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Improving Timely Sepsis Care Through Staff Education Within the Emergency Department

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NURS 635: Internship

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Abstract

**Problem:** This project was implemented to decrease patient fallout rates through timely compliance with sepsis management according to the SEP-1 bundle. The SEP-1 bundle is already implemented in the emergency department. However, a microsystem assessment indicated barriers are preventing the achievement of the SEP-1 bundle milestones.

**Context:** This 16-bed emergency department (ED) at an urban Bay Area hospital provides 24-hour emergency services to individuals who suffer from medical injuries, accidents, and other serious health conditions. A random audit of the electronic health system (EHS) revealed that this emergency department consistently fails to meet the sepsis management time goals by 90%.

**Interventions:** A video presentation was created based on the themes identified from the gap survey and the sepsis compliance and fallout metrics. In addition, the bulletin board in the staff break room was updated to provide a visual representation of current progress.

**Measures:** The outcome measure used is the percentage of patient fallouts in septic patients who received appropriate and timely sepsis management in the ED. The target goal is 0%. The process measures are the percentages of each sepsis compliance metric that has met its timed goals. The target goal is 90%. Lastly, the balancing measure includes the percentage of nursing staff engagement. The target goal is 100%.

**Results:** Data limitations and unavailability is restricting the outcome, process, and balancing measures from being obtained. As a result, no quantitative data is available for review.

**Conclusions:** Although the outcome measures were not obtained, there has been significant improvement in awareness by nursing staff on the importance of timely sepsis intervention. Further management support ensures promising results from the continuation of the project.

*Keywords:* sepsis, compliance, mortality, SEP-1 bundle, emergency department, timely
Improving Timely Sepsis Care Through Staff Education Within the Emergency Department

Sepsis is a medical emergency that requires prompt recognition and treatment. It is a leading cause of death in hospitalized patients and creates a hefty financial burden of $41 billion annually on the healthcare system (Joint Commission, 2020). A delay in treatment can result in the development of sepsis to septic shock which raises the mortality rate from 10% to 40%, respectively (Al-Kader et al., 2022). Thus, sepsis protocols should be in place to reduce patient mortality.

Most hospitals in the United States are implementing the Severe Sepsis and Septic Shock Performance Management Bundle (SEP-1), which was initially introduced by the Center for Medicare and Medicaid Services in 2015 (Gesten & Evans, 2021). As a standardized protocol, the SEP-1 bundle guides timely screening, diagnoses, and treatment management for septic patients (Sepsis Alliance, 2021). This bundle requires suspected septic patients to receive initial lactate levels, blood cultures before antibiotics, broad-spectrum antibiotics, and initial fluid bolus at 30ml/kg for hypotensive patients all within three hours (Wang et al., 2020). Repeat lactate levels are required within six hours if previously elevated (Wang et al., 2020). Full timely compliance with the SEP-1 bundle is required to improve patient clinical outcomes, reduce sepsis-related mortality, and reduce the financial burden of the hospital (Warstadt et al., 2022). For these reasons, a quality improvement project aimed at increasing prompt adherence to the SEP-1 bundle is essential for patient care.

Problem Description

This 16-bed emergency department (ED) at an urban Bay Area hospital provides 24-hour emergency services to individuals who suffer from medical injuries, accidents, and other serious
health conditions. With the ED serving as a place for initial sepsis triage, it is crucial that this ED has a protocol to manage suspected septic patients. Currently, this ED utilizes the protocol from the SEP-1 bundle and has an electronic health system (EHS) that automatically alerts staff of suspected sepsis cases when certain criteria are met during the triage phase. Despite this implementation, a microsystem assessment revealed ample room for improving the consistency of the sepsis screening and the timeliness of intervention and management within the healthcare team. Better communication between the nurses and doctors is needed to achieve the time goals of the sepsis bundle. Furthermore, in order to promote adherence with the use of the sepsis bundle, nurses' expertise and confidence in identifying sepsis and caring for septic patients should be addressed. The time goals of the current protocol require the (1) obtainment of the lactate results within 60 minutes of the first vital signs done at the emergency room, (2) administration of the antibiotics within 60 minutes of obtaining the lactate results, and (3) administration of the antibiotics within 35 minutes of the antibiotic order. However, a random audit of the EHS revealed that this emergency department consistently fails to meet the time goals by 90% (see Appendix A). Due to the costly and serious consequences of sepsis, it is necessary to improve the compliance of the sepsis bundle usage and achieve the time goals of hospital standards.

**Literature Review**

In reviewing supporting literature, the following PICO question was proposed: In septic adult patients in the emergency department (P), how does staff education (I) compared to no staff education (C) affect the sepsis compliance rate (O)? The keywords used in this literature review of this quality improvement project were: *sepsis, septic shock, severe sepsis, SEP-1 bundle, timely, timing, compliance, mortality, patient outcome, education, confidence, and emergency*
This literature search was conducted through the PubMed and CINAHL databases. Utilizing the keywords to guide this search, 57 articles were found to have relevance to the PICO question. Limitations were determined to include peer-reviewed articles that were published in English and were no older than 2018. After refining the search, eight articles were chosen based on the limitations and best relevancy to the population group, the setting of the microsystem, and the proposed intervention. These articles were evaluated using the John Hopkins Nursing Evidence-Based Practice Research Appraisal tool (Dang et al., 2021).

Throughout the literature review, compliance with the SEP-1 bundle has been evaluated as an indicator of the quality of patient care and clinical outcome of sepsis. A post hoc analysis of hospital data in the United States associated the degree of SEP-1 bundle compliance with the rate of patient mortality within 30 days of hospital admission (Townsend et al., 2022). In this study, Townsend et al. (2022) defined compliance as the completion of the elements in the SEP-1 algorithm from time zero. The moment of time zero is determined either by the doctor, when there is a possibility of infection, or when two of the systemic inflammatory response syndrome parameters are met (Townsend et al., 2022). According to the findings of this study, full adherence with the SEP-1 bundle was related to a 26% decrease in 30-day mortality and a one-day reduction in the median duration of stay (Townsend et al., 2022). This study was appraised at Level II A and serves as a foundation for this improvement project to build upon. It provides evidence of the positive effect that full compliance with the SEP-1 bundle can have on patient outcomes.

