ethics board, for a review. This review can help determine if the care of the patient needs to be transferred to another medical provider so as to receive treatment or, in the case where treatment is deemed futile, if transfer to another institution can be obtained. Failing the ability to transfer the patient to another facility however, the intervention need not be offered. It should be noted that prior to such extreme measures all opportunities should be taken to achieve a harmonious resolution so as to avoid distress for the patient, their family, and the staff.

The utilization of sedatives and opioids to relieve suffering regardless of their potential impact on hastening death is warranted under the concept of "double effect" (Denny & Guido, 2012). As Denny and Guido discuss, so long as the intent of the healthcare provider is to provide adequate medications for comfort, it is legally and ethically sound to provide these, even knowing they may have an undesired impact on vital function as confirmed by the Supreme Court ruling of *Cruzan v. Director, Missouri Department of Health* (McGowan, 2011). The provider needs to be cautious about how ordering such therapy could be perceived by staff and family members. The limitations on NP prescribing opioids and anxiolytics are often not an issue with in-patient

populations, so long as the provider's state and institution do not limit the prescriptive authority of the NP.

Recommendations and Strategies:

Socioeconomic forces are driving a greater and greater need for critical care services, while limiting traditional care delivery models. This is leading to the increasing utilization of Nurse Practitioners (NP) as active members in the multidisciplinary team that determines the medical treatment course of critically ill patients. Undergraduate nursing education lacks the didactic preparation to prepare nurses for adequate EOL care (Grant, et al, 2013; Denny and Guido, 2012) and graduate level programs have not moved to address this educational gap (Lu, et al., 2015). For these reasons, this paper offers some useful, evidence based recommendations for how to approach patients and their families when having EOL conversations and shepherding them through EOL care.

Communication:

Throughout the research, clear and open communication has been repeatedly reported as being one of the most crucial strategies for aiding patients and their families. Communicating with families can improve their satisfaction with EOL care, but only if it is done in such a manner that does not make them feel hurried to make EOL decisions (Jacobski, Girard, Mulder, & Wesley, 2010). It is important to bear in mind that communication is more than just the spoken word; providing time and space for processing and accepting the information provided has been shown to be of benefit to patient's families when receiving news of a terminal illness (Tilden, et al, 1999). Tilden and associates (1999) also reported that family members found it beneficial when the

provider “stop[ped] and listen[ed]” to their concerns, questions, and fears. It is easier for families to be given the facts, recommendations, and then make a decision as a group rather than just being provided with facts and no context or guidance (Tilden, et al, 1999).

It is vital that the NP at all times communicate in an open and honest method with the patient and their family. The same can be said for when the NP is discussing the plan of care with the multidisciplinary team, as miscommunication of the plan or misunderstanding of the purpose of some therapies has been shown to lead to moral distress for some of the staff. Scheunemann and associates (2015) provide some guidelines for how to effectively communicate about EOL care:

1. Identify key stakeholders (patient, surrogate, spouse, etc.)
2. Coordinate a period of time when no one will be rushed in a quiet personal space.
3. Assess the current level of understanding.
4. Determine willingness to hear information.
5. Deliver medical information
    a. Communicate in a clear method without utilizing euphemisms or vague statements about clinical presentation or disease trajectory.
6. Acknowledge and address emotional response
7. Establish goals of care for all potential realistic clinical scenarios
    a. Anticipate potential clinical scenarios and discuss with the patient and family
    b. Proactively address reasonable fears of discomfort (such as dyspnea) and present a plan for dealing with it (narcotics/sedatives).
8. Follow up with family and patient on a regular basis and apprise them of clinical changes that are portentous for death.

Do not present care options as being a choice between aggressive versus comfort, as this can leave family members as feeling abandoned and forced into deciding whether or not to "give up." When presenting treatment options, providers should be aware of their phrasing so as to present them as "value-neutral" (Lu, Mohan, Alexander, Mescher, Barnato, 2015). Here are some examples of how commonly said phrases could have a more tactful and productive impact.

