Decreasing Sepsis Mortality through Early Recognition

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Health care kills patients. While people naturally turn to doctors and nurses and other medical staff for preservation of life and health, a sad but very real fact is that these same people and other times, the process or system, are not perfect and vulnerabilities to error can cost the lives that they supposedly work hard to sustain. These weaknesses are manifest in occurrences of sentinel events, which The Joint Commission (TJC) defines as "patient safety events that results in any of the following: death, permanent harm, and severe temporary harm and intervention required to preserve life" (TJC, as cited in Murray, 2017). This paper will further discuss what sentinel events are in the context of nursing, using a case study based on a real-life story to illustrate one of the most commonly missed diagnosis: sepsis. As of 2019, there were 201,092 deaths in the United States involving this disease, with more than half of those deaths occurring among persons aged 65 and over (Centers for Disease Control and Prevention, 2021). Although there are quite a few drivers of this preventable, albeit challenging, incidence, the author will focus primarily on the delay in its recognition and subsequent delay in treatment. The paper will also present a plan of action, as well as develop a proposal for improvement and further evaluation of the said plan.

Sentinel Events

Nurses do not come to work wanting to make a life-threatening error, but bad things do happen despite best efforts to avoid them. The outcome, death or serious harm or injury, triggers a signal, called a *sentinel,* for immediate investigation and response (Gale & Hall, 2020). An event can also be considered a sentinel event in the absence of death or severe or permanent harm. They are still considered *sentinel* because they also signal the need to be addressed promptly. Each accredited organization is strongly encouraged, but not required, to report sentinel events to TJC. The Joint Commission on the Accreditation of Healthcare Organizations

(JCAHO) provides guidelines for organizations based on their type of accreditation in addressing these sentinel events. These guidelines help them direct their attention on the event's root causes and making changes in the organization's systems and processes to reduce the probability of such events from re-occurring (Hibbard & Tusler, 2015). For hospitals, hospital leadership reviews all sentinel events first, which then become subject to review by TJC.

The requirements by TJC in reporting and reviewing of events, as outlined on their website, are as follows:

1. A designated team stabilizes the patient, discloses the event to the patient and family, and provides support for the family as well as staff involved in the event
2. Hospital leadership (risk management in many facilities) is notified
3. Immediate investigation commences
4. A root cause analysis is conducted
5. Strong corrective actions are formulated based on the identified causal and contributing factors
6. A timeline is identified for implementation of corrective actions
7. Systemic improvement is applied with measurable outcomes

The root cause analysis and corrective action plan should be produced and submitted to TJC within 45 days from when the event occurred or from when the designated person or team is made aware. TJC's Office of Quality and Patient Safety will then conduct a collaborative review with the hospital leadership to determine if the analysis and action plan are acceptable (The Joint Commission, 2021a). As part of a profession that makes up the biggest percentage in delivering direct bedside care which therefore makes them more vulnerable to errors, nurses are expected to

understand what constitutes a sentinel event and, as leaders, be able to identify possible system failures in the care environment, assessment, information management, and other areas.

Sentinel Event Case

Among the numerous sentinel events that TJC recognizes is the development of post-surgical sepsis and its delayed recognition and treatment that results in high mortality rates across the U.S. Sepsis has been a leading cause of hospitalization and death in U.S. healthcare settings for many years, and accounts for more hospital admissions and spending than any other condition (Alberto et al., 2017). As a brief overview, sepsis is a syndrome of life-threatening organ dysfunction due to a person's systemic dysregulated response to infection and can be caused by many types of infective microbes. It can affect any age group, from neonatal to geriatric (Singer et.al., 2016). The following is a real-life-based scenario adopted from one of the patients' stories uploaded on patientsafetymovement.org (Patient Safety Movement, n.d.). It narrates the events that led a woman in her 70's to acquire sepsis and which in turn caused her untimely demise. For the sake of anonymity, the author will use a pseudonym in place of the patient's actual name. Some modifications have been made as well to narrow and further highlight the focus on the chosen root cause of the problem, which is delayed recognition of the underlying condition.