In addition, timely adherence to the sepsis workflow allowed for critical interventions, such as antibiotic administrations, to be performed. Such interventions allowed for the treatment of sepsis and prevented its progression to severe sepsis, septic shock, and death. A systematic
review revealed a positive correlation between timely antibiotic treatment and the clinical outcome of the septic patient (Al-Kader et al., 2022). Delays in antibiotic therapy can lead to the development of sepsis and septic shock, raising the death rate from 10% to 40%, respectively (Al-Kader et al., 2022). The study revealed that the longer it took to provide antibiotics, the higher the chance of mortality (Al-Kader et al., 2022). Appraised at Level I A, this study prompted the need for quality improvement projects to address compliance rates and supported the necessity of this project. Similarly, a rapid cycle quality improvement project conducted at a rural emergency department highlighted the importance of addressing all parts of patient care to achieve desired outcomes (Bray & Kennedy, 2021). Bray and Kennedy (2021) utilized plan-do-study-act cycles to target topics such as patient and team engagement, sepsis screening, and the timely use of the sepsis bundle. Bray and Kennedy (2021) emphasized the effectiveness of the quality improvement project in enhancing team communication, timely compliance with sepsis screening and management, and staff education. Appraised at Level V A, this study provides beneficial insights into how quality improvement projects can improve desired clinical outcomes by addressing all parts of patient care, thus supporting the efforts of this SEP-1 compliance improvement project.

Not only did the reviewed literature support the necessity of timely adherence to the SEP-1 bundle, but the literature also indicated a correlation between SEP-1 bundle adherence to improved hospital quality and clinical performance. A cross-sectional study by Barbash et al. (2019) examined the relationship between the timely compliance of the SEP-1 bundle with other time-sensitive medical conditions, such as stroke. Analyzing 2,851 hospitals in the United States, the researchers found that the overall SEP-1 bundle compliance has been consistently low, with a mean of 48.9%. However, the hospital with a higher compliance rate had quicker interventions
for emergent medical conditions, such as CT scans, medication administration, and EKG placements and monitoring (Barbash et al., 2019). Appraised at Level III A, this study’s association of SEP-1 bundle compliance with other time-sensitive medical conditions highlighted the possibility of reducing financial expenses and improving the performance of hospitals in this quality improvement project.

Interestingly, a study done by Ko et al. (2021) found that timely compliance to a one-hour sepsis bundle showed no significant difference in clinical outcome compared to the three-hour and six-hour sepsis bundle. The researchers examined 1512 patients and divided them into three groups to assess. The first group utilized the one-hour sepsis bundle, the second group utilized the three-hour sepsis bundle, and the third group used the six-hour sepsis bundle. According to the findings, none of the three groups' in-hospital mortality over time showed a significant difference (Ko et al., 2021). However, timely compliance with any of these sepsis bundles showed a reduction in patient mortality (Ko et al., 2021). Appraised at Level II A, this study provides a foundation for this improvement project to build upon by emphasizing improved patient outcomes through meeting timely compliance in the SEP-1 bundle.

In addition, the literature search revealed foreign studies that also supported the necessity of improving compliance with sepsis bundles to address sepsis-related mortality. A multicenter, observational study was conducted in Japan where the effect of timely completion of a one-hour sepsis bundle was evaluated (Umemura et al., 2022). The researchers measured the impact of the one-hour sepsis bundle in 17 tertiary hospitals by comparing the completion rate of each component of the sepsis bundle to the amount of in-hospital mortality (Umemura et al., 2022). It was shown to have a 12.3% decrease in patient mortality in cases where the sepsis bundle was adherent (Umemura et al., 2022). Appraised at Level III A, the result of this study supported the
necessity for a quality improvement project aiming to improve timely compliance with the sepsis bundle.

Not only did the current literature support the need for timely sepsis compliance to improve patient outcomes, but it also indicated how staff education can increase staff confidence. This increase in confidence to provide care for septic patients has been attributed to better patient outcomes. A qualitative study conducted by Harley et al. (2019) explored the knowledge and confidence of ED nurses in identifying and treating septic patients. Through semi-structured interviews, the researchers of this study were able to identify deficits in sepsis recognition and prompt interventions. After interviewing 14 emergency department (ED) nurses, it was found that the ED nurses lacked confidence in sepsis screening tools, resulting in patient fallouts and poor patient outcomes (Harley et al., 2019). From the interview, six overall themes were identified. Overall, the participants positively appreciated more sepsis knowledge opportunities, the urgency of sepsis identification and treatment, and the awareness of the need to seek advice from other staff (Harley et al., 2019). Appraised at Level III A, this study provided data and information on the perception and knowledge of ED nurses on sepsis recognition and management. It supported the implementation of this project of further sepsis education by suggesting the opportunity to better prepare ED nurses and help them gain more experience through context-specific educational materials.

Also, a cross-sectional study conducted by Chua et al. (2022) aimed to investigate registered nurses' understanding and competence in detecting and managing sepsis patients. Chua et al. (2022) sought to determine nurse and workplace characteristics that impact their sepsis knowledge. To do so, an online survey was developed and distributed to nurses of three different hospitals in Singapore to complete. The data was collected from emergency department
nurses and inpatient ward nurses. The result of the data indicated that nurses have an average understanding of sepsis and average confidence in their ability to recognize and respond to septic patients. Interestingly, only 52% of the nurse participants were able to define the meaning of sepsis. In addition to nurses’ knowledge and confidence in sepsis, the researchers also surveyed the participants’ degree of nursing education, years of experience as registered nurse, and the level of acute care that their unit provides. Chua et al. (2022) observed a correlation between higher knowledge and confidence in sepsis in those that have more years of experience and work in units that provide a higher level of acute care, such as the intensive care unit and the emergency department. The survey also revealed the desire of the participants for more opportunities in sepsis training and education. Appraised at Level III A, this study highlights how surveys can serve as a tool for knowledge assessment and constructive feedback. It supports the concept of strengthening the foundation of sepsis knowledge through the implementation of re-education and training.