Working the Process:

Discussing and planning for EOL care should be undertaken in a multidisciplinary manner which includes the patient as an equal stakeholder. If, as is often the case in EOL scenarios, the patient is not able to speak for themselves, then a specific and legal surrogate must be identified and included. It is vital that this surrogate be respected as an equal partner, as they represent the patient's preferences and wishes. Multidisciplinary rounding and involvement in family meetings helps foster improved communication and understanding, providing clarity for all stakeholders in EOL decision making (Delgado, Callahan, Paganelli, Reville, Parks, & Marik, 2009).

Group decisions lead to a more satisfactory viewpoint for all team members and help to ensure that the plan is one that focuses on the patient and their autonomous needs and wishes, not those of any other involved individual. Specialist consultation with a Palliative Care Service (PCS) should be sought in order to provide expertise to the conversation on symptom management as well as emotional and spiritual support for the patient and their family. An additional benefit of a PCS consultation is that if there is an actual or perceived "lack of time" on the part of the primary providers to fully explore

and address EOL issues, this service can aid in the discussion. A lack of time does not justify impinging on patient autonomy or delaying desired palliation of symptoms at EOL.

Meet after 48 hours to discuss GOC in patients with high risk of dying (Seaman, 2013). These family meetings should be continued every couple of days to keep the family members current on clinical changes the healthcare team are seeing. A reasonable place to start in the absence of advance directives is to first determine what to do in the event of a cardiopulmonary arrest. Resuscitative measures in dying patients are not health-promoting, but rather death-prolonging and carry with them significant negative effects such as pain, suffering, and additional medical intervention. After a decision has been reached on code status, the provider can explore with the patient/surrogate other limitations of care that are consistent with that patient's values. All therapies should be detailed as to their benefit/risk ratio and the patient should be given the option whether a therapy is desired or not. It is perfectly reasonable to attempt a "trial of aggressive care," including intubation if need be, to provide the maximum opportunity for patient improvement, but clear cut off points need to be agreed upon for when therapy is no longer health-promoting, but rather death-prolonging.

Norton and Bowers (2001) developed a stepwise approach for healthcare providers to support the family in transitioning from a curative to a palliative approach. These steps provide a framework by which the medical providers can begin the process of identifying what are the desires and goals of the patient and potentially addressing the need of limiting futile efforts at the end of life.

1. Develop trust
2. Provide information
3. “Plant seeds” about prognosis
4. Provide consistent perspective from all healthcare members
5. Hold meetings with family
6. Involve ancillary disciplines/services (social services, chaplain, PCS)
7. Continue to support decisions
8. Reiterate information as needed
9. Redirect hope from cure to comfort

Table 4 - Communication Strategies

Instead of…..	Say……
Do you want us to intubate your family member?	-Did they ever express to you any thoughts on using life support at the end of life? -We are concerned that a ventilator will only prolong the dying process. - There is a strong possibility that they will die attached to this machine - As an alternative plan, we can refocus our care towards maximizing their comfort and treat any distressing symptoms with medications

Do you want us to resuscitate your family member? Are they a full code?	-Your family member is dying, and we anticipate that their heart will stop soon. -Given their severe illness, it is unlikely that an attempt at resuscitation would be successful; if it was successful, most likely that they would have significant impairment, if they even survived. -We are only discussing what to do in the event of their heart stopping. This does not mean that we will not do all that we can for them prior to that event.
Let's just….	-Based on what I'm hearing from you, I recommend that we…. -We will aggressively manage their symptoms within the guidelines that they have established with their wishes. -We will use all our resources to support them up until the point where their heart stops or they stop breathing. If that were to happen, we will allow them to have a natural, peaceful death -We will not needlessly prolong the dying process.

Specific Interventions for End-of-Life Care:

It is crucial that the nurse practitioner be able to address common problems in the dying patient: secretions, dyspnea, pain, delirium, fatigue, loss of sphincter control, nutrition/hydration, and avoidance of dry eyes/mucous membranes. Providers will need to be comfortable prescribing scheduled comfort medications (preferably PO) with IV for breakthrough. If IV access is difficult to obtain, keep in mind that many comfort medications could be given through a SC route. A full discussion on EOL pharmacology is outside of the scope of this paper, but there are evidence-based online resources available such as ELNEC or UpToDate.com (Bailey & Harman, 2015).