Elise is a 65-year-old Caucasian female who had always been healthy and was physically fit. During one of her morning routine walks, she began experiencing shortness of breath and had to stop and rest for a bit before resuming to walk. She started enduing less and less activity when she finally went to see her doctor who referred her for catheterization lab where she was found to have a femoral arterial blockage. The thrombus was removed successfully but unfortunately, after several months she was found to have cardiomyopathy with mild systolic heart failure and

needed a defibrillator implant. The surgery was another success however, the surgical site was taking a long time to heal, and the tenderness never went away. No discharge instructions were given on proper wound cleaning nor were there any cleansing kit provided or antibiotics prescribed. 2 weeks later, she went back to the emergency department of that same hospital stating that she's feeling sick and "not right". They staff nurse, Marie, checked her vitals and they were normal except for a slight sinus tachycardia of 110 bpm. Elise's BP was 110/77, temperature was 37.0 °C., and her respirations were 20 breaths per minute and regular and were noted by Marie to be a bit shallow but there were no signs of respiratory distress. Because of the recent surgery, the ED clinician, Dr. Martin, thought about the possibility of sepsis but did not make that call because the labs came back normal, and he saw that Elise has a history of heart failure and decided to withhold IV fluids. He also did not want to add another code to bill Elise's insurance "if he did not have to". While reviewing lab results, Marie noticed that there wasn't any lactate test done and tried to page Dr. Martin, but he already left for the day. She made a mental note to ask the next doctor who hasn't arrived yet, but it slipped her mind as she needed to attend to her other patient in the next room.

Elise was admitted overnight in the ED for observation and released the next day, on bed rest and acetaminophen. Her symptoms became progressively worse at home as days went by. On the 4th day, her temperature spiked to 40 °C and she was tachypneic and feeling weak. Her sister rushed her back to the ED where they found her BP to be 95/60. Her blood culture came back positive for *staphylococcus aureus* infection. They admitted her to the ICU and began what would be days of testing, IV fluids, and oral and IV antibiotics. The numerous tests revealed the presence of a massive, systemic staph and other infections which circulated in her system and found homes in her surgical implant. The next day, a surgery was done to get the implant

removed and they found that not only was the implant loaded with infectious material but the wires as well. Several weeks of complex medical regimen went by. Elise had episodes of delirium, had kidney failure and pulmonary trauma. Her strength, stamina, and cognition continued to deteriorate until she took her last breath in an ICU bed one afternoon, with her sister by her side.

Root Case Analysis

One of the goals of TJC on sentinel events is to focus organizational attention to an event's root cause/s and change systems and processes to prevent its recurrence (The Joint Commission, 2021b). Root cause analysis (RCA) is a tool designed to help identify not only the 'what' and 'how' of an event that occurred but also the 'why' factors. Some of the other questions that guide the formation of RCA are, "Why did that action make sense at that time? Was there a deviation from best practice? Have these safe or best practices been communicated to all concerned staff? Were the expectations clear? Was it inadvertent or was it done by choice? Was there lack of knowledge? Fatigue? Stress? What can be to prevent it from happening again?" When formulating RCAs, it is important to move away as much as possible from the subjective evaluation of an outcome and instead focus on the factors that drove those outcomes through objective points of view and identify risks and vulnerabilities (Murray, 2017).

The sentinel event in the case of Elise was the delay in the identification and treatment of sepsis. Some areas that may be examined to determine the root cause include people, procedures, policies, and technology. The people component consists of the provider, Dr. Martin, and the attending nurse, Marie. Marie was responsible for getting an adequate health history which should have included Elise's baseline blood pressure which was, if asked, was in the 130's systolic. That she missed this one important question may have been caused by lack of education

where the nurse was not aware of the need, by fatigue from perhaps working a double shift or stress from personal matters that drove her to be less attentive to details. Dr. Martin on his end, withheld fluids upon learning about Elise's history of heart failure. Because there was no sign of hypovolemia except the drop in blood pressure, which was missed, he assumed it was not needed at that time and was being cautious not to overload the patient with fluids. One could say culture is at play here; that the provider was considering pertinent conditions the patient has and while this is acceptable, treatment must be focused on the current need. He also chose not order lactate or antimicrobials. The nurse noticed this but failed to follow up with the following shift's provider. There was an inadequacy in the treatment procedure in that there was no continuous BP and SpO2 monitoring. The refusal of the provider to add a code may root from restrictions set by the insurance company and hospital policies. The lack of a sepsis protocol was also apparent. A fishbone diagram breaks down the different root causes that contributed to the delayed recognition of Elise's septic condition and the subsequent delayed treatment (see Appendix A).

