Implementation of Code Sepsis Response Teams

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Abstract

Sepsis is a life-threatening condition requiring timely intervention to reduce morbidity and mortality. Despite the implementation of best practice alerts (BPAs) for early recognition, compliance with the Centers for Medicare & Medicaid Services (CMS) sepsis bundle remains suboptimal. This Doctor of Nursing Practice (DNP) project aimed to improve sepsis bundle compliance and decrease mortality rates by implementing a Code Sepsis Response Team in two intensive care units (ICUs) at an organization in the Midwest. The intervention involved multidisciplinary team activation upon sepsis recognition, streamlining timely interventions. The study compared pre- and post-intervention data on sepsis bundle compliance and mortality. Results indicated a 5.6% increase in compliance but an unexpected 11% rise in ICU mortality. Statistical analysis found no significant impact on either compliance ($p = .487$) or mortality ($p = .113$). Despite these mixed outcomes, the project underscored the need for continued refinement of rapid response models and ongoing staff education.

Future efforts will focus on optimizing workflow efficiency, incorporating predictive analytics for early sepsis detection, and extending the evaluation period. The findings were disseminated through the OhioLINK Consortium of Ohio Libraries to ensure accessibility for healthcare professionals implementing evidence-based sepsis interventions. This project highlights the importance of structured response teams while emphasizing the necessity for further research to refine sepsis management strategies and improve patient outcomes.

Key words: Sepsis, sepsis bundle compliance, code sepsis response team, early sepsis recognition

Implementation of Code Sepsis Response Teams

Sepsis, a life-threatening infection, causes organ dysfunction, lowers blood pressure, and reduces tissue perfusion (Srzić et al., 2018). Bacterial and viral infections are two causes of sepsis. When sepsis occurs, the body's immune system attempts to fight the infection, but widespread inflammation can result, which can lead to severe sepsis or septic shock. Individuals at high risk for developing sepsis include those over 65 years of age, infants and newborns, pregnant individuals, and those with certain medical conditions such as diabetes, cancer, obesity, and kidney disease. Additionally, individuals with weakened immune systems, hospitalized patients with Foley catheters, intravenous lines, or breathing tubes, and those with severe skin injuries, such as burns or open wounds, face an increased risk (Cleveland Clinic, 2024).

Septic shock is the most severe stage of sepsis and occurs when blood pressure decreases to dangerous levels (Sepsis Alliance, 2023). Sepsis and septic shock are life-threatening conditions precipitated by infection that require timely intervention to reduce mortality. To treat sepsis, the clinician must be able to recognize signs and symptoms promptly and implement treatment interventions. The sepsis bundle is a group of interventions quickly used at the first onset of signs and symptoms of sepsis. The bundle initially includes timely lab draws such as blood cultures and serum lactic acid levels. Early intervention includes crystalloid fluid administration within three hours of presentation and vasoactive medications if fluid resuscitation is inadequate. Within six hours of presenting symptoms, the practitioner should assess volume status and tissue perfusion (Guarino, 2023).

Per the Centers for Disease Control and Prevention (CDC) (2023), for every hour of delayed treatment, patients experiencing sepsis have an 8% risk of death and an overall 30% average mortality rate. The World Health Organization (WHO) (2023) concludes that sepsis's

initial signs and symptoms are high heart rates, fever, fast breathing, confusion, and general pain. The CDC (2023) describes many long-term, lasting effects that sepsis leaves on patients, such as inability to sleep, hallucinations, panic attacks, chronic aches and pain, feelings of helplessness and depression, long-term organ dysfunction, and loss of limbs.

The Center for Medicare and Medicaid Services (CMS) introduced severe sepsis and septic shock (SEP-1) early management bundles in 2015 (Sepsis Alliance, 2023). The sepsis bundle comprises evidence-based interventions clinicians should acknowledge when they suspect sepsis to decrease mortality rates. In May 2023, CMS announced that SEP-1 would be a part of the value-based purchasing program (VBP) beginning in 2024 to improve quality care. For many healthcare organizations in the United States, there is a financial penalty when SEP-1 measures are not met by healthcare organizations, and when these are achieved, a financial bonus is awarded. On average, most healthcare organizations have a 50% compliance rate with the sepsis bundle. To meet the measure and avoid penalties, healthcare organizations must achieve 59% compliance with SEP-1 (Sepsis Alliance, 2023). Sepsis already comes with high costs, the need for additional resources, and increased length of stay.

A large healthcare organization in the Midwest that includes both inpatient and outpatient services across several locations identified that sepsis bundle compliance is not meeting CMS standards. Two intensive care units at different locations were identified as areas of opportunity regarding sepsis bundle compliance, putting both locations at risk for a CMS penalty (Klaz, 2023). Bundle compliance was at 41% at one location, and 52% at the other location. The sepsis mortality rate for all facilities (five in Northern Kentucky and one in Southeast Indiana) was 27% in 2023, 31% at one of the ICUs identified as an area of opportunity, and 12% at the other. This Doctor of Nursing Practice (DNP) project aimed to

implement Sepsis Response teams to meet the CMS bundle compliance goal of 59% and decrease sepsis mortality in those who experienced severe sepsis and septic shock in the two Intensive Care Units (ICUs) over three months.

Problem

The Sepsis Alliance (2023) states that an astonishing 1.7 million people in the United States experience sepsis each year. Sepsis is the third most common cause of death in hospitals, where one in three deaths had experienced sepsis during their stay. In 2021, the Kentucky Hospital Association (2023) reported that sepsis ranked fourth highest in the nation for sepsis mortality, with 923 deaths and an age-adjusted death rate of 16.9 per 100,000 total population. The national costs associated with sepsis are about 62 billion dollars each year. While sepsis can happen to anyone, specific populations are more vulnerable to the condition, according to the CDC (2023). The Sepsis Alliance (2023) describes sepsis as a life-threatening emergency in which the body overreacts to an infection, the same as it responds to strokes and heart attacks. Those at higher risk are people older than 65, have chronic conditions such as diabetes, lung disease, kidney disease, a prior diagnosis of sepsis who have survived the condition, weakened immune systems, recent severe illness that required hospitalization, and children younger than one-year-old (CDC, 2023). Lee et al. (2020) concluded that sepsis has an average mortality rate in the United States between 24% and 30%, providing evidence that this is a national problem. According to Bolte et al. (2022), implementing sepsis bundles promptly, using them appropriately, and monitoring for performance improvement decreases sepsis mortality. A study conducted by Taj et al. (2022) concluded that sepsis mortality rates decrease by 22.66% when sepsis protocols and bundles are in place, even when partially followed.

The organization's best practice alert (BPA) immediately notifies clinicians through the electronic health record (HER) when a patient experiences signs and symptoms of severe sepsis or septic shock. When a patient meets two specific Systemic Inflammatory Response Syndrome (SIRS) criteria, the BPA alerts the clinician. The present SIRS criteria are based on the last set of documented vital signs, highlighted in red, including pulse, temperature, blood pressure, and respiration rate outside of the normal range. The vital-sign criteria include a pulse is elevated (greater than ninety beats per minute), a decreased blood pressure (systolic blood pressure less than 90 millimeters of mercury), a temperature greater than 100.9 degrees Fahrenheit or less than 96.8 degrees Fahrenheit, and an elevated respiration rate (greater than twenty breaths per minute). Within the BPA, lab values outside the normal range also populate, including an elevated white blood cell count, lactic acid, procalcitonin, glucose, and creatinine levels. Fan et al. (2016) explained that due to the significant inflammation in the body during sepsis, laboratory results are essential for diagnosing sepsis, severe sepsis, and septic shock.

The BPA intends to provide a pathway for treating severe sepsis or septic shock within three hours of presentation. For nursing personnel, this is a que to implement the nursing sepsis protocol, which includes specific orders that do not require provider approval for the collection of a white blood cell count, lactic acid, procalcitonin, blood cultures, and a reminder to contact the provider for the sepsis order set with the remaining bundle items. For the provider, this is an alert to document that the patient truly is experiencing sepsis, to order the sepsis bundle that includes fluid administration and antibiotics, and to reassess blood pressure and tissue perfusion promptly (Sepsis Alliance, 2023).

While the organization's facilities have a BPA to guide the clinician when there are early signs and symptoms of sepsis, there remains a gap in addressing sepsis promptly. This method

had yet to improve sepsis bundle compliance and sepsis mortality rates. Harrison et al. (2017) concluded that despite the latest technology, best practices for timely intervention with sepsis patients do not recommend using BPA alerts alone. Besides the BPA alerting the clinician, the healthcare team must implement a course of action to improve sepsis outcomes. Guirgis et al. (2017) stated that a team approach to treating sepsis, such as a designated response team, is the missing piece to improving sepsis bundle compliance and mortality rates.

Evidence Search

PICOT Question

The intervention for addressing sepsis bundle compliance and mortality occurred in two Medical Intensive Care Units (ICUs). In the (ICU) (P), how does a Code Sepsis Response Team (I) compared to no code sepsis response team (C) affect sepsis bundle compliance and overall mortality of those diagnosed with severe sepsis or septic shock (O) within a three-month period(T)?

Search Strategy

Databases searched for this project were the Cumulative Index of Nursing and Allied Health Literature (CINAHL), Medline, and Joanna Briggs to locate evidence for the initial search. Search criteria included “sepsis management in the ICU” and “sepsis bundle compliance education.” Combination search criteria included “sepsis response teams and sepsis code teams, “sepsis bundle compliance, sepsis outcomes, and gaining compliance with sepsis bundles,” “decreasing sepsis mortality and sepsis mortality rates,” and “sepsis alarm fatigue and BPA alarm fatigue.” All databases returned 1,664 results. The results were further narrowed to include adult patients of all genders, literature in English, articles within the last five years, systematic

reviews, randomized controlled trials (RCTs), and qualitative studies. Exclusion criteria included pediatric studies, duplicates, magazines, and articles over ten years old. After applying those limitations, 11 articles were appropriate for review. See the summary of the Search Strategy Table below (Table 1).

Table 1

Search Strategy Table

Search Term(s)	**PubMed Medline**	**CINAHL**	**MEDLNE**	**Joanna Briggs**	**Cochrane**	**Psych**
"Sepsis response teams" and "Sepsis code teams"	37 (Refined to 33)	20		275		
"Sepsis bundle compliance and outcomes" and "Gaining compliance with sepsis bundles"	110 (Refined to 81)	75		51		
"Sepsis management in the ICU"	16	6		217		
"Sepsis bundle compliance education"	1	1		370		
"Decreasing sepsis mortality" and "Sepsis mortality rates"	6	14		379		
"Sepsis alarm fatigue"	11	4 (2 applicable)		71		

Search Term(s)	PubMed Medline	CINAHL	MEDLNE	Joanna Briggs	Cochrane	Psych
and “BPA Alarm fatigue”						
Totals for all Databases and Search Terms	Total number of hits = 1664			Total number of relevant hits = 11		

Evidence Synthesis

Critical Appraisal

Melnyk and Fineout-Overholt (2023) used Rapid Critical Appraisal (RCA) checklists to assess the evidence and answer the PICOT question. The RCA checklists assisted with analyzing the research studies to determine the project’s strength, validity, reliability, applicability, and credibility. Next, the project leader evaluated each relevant article based on evidence level, strengths, limitations, feasibility of use, conclusions, recommendations, and the need for further research. This assessment helped determine whether Code Sepsis Response Teams effectively facilitate timely sepsis treatment in clinical settings. The evidence synthesis table includes all completed RCA checklists (see Appendix A).

The RCA checklists from Melnyk and Fineout-Overholt (2023) encompassed 11 research articles, evaluating the study’s purpose, the use of a conceptual framework, research design, methodology, sample type, study setting, independent and dependent variables, measurement methods, data analysis, and overall findings. The evaluation aimed to determine if the literature would be practical in the clinical setting or enhance sepsis-related patient outcomes.

Evidence Synthesis Summary

A Code Sepsis Response Team is critical in intensive care units to improve sepsis bundle compliance and patient outcomes. A systematic review by Levy et al. (2015) concluded that these teams significantly reduce sepsis-related mortality by at least 15% and decrease the length of hospital stay. A team approach to treat sepsis includes early recognition of signs and symptoms, leading to increased bundle compliance and improved outcomes. For the successful implementation of Code Sepsis Response Teams, staff education, training, clear guidelines and protocols, and practical strategies for communication are necessary (Levy et al., 2015).

