Improving Timely Sepsis Care Through Staff Education Within the Emergency Department

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Improving Timely Sepsis Care Through Staff Education Within the Emergency Department

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NURS635-Internship
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May 11, 2023
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Abstract

Problem: Providing high-quality sepsis care in a San Francisco Bay Area emergency department (ED) is an organizational priority, however Centers for Medicare & Medicaid Service (CMS) SEP-1 sepsis bundle compliance has decreased to an average of 79% compliance since October of 2022. It was revealed that CMS SEP-1 sepsis bundle compliance issues have resulted in increased patient fallouts.

Context: A microsystem assessment was conducted by the quality improvement team to help identify gaps in practice. After an assessment survey of nursing staff, it was revealed that barriers such as physician order sets, lack of communication, lack of staffing during peak ED hours, and inability to gain intravenous access to patients were limiting staff to meet sepsis bundle 3- and 6-hour goals.

Intervention: A PowerPoint video presentation and a poster displayed in the nursing staff room was implemented to educate staff on recognizing the presentation of sepsis at triage under the systemic inflammatory response syndrome (SIRS) criteria, current best practices of CMS SEP-1 sepsis bundle, patient advocacy measures, and recommended next steps for action.

Measures: Outcome measures studied were the first vital sign to lactate result within 60 minutes, lactate to antibiotic administration within 60 minutes, and antibiotic order to administration within 35 minutes.

Results: The outcome measures for the CMS SEP-1 sepsis bundle compliance were not collected due to the production of results being in the second quarter of 2023.

Conclusion: The project took positive strides in increasing the compliance of CMS SEP-1 sepsis bundle care at a microsystem level, despite the ability to reach the project's aim.

Keywords: sepsis, sepsis protocol, sepsis bundle, emergency department
Improving Timely Sepsis Care Through Staff Education

Sepsis can be detrimental to the health of patients in the hospital, leading to increased morbidly and mortality rates. It causes major issues for healthcare systems across the globe causing more than 11 million deaths annually (Borguezam et al., 2021). In the United States, the cost associated with sepsis has skyrocketed to almost $24 billion per year (Paoli et al., 2018).

The emergency department (ED) triage is the first point of contact in identifying signs and symptoms of sepsis. Sepsis has many forms of presentation, the most common signs and symptoms are categorized under the systemic inflammatory response syndrome (SIRS) criteria such as temperature irregularities >38°C or <36°C, heart rate >90 beats/min, respiratory rate >20 breaths/min, white blood cell count >12,000/nm3, >10% immature neutrophils, and change in mentation (Worapratya & Wuthisuthimethawee, 2019).

Early recognition of sepsis is pivotal for the promotion of positive patient outcomes. The Centers for Medicare and Medicaid Services (CMS) initiated hospital quality initiatives for the “Early Management Bundle, Severe Septic Shock Measure” which is referred to as SEP-1 (Alexander et al., 2022). The focus is geared towards the promotion of early goal-directed sepsis bundle care administration. Items such as obtaining blood lactate, blood cultures, administration of antibiotics, and intravenous fluids are suggested to be completed within the first 3-hours of first reported sepsis symptoms (Kim & Park, 2019). The reassessment of lactate, fluid status, and administration of vasopressors (relating to the patient’s blood pressure) must be completed within 6-hours (Kim & Park, 2019). The ED is the most important area of compliance with sepsis bundle care and the timeliness in the administration of protocols is a deciding factor of patient mortality.
**Problem Description**

In a San Francisco Bay Area hospital, sepsis bundle compliance is an ongoing obstacle that faces the 16-bed emergency room. Compared to the two other hospitals in the network, this ED has scored significantly lower in the early sepsis identification categories. Compliance with the timely administration of sepsis bundle care is highly stressed organizationally wide. To combat the continuing battle against compliancy with sepsis protocols, the hospital formed a quality improvement team consisting of a sepsis coordinator and ED nursing manager. The main reason was to help analyze and evaluate case-by-case data to better improve sepsis care in the ED.