Literature Review

Early recognition of sepsis is not an easy task, especially because of the non-specific nature of the initial signs and symptoms. The challenging feat of decreasing mortality of septic patients through prompt identification has given rise to the development of several screening tools, both in the in-patient setting and the emergency department. Moore & Villegas (2018) provided a systematic review of some of the available tools at present and they first analyzed tools utilized in surgical ICUs, where they compared the criteria used and their corresponding sensitivity scores. One tool, the Sepsis Screening Score (SSS) tabulates scores for routinely based systemic inflammatory response syndrome (SIRS) criteria: heart rate, respirations, minimum and maximum temperatures, and white blood cell (WBC) count. A score of 4 or

greater would warrant a second screening, where the clinician identifies the source of infection. This tool was used for patients admitted in the surgical ICU and they are screened twice daily by nurses. This method was compared to St. John's Sepsis Agent (SJSA), which is a tool that is continuously running in the background of the unit which evaluates temperature, heart rate, ventilatory rate, serum glucose concentration and WBC count for a primary screen and serum lactate concentrations, systolic BP, mean arterial pressure, creatinine, and bilirubin for a secondary screen. It was implemented by constant surveillance of patients' EMRS whereas the SSS was performed daily by a nurse. The SJSA detected fewer truly septic patients than the SSS (Moore & Villegas, 2018). This outcome influenced the resolution proposed in this paper to focus more on human skills than computer-generated data and automated analysis, and therefore invests on training and education for the most part.

In 2020, a screening protocol called History, Assessment, Labs, and Trends (HALT) was initiated by Providence Sacred Heart Medical Center & Children's Hospital in Spokane, Washington. Boldt & Cole (2019) made a presentation of the tool as part of the hospital's sepsis campaign, and which was made as a reference by the Clinical Science Investigator (CSI) group under the American Association of Critical-Care Nurses (AACN). The HALT tool has been used primarily by nurses in the med-surg unit and was added some of the already existing criteria used in many hospitals today (SIRS, severe sepsis, and septic shock). HALT is information gathering based on 4 areas. *History* is composed of potential source, medical history, co-morbidities, and current medications, especially antibiotics. The *Assessment* portion will have data on vital signs, changes in the level of consciousness, and skin changes. *Labs* require serum lactate levels, ABGs, CBC/WBC and BMP. *Trends* pertain to the changes and relationships of all the values mentioned within 24-48 hours. As of yet, there are no report on this project's outcomes as it was

just recently introduced. Nevertheless, this tool will be adopted as the highlight of the proposed procedure change in identifying sepsis for in-patients.

Lasater and colleagues (2021) conducted a systematic review of different studies associating septic patient outcomes with staffing standards and concluded that each additional patient per nurse is associated with higher odds of in-hospital mortality, and longer lengths of stay. And because early sepsis recognition requires frequent assessment, it's logical to implement a smaller nurse-to-patient ratio for patients diagnosed with sepsis or those deemed at risk.

Today, a third of sepsis cases are evaluated initially in the ED. Therefore, developing a robust sepsis screening program for the ED could have a tremendous impact on patient outcomes. In Elise's case, although the infection originated from an in-patient surgical incision, the screening and diagnosis failed in triage. Understandably, however, screening in this setting is more difficult because of limited patient information, higher nursing workload and faster pace of the workflow. Thus, electronic sepsis alert systems may be useful for the ED, and it is for this reason that a sepsis alert incorporated in the ED's electronic medical records (EMR) is included in the proposal. This recommendation is based on a study in 2016 by Hunter et al. (as cited in Gale & Kendall, 2020), which found that "sepsis alerts" embedded in the system were instrumental in early resuscitative efforts. Manaktala & Claypool (2017), on the other hand, conducted a study which explored the impact of these computerized programs or patient monitoring systems (PMS) and analyzed the algorithm that goes through not only the patient's vital signs and lab values, but their available history as well. This study found 43-53% decrease in sepsis mortality rate in all hospital units.