Organizations participating in severe sepsis and septic shock early management bundles (SEP-1) have significantly decreased mortality rates in septic patients (August et al., 2022). The current process for SEP-1 compliance at the organization for detecting and treating sepsis is through a BPA delivered through the electronic health record (EHR). In an observational study, Narayanan et al. (2015) found that antibiotic administration time could improve through electronic BPAs but failed to increase overall SEP-1 bundle compliance and decrease mortality. Harrison et al. (2017) concluded through a qualitative comparison study that EHR alerts alone versus traditional texting via a pager-type device often led to alert fatigue, longer response rates, and failure to improve compliance with sepsis measures. Fifty-one percent (n= 80) of providers responded to a text page that alerted them of sepsis versus 3% (n=5) of providers that responded to an EHR alert (p=0.001). The median time to acknowledge a text page alert was two minutes compared to 274 minutes to recognize an EHR alert (p=0.053), providing evidence that electronic alerts alone do not provide prompt sepsis evaluation and treatment (Harrison et al., 2017).

Implementing a Code Sepsis Response Team has proven effective in the hospital setting in increasing sepsis bundle compliance and decreasing patient mortality. However, a multidisciplinary team must be prepared to treat sepsis promptly and efficiently. The team should include an active sepsis committee, sepsis coordinator, physician and nurse leaders, standardized processes for sepsis patient identification, routine sepsis training, and enrollment in the sepsis registry (Bolte et al., 2022). Shramko et al. (2021) examined a random sample of 60 cases in a case series study to determine the treatment duration for patients suspected of sepsis when clinicians initiated a traditional rapid response for hypotension. The study included 41 patients, with a median time of 47 minutes to arrive in the ICU. Patients remained hypotensive for 70% of the rapid response time (41-100 minutes). Failing to address all bundle components during the rapid response resulted in only 32 (78%) patients receiving intravenous fluids and 20 (49%) receiving vasopressor support, further supporting the need for a Code Sepsis Response Team to effectively treat septic patients (Shramko et al., 2021).

Electronic health record alerts, including BPAs, implementing Code Sepsis Response Teams, and adhering to a sepsis bundle within three hours of recognizing sepsis are essential for improved outcomes. Choi et al. (2021) conducted a cohort study to determine if sepsis response teams improved sepsis bundle compliance and found that when fully implemented, mortality rates were lower compared to the incomplete group (OR 0.61, 95% CI, 0.33-0.63; $p<0.001$). Guirgis et al. (2017) aimed to determine the effectiveness of outcomes after initiating a sepsis alert combined with rapid response teams in a retrospective review that concluded that the odds of death significantly decreased after implementation in the “after” phase compared to the “before” phase (OR 0.62, 95% CI 0.39-0.99, $p=0.046$). Hyun et al. (2022) conducted a cohort study to determine if all-day response teams compared to non-all-day response teams influenced

mortality related to sepsis and concluded that all-day response teams significantly reduced in-hospital sepsis mortality (OR 0.57; 95% CI 0.35-0.93; p=0.024).

The evidence supports adding a Code Sepsis Response Team in combination with the existing SEP-1 measure and BPA to improve sepsis bundle compliance and decrease mortality. Taj et al. (2020) conducted a systematic review and concluded that sepsis mortality rates decreased by 22.6% when resources were readily available and staff received adequate sepsis identification and treatment training. Maclay (2017) determined through an observational study that, on average, healthcare costs could decrease by $517,500 through a multidisciplinary approach to treating sepsis. Grek et al. (2017) concluded that ongoing evaluation of the project through quality improvement interventions is essential to continuing to meet all bundle components and provide the best patient outcomes.

Evidence-Based Practice Model and Theoretical Framework

The evidence-based practice model chosen for this project was the Academic Center for Evidence-Based Practice (ACE Star) model (Melnyk & Fineout-Overholt, 2023). This model supported the quality improvement projects aspect and transfer knowledge in the healthcare setting, as Schaffer, Sandau & Diedrick (2012) described. Kurt Lewin's Change Theory was the selected theoretical framework for implementing Code Sepsis Response Teams. Hussain et al. (2016) noted that Lewin's model included three stages of implementing change: unfreezing, movement and change, and refreezing. This theory was preferable because of the ineffective practice within the organization that requires modification of strategies, processes, and structures.

Evidence Based-Practice Model

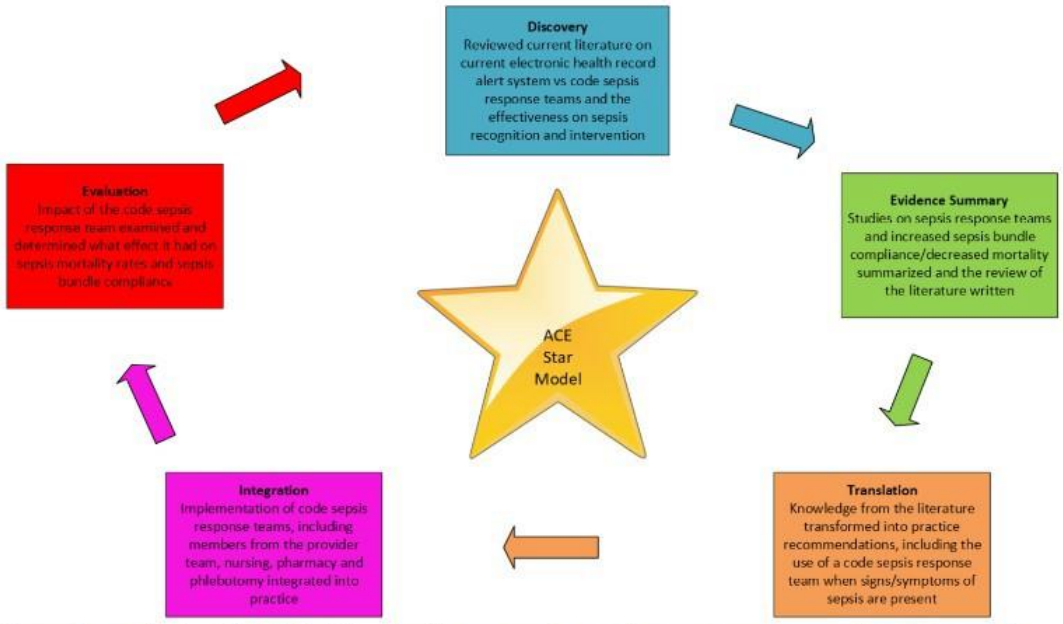
Schaffer, Sandau & Diedrick (2012) outlined the five steps in the ACE Star Model as the discovery of new knowledge, a summary of the evidence after the review of the literature, translation of the evidence into practice, integration of the suggested change into practice, and evaluating the effect of the practice change. Melnyk and Fineout-Overholt (2023) explained that the ACE Star Model illustrates five stages of knowledge transformation, with evidence-based processes evolving at each stage. This model integrates both established scientific concepts and new insights within a structured framework, enhancing the organization and application of evidence-based approaches. The ACE Start Model is designed to translate research into clinical practice. The continuous cycle ensures that clinical practices evolve with the latest research, improving patient care and healthcare outcomes.

The discovery of knowledge step included the evidence search and synthesis of 11 articles evaluating the effectiveness of Code Sepsis Response Teams. The summary of evidence, which is the second step in the model, included an evaluation of each study regarding increased sepsis bundle compliance and decreased mortality. Translation of knowledge is the third step in the model, where knowledge from the literature on Code Sepsis Response Teams was shared with the project team and hospital staff, and transformed into practice recommendations. In this project, integrating sepsis response teams through a multidisciplinary approach that includes members from nursing, physicians, advanced practice providers, pharmacy, and phlebotomy is the fourth step of the model, integration. In the final phase of the model, evaluation included determining the effectiveness of Code Sepsis Response Teams through monitoring sepsis bundle compliance and mortality rates. The evaluation also provided discovery of areas for improvement or change in the Code Sepsis Response Team process.

The ACE Star Model was most appropriate for this project because of its known use in educational and clinical settings. Implementing Code Sepsis Response Teams uses an evidence-based approach to improving sepsis bundle compliance and patient outcomes. The ACE Star Model is easy for multidisciplinary team members to understand and helps guide organizational practice changes through effective teaching strategies (Schaffer, Sandau & Diedrick, 2016). (Figure 1)

Figure 1

Figure 1. ACE Star Model



Note. Figure 1. Ace Star Model as it relates to code sepsis response teams to increase sepsis bundle compliance and improve patient outcomes.

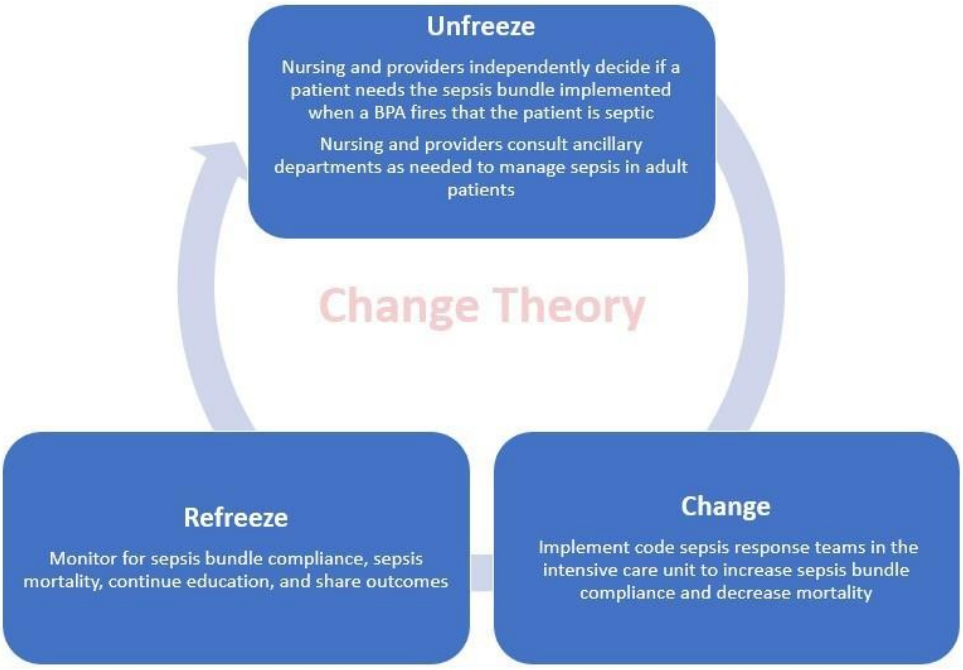
Theoretical Framework

Kurt Lewin's Change Theory and Model incorporate the steps involved in change by "unfreezing" old processes through active employee involvement and empowerment (Hussain et al., 2016). Kurt Lewin's Change Theory is a widely used model for understanding and managing

change in organizations, particularly in healthcare and business. This model was chosen for the project since it involves changing practice behaviors. Lewin's model consists of three phases: Unfreezing, Changing, (or Moving), and Re-freezing. Lewin's Change Theory emphasizes the importance of preparing individuals for change, and implementing new behaviors, which ensures they are sustained over time. To unfreeze an old process, the project leaders provided ongoing communication, background, and education on the change while remaining transparent. In the movement and change phase, the project leaders supported and motivated the team to decrease resistance as the project progressed, this ensured the employees stayed engaged and trusted the process. Re-freezing involved solidifying the desired change. This included strategies such as the routine collection of employee feedback and rewarding those who adopted the change early on. Lewin's model operates as a continuous cycle rather than a singular occurrence. After the Re-freezing phase, new challenges can arise, prompting a renewed cycle of Unfreezing, Changing, and Re-freezing. This ongoing cycle enables organizations and individuals to consistently adapt to evolving circumstances (Hussain et al., 2016). (Figure 2)

Figure 2

Figure 2. Kurt Lewin's Change Theory



A five-question survey shared with the nursing staff determined the knowledge gap in the management of septic patients. This allowed the "unfreezing" of the current process, as Hussain et al. (2016) defined. The workflow consisted of nursing acting solely through the EHR alert system and notifying the provider that the patient was exhibiting signs and symptoms of sepsis. Education was provided to both nurses and providers on the new workflow with the implementation of Code Sepsis Response Teams via a 30-minute lecture that outlined how to initiate a Code Sepsis. The movement and change phase of the project included ongoing education on current progress and the evidence supporting the implementation of a Code Sepsis Response Team. Leaders identified super users, who were staff that had been highly trained regarding the electronic health record (EHR) and best practice alert (BPA) for sepsis, severe

sepsis, and septic shock. Super users received training before other staff to be the resources on each unit to enhance motivation. The multidisciplinary team continued to evaluate and critique the process of re-freezing, with feedback collected through another five-question survey, which was sent post-implementation and compared to the initial survey (Appendix F). After a review of patient outcomes and sepsis bundle compliance, it was necessary to share patient outcomes and sepsis bundle compliance at the unit level, so the team could see that progress was made, to sustain motivation and the change in practice.