Bailey and Harman (2015) advise judicious utilization of narcotics to manage the primary symptoms of end-of-life; dyspnea and pain. They recommend providers be aggressive in managing symptoms, but remember that the goal is comfort. Most patients and their families would prefer they be cognizant and able to interact for as long as is comfortably possible. It is appropriate to start off with PRN medications with a plan for escalation of medication dosage and scheduling if needed. If patients are requiring frequent dosing, then a continuous infusion may provide more comfort. Discontinue unneeded medications, excepting cardiac meds and meds that act on the central nervous system as their abrupt removal could potentiate seizures. There is no evidence to support oxygen therapy for comfort except as incurring a placebo effect. Intravenous hydration can prolong the dying process needlessly; it is better to manage dry mucous membranes and dry eyes with oral hydration agents and eye drops respectively (Puntilo, Nelson, Weissman, Curtis, Weis, & Campbell, 2014).

If the patient is not likely to die within the next 12-24 hours, a decision should be made about the preferable location of death. If they are stable enough, consider discharging the patient home with hospice. If they are unlikely to survive such a transfer, but anticipated time of death is a matter of days, then a transfer to a private room on a designated palliative care floor is preferable if possible, so as to not needlessly tie up critical care resources and to provide the family a setting where there will be minimal intrusions. If the patient is unlikely to survive long enough to allow for transfer out of the ICU, then all efforts should be taken to maximize family presence and visitation policies should be relaxed.

Standardization of EOL care can help guide junior staff and support achievement of goals of care, but care must be taken to avoid depersonalizing the patient and their family. Venkatasalu, Whiting, and Cairnduff (2015) described how an evidence-based care pathway called the Liverpool Care Pathway (LCP) provided guidance to staff and ensured standardization of quality of EOL care while the program was running. Unfortunately, public opinion and media criticism caused the program to be abandoned. This underlines the importance of recognizing the individuality of the patient and their family and managing the perception of care. It is important that critical care providers encourage all patients, even those who have a low likelihood of death, to have EOL conversations with their loved one and physicians.

Conclusion:

As the population ages and we are able to prolong life, it is crucial that medical providers are able to help patients and their families navigate the balance between quality

and quantity of life. Specific communication strategies can help improve provider and patient understandings of available EOL care options and avoid unwarranted and potentially futile therapy. Acute Care Nurse Practitioners (ACNP) are in a unique position to significantly contribute to the improvement of end-of-life care provided to patients in critical care areas. As members of the multidisciplinary, ACNPs have a responsibility to help patients and their family best realize their care goals while enhancing their quality of life as much as possible. When the moment of death is approaching, the ACNP will need to prepare the family so they know what to expect and to address their fears and expectations.

In these emotionally charged moments, it is crucial that providers be aware of the ethical and legal guidelines that define decision making and that such decision making be undertaken in a multidisciplinary method that includes the patient or their surrogate as an equal partner. If there is a conflict between the viewpoint of the provider and the patient/surrogate, additional outside input from palliative care services or an ethics committee may help provide a way to move forward.

Capstone Conclusion:

The journey towards achieving my Doctorate of Nursing Practice (DNP) has been a challenging one, but one well worth the effort. I had already been prepared as a Masters of Science in Nursing to act as an Acute Care Nurse Practitioner in the care of my individual patients; now I am prepared not just to assess and intervene with individual patients, but systems and policies that can have an impact on countless more than I could ever conceivably help at the bedside. The further academic empowerment that the DNP will provide allows me now to function on a higher level; one of policy development, program planning and evaluation, and as a leader on issues facing our profession. I have gained a deeper knowledge and respect for the ability of policy change to initiate sizable impact, not just on the individual level, but on whole populations. By achieving my DNP I can now speak as a peer in the discussions that occur at levels away from the bedside that influence and shape our profession and the delivery of healthcare in this country. It will allow me to further my own professional development, and thereby enhance my ability to foster the development of others in the nursing profession. By obtaining my DNP, I now have an elevated vantage point to provide a clearer vision of the macrocosm of healthcare in America and been provided with the skillset to foster and actualize important improvements in how that healthcare is delivered on all levels. I stand on the shoulders of the giants in the field that have come before me, ready to further the field and lift others up to even greater heights.

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