Corrective Action Plan

In Elise's case, human error is the biggest factor that directly caused the sentinel event. Hence, the corrective action plan will concentrate on training and education but will also include improvements on policies and procedures.

Problem statement

Early recognition of sepsis is challenging, especially in the post-surgical patient. Because of the non-specific nature of the initial signs and symptoms, delays in recognition are all too common. A person with sepsis can come in and have normal vital signs so when a patient comes in the ED, the chances of the clinician missing it is high (Villegas & Moore, 2018). In the case study, the problem identified is delayed identification of sepsis which subsequently delayed proper treatment. The provider and the nurse failed to identify an underlying problem because the history taking was inadequate which led to a cascade of other insufficient tests and treatments. Other factors that were not directly related to the missed diagnosis but would have made an impact nonetheless were the absence of a continuous assessment and monitoring system and lack of sepsis protocol.

Goal and Objectives

The overall goal of this corrective action plan is to reduce the sepsis mortality rates and decrease hospital length of stay through early recognition of sepsis and initiation of sepsis treatment. Objectives that would help achieve this goal would be to (a) increase the confidence of both the providers and nurses in being able to recognize the early signs of sepsis by 80% in a 12-month period; (b) achieve a 95% compliance rate among nurses in adhering to the HALT protocol over a 12-month period, and (c) decrease the time it would take to complete the tasks in the sepsis bundle: obtaining labs, lactate, 2 blood cultures, IV access, IV fluid resuscitation and

administration of antibiotics, to at most an hour from the moment sepsis is identified and proclaimed by the provider by the end of 12 months.

Logic Model Summary

Appendix B shows the logic model that will be followed in deploying the Early Sepsis Recognition & Treatment (ESRT) campaign, which is intended to run for 12 months following its launch up to the evaluation of results. An estimated amount $1.5 million will be allotted to mobilize activities which includes data collection, trainings, additional staffing, and software upgrade to integrate alerts into the EMR. Data collection will assess the current resources and that includes nurses and provider's current knowledge and confidence level when identifying sepsis, as well as what process and tools are being used for it. Trainings will concentrate on the HALT process and some minor process changes such as using a particular vial set for lab draws. Staffing will be modified to having 2 nurses for deemed at-risk patients, and the software upgrade will be in the form of additional alerts and real-time entry of patient VS into the EMR. outcome components are the desired results of each activity and corresponding outputs by the end of 12 months.

Change Strategy

To implement the major process change, the author chose Lippitt's Phases of Change Model, which is an expanded version of Lewin's unfreeze-move-refreeze model (Lippitt et.al., 1958, as cited in Murray, 2017). The advantage of Lippitt's model is that because it uses the same language as the nursing process, it's easier for nurse managers and leaders to execute the changes and because it focuses more on the people involved rather than the process, it works very well for the given scenario where, as mentioned earlier, a big portion of what's caused the sentinel event is accounted to human factors.

Phase 1 is diagnosing the problem. Nurse managers and leaders can create a sense of urgency by describing the gravity of the situation, using statistics and real-life events and their turnouts, which can directly impact the staff and their professional practice. Phase 2 is assessing the motivation and capacity for change. This is where the data collection at the beginning of the proposed action plan comes into play. The data gathering portion will also cover phase 3 as it is supposed to gauge the staff's values and opinions on the current practice and survey the tools available at present. Barrow et al (2021) summarized the other next steps into: setting change goals and action plan for achievement, implementing the change, staff accepting the change (stabilization) and redefining the relationship of the change agent and the system. Change agent refers to the concerned personnel giving care. Their efforts should constantly be validated by nurse managers and leaders, who should model and advocate for the change themselves by "driving the innovation into everyday practice" (Mensick, 2014, as cited in Murray, 2017). Leader engagement is a vital component of Lippitt's model.