Project Plan

The project plan included the population, setting, project aim, and outcomes for implementing a Code Sepsis Response Team (Melnyk and Fineout-Overholt, 2023). The project leader (see Appendix B) created a logic model to identify the inputs, outputs, activities, short-term, intermediate-term, and long-term outcomes, and any external factors that may affect the outcomes (CDC, 2024). Key members of the Code Sepsis Response Team identified inputs for the project proposal. The overall outcome of the logic model was implementing a Code Sepsis Response Team, achieving 59% SEP-1 bundle compliance with CMS, and decreasing patient mortality rates by ten percent related to severe sepsis and septic shock.

Population

The study included all adult patients admitted to the two (ICUs) who met the criteria for severe sepsis or septic shock during their hospitalization. The quality department extracted a monthly report on all patients who had documentation of severe sepsis or septic shock. Manual chart reviews occurred on all the cases extracted from this report and bundle compliance was calculated. The team created a separate report on all Code Sepsis cases to determine the effectiveness of initiating the Code Sepsis. The Sepsis Collaborative committee, which included

senior leadership, clinical nursing staff, the organization's quality department, emergency, hospitalists, and critical care intensivists, trended and presented SEP-1 bundle compliance and mortality rates monthly. A sub-committee that included the Doctor of Nursing Practice (DNP) candidate, who is the project leader, a second DNP candidate who is the co-project leader, critical care intensivists, hospitalists, Information Technology (IT), pharmacy, and phlebotomy reported Code Sepsis Response Team implementation information to the Sepsis Collaborative Committee which was a standing committee within the organization as well as the Critical Care Committee. The Critical Care Committee was a standing committee that included nursing leaders, critical care provider leaders, and pharmacists.

Ten critical care intensivists, twenty hospitalists, twelve advanced practice providers, one hundred ICU nurses, ten phlebotomists, and ten pharmacists were included as members of the Code Sepsis Response Team.

Setting

The project took place in two separate facilities. One location is a fourteen-bed ICU, with 122 beds, and the other location is an eighteen-bed ICU, with 160 beds. The fourteen-bed facility averaged six severe sepsis or septic shock cases per month, and the eighteen-bed unit averaged seven cases per month. Both units were medical ICUs that achieved a Magnet redesignation in 2023. The fourteen-bed unit achieved Beacon Gold status in 2023, and the eighteen-bed unit achieved Beacon Silver status in 2022.

The fourteen-bed ICU had two centralized nursing stations, and the unit was rectangular. The front half of the unit used the first nursing station, while the back half used the back nursing station. The medication room, supply room, patient kitchen, and soiled utility were all centrally located for staff members to easily access. The eighteen-bed unit contained linear patient rooms,

with an elongated nursing station outside each room. The medication room, supply room, patient kitchen, and utility room were located behind the central nurse's station.

Project Aim and Outcomes

This DNP project aimed to achieve the CMS sepsis bundle compliance goal of 59% and reduce sepsis-related mortality by 10% in patients with severe sepsis or septic shock in two ICUs over a three-month period. The project had three primary outcomes. Structure outcome involved implementing a Code Sepsis Response Team to achieve at least 59% SEP-1 bundle compliance within the two ICUs by January 2025. Monthly manual chart reviews were conducted to measure bundle compliance and compare it against the number of Code Sepsis cases. The second primary outcome, process outcome, consisted of utilizing the Code Sepsis Response Team as outlined in the process map. The project leader reviewed the number of patients meeting the criteria for severe sepsis and septic shock, and all sepsis opportunities for improvement were sent for manual chart review to determine ICU Length of Stay (LOS), System Inflammatory Response Syndrome (SIRS) criteria, and overall sepsis bundle compliance. The third outcome, patient outcome included reducing mortality by 10% in patients with severe sepsis and septic shock in the two ICUs. The project leader trended mortality rates through monthly manual chart reviews and collaborated with the quality and data analyst teams.

Additionally, the project included staff assessment after education on the practice change, with 90% of nursing staff attending the training. The long-term plan was to expand Code Sepsis Response Teams throughout the entire organization.

Intervention

Nursing and provider education took place before implementing the Code Sepsis Response Team, through a 30-minute live lecture accompanied by a PowerPoint presentation

(see Appendix C). The education was developed for staff and providers based on a pre-assessment survey distributed by the Quality department within the organization that assessed knowledge and competency related to severe sepsis and septic shock management. The survey included six questions for providers (see Appendix D) and five for nurses (see Appendix E) with yes or no options for each question. Unit educators, unit managers, and healthcare provider leaders for the project collaborated in two ICUs to develop and tailor education to fit the needs based on the survey results that assessed provider and nursing knowledge. The project leader for the nursing staff was an ICU Nurse Manager, and the project leader for the providers was a critical care Advanced Practice Provider.

Ongoing education occurred for nursing staff within the ICUs annually during Skills Day. Provider education occurred through updates and meetings. The quality department sent a follow-up survey to assess knowledge and competency related to severe sepsis and septic shock management after the project had been in place for three months. Bi-weekly planning meetings included all members of the Code-Sepsis Response Team that began in June of 2024 to allow all team members to collaborate and finalize processes such as workflow, documentation, and sustainability.

After completing the education, the team implemented the project on September 10th, 2024. The registered nurse or provider activated a Code Sepsis through the hospital paging and alert system once they identified severe sepsis or septic shock. Practitioners could activate a Code Sepsis based on a provider's diagnosis or suspicion of severe sepsis or septic shock, or once the automated sepsis best practice alert (BPA) from the electronic health record (EHR) notified them.

The Code Sepsis Response Team responded to the bedside within fifteen minutes of receiving the code sepsis notification. The Code Sepsis Response Team consisted of the intensive care unit provider (Advanced Practice Provider or Physician), pharmacist, phlebotomist, house-nursing supervisor, charge nurse, and primary nurse. The critical care provider at the bedside assessed the patient and reviewed the chart to determine if severe sepsis or septic shock was suspected or present. If severe sepsis or septic shock was present or suspected, the provider ordered the sepsis bundle via the electronic medical record. Pharmacy was available at the bedside to ensure broad-spectrum antibiotics were available for dispensing. Phlebotomy obtained necessary laboratory work if central venous access was not present on the patient. Nursing staff completed a checklist within the EHR to ensure all components of the sepsis bundle had been met.

Once the Code Sepsis had ended, a debriefing occurred with all members of the team. The sepsis coordinator and project leaders tracked all identified Code Sepsis cases and the number of patients who met the criteria for severe sepsis and septic shock in the two ICUs. They presented the findings monthly during the Sepsis Collaborative meeting.

The two ICUs trialed the Code Sepsis Response Team for three months and collected data. Pre-intervention data collection occurred between January 1, 2024 through September 9th, 2024, via manual chart reviews of patients with documentation of severe sepsis or septic shock during their ICU stay. The team conducted post-data collection from September 10, 2024, to December 31, 2024, through manual chart reviews of patients with documentation of severe sepsis or septic shock. The team compared this data to the number of Code Sepsis cases in the two ICUs from the pre-intervention data.

Strategic Planning

Strategic planning for the implementation of Code Sepsis Response Teams included ethical considerations, key stakeholders, and driving and restraining forces (Melnyk and Fineout-Overholt, 2023). The project leaders established budgets and project timelines to secure support from senior leadership before implementing the Code Sepsis Response Teams.

Ethical Considerations

Both the organization where the project took place, and the university where the project attends, Internal Review Boards (IRB) deemed the project a quality improvement project that did not require IRB review for approval (see Appendix G). The project leader completed Protection of Humans in Research (PHRP) training prior to implementation of the project. Aggregated data regarding SEP-1 compliance and mortality rates in the two intensive care units were obtained with the help of the quality department through chart reviews pre-and post-intervention. All data was de-identified and stored in an encrypted and secure nursing drive accessible only with permission from senior leadership and the organization's information technology (IT) department. The results of this project were not intended to be generalized to other organizations or the greater population; rather they were an indication of improving the quality of patient care in the two ICUs at the organization. Survey completion was another ethical consideration. Survey completion was voluntary and anonymous by providers and nursing staff and was not a condition for employment. The project leaders, nursing leaders, and the Sepsis Collaborative received the overall data. The project leader published the final project paper.

Stakeholders

Many different disciplines have been included as Code Sepsis Response Team members. The key stakeholders for the project included patients with suspected or confirmed severe sepsis

or septic shock, family members of patients with suspected or confirmed severe sepsis or septic shock, senior leadership, critical care intensivists, hospitalists, advanced practice providers, project leader, frontline nursing staff, phlebotomy, and pharmacy. The quality team shared SEP-1 bundle compliance during the Sepsis Collaborative meetings. The sepsis subcommittee helped achieve 59 percent SEP-1 bundle compliance by gaining buy-in through sharing evidence related to the implementation of Code Sepsis Response Teams. Two critical care intensivists agreed to chair the subcommittee and supported the project. The team shared the proposal through the Critical Care Committee and obtained approval prior to implementation.

Driving & Restraining Forces

A substantial driving force for the project was the financial penalty from CMS if the organization did not achieve 59 percent SEP-1 bundle compliance. Another driving force was to align with the organization's strategic goal of offering a seamless experience to the patient by decreasing mortality rates from severe sepsis and septic shock by ten percent. The team identified potential barriers as implementation costs, resource availability due to staffing crises, and provider hesitancy to activate a Code Sepsis when necessary. Buy-in from nursing staff and health care providers was another potential restraining force as they may find the initiative unnecessary or labor-intensive rather than an improvement in practice and patient outcomes. Continued compliance with the new practice change was an obstacle as well.

Budget

Meetings began in June of 2024 in preparation for project implementation through the sepsis subcommittee. Nursing leadership, the project leader, the pharmacy, and phlebotomy were key stakeholders when determining the costs of implementation (see Appendix H). The overall costs for implementation of a Code Sepsis Response Team was $4,863. The most significant

financial implication was purchasing marketing items and education for nurses, providers, phlebotomists, and pharmacists.

The budget allocated $1,000 for purchasing marketing items. No additional costs were necessary for the use of the project leader, data analyst, and sepsis coordinator. The project leaders held thirty-minute education sessions for registered nurses, physicians, advanced practice providers, pharmacists, and phlebotomists. The project leaders calculated estimated costs for providing education based on the average hourly rate. Registered nurses in Kentucky average $45 per hour (ZipRecruiter, 2024). The average hourly rate for advanced practice providers is $58 per hour (Talent, 2024). The average hourly rate for hospitalists in Kentucky is $110 per hour (ZipRecruiter, 2024). The average hourly rate for critical care intensivists is $164 in Kentucky (ZipRecruiter, 2024). The average hourly rate for pharmacists in Kentucky is $53 (Indeed, 2024). The average hourly rate for phlebotomists in Kentucky is $16 (Indeed, 2024). The total amount for one hour of education for each discipline totaled $9,726. To account for 30 minutes of education for each discipline, the project leaders cut total cost to $4,863. There were no additional capital or operational costs.

Final Project Timeline

Four phases were included in the DNP project timeline (See Appendix I). The Project Leader began collecting pre-data before project implementation, from January 1, 2024, through September 9, 2024. The Sepsis Collaborative and the sepsis subcommittee identified System Opportunities for Improvement (OFIs). The data showed the need to implement a Code Sepsis Response Team to achieve the SEP-1 bundle compliance of 59 percent. The organization and university approved the project in April 2024. IRB approval was not necessary because the project is a quality improvement initiative.

The second phase of the project began in June 2024 with the development of the Code Sepsis Response planning team. The team comprised physician and nursing leaders, the project leader, pharmacy, phlebotomy, and Information Systems (IS). The team created a process map for activating a Code Sepsis and outlined each member's responsibility during the event (See Appendix J).

The third phase of the project involved education and implementation. Frontline nursing staff in the two ICUs received a thirty-minute education session on the process and the roles and responsibilities of the nurse. The project leader collaborated with the unit educators and nurse managers of the units and assisted with development of the education. The organization's sepsis coordinator shared the same education with the hospitalists, intensivists, phlebotomists, and pharmacy team members. A start date of September 10th, 2024 was established. The project leader extracted and reviewed post-implementation data, which concluded phase four.

Evaluation of DNP Project

Outcome Measures

This DNP project, which took place from September 2024 to December 31st, 2024, aimed to achieve the 59 percent sepsis bundle compliance outlined by CMS and decrease mortality related to severe sepsis and septic shock by 10 percent. The project leader determined outcome metrics with the Critical Care Committee and the Sepsis Collaborative, which included senior leadership, frontline nursing staff, and critical care providers.