The analysis of this body of evidence demonstrates the necessity of timely compliance with the SEP-1 bundle to improve patient outcomes. Furthermore, these studies illustrate surveys and re-education as effective tools that can be used to achieve the desired outcomes. As a result of the current evidence, this quality improvement project will focus on nurse re-education on the SEP-1 bundle and sepsis triage to help achieve the timed goals of the organization.

**Rationale**

This quality improvement project was guided by Kurt Lewin’s Change Theory. Kurt Lewin developed this change model that focuses on balancing the driving and restraining forces to implement new changes in the department (James et al., 2016). The model utilizes the analogy
of an ice cube and involves three critical stages: unfreezing, changing, and refreezing (James et al., 2016).

The first stage of Lewin’s theory is the unfreezing stage, which requires the preparation and identification of the need for change from the change leaders (James et al., 2016). For this project, six change leaders will meet with the stakeholders of the hospital to identify areas of sepsis management improvement. They will perform a thorough microsystem assessment and data analysis to identify possible strengths and barriers. The change leaders need to identify a change strategy using the best evidence-based practice. For this project, an in-service sepsis presentation and re-education were selected to address improving compliance. During this stage, it is necessary for the change leaders to prepare for an educational video presentation while maintaining close communication with stakeholders to ensure the goal of this change can be met.

The second stage of Lewin’s theory is the changing stage. This is a transition stage where the intervention will trigger an internal response from the staff (James et al., 2016). During this stage, the employee’s resistance to change and the willingness to change play an important role in the change process. It is important for change leaders to observe these two factors and take them into consideration for future interventions. It is also necessary for the change leaders to work with the stakeholders to ensure proper participation from the staff and provide transparent communication and support. This will motivate and empower the employees to manage this change proactively. Also, the change leaders must take into consideration feedback from staff and incorporate them as appropriate.

The third stage of Lewin’s theory is the refreezing stage, where the change is sustained and standardized (James et al., 2016). This stage is reached once the staff completes the in-service educational training and feels confident in the SEP-1 bundle. During this stage, the
change leaders must collaborate with the stakeholders to reinforce the change and provide resources to the staff. This step ends with achieving the desired outcome and celebrating the success of the change.

**Project Aim**

We aim to improve the compliance of early sepsis management in the emergency department of an urban San Francisco hospital. The process begins with nurses recognizing sepsis using the standardized SEP-1 screening tool. The process ends with the appropriate and timely administration of antibiotics and intravenous fluids. By working on the process, we expect (1) reduced time between the onset of sepsis symptoms, recognition, and management, (2) decreased sepsis mortality rate, (3) improved clinical outcome, and (4) a lower cost of care. It is important to work on this now because we have identified the need to improve (1) patient outcomes and satisfaction, (2) prevention of patient fallouts, and (3) reducing the financial burden of the hospital.

**Methods**

**Context**

A microsystem assessment was conducted using the 5 P’s framework. The use of the 5 P’s framework allows for the identification of quality issues within the emergency department and allows for the recognition of barriers. This framework includes exploring the purpose, patients, professionals, processes, and patterns of the microsystem (see Appendix B). Examining the 5 P’s, the area identified in need of improvement is the patterns of the microsystem. The current patterns require accurate sepsis screening during triage, timely interventions and management of sepsis, effective communications, and accurate and timely documentation. A thorough
assessment of the process revealed inconsistent timely sepsis interventions and poor interdisciplinary communication.

Furthermore, a SWOT analysis was also performed to identify the strengths and weaknesses of the emergency department (see Appendix C). A major strength of this microsystem is that there is a sepsis quality improvement team that allows for collaborative participation from all members of the unit. A major weakness is that there is poor communication between the doctors and nurses. In addition, the opportunities and threats for the success of this project were identified in the SWOT analysis as well. A major opportunity in this microsystem is that there is an organizational commitment to quality improvement. A major threat is identified to be the limited time and resources available. To strengthen these quality issues, this quality improvement project focuses on the re-education of nursing staff.

To determine the themes for re-education, the sepsis compliance and fallout data in the fourth quarter of 2022 and the first quarter of 2023 were analyzed (see Appendix D). From the data, the emergency department of this urban hospital consistently failed to meet the benchmark of 90% in obtaining lactic acid results within 60 minutes of first vitals and administering antibiotics within 35 minutes of the antibiotic order. There were three fallouts during these past two quarters. The first two fallouts relating to blood culture and repeat lactate can be attributed to the poor timely compliance of obtaining lactic acid results within 60 minutes of the first vitals. Blood cultures should be obtained during the same time the blood sample for lactic acid is retrieved. In addition, repeat lactate is needed if the initial lactate result is elevated. In order to timely obtain the repeat lactate, the first lactate needs to be promptly obtained. The last fallout was related to intravenous fluids and can be attributed to inconsistent failure to administer antibiotics within 35 minutes of the antibiotic order. Prompt intravenous fluids and antibiotic
administration are essential in early sepsis management. With inconsistent timely administration of antibiotics, sepsis may progress in severity, resulting in the patient in need of more intravenous fluids.

Also, a gap survey was developed and distributed to the staff to investigate the benchmark confidence of the nursing staff (see Appendix E). This survey had a 23% return rate which was equivalent to eight responses. Five of the responses were from the AM shift who are either working full-time or part-time. Surprisingly there were no responses from traveler nurses or nurses that worked night shifts. In addition, the gap survey provided insight into the confidence level of nurses in successfully recognizing sepsis symptoms, the confidence level in initiating the sepsis bundle, the confidence level in timely completing the sepsis screening during triage, and the confidence level in the support from the team. Overall, 88% of the nurses have above-average knowledge and confidence in the sepsis workflow. This survey provided information about the nurses’ experience and employment status, which can help identify any trends associated with sepsis knowledge or sepsis fallout. Lastly, this survey provided an opportunity for nurses to anonymously indicate their concerns or barriers that are preventing them from meeting the sepsis workflow milestone. These barriers were identified to be doctor-to-nurse communication, difficulty starting an IV, and not having enough nursing staff.