The most pertinent metrics monitored by the hospital's sepsis quality improvement team are the first vital sign to lactate result within 60 minutes, lactate to antibiotic administration within 60 minutes, and antibiotic order to administration within 35 minutes. Out of the three time-related goals measured, only lactate to antibiotic administration within 60 minutes has an average above the goal of 90% compliance since October of 2022. The first vital sign to lactate result within 60 minutes has an average of 69.6% compliance and antibiotic order to administration within 35 minutes has an average 77% compliance since October of 2022. To meet a 90% compliance in all sepsis care time goals, the gaps in practice must be identified within the microsystem. See appendix A for quarterly benchmark data.

The lack of compliance with timely sepsis protocols has led to patient fallouts in the ED. This may cost the microsystem fiscally by increased admission to other units (intensive care/medical-surgical units) and increased patient days. With nursing staff being the first to triage patients in the ED, communication between interdisciplinary teams is important when a patient positively screens for sepsis. The proper education of nursing staff can positively affect
the microsystem to minimize the amount of patient fallout by the use of evidence-based practices with an emphasis on common best practices such as 3- and 6-hour bundle protocol, early sepsis markers, and fluid resuscitation. The organization’s goal is to provide high-quality punctual sepsis care and educating nursing staff will help further those goals.

Available Knowledge

PICOT Question

With the use of the following PICOT (population, intervention, comparison, outcome, and time) question an evidence-based literature review was conducted to find the correlation between early sepsis recognition and staff education. In patients who screen positive for sepsis in the ED (P), how does educating staff on timely first vital signs to lactic acid and antibiotic order to administration (I), compared to staff who have had minimal education on sepsis protocol (C), affect improved patients’ outcomes (O), within a 6-hour mark of sepsis alert (T)?

Literature Review

The review of literature was conducted to find peer-reviewed evidence on the importance of timely administration of CMS SEP-1 sepsis bundle care and how it is driven by proper education of nursing staff. Research was found through databases such as PubMed, CINHAL, and Google Scholar while using articles published between 2018-2022. Phrases used for literature review are as follows: CMS SEP-1 sepsis bundle compliance, sepsis prevention in the emergency department, early goal-directed sepsis bundle compliance, and nursing staff sepsis education. The following articles were most relevant to the proposed PICOT question.

A quality improvement project conducted by Warstadt et al. (2022) saw a downward trend in sepsis bundle compliance in a large metropolitan hospital ED due to the increased rates of COVID-19. The authors took action to combat decreased bundle compliance by implementing
re-education of electronic health record (EHR) screening tools and sepsis bundle care. After the implementation of intervention, it was found that after re-education 83.6% of patients met 6-hour bundle compliance (Warstadt et al., 2022). This project identifies the positive effect on patients that re-education of sepsis protocols to nursing staff can offer.

Rechter et al. (2022) measured sepsis recognition and treatment knowledge of ED nurses through didactic education. The purpose of this interventional study was to evaluate the knowledge gaps. The program used pre-and post-surveys and found that after the intervention nurses had 80% greater knowledge of sepsis recognition and organizational protocols (Rechter et al., 2022). Knowledge gaps are common in all healthcare systems, but an organization's effort to address gaps through education can improve the system. This study confirms the benefit that proper education on sepsis-related protocols can benefit a microsystem.

In an observational study, researchers developed initiatives to improve the knowledge, attitudes, and behaviors of sepsis protocols among staff. The use of EHR sepsis reminders, the creation of a “Stop Sepsis Portal”, visual marketing with the use of colored posters and badge reels, and fifteen-minute “sepsis drills” were at the forefront of the plan. Following a post-intervention survey, authors found that staff felt “more comfortable” with the early recognition and protocols in place to stop the increase in sepsis rates (Breuer et al., 2020). This study shows that low-fidelity education sessions can increase staff knowledge regarding sepsis protocols.