Project outcome one (structure outcome) included implementing a Code Sepsis Response Team to achieve 59 percent SEP-1 bundle compliance within the two ICUs by January 2025 (Melnyk & Fineout-Overholt, 2023). The project leader performed monthly manual chart reviews on all patients with documentation of severe sepsis or septic shock to measure bundle

compliance and compared the information against the number of Code Sepsis cases. Data was stored in an Excel spreadsheet by the project leader. The team shared the bundle compliance percentage and the number of Code Sepsis cases monthly in the Sepsis Collaborative meetings.

Project outcome two (process outcome) included the utilization of the Code Sepsis Response Team outlined by the process map (See Appendix J). The project leader reviewed the number of patients who met the criteria for severe sepsis and septic shock. All sepsis improvement opportunities were forwarded to the project leader for a manual chart review to assess ICU length of stay, the timing of Systemic Inflammatory Response Syndrome (SIRS) criteria identification, and overall compliance with the sepsis bundle. The project leader reviewed monthly mortality rates for two ICUs and reported to the Sepsis Collaborative.

Project outcome three (patient outcome) aimed to decrease mortality by ten percent in patients with severe sepsis and septic shock in the two ICUs. The average mortality rate for patients experiencing severe sepsis and septic shock was between 24 and 30 percent (Lee et al., 2020), and was 31 percent at one of the ICUs, and 12 percent at the other. The project leader conducted monthly manual chart reviews to track mortality related to severe sepsis and septic shock, collaborating with the quality and data analyst to analyze and trend the data.

Data Collection

The project leader gathered data through manual chart reviews from the report generated by quality, which included any patient with documentation of severe sepsis or septic shock, to determine if the ICUs met SEP-bundle compliance. Manual chart reviews assessed the following components: the time that documentation of severe sepsis or septic shock occurred, the time severe sepsis or septic shock criteria were met, the time of intravenous antibiotic administration, and the time of intravenous fluid administration. Additionally, the reviews included the time

when lactic acid was collected and subsequent repeat lactic acid lab results, as well as the reassessment of the patient by the provider after fluid administration in cases of septic shock. Mortality rates were determined by death (yes or no) during the severe sepsis or septic shock encounter.

The project leader stored the data in a secure drive within the organization using an Excel spreadsheet. Graphs showed progress or regression from month to month. The project leader entered the data into the Excel spreadsheet and shared the information with the organization's data analyst, quality department, and sepsis coordinator. The project leader collected the data monthly and shared it with the Sepsis Collaborative Committee.

The project leader used descriptive statistics and inferential methods (two-sample proportion z-tests and confidence intervals) to assess mortality rates for patients who met compliance compared to those who failed the bundle to determine statistical significance Melnyk & Fineout-Overholt, 2023). The project leader incorporated confidence intervals and descriptive statistics to evaluate bundle compliance and mortality. The data was analyzed using Minitab 20 Statistical Software (2010) to determine statistical significance. Additionally, the project leader collaborated closely with the organization's data analyst and sepsis coordinator to assess SEP-1 bundle compliance and mortality rates.

Results

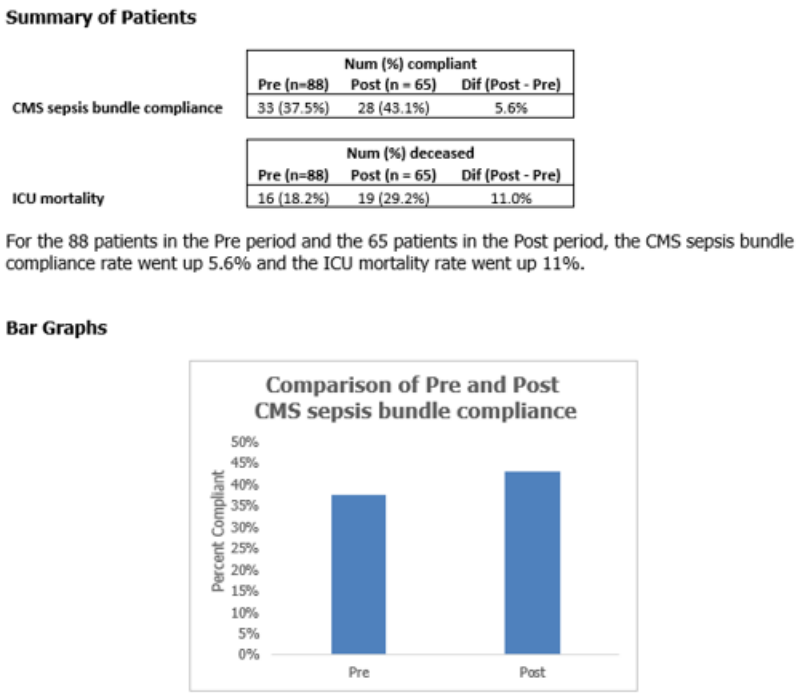
This DNP project aimed to achieve the 59% sepsis bundle compliance outlined by the Center for Medicare & Medicaid Services (CMS) and reduce mortality related to severe sepsis and septic shock by 10% in two intensive care units by January 2025. Eighty-eight patients were evaluated for severe sepsis and septic shock from January 1, 2024, through September 9, 2024, before the implementation of Code Sepsis Response Teams. Following implementation, 65

patients were evaluated utilizing the Code Sepsis Response Teams between September 10, 2024, and December 31, 2024.

The CMS sepsis bundle compliance rate increased by 5.6%, while the ICU mortality rate increased by 11%**.** Compliance with the sepsis bundle pre-intervention was determined to be 37.5% and increased to 43.1% post intervention. Mortality in ICU patients experiencing severe sepsis or septic shock pre-intervention was 18.2% and increased to 29.2% post-intervention (Figure 3).

Figure 3

Sepsis Bundle Compliance and Mortality Difference



Two-proportion z-tests were conducted to compare bundle compliance and mortality rates pre-and post-implementation. Results indicated insufficient evidence to suggest that implementing a Code Sepsis Response Team significantly affected compliance or mortality *(z* =

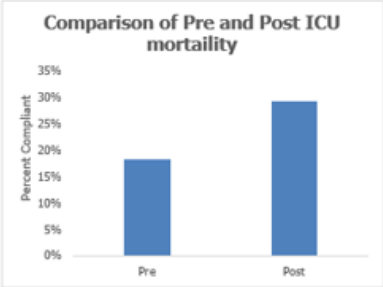
0.70, 1.61; p = .487, .113). With 95% confidence, the implementation of Code Sepsis Response Teams could increase compliance by as much as 21% and decrease mortality by up to 3%. (Figure 4)

Figure 4

Two-proportion Z-tests comparing pre and post Code Sepsis Response Team Implementation

Two-proportion Z-tests comparing Pre and Post

	2 proportion z-test		
	Test stat (z)	P-value	95% Conf Int
CMS sepsis bundle compliance	0.70	0.487	(-10.1%, 21.3%)
ICU mortality	1.61	0.113	(-2.6%, 24.7%)



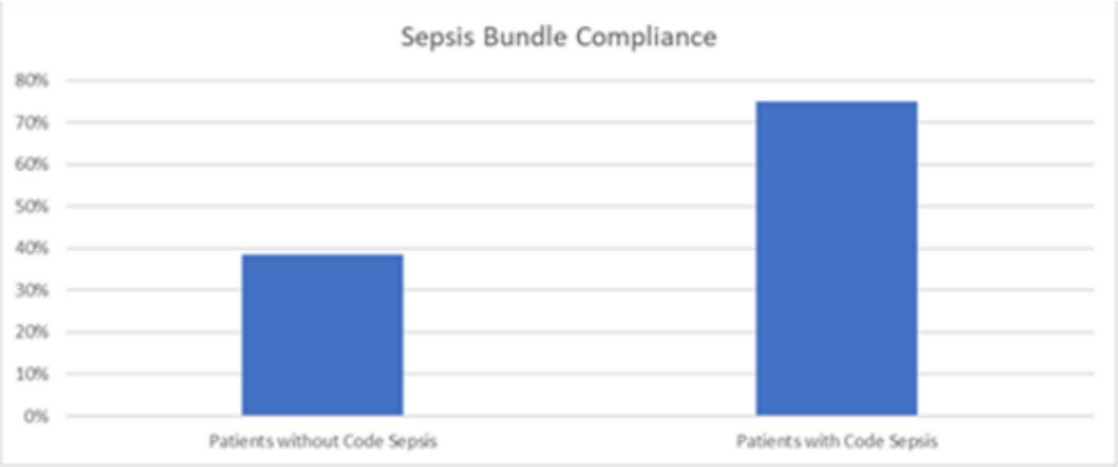
Additionally, patients who had a Code Sepsis implemented were 75% compliant with the SEP-1 bundle compared to patients without Code Sepsis that were 38.6% compliant. (Figure 5)

Figure 5

Descriptive Statistics-Sepsis Bundle Compliance

Descriptive Statistics – Sepsis Bundle Compliance

Sample	N	Event	Sample p
Sepsis Patients without Code Sepsis (p_1)	153	59	0.386
Sepsis Patients with Code Sepsis (p_2)	8	6	0.750



Compliance for patients in the sample was 36% higher for those who experienced a Code Sepsis than those who did not experience a Code Sepsis. There is a statistically significant difference in SEP-1 bundle compliance between patients who have a Code Sepsis called and those who do not (p=.021). (Figure 6)

Figure 6

2- Proportions Test

2-Proportions Test

Null hypothesis	$H_0: p_1 - p_2 = 0$
Alternative hypothesis	$H_1: p_1 - p_2 \neq 0$

Method	Z-Value	P-Value
Normal approximation	-2.31	0.021
Fisher's exact		0.062

Figure 7

Descriptive Statistics-Sepsis Mortality

Sample	N	Event	Sample p
Sepsis Patients without Code Sepsis (p_1)	153	29	0.190
Sepsis Patients with Code Sepsis (p_2)	8	0	0.000

No mortality events occurred among patients in the sample who received a Code Sepsis, while those who did not receive a Code Sepsis had a 19% mortality rate (Figure 7). The data shows a statistically significant decrease in mortality for sepsis patients who received a Code Sepsis compared to those who did not ($p < .001$) (Figure 8).

Figure 8

2- Proportions Test

2-Proportions Test

Null hypothesis	$H_0: p_1 - p_2 = 0$
Alternative hypothesis	$H_1: p_1 - p_2 > 0$

Method	Z-Value	P-Value
Normal approximation	5.98	0.000
Fisher's exact		0.196

Significance, Implications, and Limitations

Significance

Sepsis remains a leading cause of mortality and morbidity in hospitalized patients, with delayed intervention contributing to poor outcomes (Sepsis Alliance, 2023). Early recognition and timely treatment are crucial in improving survival rates, yet adherence to evidence-based sepsis protocols remains inconsistent across healthcare settings.

This DNP project aimed to enhance sepsis bundle compliance and reduce mortality rates through the implementation of a Code Sepsis Response Team in two ICUs. The initiative focused on early identification, standardized treatment protocols, and improved interdisciplinary communication to ensure timely interventions.

Although the project resulted in a 5.6% increase in sepsis bundle compliance, an unexpected 11% rise in ICU mortality was observed. This outcome suggests that while adherence to protocols improved, other factors, such as disease severity at presentation, delays in escalation of care, or variations in treatment effectiveness, may have influenced patient outcomes.

Despite this, the initiative underscored the critical need for continuous evaluation and optimization of rapid response models in sepsis management. The findings contribute to the growing body of evidence supporting multidisciplinary approaches in sepsis care while also identifying potential gaps in current intervention strategies.

Implications

The implementation of Code Sepsis Response Teams has several implications for clinical practice, healthcare policy, and future research. Although increased compliance reflects better adherence to evidence-based protocols, the rise in mortality suggests that additional factors beyond compliance may impact patient outcomes. Organizations should incorporate ongoing staff education, real-time performance monitoring, and refinement of activation protocols to optimize effectiveness. CMS mandates 59% SEP-1 bundle compliance, and financial penalties reinforce the need for institutions to adopt structured sepsis interventions. The results suggest that Code Sepsis Response Teams alone may not suffice, necessitating additional policy-driven quality improvement initiatives.