To summarize the result of these assessments, a fishbone diagram was used to visualize possible causes that are leading to a gap in achieving the sepsis benchmark (see Appendix F). From these assessments, it is clear to see that communication and confidence in recognizing sepsis knowledge by the nurses are two major factors that fuel the necessity of this quality improvement project. These identified causes will help guide the intervention of this quality improvement project.
A cost-benefit analysis was done to highlight potential cost savings associated with timely SEP-1 bundle compliance (see Appendix G). Since sepsis is the leading cause of death in hospitalized patients, which creates a hefty financial burden of $41 billion on the healthcare system each year (Joint Commission, 2020). If left untreated, sepsis can progress into severe sepsis, septic shock, and death (Paoli et al., 2018). The national average hospital cost for sepsis is $16,324 per case, while it costs $24,638 for severe sepsis and $38,298 for septic shock (Paoli et al., 2018). If the patient is presented at admission with the diagnosis of sepsis, the average cost is $13,384 for sepsis, $19,851 for severe sepsis, and $31,704 for septic shock (Paoli et al., 2018). With the cost of hospital stays increasing with the degree of sepsis severity, it is essential to initiate prompt sepsis diagnosis and treatment to reduce patient mortality and decrease the length of hospital stay. Through timely adherence to the SEP-1 bundle, this project can prevent the progression of sepsis into severe sepsis or septic shock and reduce the financial cost of the hospital. Our project aims to increase compliance with the timely usage of the sepsis bundle by implementing an in-service educational presentation. The individuals creating and presenting the in-service training are graduate nursing students and are not compensated for their participation. Thus, the associated cost to this project is estimated to be $0, while the estimated savings is up to $6,594 per case. As a result, this project anticipates a decrease in the length of hospital stays and a reduction in hospital financial burden. In addition, this project will improve clinical outcomes and reduce patient fallouts.

A communication plan was initiated to ensure timely and transparent communication with the key stakeholders of this project. An initial meeting was held with the sepsis coordinator and nursing manager of the ED to discuss the current process of the SEP-1 bundle and the
compliance metrics. Information and feedback regarding the project assessment, planning, and implementation were discussed with the sepsis coordinator and nursing manager through e-mail.

**Intervention**

The specific steps of this project intervention were implemented as followed in the process map (see Appendix H). From the result of the gap survey and the sepsis compliance and fallout data, the themes for the re-education of the sepsis workflow were identified. A video presentation was created and included a PowerPoint presentation with a voice recording. The slides of PowerPoint presentation included an overview for identifying sepsis, current sepsis compliance data at ED, a summary of the gap survey, current best practices, an analysis of the data pertaining to the first vitals to lactic acid results, an analysis of the data pertaining to antibiotic order to administration, current evidence on improving MD-RN communication, and recommended next steps (see Appendix I). Next, the video presentation was shared with the nurse manager and sepsis coordinator, which was then shared with the nurses within the microsystem. The nurses were instructed to view the presentation on their own time. In addition, the bulletin board in the break room was updated with a poster that summarizes the materials from the in-service presentation and current data on sepsis bundle compliance. The poster provided a visual representation to allow for quick interpretation of current progress. Lastly, the sepsis compliance and fallout data for the second quarter of 2023 will be obtained and evaluated when available.

**Study of the Intervention**

The measurement strategy of this project focused on obtaining current quantitative data from the fourth quarter of 2022 and the first quarter of 2023 and comparing it with the data from the second quarter of 2023. The measurement tools used for the study of intervention include the
reports generated by the EHS system. Qualitative data is obtained through the means of feedback from surveys.

Measures

Within the allocated time, this project began one plan-do-study-act (PDSA) cycle. During the “plan” step of the PDSA cycle, a video presentation was developed based on the themes identified from the sepsis compliance and fallout data and the results of the gap survey. Next, the “do” step involved the distribution of a video presentation for the nursing staff to view. Next, measures fall in the “study” step, which required analysis of the sepsis quarterly data of the second quarterly data of 2023. Lastly, the “act” step required the conclusion of the cycle to see if the desired outcome was achieved and if another PDSA cycle is required.

During this study, data from the EHS regarding sepsis compliance, fallouts, and trends were collected by consulting with the sepsis coordinator and the clinical nurse manager. The sepsis compliance metrics and fallout data are measured on a monthly basis. The sepsis compliance metrics that were selected to track improvement include (1) first vital signs to lactic acid results within 60 minutes, (2) antibiotic order to antibiotic administration within 35 minutes, and (3) lactic acid results to antibiotic administration within 60 minutes. In addition, feedback from nurses, the sepsis coordinator, and the clinical nurse manager was obtained through verbal conversations, emails, and surveys. The outcome measure used is the percentage of patient fallouts in septic patients who received appropriate and timely sepsis management in the ED. The target goal is 0%. The process measures are the percentage of each sepsis compliance metric that has met its timed goals. The target goal is 90%. Lastly, the balancing measures include the percentage of nursing staff engagement. The target goal is 80%. In order to determine if this improvement effort was successful, all three of these measures must be met.
**Ethical Considerations**

To evaluate the ethical considerations, it is necessary to review the American Nurse Association (ANA) Code of Ethics and compare it to the evaluation of the microsystem. From the microsystem assessment and analysis of the quarterly sepsis data, it was determined that the nurses are consistently failing to timely meet the goals of the sepsis interventions. These actions violate the ANA Code of Ethics Provision 4. This provision states that the “nurse has authority, accountability, and responsibility for nursing practice; makes decisions; and takes action consistent with the obligation to provide optimal patient care” (American Nurse Association, 2015). By failing to meet the standards of care for septic patients, these nurses are neglecting the ethical principle of beneficence and nonmaleficence. These ethical principles were taken into consideration when planning this quality improvement project. As a result, this project aims to improve compliance and support nurses in fulfilling their obligations to provide optimal patient care.