Implementation Plan

The action plan will be initiated in the emergency department (ED) because this is the "receiving unit" and where sepsis can be identified the earliest. Proposed specific activities and the group or person responsible for initiating and overseeing them, as well as each activity's expected completion time, are shown in Appendix C. The program begins with data collection on the current knowledge of concerned personnel (nurses, leaders and managers, providers) on sepsis and its treatment. It is important to gauge their knowledge level before initiating a change to identify gaps and areas for improvement. This information will then be used to develop the training and continuing education (CE) materials. The staff will be asked to fill out questionnaires which will also cover areas like their openness to new procedures, what they

perceive to be the best method of care, and what they think are barriers in applying these methods. 100% of the nursing staff and 65% of providers will have completed all the preliminary exams and questionnaires within 1-2 months and within 6 months, 70% of the staff will complete the required trainings and CEs and this rate will increase up to 100% in 12 months. In this same timeframe, an ongoing assessment of the current procedures and availability of tools will also be done and by 3 months, a report consisting of proposed changes will be generated for approval. The trainings will be made mandatory and will cover refresher courses for the staff on the pathology and treatment of sepsis. There will be educational packets handed out which will summarize the important lab values to consider and their corresponding meaning and nursing implications. In 12 months, 100% of the staff and concerned personnel will be equipped with additional knowledge and skills which will create more sense of urgency and awareness about sepsis and have them gain more confidence in managing this condition.

To guide the interventions, the protocol will adopt the HALT model (Boldt & Cole, 2019). This process will be the focus of most of the trainings and simulations conducted and educative materials distributed and posted. And by 12 months, 100% of the direct care staff will be aware of this new initiative and 90% of them will be doing this consistently for all patients who are identified as at-risk.

Changes to policies and procedures, apart from the launch of HALT, is the 1-nurse policy for every identified at-risk patient, continuous BP and SpO2 monitoring, and reduced or elimination of paperwork by providers who currently are required to justify adding a billing code for insurance purposes. The latter will be facilitated by the managers and administration who will work together with the insurance companies to come up a more efficient way of billing and relieve providers of this responsibility.

A sepsis alert feature is proposed to be added to the current EMR. Contingent to approval, it will be a part of the training content as well. This will make identification of at-risk patients easier because it will pull from the existing history of the patient provided records are always kept up to date.

Finally, to reduce incidences of delayed or missing lab work, especially for lactate levels, the supplies room will provide for 4 vials rubber-banded together, to use for lab draws for at-risk patients, 1 vial with for lactate and the rest for CBC and blood culture (UCLA, 2013).

Evaluation

To gauge the effectiveness of the program, results will be evaluated based on the objectives set initially before the program is launched. The overall goal of decreasing mortality rate is not assigned a specific number because any decrease in sepsis-induced mortality rate, no matter how slight, should be considered a success. The population serviced by the program will be the patients seen in the ED. Evaluation will take a quantitative approach, using percentage of identified at-risk patients and from which, the percentage of patients who are determined positive for sepsis. Because at-risk and diagnosed patients are expected to be admitted, the mortality rates will be compared before and after the program in all the hospital units. Compliance with the HALT protocol can be measured simply by adding a tiny box on the current SBAR form for example, that the nurse can check if HALT was completed or leave blank and provide a reason why, if it was not completed. Once the clinician declares a patient as at-risk or gave a definite diagnosis of sepsis, orders will be placed for lab draws and completion time will be determined through timestamps on the EMR between when the orders were initiated, and the time nurses mark each task as “complete.”

Another evaluation process will be conducted of the staff and will be qualitative. This will measure the confidence of nurses in assessing and managing at-risk patients and those diagnosed. Data gathering will be done using questionnaires after 12 months and if 80% or more answers in the affirmative, then one of the objectives is met.

Dissemination of Findings

The findings and evaluation of the proposed program after 12 months will be shared among leadership and staff through in-person presentations. Then results will also be communicated with other unit managers and leaders of the hospital. It may also help to submit data to a nursing research body that may use the information in studies and thus help other facilities who may have a need to revamp their own sepsis protocols.