Stakeholder satisfaction with the Code Sepsis Response Team implementation was mixed. While clinical staff and administrators appreciated the 5.6% increase in sepsis bundle compliance, concerns arose regarding the 11% rise in ICU mortality and the added workload. Nurses and providers valued improved workflow coordination, but some questioned the intervention's effect on patient outcomes. Hospital leadership acknowledged progress toward CMS compliance goals but emphasized the need for further refinement. Overall, stakeholders recognized the project's benefits but highlighted areas for ongoing improvement and evaluation.

Limitations

Several limitations effected this project’s findings. A short, three

month post-implementation period may not have been sufficient to capture the full impact of Code Sepsis Response Teams. A longer study duration may provide a clearer understanding of sustained outcomes. Differences in the patient population may have also caused variability in severity of illness, comorbidities, and baseline health status between pre- and post-implementation groups, which could have skewed mortality outcomes and limited direct comparability. The project was conducted in two ICUs within one healthcare system, restricting broader applicability to other hospital settings with differing resources, staffing models, or patient demographics. External factors such as staffing shortages, variations in provider decision-making, or concurrent quality improvement initiatives may have influenced compliance and mortality rates. Over the three-month trial period, only eight Code Sepsis activations occurred across the two ICUs. The relatively small sample size (N = 153 patients total) reduced the power of statistical analyses, increasing the risk of Type II error (failure to detect a true effect).

Project Future

Sustainability

Future efforts will refine the Code Sepsis Response Team model to improve sepsis bundle compliance and patient outcomes. Key priorities will include extending the evaluation period to allow for a more comprehensive assessment of the team's impact over time, ensuring that short-term results are not skewed by limited data. Additionally, the integration of predictive analytics, such as Artificial Intelligence (AI), will be explored to enhance early sepsis detection by identifying at-risk patients more quickly and accurately. By leveraging AI, healthcare providers can be alerted to potential sepsis cases earlier, allowing for timely intervention.

Optimizing workflow efficiency will be a critical focus to reduce the cognitive and operational burden on providers, ensuring that they can promptly respond to sepsis cases without added strain. Streamlining communication protocols, improving the coordination between interdisciplinary teams, and incorporating technology to support decision-making will also be integral to reducing delays in treatment. Continuous staff training and support will be essential to maintain high levels of engagement and adherence to the sepsis protocols. These combined efforts will work to strengthen the model, ultimately leading to improved patient outcomes and a more effective sepsis response across the system. Further, longitudinal studies are required to examine the long-term impact of Code Sepsis Response Teams on SEP-1 bundle compliance and mortality rates and to determine whether modifying response protocols can improve survival outcomes. Staff input will be solicited as the Code Sepsis Response Teams are rolled out across the healthcare system.

Dissemination efforts will prioritize sharing findings, promoting best practices, and fostering collaboration across the organization. The project was submitted to the OhioLINK Consortium of Ohio Libraries, an open-access content library that ensures broad reach among those who can implement evidence-based sepsis interventions. Additional staff training and protocol modifications should be explored to ensure timely interventions translate into reduced mortality rates. Expanding the initiative to other hospital units and conducting longitudinal studies will provide further insights into the long-term effect of structured sepsis response teams on clinical outcomes.

Summary and Conclusion

Summary

The implementation of the Code Sepsis Response Team aimed to improve sepsis bundle compliance and reduce ICU mortality in two intensive care units. The project resulted in a 5.6% increase in compliance with the CMS SEP-1 bundle; however, ICU mortality unexpectedly rose by 11%. Despite improvements in adherence to evidence-based protocols, statistical analysis indicated insufficient evidence that Code Sepsis Response Teams significantly impacted either compliance or mortality rates ($z = 0.70, 1.61$; $p = .487, .113$).

Stakeholder satisfaction was mixed. Hospital leadership and quality improvement teams acknowledged progress toward meeting CMS compliance goals, while frontline nurses and providers appreciated the improved workflow coordination. However, the frontline staff and providers voiced concerns about the increased workload burden and questioned the clarity of the mortality benefits associated with the initiative. Limitations such as short evaluation duration, variability in patient populations, and external confounding factors may have influenced the results, highlighting the need for continued monitoring and process refinement.

Conclusion

While the Code Sepsis Response Team model demonstrated potential in enhancing sepsis bundle compliance, its impact on mortality rates remains inconclusive. The findings suggest that multidisciplinary rapid response teams alone may not be enough to improve patient survival. Additional interventions, such as extended monitoring, predictive analytics, and ongoing staff training, are essential to further enhance outcomes. Future research should focus on long-term evaluations and system-wide protocol refinements to optimize sepsis management strategies and achieve sustainable improvements in patient outcomes.

The project results were disseminated to frontline staff through various channels, including monthly Sepsis Collaborative meetings, unit staff meetings, and Critical Care Nurse Practice Council meetings. Additionally, updates were provided every other month at the Critical Care Quality meeting. To highlight the project's success, a poster was created and presented at the March 2025 Patient Safety Summit.

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Appendix A

Evidence Synthesis Table

Citation: Author, Date of Publicati-on, & Title	Purpose of Study	Concep -tual Frame work	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definition	Measure-ment of Major Variables	Data Analysis	Study Findings	Worth to Practice: LOE Strengths/ Weaknesse-s Feasibility Conclusion Recommen-dation
Guirgis, F. (2017). Managing sepsis: Electronic recognitio n, rapid response teams, and standardiz ed care save lives	Evaluate outcome post implemen tation of a hospital-wide sepsis alert program	n/a	Retrospective review of all patients 2013-2015 to evaluate sepsis outcome before and after intervention	3205 patients with 3917 sepsis admission s Patients who coded as having severe sepsis/sep tic shock + 2 SIRS criteria + document ed source of infection all departme nts were included	IV: implementa tion of sepsis manageme nt strategies (electronic recognition, rapid response teams, standardize d care) DV: number of lives saved/impr ovement sepsis outcomes DV1: POA sepsis DV 2: non POA sepsis	DV: Charlson comorbidit y index, Akaike Informatio n Criterion The primary outcome was inpatient mortality	Categori cal variable s were summari zed with counts and percent ages, and analyzed with Chi-square or Fischer's Means, standar d deviatio ns, medians (Wilcoxo n rank sum) Multivar iable analyses Odds ratios, confiden ce intervals	Charlson score: 2.52, SD 2.62, 2.47, SD 2.66 p=0.35 Multivariate analyses: OR 0.62, 95% CI, 0.39-0.99, p=0.046 DV 1: (OR 0.35, 95% CI, CI 0.28-0.45). DV 2: OR 0.78, 95% CI, 0.65-0.94, p=0.01)	**LOE**: retrospective review **Strengths**: large sample size, multifaceted approach **Limitations**: retrospective nature regarding accuracy of sepsis coding **Feasibility**: Would need support from providers, ancillary services **Conclusion:** Decreased sepsis mortality with multidisciplin ary approach **Recommenda tions:** Implement in the ED and ICU and then a system-wide approach to reduce sepsis mortality
August, B. (2022). Evaluating the impact	Whether adherenc e to the bundle	n/a	Retrospective nested case-control study	325 compliant and 325 noncompli	IV: compliance with the 3 hour severe	DV: Propensity score	T-tests Pearson' s chi-	DV: 1.035 (0.620-1.728)/1.03	**LOE:** retrospective nested case-control study

Citation: Author, Date of Publicati-on, & Title	Purpose of Study	Concep-tual Frame work	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definition	Measure-ment of Major Variables	Data Analysis	Study Findings	Worth to Practice: LOE Strengths/ Weaknesse-s Feasibility Conclusion Recommen-dation
of severe sepsis 3-hour bundle compliance on 28 day in-hospital mortality: A propensity adjusted, nested case-control study	recommended within 3 hours of sepsis recognition has an effect on patient outcome, specifically mortality			ant patients were included. Conducted at an academic tertiary care medical center in Detroit 2017-2019	sepsis bundle DV: primary outcome (overall 3-hour bundle compliance: odds of 28 day in hospital mortality) DV2: Secondary outcomes DV 3: Time to bundle element completion	Outcome variables: unadjusted and propensity adjusted odds of 28 day in hospital mortality	squared tests Mann-Whitney U-tests Covariates	9 (0.721-1.497) DV 2: a: 0.558 (0.0207-1.507)/0.558(0.267-1.167) b: 2.206(0.982-4.954)/2.543 (1.380-4.684) c: 0.804(0.480=1.348)-0.852 (0.589-1.231) DV 3: A: 0 (0,19)/15 (0,248) B: 44 (0,92.5)/251 (188,386) C:0 (0,0)/0 (0, 18.5)	**Strengths:** IRB approval, large sample, large center **Limitations:** unmeasured confounders, accuracy of chart documentation, bias toward the null hypothesis **Feasibility:** Already implemented in organization, noncompliant with measures. Would be easy to do with sepsis response team. **Conclusion:** Study needed to be completed prior to progression of severe sepsis when applicable. **Recommendations:** N/a already part of organization. 3 hour bundles alone are ineffective.

Citation: Author, Date of Publication, & Title	Purpose of Study	Concep-tual Framework	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definition	Measure-ment of Major Variables	Data Analysis	Study Findings	Worth to Practice: LOE Strengths/ Weaknesses Feasibility Conclusion Recommen-dation
Bolte, T. (2017). Hospitals that report severe sepsis and septic shock bundle compliance have more structured sepsis performance improvement	1: compare sepsis performance improvement activities in hospitals that do and do not support SEP-1 performance 2: identify elements of sepsis performance improvement associated with better SEP-1 scores and outcomes		Mixed method analysis	Telephone survey of hospital QI and safety coordinator of 118 hospitals.	IV: reporting of severe sepsis and septic shock compliance by hospital DV: level of structured sepsis performance improvement program in hospitals	IV 1: sepsis committee IV 2: sepsis coordinator IV 3: physician sepsis champion IV4: severe sepsis case review process IV 5:Code Sepsis Response Team: IV 6: Standardized process for sepsis patient identification IV 7: sepsis training IV 8: sepsis registry DV 1: performance improvement practices by SEP-1 reporting status DV 2: Association of PI practices with SEP-1 scores DV3: association of PI practices	Descriptive statistics, x2 tests, Fischer exact tests, O:E mortality ratios, Wilcoxon-Mann-Whitney tests, logistics/linear regressions, 2-tailed tests	IV 1: 72.7 vs 18.9 IV 2: 61.4 vs 36.5 IV 3: 65.9 vs 31.1 IV 4: 59.9 vs 31.1 IV 5: 88.6 vs 67.6 IV 6: 22.7 vs 6.8 IV 7: 97.7 vs 89.2 IV 8: 65.9 vs 25.7 DV 1: See IVs DV 2: no association DV 3: OR 0.37; 95% CI, 0.14-1.96; p=0.041 DV 4= OR= -0.43; 95% CI, -2.75 to 1.88,p=0.708	**LOE:** Level II **Strengths:** mixed methods, comprehensive approach, generalizability **Limitations:** results not adjusted for multi-comparison, CAH's not required to report on SEP-1 **Feasibility:** Many recommendations already in place at St. Elizabeth **Conclusion:** Hospitals that report on SEP-1 have a more robust PI program and practice **Recommendations:** Use sepsis registry, multidisciplinary sepsis committee, OFIs from individual sepsis cases

Citation: Author, Date of Publicati-on, & Title	Purpose of Study	Concep-tual Frame work	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definition	Measure-ment of Major Variables	Data Analysis	Study Findings	Worth to Practice: LOE Strengths/ Weaknesse-s Feasibility Conclusion Recommen-dation
						with mortality DV 4: association of subcompo nents with SEP-1 scores and mortality			
Choi, S. (2021). Rapid response system improves sepsis bundle complianc es and survival in hospital wards for 10 years	To estimate the outcome of bundle complian ce of patients with septic shock managed through RRS	IRB, Internati onal Confere nce on Harmoni zation of Good clinical practice guidelin es	Retrospective cohort study	976 patients with septic shock managed through RRS March 2008-December 2017	IV: implementa tion of RRs complete (1) and incomplete (2) DV: sepsis bundle compliance (1) and survival rates over 10 years (2)	IV: percentag es of complete vs incomplet e DV 1: sofa scores DV 2: CRP levels **Shock within 6h** DV 3: fluid resuscitati on (complete group) DV 4: Vasopressi n DV 5: epinephrin e DV 6: POC ultrasound DV 7: arterial catheters DV 8: source control	Multivar iate multiple logistic regressi on models, confiden ce intervals , odds ratios	IV 1: n=569 (58.3%) IV 2: n=407 (41.7%) DV 1: 10.6 +/- 3 vs 11.1 +/- 3.7; p=0.029 DV2: 12.20+/- 9.52 vs 13.38+/- 10.37, p=0.002 DV 3: 2.34 +/- 1.26 L vs 1.77 +/- 1.36 L, p=<0.001 DV4: 40.4% vs 22.4% p= <0.001 DV 5: 12.0% vs 6.9% p=0.005 DV 6: 45.0% vs 25.3% p<0.001 DV 7: 72.6% vs 60.9% p=<0.001 DV 8: 20.0% vs 13.3% p=0.003	**LOE:** cohort study level II **Strengths:** longitudinal design, real world setting, large sample size, clinically relevant **Limitations:** confounding variables, selection bias, generalizabilit y, causality **Feasibility:** Could easily compare complete vs incomplete bundle data. Not able to study over 10 years **Conclusion:** Bundle compliance increases with rapid response systems **Recommenda tions:** To increase