During this quality improvement project, there were no conflicts of interest or ethical implications identified. The whole project was acknowledged and approved by the nursing manager, the sepsis coordinator of the ED, and the advising faculty. No threats to patient privacy were identified, as all data shared by the sepsis coordinator did not contain any personal patient identifications. This project is acknowledged as a non-research-based study and has been approved as a quality improvement project by faculty using QI review guidelines (see Appendix J). As a result, this project does not require the approval of the Institutional Review Board (IRB).

**Results**

The measure outcomes have not been obtained at the time of concluding this quality improvement project. As a result, no quantitative data is available for review. The main barrier
preventing the obtainment of such measures is due to the limited time that this project has. The measure outcomes required the comparison of the second quarterly sepsis compliance and fallout data of 2023 to the previous two quarters. However, the second quarterly data for 2023 is still in collection and will not be available until the end of June 2023. In addition, this project was delayed due to badge access issues which prevented a microsystem assessment from being completed earlier. A microsystem assessment is crucial in determining the areas for improvement. During the assessment phase of this project, there was a limitation to the data collection. Data required for the assessment of the microsystem were provided by the sepsis coordinator only. The inability to access the detail of such data hindered the planning of this quality improvement project. Also, the staffing data during the time the patient fallouts occurred was not available. Crucial data, such as the number of sick calls, high registry, short staff, census number, and skill mix, can provide valuable information that may better guide the implementation approach of this project to prevent future fallouts. In addition, these specific data can help determine the root cause of the patient fallout.

**Discussion**

**Summary**

This project highlighted the ability of how simple interventions, such as a video presentation and a poster, can cost-effectively increase staff compliance. Despite the lack of statistical results, this project raised awareness of the importance of early identification and management of sepsis. This project aimed to reduce patient fallouts and patient mortality through timely adherence to the sepsis workflow. The processes and implementations of this project aligned with the project aim by supporting recognition of the severity of the SEP-1 bundle, which can lead to patient fallout and patient mortality if not timely completed. By creating a
presentation, the nursing staff was educated on the current best practices and sepsis data to fulfill the nurses’ lifelong commitment to learning. In addition, this project inspired quality changes and served as a foundation for future improvement projects to build upon.

A few lessons were learned from the methods of employment and intervention. One lesson was the need to allocate more time for the microsystem assessment. It would be beneficial to perform the microsystem assessment during different times of the day and on different days of the week as the emergency department experiences different levels of the census for patients and nursing staff. These additional assessments will provide a different perspective of the ED and will help tailor the implementation to fit the needs of the overall microsystem. Another lesson was to implement the gap survey earlier to allow for more time for all staff to participate. The current gap survey only received a 23% return rate. In order to have a better representation of the ED, there should be at least a 25% return rate. Another lesson was to send the PowerPoint presentation to the sepsis coordinator and nursing manager for feedback before voice recording it. This way, the video presentation can be more efficiently created.

Notably, there are a few key findings that attributed to the success of this project. The first key finding was this microsystem has a high potential for quality improvement as it has a very supportive management team. The nursing manager and sepsis coordinator serve as valuable resources to the staff and actively participate in the care of septic patients. In addition, there is already an electronic health record system that automatically tracks sepsis rate, sepsis compliance, and fallouts. This built-in EHS system provides easy access to audits and reports that are necessary for understanding and preventing patient fallouts.
Conclusion

The current key findings and results of this quality improvement project were promising. Although the outcome measures were not obtained, there has been significant improvement in awareness by nursing staff on the importance of timely sepsis intervention and management. With the support of management on this quality improvement initiative, continued improvement in the SEP-1 bundle compliance is expected. The work of this quality improvement project is beneficial as this microsystem is part of a larger healthcare organization that also uses a similar workflow and sepsis bundle. The success of this project can be shared with other departments of this healthcare organization and guide other hospitals in achieving sepsis compliance benchmarks. Since the sepsis coordinator also collaborates with other sister hospitals in San Francisco, there is ample opportunity to spread.

Even without the availability of the outcome data, this project will impact current practice by revealing the need for further nursing staff engagement. As seen by the return rate of the gap survey, this project sheds light on the necessity of full engagement of staff in order to achieve full sepsis bundle compliance and reach the benchmark (see Appendix E). There is great potential for the sustainability of this project as long as there is continued improved support and encouragement by management.

Recommendations for the continuation of this project include evaluating the sepsis compliance and fallout data for the second quarter of 2023. This will determine if the project is meeting the required measures standards. If the ED is experiencing lowered rates of compliance or an increased rate of patient fallouts, it is then necessary to adjust the PDSA cycle. Another recommendation for future projects is to ensure that there are specific data available pertaining to patient fallout and perform a root cause analysis for such fallouts. This root cause analysis will
help identify the underlying issue and guide the intervention to address the issue systematically. Overall, maintaining full engagement between all members of the interdisciplinary team is the key to improving patient outcomes, reducing patient fallouts, and reducing hospital costs.
References


Appendix A

Metrics of Sepsis in the Emergency Department:
Appendix B

5 P’s Framework

Purpose
Timely and high quality sepsis screening, treatment, and management for patients in the Emergency Department.

Patients
ED patients who suffer accidents, injuries, or other serious medical conditions, such as difficulty breathing, unconsciousness, severe bleeding, poisoning, chest pain, severe allergic reactions, moderate to severe burns or wounds, seizures, and more.