Budget Justification

The plan will work best utilizing the zero-based budgeting method, which itemizes the expenditures for all activities and outputs and the alternative methods and their costs (Murray, 2017). The budget plan will provide a rationale for each expenditure and although labor-intensive, the allotted funds will work around the projected expense and not the other way around. The expenditures on training will largely comprise of just the education materials because training will be provided by in-house clinical nurse specialists (CNS), and the hours of the staff are already included in the FTE as indirect care. Training materials will be in the form of pamphlets and posters which would cost around $1,000 for all ED staff. An additional $5,000 should be set aside for all hospital staff if training will be extended eventually, contingent to the program's success. Because of the proposed 1:1 nurse-patient policy, additional staff will be needed. Based on the current number of FTEs to cover 1:3 nurse-to-patient ratio, the ED will

need an additional 5 FTEs to fulfill the 1:1 ratio. Thus, a budget of $561,600 is proposed for 5 more FTEs for the year.

An improved patient monitoring system (PMS) will mean adding features like alarm management, clinical decision support, medical device integration and such to the current EMR. TJC's Reducing Sepsis Targeted Solutions (TST) will be used to direct the decision on what kind of application will best suit to gather and manage patient data (The Joint Commission, 2021c). At the same time, a bidding will be done to find out the company who can offer the most cost-effective application. A budget of $1-1.5 M will be set aside for PMS.

Conclusion

Establishing a process for early recognition is the absolute key to improving sepsis mortality rate. The faster it is identified, the faster a fix can be provided to stop it from progressing to a fatal disease. The story of Elise illustrates a sentinel event where her death was not caused by the natural progression of any of her illness but by a post-surgical infection that was not treated immediately because of delayed identification. Clearly, there was a need for change and that change is the shift of culture from "sepsis as worst case" to rule out sepsis first" (Boldt & Cole, 2019). Nurses are at the forefront of patient care and are in a unique position to make that crucial first assessment in detecting sepsis. As what has been reiterated multiple times, assessment is the most important step of the nursing process. The changes proposed by this paper upholds the value of safe, evidence-based practices that should be embedded deep into the system and its constituents not just because the reputation, earnings, and credentials of a facility is at stake, but because the well-being and the lives of patients depend on safe and high-quality care.

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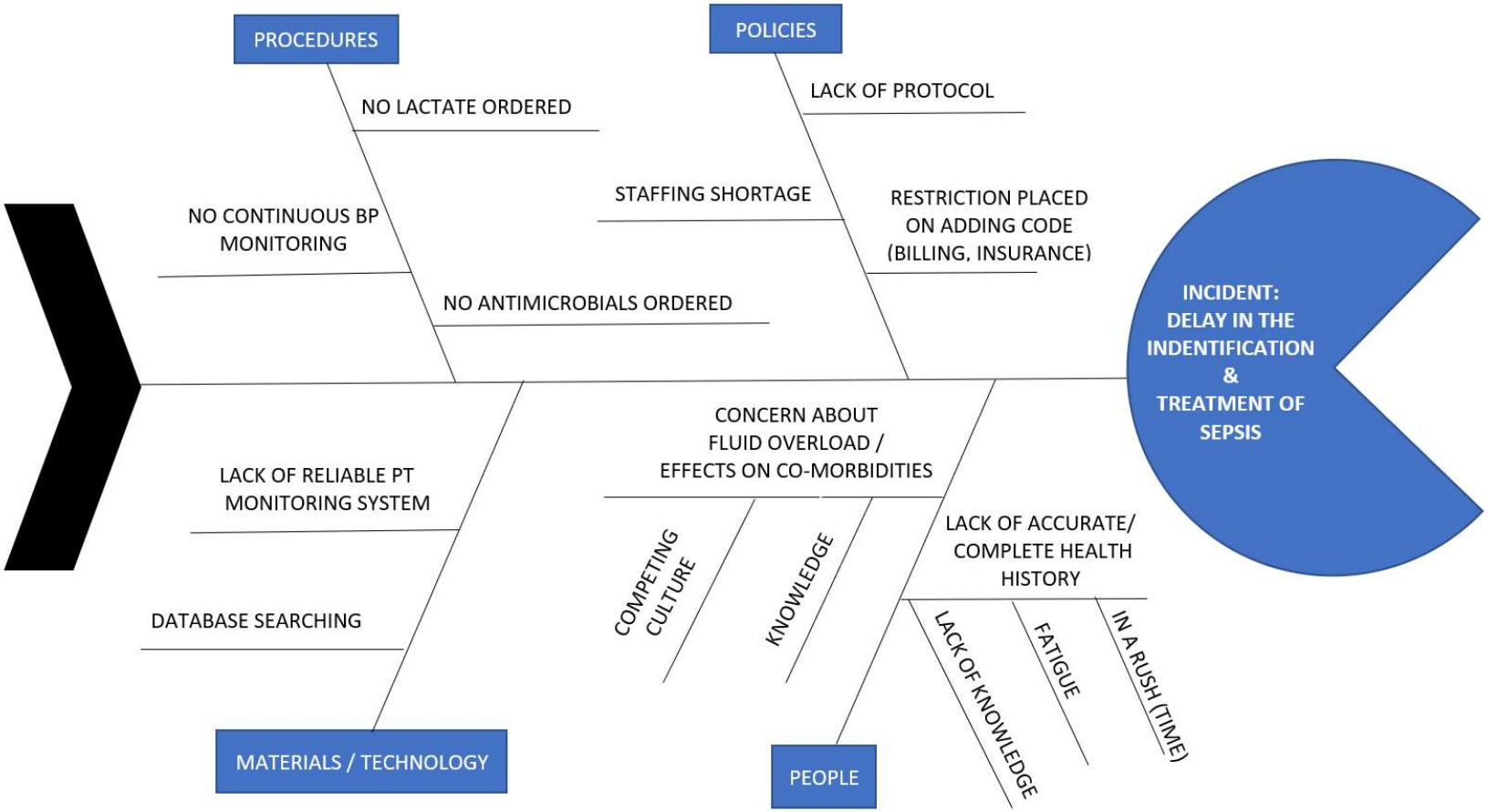
Appendix A. *Fishbone Diagram used for Root Cause Analysis (RCA)*