Citation: Author, Date of Publicati-on, & Title	Purpose of Study	Concep-tual Frame work	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definition	Measure-ment of Major Variables	Data Analysis	Study Findings	Worth to Practice: LOE Strengths/ Weaknesse-s Feasibility Conclusion Recommen-dation
						Incomplete group: DV 9: dopamine DV 10: mechanical ventilation: **Survival & completion:** DV 11: 28 day mortality DV 12: re-measured serum lactate DV 13: CRP DV 14: arterial catheter DV 15: source control Associated with mortality: DV 16: blood cultures DV 17: re-measuring lactate:		DV 9: 4.0% vs 6.6% p=0.049 DV 10: 32.3% vs 39.1% p=0 018 DV 11: OR 0.61; 95% CI, 0.40-0.91 DV 12: OR 1.20;95% CI, 1.12-1.29 p=<0.001 DV 13: OR 1.04;95% CI, 1.02-1.06 p=<0.001 DV 14: OR 0.59; 95% CI, 0.38-0.91, p=0.018 DV 15: OR 0.50; 95% CI, 0.30-0.84; p=0.008 DV 16: OR 1.33; 95% CI, 1.23-1.44; p=<0.001 DV 17: 0.69; 95% CI, 0.50-0.95; p=0.024	bundle compliance, utilize rapid response systems
Grek, A. (2017). Sepsis and shock response team:	Create series of QI interventi ons through	UHC models, PDSA cycles, FMEA tool	Quality improvement study	304 bed tertiary academic medical center	IV: Multidisciplinary approach to sepsis	DV 1: lactate measurement and remeasurement	X2 tests, logistic regression analyses	DV 1: 40% DV 2: 76% DV 3:60% DV 4:33% DV 5: 0% DV 6: 0%	**LOE: II Strengths:** multidisciplinary approach, implementation of

Citation: Author, Date of Publicati-on, & Title	Purpose of Study	Concep-tual Frame work	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definition	Measure-ment of Major Variables	Data Analysis	Study Findings	Worth to Practice: LOE Strengths/ Weaknesse-s Feasibility Conclusion Recommen-dation
impact of a multidisciplinary approach to implementing surviving sepsis campaign guidelines and surviving the process	implementation of SSCG				bundle compliance DV: improved compliance with the 7 element bundle by 30 % and sepsis mortality rates	DV 2: blood culture prior to antibiotics DV 3: antibiotics prior to blood cultures and within 3 hours of administration DV 4: administration of fluids 30 ml/kg DV 5: placement of central line if lactate >4 DV 6: CVP and Scv02 measurement D7: sepsis mortality rate		DV 7: 0.763 to 0.642 (p=.159; 0.745 to 0.591, p=0.69	guidelines, process evaluation, patient-centered outcomes **Limitations:** Small baseline sample **Feasibility:** Tracking coded patients for SSCG already **Conclusion:** Making sepsis bundle compliance a unit initiative as part of performance improvement would be beneficial rather than a whole organization **Recommendations:** Implement unit specific sepsis PI that is reviewed monthly
Harrison, A. (2017). Comparison of methods of alert acknowledgement by critical care clinicians	To compare text messaging based systems with EHR alert systems in the ICU		Comparison of methods, structured, mixed quantitative/qualitative survey	February 2015 in the medical ICU at Mayo Clinic in Rochester, MN	IV: method of alert acknowledgement (pager vs EHR) DV: response time, accuracy of	DV 1: alert response rate (text value, aware value, p-value) DV 2: media time to alert	AWARE, METRIC data Mart, two-sided student t-tests, chi-squared tests,	DV 1: n= 80 (51%)n=5 (3%), p=0.001 DV 2: 2 min (1-32), 274 minutes (130-517), p=0.53 DV 3: 3 DV 4: 2	**LOE:** qualitative/comparison of methods **Strengths:** objective measures, relevant to clinical practice,

Citation: Author, Date of Publicati-on, & Title	Purpose of Study	Concep-tual Frame work	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definition	Measure-ment of Major Variables	Data Analysis	Study Findings	Worth to Practice: LOE Strengths/ Weaknesse-s Feasibility Conclusion Recommen-dation
in the ICU setting	on septic patients				acknowledgement)	acknowledgement IQR) DV 3: was paging disruptive? DV 4: was notification by AWARE disruptive? DV 5: Was paging acknowledgement difficult? DV 6: Was AWARE acknowledgement difficult? D7: Which would be your preferred method of non-urgent alert notification? DV 8: What would be your preferred method of urgent alert/notification? DV 9: The best method for non-urgent clinical	median values, IQR	DV 5: 3 DV 6: 3 DV 7: 2 DV 8: 1 DV 9: 6 (paging) DV 10: 11 (paging)	clinical impact **Limitations:** single center study at an academic medical center **Feasibility:** Could easily be alerted through mobile devices **Conclusion:** EHR alerts compared to the traditional paging system often leads to alert fatigue, which does not improve compliance with sepsis measures. **Recommendations:** EHR alerts alone are not effective. There needs to be a course of action for the EHR alert.

Citation: Author, Date of Publication, & Title	Purpose of Study	Concep-tual Framework	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definition	Measure-ment of Major Variables	Data Analysis	Study Findings	Worth to Practice: LOE Strengths/ Weaknesses Feasibility Conclusion Recommen-dation
						alert/notification is? DV 10: The best method for urgent clinical alert/notification is:			
Dong-gon, H. (2022). Mortality of patients with hospital-onset sepsis in hospitals with all-day and non-all-day rapid response teams: a prospective nationwide multicenter cohort study.	Aimed to determine the effect of RRTs and operating hours on in-hospital mortality		Multi-center cohort study	Multi-center study conducted in South Korea in 11 hospitals with RRT September 2019-February 2020 utilizing data from the Korean Sepsis Alliance Inclusion: patients over 19 who had sepsis. Total of 2126 patients	IV: all day RRTs vs non-all day RRTs DV: effects of all day RRTs vs non RRTs	DV 1: mortality rates (all day vs non-all day) DV 2: hospital length of stay in all day vs non all day group DV 3: ICU transfer between two groups DV 4: Mechanical ventilation between 2 groups DV 5: 3 hour sepsis bundle	Bivariate analyses between two groups, standard deviations, medians, IQRs, x2 tests or Fischer's exact tests, independent two sample t test or Mann-Whitney U-tests, Kaplan Meier analysis, multivariable modeling, log rank, logistic regression, p-	DV 1: 39% vs 42% DV 2: 16 vs 14, p=0.183 DV 3: 52.4% vs 48.2%; p=0.400 DV 4: 63.9% vs 50%; p=0.045 DV 5: 55.9% vs 42.6%	**LOE:** II **Strengths**: controlled for confounding variables, nationwide multicenter cohort **Limitations:** potential for bias, generalizability, data collection methods **Feasibility:** resources, data collection, participant recruitment **Conclusion:** utilizing RRTs all day is associated with a reduction in hospital mortality rates. **Recommendations:** Implement all day RRT in the ICUs to decrease

Citation: Author, Date of Publicati-on, & Title	Purpose of Study	Concep-tual Frame work	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definition	Measure-ment of Major Variables	Data Analysis	Study Findings	Worth to Practice: LOE Strengths/ Weaknesse-s Feasibility Conclusion Recommen-dation
							values, OR		sepsis mortality
Maclay, T. (2017). The impact of early identification and a critical care-based sepsis response team on sepsis outcomes	Standardized approach to sepsis management would lead to improved outcomes, decreased mortality and decreased length of stay		Observational study	Chambersburg hospital (250 beds). 458 patients admitted with severe sepsis from October 2014 through September 2015.	IV: effects on a sepsis response team DV: sepsis outcomes	DV 1: mortality rate DV 2: average length of stay: DV 3: 30 day readmission rate DV 4: Healthcare costs	SOFA and qSOFA scores, descriptive statistics, regression analyses, survival analysis	DV 1: 17.7% to 12.9% DV 2: 7.51 to 6.21 DV 3: 15.6% to 12.6% DV 4: $517, 500 saved	**LOE:** observational study **Strengths:** potential for quality improvement, controlled comparison **Limitations:** external validity, selection bias, single center study, limited sample **Feasibility:** resources, collaboration, time frame, statistical analysis **Conclusion:** All factors included in the study were decreased with the use of RRTs **Recommendations:** Implement RRTs in organization and utilize a checklist for appropriate handoff.

Citation: Author, Date of Publication, & Title	Purpose of Study	Concep-tual Framework	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definition	Measure-ment of Major Variables	Data Analysis	Study Findings	Worth to Practice: LOE Strengths/ Weaknesses Feasibility Conclusion Recommen-dation
Narayanan, N. (2015). Effects of an electronic medical record alert for severe sepsis among ED patients	Determine if severe sepsis BPAs was associated with improved processes of care and clinical outcome among patients with sepsis in the ED		Single center before and after observational study	103 patients in the intervention group during a 7 month period. The control group included 111 patients.	IV: BPA for septic patients DV: In-hospital mortality	DV: In-hospital mortality DV 1: time to antibiotics (before BPA and after BPA) DV 2: antibiotics within 60 minutes of sepsis (before BPA and after BPA) DV 3: LOS	Multi-variable analysis, geometric mean ratios, confidence intervals, x2 tests, odds ratios, t test, Mann Whitney u tests, logistic regression analysis,	DV: OR 0.64, 95% CI, 0.26-1.57 DV 1: 29 vs 61.5, p<.001 DV 2: 76.7 vs 48.6%; p<.001 DV 3: 0.66; 95% CI, 0.53-0.82	**LOE:** observational study **Strengths:** objective outcome measures **Limitations:** small sample size, population identified by ICD codes (could be inaccurate) **Feasibility:** Easy to implement due to study design. **Conclusion:** when utilizing a BPA, timeliness of antibiotics is improved and LOS is decreased **Recommendations:** BPAs already active, aiming to evaluate the general usefulness on sepsis bundle compliance and mortality rates
Schramko, L. (2021). Duration and management of sepsis-	Duration and management of hypotension during RRT call-		Retrospective audit, case series, descriptive study	RRT call outs for hypotension in 2018. Random sample of	IV: duration and management of sepsis-associated hypotension	DV 1: median time to ICU arrival DV 2: hypotensio	Median IQRs, regression analysis	DV 1: 47 min DV 2: 70% (41-100) DV 3: 83% DV 4: 78% DV 5: 49%	**LOE:** Case series, descriptive **Strengths:** use of case series design, potential for

Citation: Author, Date of Publication, & Title	Purpose of Study	Concep-tual Framework	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definition	Measure-ment of Major Variables	Data Analysis	Study Findings	Worth to Practice: LOE Strengths/ Weaknesses Feasibility Conclusion Recommen-dation
associated hypotension at rapid response team call-outs to patients subsequently admitted to the intensive care unit: A case series	outs to patients who required transfer to the ICU			60 cases reviewed, 41 analyzed at St. Gairdner Hospital in Western Australia	DV: Admission of patients to the ICU after RRT call	n during RRT time DV 3: received blood pressure support during RRT DV 4: Treatment with IVFs DV 5: treatment with vasopressors DV 6: Mortality DV 7: Median ICU LOS DV 8: hospital LOS		DV 6: 7 DV 7: 3 (2-4) DV 8: 9	quality improvement, detailed description **Limitations:** selection bias, small sample size **Feasibility:** would need a tool developed to determine what hypotension was related to, many calls for hypotension outside of sepsis **Conclusion:** Very long time hypotensive **Recommendations:** Develop a tool to treat hypotension faster, MEWS score or the equivalent
Taj, M. (2020). Sepsis protocols to reduce mortality in resource-restricted settings: a systematic review	Summarize evidence regarding components of sepsis protocols, compliance with implementation, effects of	John Hopkins Nursing Evidence Based Practice Evidence Level and Quality Guide	Systematic review	Adult critically ill patient with s/s of sepsis in resource-restricted countries. Six studies met criteria for synthesis	IV: Compared groups with and without sepsis protocols DV: mortality rate of patients with sepsis in resource	DV 1: Compliance with sepsis protocol Time to 2nd vital signs were checked from time of triage	Literature search, study selection	DV 1: • 240 to 140 • 17% to 55% DV 2: 4 (2-6) vs 6 (4-13) p=<0.001 DV 3: 50% vs 32%, p=0.06,	**LOE: Level I** **Strengths:** systematic review **Limitations:** heterogeneity, risk of bias, quality of included studies **Feasibility:** Could simplify current BPA

Citation: Author, Date of Publicati-on, & Title	Purpose of Study	Concep-tual Frame work	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definition	Measure-ment of Major Variables	Data Analysis	Study Findings	Worth to Practice: LOE Strengths/ Weaknesse-s Feasibility Conclusion Recommen-dation
	LOS and mortality, facilitators and barriers to implementing sepsis protocols				restricted countries	Timely ordering of radiographic tests DV 2: impact on length of stay: DV 3: sepsis-related mortality rate		22.6% (overall)	and sepsis order set to gain more compliance with the bundle**.** Would not require more resources **Conclusion:** sepsis protocols are useful, but need to be simplified in resource-restricted settings **Recommendations:** Evaluate current barriers with process to see what improvements can be made.