Professionals
- Nurses
- Sepsis coordinator
- ED nurse manager
- Doctors

Processes
- Triage patient and perform sepsis screening
- If screen positive, notify RRT RN or charge nurse who will repeat screen and notify MD.
- Initiate the standardized RN sepsis order set
- Document appropriately of interventions

Patterns
- Accurate sepsis screening during triage
- Effective communication
- Timely interventions and management
- Accurate and timely documentation
Appendix C

SWOT Analysis

<table>
<thead>
<tr>
<th>Internal</th>
<th>Favorable/Helpful</th>
<th>Unfavorable/Harmful</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strengths</strong></td>
<td>● Sepsis quality improvement team</td>
<td>● Lack of awareness from the nursing staff to identify necessary changes in sepsis prevention.</td>
</tr>
<tr>
<td></td>
<td>● Collaborative participation from the ED sepsis coordinator and manager</td>
<td>● Lack of emphasis and reinforcement for standardized practices.</td>
</tr>
<tr>
<td></td>
<td>● Hospital Quality Dashboard in place that tracks rates of Sepsis in the ED and select wards, comparing them to CA and USA averages.</td>
<td>● Poor Physician support of current best practices (incorrect bundle order sets).</td>
</tr>
<tr>
<td></td>
<td>● Manageable size of the ED</td>
<td>● Poor communication between Physicians and nurses</td>
</tr>
<tr>
<td><strong>Opportunities</strong></td>
<td>● Reduce the risk of Sepsis</td>
<td><strong>Threats</strong></td>
</tr>
<tr>
<td></td>
<td>● Improvement of patient care and safety</td>
<td>● Lack of education retention of proposed changes among staff</td>
</tr>
<tr>
<td></td>
<td>● A hospital-wide commitment to quality improvement</td>
<td>● Limited time, staff, and resources to conduct change.</td>
</tr>
<tr>
<td></td>
<td>● Tracking metrics on quality improvement indicators</td>
<td>● Fast-paced busy ED workflow that may interrupt bundle administration times.</td>
</tr>
<tr>
<td></td>
<td>● Evidence-based practice on Sepsis reduction, patient and nurse education</td>
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Appendix D

Sepsis Compliance and Fallout Data

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<tr>
<th>Month</th>
<th>First Vital to Lactic Acid Result within 60 min</th>
<th>Lactic Acid Result to Antibiotic Administration within 60 minutes</th>
<th>Antibiotic Order to Administration Within 35 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>October</td>
<td>100%</td>
<td>86%</td>
<td>100%</td>
</tr>
<tr>
<td>November</td>
<td>60%</td>
<td>90%</td>
<td>70%</td>
</tr>
<tr>
<td>December</td>
<td>71%</td>
<td>85%</td>
<td>75%</td>
</tr>
<tr>
<td>January</td>
<td>59%</td>
<td>94%</td>
<td>83%</td>
</tr>
<tr>
<td>February</td>
<td>60%</td>
<td>92%</td>
<td>77%</td>
</tr>
<tr>
<td>March</td>
<td>68%</td>
<td>100%</td>
<td>57%</td>
</tr>
</tbody>
</table>

**OFIs in MBC ED**

October- None

November- 1 Blood cultures (Time Zero 0507a), 1 Fluids (Time Zero 1906p)

December- 1 Repeat lactate (Time Zero 0735a)

January- None

February- None

March- still being abstracted by our central abstraction team
Appendix E

Gap Survey

1. What is your highest degree?
   - BSN: 4
   - ADN: 0
   - ENS: 4
   - DNP: 0

2. How long have you been working at CPMC Mission Bernal, Emergency Department?
   - < 1 year: 1
   - 1-4 years: 6
   - 5-10 years: 0
   - > 10 years: 0

3. What is your primary shift & employment status?
   - AM: 5
   - PM: 2
   - NOC: 0
   - Per Diem: 1
   - Part-time: 4
   - Full-time: 1
   - Travel/Temporary: 0

4. How many years have you been an RN?
   - < 1 year: 1
   - 1-4 years: 1
   - 5-10 years: 4
   - > 10 years: 2

5. Please rate your expertise of sepsis.

4.13 Average Rating

6. Please rate your knowledge of early warning signs of sepsis.

4.25 Average Rating

7. When triaging I am able to:
   - Complete entirety of screening: 7
   - Identify infection appropriately: 8
   - Call sepsis alert when needed: 8
   - Use distress phrases when charting: 1
   - Ensure timely and appropriate:

8. What is the average time it takes you to complete the sepsis screening section in Epic?
   - < 5 minutes: 8
   - 5-10 minutes: 0
   - 10-15 minutes: 0
   - 15-30 minutes: 0

9. Based on your knowledge of sepsis, how confident do you feel in running the sepsis workflow?

4.13 Average Rating

10. Do you feel supported by the team when using the sepsis workflow?

4.00 Average Rating
11. When I am not able to meet sepsis workflow milestones, it is because:

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>anonymous</td>
<td>MD dispute</td>
</tr>
<tr>
<td>2</td>
<td>anonymous</td>
<td>MD discretion, simply not enough time/resources/marpower.</td>
</tr>
<tr>
<td>3</td>
<td>anonymous</td>
<td>Confounding factor such as difficult IV start, pt won’t hold still for a clean 12 lead, etc.</td>
</tr>
<tr>
<td>4</td>
<td>anonymous</td>
<td>The use of the orderset is not helpful</td>
</tr>
<tr>
<td>5</td>
<td>anonymous</td>
<td>The patient is a hard stick, the fluids are not infusing quickly, the physician did not order the antibiotics</td>
</tr>
<tr>
<td>6</td>
<td>anonymous</td>
<td>Poor coordination/recognition by attending</td>
</tr>
<tr>
<td>7</td>
<td>anonymous</td>
<td>When busy with other sick patients</td>
</tr>
<tr>
<td>8</td>
<td>anonymous</td>
<td>Staffing</td>
</tr>
</tbody>
</table>

12. If you do not feel comfortable with the sepsis workflow, explain below.

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>anonymous</td>
<td>n/a</td>
</tr>
<tr>
<td>2</td>
<td>anonymous</td>
<td>n/a</td>
</tr>
<tr>
<td>3</td>
<td>anonymous</td>
<td>Using order set is not helpful if MD can see the patient promptly.</td>
</tr>
<tr>
<td>4</td>
<td>anonymous</td>
<td>n/a, the workflow is easy to complete</td>
</tr>
</tbody>
</table>