Appendix B. *Program Logic Model. Early Sepsis Recognition & Treatment (ESRT)*

Appendix C. *Implementation of Proposed Changes Plan*

	Actions	Critical	Responsible party	Completion timeframe
People and current tools and processes	Assess the current knowledge of staff and providers on sepsis and treatment through paper tests	Yes	Nursing leaders will administer and score tests	3 months
	Assess the perspectives of the staff on current sepsis practice and what they think are barriers in implementing proper care through questionnaires	Yes	Nursing leaders and managers will administer and evaluate responses	3 months
	Assess current tools, equipment, technology available used in recognizing and monitoring sepsis by surveying the unit and process	Yes	Nurse managers will conduct a physical surveillance of the unit and include findings in change plan	1 month
Knowledge	-Staff and all care providers will receive training and CE materials on sepsis through group lectures and lab simulations - Educational packets distributed - Pin educational material on bulletin board like lab values and their meanings	Yes	Trainers and nurse educators will develop and conduct the trainings which will cover sepsis pathophysiology, treatment, and the HALT model for early identification of sepsis	6 months
New procedures and policies	Implementation of the HALT model when assessing patients: History – potential source, medical history, co-morbidities, baseline vitals, current medications Assessment- skin, vital signs, LOC changes Labs- lactate, ABGs, CBC/WBC, BMP Trends- all of the above; 24-48 hours back	Yes	Nurses will implement and practice this new guideline for sepsis assessment	12 months
	Every identified at-risk patient will have 1 exclusive nurse to care for them, and if staffing allows the same nurses throughout the observation and treatment period	Yes	Nurse managers will create the staffing assignments to adhere to the new 1-nurse policy for septic pts	12 months
	Adding codes for sepsis will not be restricted for provides; additional paperwork will be minimal	No	Managers and administration will work with insurance to facilitate ease of adding billing codes	As soon as feasible
	Investing on continuous patient monitoring equipment to continuously assess BP and SpO2 as ordered	Yes	Managers will include new equipment in budget proposal	As soon as approved
Materials/ Technology	Adding sepsis alert feature on EHR	No	Managers will work with IT team to discuss adding this feature	As soon as approved
	2 vials rubber banded together, ready for CBC and lactate draws	Yes	Staff can rubber band 2 vials and place them in the supplies room where it's visible	Immediately