Legend:
LOE = level of evidence
POA= present on admission
IV= Independent variable (IV 1, IV 2, etc.)
DV= Dependent variable (DV1, DV2, DV3, etc.)
LOE= level of evidence
OR= odds ratio
SD=standard deviation
CI= confidence interval
PI= performance improvement

CAH= critical access hospital
RRS/RRT= rapid response system/rapid response team
SSC= surviving sepsis campaign
CRP= c-reactive protein
POC= Point of care
SSCG= surviving sepsis campaign guidelines
UHC= University HealthSystem Consortium
CVP= central venous pressure
Scv02= central venous oxygen saturation
PDSA= plan, do, study, act
FMEA= failure modes effects analysis
AWARE= ambient warning and response evaluation
RSMR = risk standardized mortality rate
NIS= National Inpatient Sample

Appendix B

Logic Model

Program: Code Sepsis Response Team Logic Model
Situation:

Inputs	Outputs		Outcomes – Impact		
	Activities	*Participation*	*Short*	*Medium*	*Long*
• RNs • Intensivists • Hospitalists • Advanced Practice Providers • Data Analyst • Quality • Sepsis Coordinator • Senior Leadership • Phlebotomy • Pharmacy • Nursing Supervisor • Project Leader/DNP candidate	• Implementation of Code Sepsis Response Team • Increase SEP-1 bundle compliance to 59% • Decrease mortality rates related to severe sepsis and septic shock by 10%	• # of code sepsis cases • # of patients with documentation from quality report of severe sepsis or septic shock during ICU stay	• Implementation of Code Sepsis Response Team in the Florence and Ft Thomas ICUs	• Increase SEP-1 bundle compliance through the use of Code Sepsis Response Teams to meet the 59% requirement by CMS • Decrease mortality rate by 10% for patients with severe sepsis and septic shock	• Appropriately call Code Sepsis events • Expand Code Sepsis Response team to every facility in the organization

Assumptions
All physicians and nursing staff will activate a Code Sepsis when a patient meets criteria for severe sepsis or septic shock

External Factors
Number of sepsis cases

Appendix C

Education

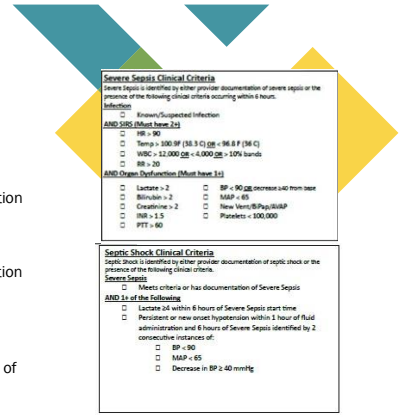
Code Sepsis Trial in the FTT & FLO ICU

Objectives

- Review the workflow for the Code Sepsis
- Review Sepsis Checklist & Compliance Bundle

Sepsis Review

- Simple Sepsis
  - Two or more SIRS criteria and a source of infection
  - No Organ Dysfunction
- Severe Sepsis
  - Two or more SIRS criteria and a source of infection
  - Organ Dysfunction is present
- Septic Shock
  - Severe Sepsis present-AND-
  - A Lactic > or = to 4-OR- persistent or new onset of hypotension



Severe Sepsis Clinical Criteria

Severe Sepsis is identified by either provider documentation of severe sepsis or the presence of the following clinical criteria occurring within 6 hours.

Infection

- ☐ Known/Suspected Infection

AND SIRS (Must have 2+)

- ☐ HR > 90
- ☐ Temp > 100.9F (38.3 C) OR < 96.8 F (36 C)
- ☐ WBC > 12,000 OR < 4,000 OR > 10% bands
- ☐ RR > 20

AND Organ Dysfunction (Must have 1+)

- ☐ Lactate > 2
- ☐ Bilirubin > 2
- ☐ Creatinine > 2
- ☐ INR > 1.5
- ☐ PTT > 60
- ☐ BP < 90 OR decrease ≥40 from base
- ☐ MAP < 65
- ☐ New Vent/BiPap/AVAP
- ☐ Platelets < 100,000

Septic Shock Clinical Criteria

Septic Shock is identified by either provider documentation of septic shock or the presence of the following clinical criteria.

Severe Sepsis

- ☐ Meets criteria or has documentation of Severe Sepsis

AND 1+ of the Following

- ☐ Lactate 24 within 6 hours of Severe Sepsis start time
- ☐ Persistent or new onset hypotension within 1 hour of fluid administration and 6 hours of Severe Sepsis identified by 2 consecutive instances of:
  - ☐ BP < 90
  - ☐ MAP < 65
  - ☐ Decrease in BP ≥ 40 mmHg

Sepsis Risks in the FTT & FLO ICUs

- CMS penalizes if organizations do not meet 59% compliance for Sepsis Documentation
- January-May 2024 Average Total Bundle Compliance:
  - FTT: 36%
  - FLO: 54%

Go-Live

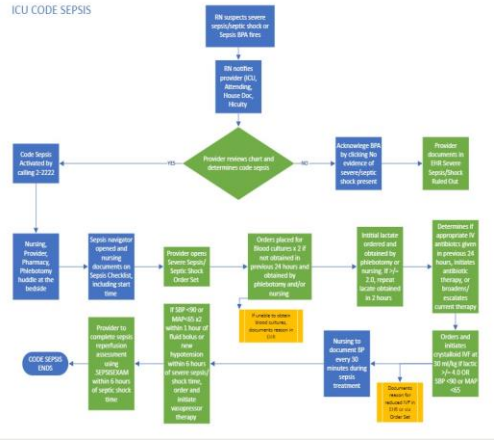
- Starting Tuesday, September 10th, the FLO and FTT ICUs will trial a Code Sepsis Workflow to ensure compliance measures are met per CMS standards.

BPA Fires

- When the BPA fires, contact the provider and determine if the Code Sepsis needs to be activated

New Code Sepsis Workflow

- Providers can include the Intensivist, the ICU APP, Hicuity, or the House Provider.
- The provider will be the one to determine if the code sepsis should be activated.
- If they deem “No” documentation of “No evidence of severe/septic shock present.” is acceptable.
- If they deem yes…

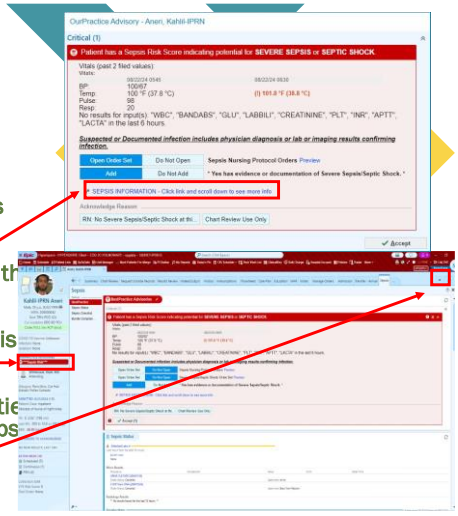


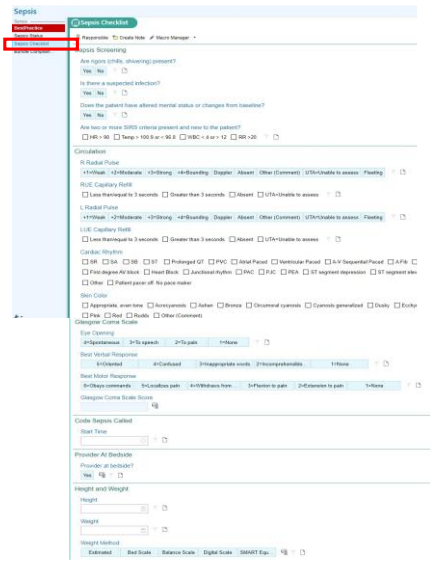
CALL 22222 for a CODE SEPSIS

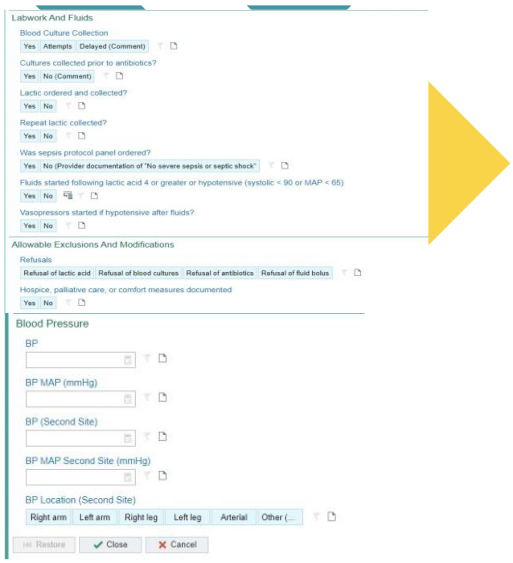
- Activate the Code Sepsis
- This will call the ICU charge nurse, Phlebotomy, Pharmacist, Nursing Supervisor, and House Physician all to the bedside.
- As these individuals gather at the bedside, the Primary RN pulls up the Sepsis Checklist in the Sepsis Navigator.

Utilizing the Sepsis Navigator

- There are three different ways to access the Sepsis Navigator
- The first way is through the hyperlink in th BPA
- The second way is through the Sepsis Ris Banner on the patient’s Storyboard.
- The third way is through the more activitie menu or Rarely Used file to find the ‘Seps navigator

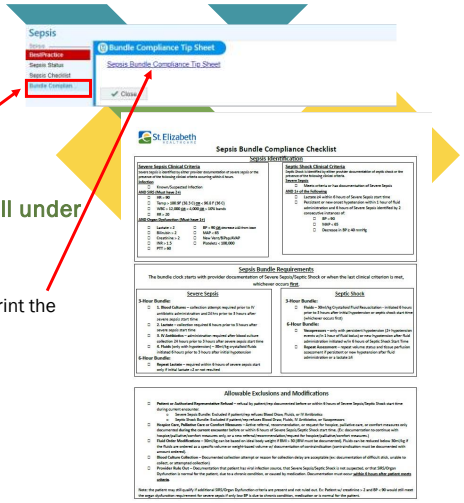






Sepsis Checklist

- There is a paper version available as well under the Sepsis Checklist!
- This is called Bundle Compliance
  - Click on the hyperlink, and you will be able to print the Compliance Checklist!



Nursing Reminders

- During Code Sepsis, Vital Signs should be taken every 30 minutes for 6 hours
- Two Blood Pressures must be documented within an hour of bolus completion.
- If BP remains low at any point during fluid resuscitation (SBP <90 or a MAP <65), contact the provider to start pressors.
  - While not ideal, pressors can be started via a PIV so as not to delay treatment.

What if my patient is admitted with Septic Shock from the ER?

- We will not have to call a Code Sepsis on a patient who was admitted from the ER with a documented diagnosis of Sepsis/Septic Shock
- But we still need to recognize that the patients did receive a fluid resuscitation, and their BP needs to be taken every 30 minutes for 6 hours!
- We can always use the Sepsis Navigator to ensure that all aspects for Septic patients are met!