13. I feel like improvements can be made to these protocols to decrease failouts.

More Details

2.88 Average Rating

14. If you feel there is room for improvement, what would yours be?

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>anonymous</td>
<td>n/a</td>
</tr>
<tr>
<td>2</td>
<td>anonymous</td>
<td>Running the protocol efficiently requires staff to do so, especially during busier times in the ER.</td>
</tr>
<tr>
<td>3</td>
<td>anonymous</td>
<td>Stop the order set unless provider is unable to place orders within 15 minutes.</td>
</tr>
<tr>
<td>4</td>
<td>anonymous</td>
<td>Physicians ordering the correct order set, all staff entering the correct sepsis screening and re-screening appropriately</td>
</tr>
<tr>
<td>5</td>
<td>anonymous</td>
<td>MDs to use protocols, physically respond to bedside on all sepsis alerts</td>
</tr>
<tr>
<td>6</td>
<td>anonymous</td>
<td>More staff</td>
</tr>
</tbody>
</table>

15. Thank you so much for your time! Please add any other comments here!

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>anonymous</td>
<td>the dot phrase does not get entered during triage, it gets entered hours later after the entire workup is completed. Also, the sepsis screening takes about 30-60 seconds, never 25-35 minutes, and rarely more than 1 minute. It should never take a nurse more than 1 minute to complete the sepsis screening. There are also many other documentation points for sepsis not mentioned in the survey that I’m not sure if you want to include.</td>
</tr>
<tr>
<td>2</td>
<td>anonymous</td>
<td>LR or plasmyte should be the standard fluid stocked and used in the ED</td>
</tr>
</tbody>
</table>
Appendix F

Fishbone Diagram
Appendix G

Cost-Benefit Analysis

<table>
<thead>
<tr>
<th></th>
<th>Sepsis</th>
<th>Severe Sepsis</th>
<th>Septic Shock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost per case</td>
<td>$16,324</td>
<td>$24,638</td>
<td>$38,298</td>
</tr>
<tr>
<td>Total savings per case</td>
<td>$2,940</td>
<td>$4,787</td>
<td>$6,594</td>
</tr>
<tr>
<td>Cost of Implementing this project</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Net savings</td>
<td>$2,940</td>
<td>$4,787</td>
<td>$6,594</td>
</tr>
</tbody>
</table>
Appendix H

Process Map

Create a Gap survey

Submit the Gap survey to the sepsis coordinator and manager for feedback

Revise the Gap survey based on feedbacks

Distribute the Gap survey to the nursing staff

Collect and analyze the Gap survey

Identify themes for re-education from the Gap survey

Identify the themes for re-education from the Sepsis Compliance and Fallout metrics

Analyze the Sepsis Compliance and Fallout metric of 4Q2022 and 1Q2023

Distribute the video presentation to the nursing staff

Submit the video presentation for feedbacks

Record a voice over of the PowerPoint for a video presentation

Create a PowerPoint presentation

If the goals are met, then continue to provide support to nursing staff

If the goals are not met, need to reevaluate the PDSA cycle and make appropriate changes

Collect and analyze the Sepsis data from the second quarter of 2023

Update the bulletin board with a poster of this QI project
Appendix I

PowerPoint Slides

1. Improving Timely Sepsis Care through Staff Education Within the Emergency Department
   Jillian Almada RN, Lemas Bush RN, Kaylee Castro RN, Shirley Chen RN, Spencer Forest RN, Lion Radcliffe RN, and Gregory Trevino RN

2. Identifying Sepsis
   Sepsis: ≥ 2 SIRS criteria + known or suspected infection
   Symptoms: Inflammatory Response Syndrome
   - Temperature >38.5°C or <36°C
   - Heart Rate >90 beats/min
   - Respiratory Rate >20 breaths/min
   - White Cell Count >12k or <4k
   - Blood Glucose >140 and non-diabetic
   - Change in mentation
   Possible Signs & Symptoms of Infection
   - Fever/Chills/Rigors/Weakness
   - Change in cough/New cough
   - Sore throat/New mouth sore
   - SOB/Nasal congestion/Still neck
   - Burning/Pain/Increased in Urination
   - Redness/Soreness/Swelling on skin
   - Diarrhea/Tumeting/Pain in the abdomen

3. CPMC Mission Bernal Data
   How has the microsystem been doing?
   Last Quarter of 2022 at a Glance
   First Quarter of 2023 at a Glance
   Bar Chart: First 60 minutes vs. 1-8 hours

4. Survey Summary
   - 23% response rate (n = 68) (5 AM shift, 3 part-time/full-time)
   - 0 response from travelers or night shift
   Years of RN experience
   Bar Chart: Knowledge in Early Warning Signs of Sepsis
   - Can Improvements to the Sepsis protocol decrease sickness?
   - Average rating of 2.88/5

5. Current Best Practices
   1. Screen patients for sepsis using a screening tool within the electronic health record system.
   2. Administer patients quickly using a standardized set of physiological triggers including: sweating, abnormal temperature, shivering, confusion, tachycardia, tachypnea
   3. Implement sepsis resuscitation bundles: obtain blood cultures, administer antibiotics, measure serum lactate, manage fluid status for hypotension (fluid shifting) and lactate greater than or equal to 4 mmol/L, all within the first 3 hours of sepsis diagnosis.
   4. Apply sepsis bundles on the 3rd and 6th hour of sepsis diagnosis.

6. First Vitals to Lactic Acid Results Within 60 Minutes
   Bar Charts: Q4 2022 and Q1 2023
Antibiotic Order to Administration Within 35 Minutes

Q4 2022 - Antibiotic Order To Administration Within 35 Minutes
Q1 2023 - Antibiotic Order To Administration Within 35 Minutes

Recommended Next Steps

- Evaluate Q2 2023 data
- Educate new staff on the sepsis protocol
- Periodically continue to educate staff about sepsis and the sepsis protocol, as well as annual competency
- Continue to improve communication regarding sepsis
- Keep up the great work screening every patient and enacting the sepsis bundle rapidly
- Ask for help when needed

Advocating for Patients

- Improving MD-RN communication was identified as a major goal to achieving timely sepsis care
- 50% of survey respondents cited MD-RN communication gaps as reasons for why sepsis workflow milestones were not being met

- One study by Simon et al. (2023) implemented scripted communication tools as part of a coordinated response team effort to improve time to sepsis treatment
- Clear MD-RN communication regarding "best practice alert time and pathway selection" was noted in 89% of observations after implementation

Thank You!