Lab Issues

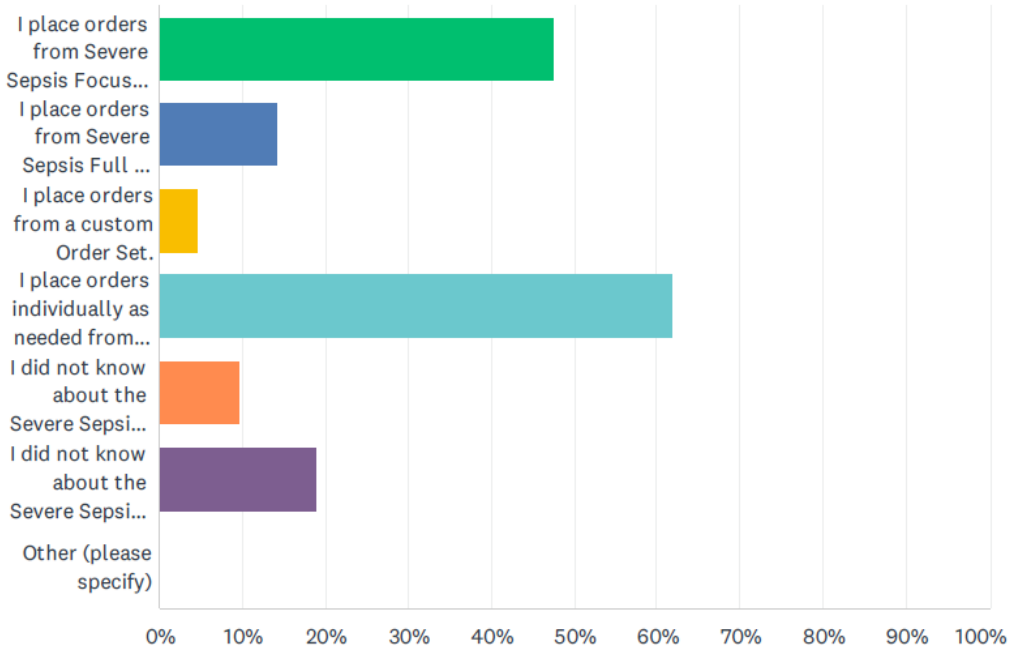
- If the delay in collecting Blood Cultures is going to be greater than 45 minutes, go ahead and start the antibiotics. Just ensure that documentation is in place to address the delay in blood cultures.
- But the Sepsis Checklist will help you meet the documentation requirements!!

Resources

- 2024 (SEH) Sepsis Guidelines and Order Bundles. Clinical Skills.
- Surviving Sepsis Clinical Guidelines
- Rivers E, Nguyen B, Havstad S, et al. Early Goal-Directed Therapy Collaborative Group. Early goal-directed therapy in the treatment of severe sepsis and septic shock. N Engl J Med. 2001 Nov 8;345(19):1368
- National Quality Forum. Composite measure 0500: Severe sepsis and septic shock management bundl December 1st, 2021. https://www.qualityforum.org/QPS/0500. Accessed December 27, 2021.
- Evans L, Rhodes A, Alhazzani W, et al. Surviving Sepsis Campaign: International Guidelines for Tier 1: Inpatient nurse driven sepsis protocol Management of Sepsis and Septic Shock 2021. Crit Care Med. 2021 Nov 1;49(11):e1063-1143. doi: 10.1097/CCM.0000000000005337. PMID: 34605781.

Appendix D

Provider Survey



ANSWER CHOICES	RESPONSES
I place orders from Severe Sepsis Focused Orders Order Set [1452].	47.62%
I place orders from Severe Sepsis Full ICU Orders Order Set [622].	14.29%
I place orders from a custom Order Set.	4.76%
I place orders individually as needed from manage orders.	61.90%
I did not know about the Severe Sepsis Focused Orders Order Set [1452].	9.52%
I did not know about the Severe Sepsis Full ICU Orders Order Set [622].	19.05%
Other (please specify)	0.00%
Total Respondents: 21	

#	OTHER (PLEASE SPECIFY)	DATE
	There are no responses.	

Appendix E

Nursing Survey Pre-Implementation

1. I routinely hit "chart review only" when I get the Sepsis BPA

More Details

Yes	125
No	55

2. If you selected yes to #1, select all that apply: (If you did not select yes to #1, proceed to question 3):

More Details

Unclear understanding of BPA	40
I do not suspect sepsis in my pa...	94

3. I feel confident contacting the provider for additional orders when Sepsis is suspected

More Details

Yes	150
No	30

4. I know how to utilize the Sepsis Navigator (inpatient)

More Details

Yes	82
No	95

5. I feel that we treat septic patients timely and adequately

More Details

Yes	141
No	38

Appendix F

Nursing & Provider Survey Post-Implementation

1. I feel most sepsis cases are treated in the ER, no additional intervention is needed when the patient arrives to the ICU. More details

2. I feel most sepsis cases receive adequate amounts of crystalloid fluid resuscitation. More details

3. I feel confident using the Sepsis order sets to treat septic patients More details

4. What barriers do you experience with calling a Code Sepsis in the ICU? More details

28
Responses

Latest Responses
"Timing - when dx is already several hr into the process"
"Fluid administration with HF or ESRD patients"
"many of the patients already have a sepsis dx"
...

Responses
I have not had to since the protocol has been implemented.
none
People still say “it’s not necessary”.
Majority of the time sepsis protocols are ordered by the time the BPA fires.
The BPA fires for almost all of our patients but blood cultures were already collected and fluids were already given 9/10 times. I feel like there is never anything additional that we can do.
Most of the time providers don’t want you to
I is helpful to get lab and pharmacy present in the room to get blood cultures drawn and antibiotics verified.
not well practiced on the process
Sometimes its already been done recently not sure if we shouldDo again ie 2 days later
I have never called a code sepsis in the icu yet. I do not know what it entails.
I have asked providers on multiple occasions about calling a code sepsis, however, either it has already been taken care of (like in the ED), or providers feel like the sepsis bundle wouldn't really be necessary because a lot of the parts of it have been done already.
none
So far I have not had to call a code sepsis.
Our patients are so sick and there can be other things that will cause EPIC to think it's sepsis when it's not. Sometimes recognizing the difference is difficult.
None
None
Multiple providers rounding on patients in the ICU, unclear timeline
No one responds other than the NP and the nurse
Pt are frequently already on antibiotics and pressors or have issues with renal failure/fluid overload and giving boluses is contraindicated. The narrator flow doesn't make sense either.
Not sure the benefits of calling a "Code Sepsis" as opposed to just placing sepsis orders

I feel most, if not all aspects of the sepsis work up and treatment have already been addressed when the BPA fires. I cannot say that is 100% of the time of course, just my personal experience
most times everyone needed is on the unit already
I cannot comment as I have not worked at Flo/FTT ICUs during the period of the study.
None now
ESRD patients need a modified version of the Code Sepsis due to not warranting fluids in some cases
many of the patients already have a sepsis dx
Fluid administration with HF or ESRD patients
Timing - when dx is already several hr into the process

5. Please provide any additional feedback for treating patients in the ICU experiencing severe sepsis/septic shock

I feel since we have nurse practitioners available on day shift we don't really need a code sepsis.
none
I do feel that majority of our septic patients are already worked up in the ER prior to transfer to us. I have seen however some providers request additional fluids upon arrival to ICU. I've only experience a code sepsis once so far, so I do not feel like I have much experience to give good feedback, however, I do see the reasoning behind the idea.
I feel this "code sepsis" is worthless. When the patient is showing signs of needing something, providers are notified and orders are obtained.
None
Fluid resuscitation in the ICU setting has been difficult due to the patient being CHF or fluid overloaded and the doctors not wanting to order fluid on cardiac patients.
I feel once the patient is in the ICU and develops sepsis later on during the stay, we are late in getting them treatment. More of a reactionary stance rather than being proactive if we know the patient is potentially headed in that direction. Alot of times we just click out of the sepsis BPA when it fires. I feel more education needs to happen on this topic and what we need to do in order to be proactive with these types of patients.

One of the tricky parts is that the sepsis protocol or whatever it's called has certain guidelines for pressors in a specific timeframe but some providers like to wait and monitor which takes us outside of the timeframe. And sometimes the blood pressure does bounce back after waiting post fluids, but it ends up contradicting the guidelines
Trying to understand everything regarding sepsis.
I have none
If we are concerned we are missing sepsis bundle things, i feel like a flowsheet checklist or BPA specific warnings would be more helpful
None
it could help to have a sepsis checklist. Instead of a BPS or code. When the pt comes up we can check off things on the checklist and order things that have yet to be addressed. This could be used for a pt that acquires sepsis in the ICU as well.
Fluid resuscitation
I'm just happy I have an NP to discuss this with

Often the sepsis reminder will fire and the patient has already had the necessary labs and fluids.
MD and RNs not on the same page
Na

Appendix G

Human Research
MSJ IRB

Organization IRB

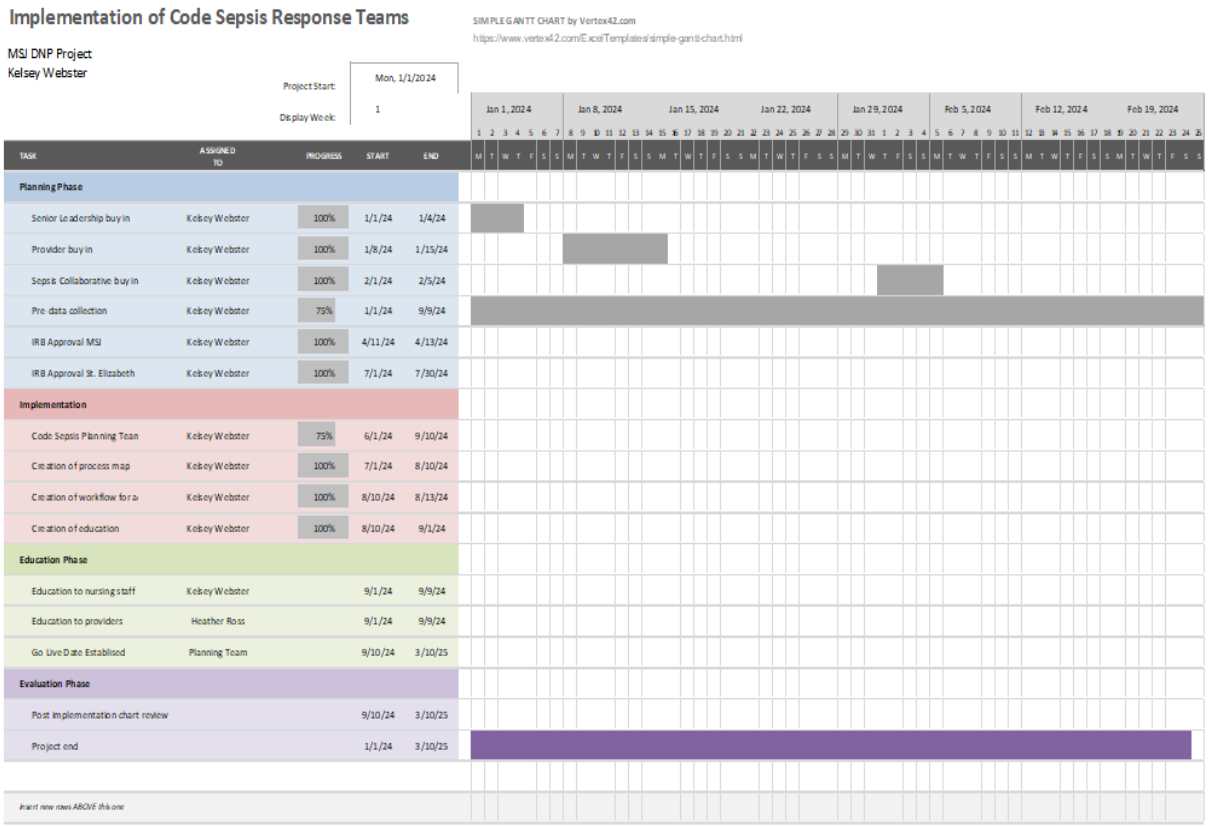
Appendix H

Budget

Program Expenses	Monthly	Total
• APP • Nurse Manager • Quality Specialist • Data Analyst	• $0 • $0 • $0 • $0	$0
Initial Costs: • Marketing Items Education • 45 FTT RNs • 55 FLO RNs • 12 APPs • 20 hospitalists • 10 intensivists • 10 pharmacists • 10 phlebotomists	• $1,000 • 30 minute education x ½ hourly salary for each member • $9,726/2	$4,863
Capital Costs • Hardware • Equipment • Other	• $0 • $0 • $0	• $0
Operational Costs	• $0	• $0

Appendix I

Project Timeline: Implementation of



Appendix J

Process Map