References


Appendix J

Project: Statement of Determination and Non-Research Determination Form

Student Name: Shirley Chen

| Title of Project: Improving Timely Sepsis Care Through Staff Education within the Emergency Department |

**Brief Description of Project**
This project is implemented to decrease adult sepsis mortality rates through timely compliance of antibiotics and intravenous fluids according to the SEP-1 bundle. The SEP-1 bundle is already implemented in the emergency department. However, a thorough microsystem assessment indicated that an improvement in compliance with early recognition and intervention is needed. The emergency department may benefit from an in-service video presentation of the sepsis workflow and an updated break room bulletin board with current sepsis data and quarterly progress.

**Data that Shows the Need for the Project**
Sepsis is a medical emergency that requires prompt recognition and treatment. It is a leading cause of death in hospitalized patients and creates a hefty financial burden of $41 billion on the healthcare system each year (Joint Commission, 2020). A delay in treatment can result in the development of sepsis to septic shock which raises the mortality rate from 10% to 40%, respectively (Al-Kader et al., 2022). Thus, sepsis protocols must be in place to reduce patient mortality. Currently, the emergency department (ED) of an urban hospital is utilizing the protocol of the SEP-1 bundle which has been associated with improved clinical outcomes in septic patients (Bray & Kennedy, 2020). Recent data indicates that the ED is failing to consistently meet the benchmark of 90% compliance within the last few years. The success of such a protocol requires full compliance with early sepsis intervention in order to lower hospital costs and patient mortality (Townsend et al., 2022). Thus, it is necessary to improve compliance in order to improve patient outcomes.

**Aim Statement**
We aim to improve the compliance of early sepsis management in the emergency department of an urban San Francisco hospital. The process begins with nurses recognizing sepsis using the standardized SEP-1 screening tool. The process ends with the appropriate and timely administration of antibiotics and intravenous fluids. By working on the process, we expect (1) reduced time between the onset of sepsis symptoms, recognition, and management, (2) decreased sepsis mortality rate, (3) improved clinical outcome, and (4) a lower cost of care. It is important to work on this now because we have identified the need to improve (1) patient outcomes and satisfaction, (2) prevention of near misses and errors, and (3) reducing the financial burden of the hospital.

**Description of Intervention(s)**
A microsystem assessment was done to understand the needs of the emergency department. Through the assessment, we have identified the need to improve compliance with the SEP-1 bundle. We initiated a gap survey to identify gaps in sepsis knowledge. Next, a video presentation was conducted to re-educate nurses on the sepsis workflow. In addition, the bulletin board in the staff break room was updated with current sepsis data to provide a visual representation of current progress.

**Desired Change in Practice**
The desired change in practice is to increase compliance with the timely use of the SEP-1 bundle through prompt recognition of sepsis, administration of antibiotics, and administration of intravenous fluids.

**Outcome measurement(s)**
The outcome measure used is the percentage of patient fallouts in septic patients who received appropriate and timely sepsis management in the ED. The target goal is 0%. The process measures are the percentage of each sepsis compliance metrics that has met its timed goals. The target goal is 90%. Lastly, the balancing measures includes the percentage of nursing staff satisfaction. The target goal is 80%.

**References:**


To qualify as an Evidence-based Change in Practice Project, rather than a Research Project, the criteria outlined in federal guidelines will be used: (http://answers.hhs.gov/ohrp/categories/1569)

☑ This project meets the guidelines for an Evidence-based Change in Practice Project as outlined in the Project Checklist (attached). Student may proceed with implementation.
This project involves research with human subjects and must be submitted for IRB approval before project activity can commence.

### EVIDENCE-BASED CHANGE OF PRACTICE PROJECT CHECKLIST *

Instructions: Answer YES or NO to each of the following statements:

<table>
<thead>
<tr>
<th>Project Title:</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The aim of the project is to improve the process or delivery of care with established/accepted standards, or to implement evidence-based change. There is no intention of using the data for research purposes.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>The specific aim is to improve performance on a specific service or program and is a part of usual care. ALL participants will receive standard of care.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>The project is NOT designed to follow a research design, e.g., hypothesis testing or group comparison, randomization, control groups, prospective comparison groups, cross-sectional, case control). The project does NOT follow a protocol that overrides clinical decision-making.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>The project involves implementation of established and tested quality standards and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does NOT develop paradigms or untested methods or new untested standards.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>The project involves implementation of care practices and interventions that are consensus-based or evidence-based. The project does NOT seek to test an intervention that is beyond current science and experience.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>The project is conducted by staff where the project will take place and involves staff who are working at an agency that has an agreement with USF SONHP.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>The project has NO funding from federal agencies or research-focused organizations and is not receiving funding for implementation research.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>The agency or clinical practice unit agrees that this is a project that will be implemented to improve the process or delivery of care, i.e., not a personal research project that is dependent upon the voluntary participation of colleagues, students and/or patients.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>If there is an intent to, or possibility of publishing your work, you and supervising faculty and the agency oversight committee are comfortable with the following statement in your methods section: “This project was undertaken as an Evidence-based change of practice project at X hospital or agency and as such was not formally supervised by the Institutional Review Board.”</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
ANSWER KEY: If the answer to ALL of these items is yes, the project can be considered an Evidence-based activity that does NOT meet the definition of research. **IRB review is not required. Keep a copy of this checklist in your files.** If the answer to ANY of these questions is NO, you must submit for IRB approval.

*Adapted with permission of Elizabeth L. Hohmann, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.

STUDENT NAME (Please print): Shirley Chen

____________________________________________________

Signature of Student:

DATE: 2/14/2023

SUPERVISING FACULTY MEMBER NAME (Please print):

   Dr. Patterson

____________________________________________________

Signature of Supervising Faculty Member

_________________________________ DATE 4/7/2023