An epidemiological observation study published by Borguezam et al. (2021) aimed to assess the impact of newly proposed sepsis protocols and how it related to patient mortality rates in three emergency rooms in Brazil. The intervention used staff training with online education modules and in-person PowerPoints on how to properly use the proposed sepsis checklist. Sepsis checklists highlighted Surviving Sepsis campaign materials which consisted of adherence to
lactate, blood culture, and antimicrobial therapy collection within 3- and 6-hour markers. The number of deaths over the span of four years was 276 patients. 64% of patients were treated without the proper sepsis checklist and 41% died with the use of the sepsis checklist (Borguezam et al., 2021). The adherence to the time-sensitive sepsis bundle checklist affected patient mortality by 23%. This study proves that early recognition and treatment can increase positive patient outcomes.

An evidence-based nurse-led quality improvement project conducted by Moore et al. (2019) used the Detect, Act, Reassess, Titrate (DART) evaluation tool to properly monitor the effectiveness of the 3-hour sepsis bundle care protocol. Before implementation, staff was educated on the new DART-related deliverables which focused on timely administration of sepsis bundle administration, current best practices, and current quality performance data. 3-hour sepsis bundle adherence was at 30% before implementation and after the rollout of DART deliverables, the ED saw that increase to 80% compliance along with a massive decrease in overall patient day admission of 2.5 days (Moore et al., 2019). This study is useful in supporting the argument that education on sepsis-related protocols can increase compliance with timely administration of sepsis bundles.

The body of evidence related to the proposed PICOT question is extensive and thoroughly supports the benefit of timely recognition and treatment of sepsis in the ED. There is a positive correlation between educated nursing staff and decreased mortality. Education is the driver for positive patient outcomes and adherence to sepsis protocol. Recognizing the first adverse vital sign that may indicate sepsis is pivotal for patient survival and must be addressed among healthcare systems. Education of nursing staff on the current best evidence-based practices improves a microsystem by decreasing costs, admissions, patient days, morbidity and mortality
rates. The research presented can further the proposed project by authenticating education as the priority.

**Rationale**

The theory used to guide this project is Lewin’s Change Theory. Considered the “epitome of change models” Kurt Lewin created a three-step process that promotes organizational change by way of unfreezing, changing, and refreezing (Hussain et al., 2018). With healthcare systems being complex with multiple disciplines the process of change must be straightforward and properly laid out to get staff buy-in. For the microsystem to achieve equilibrium, organizations must respond to the ever-changing environment (Wojciechowski et al., 2016).

The process of unfreezing is to create awareness of an issue by changing human behavior or mindset (Warstadt et al., 2022). This can be done by re-educating staff on proposed protocols for the timely sepsis bundle protocols. Changing is done with a form of leadership initiative to implement the proposed materials (Warstadt et al., 2022). Refreezing is the process of inhabiting the change to become the new normality among the system (Wojciechowski et al., 2016). When leading change initiatives using Lewin’s Change Theory the driving and restraining forces must be accounted for to maintain equilibrium (Kaminski, 2011). When equilibrium is reached, it is important to put emphasis on the positive driving forces to outweigh the retraining forces. With the proper interdisciplinary teams and leadership, change can increase positive outcomes in the microsystem.

To effectively implement change in the microsystem, a strong group of professionals were gathered consisting of a sepsis coordinator and an ED nursing manager. The sepsis coordinator and nursing manager assisted in collecting the benchmark data so it could be analyzed for the unfreezing step in the change model. After the proper evaluation of quarterly sepsis bundle
compliance data, surveys were then sent out to staff to help identify gaps in practice. This sparked the changing step by creating a PowerPoint presentation and poster with the use of common evidence-based practices. The refreezing process is a consistent method when using education because re-education can always be used and must be initiated by the core leadership.

Collaborating with the quality improvement team in the ED positively furthered change to increase the timely administration of CMS SEP-1 sepsis bundle care. See appendix B for more on Lewin’s Change Theory.

**Specific Project Aim**

The aim of this project was to increase compliance of timely CMS SEP-1 sepsis bundle care from a baseline of 71% to 90% compliant. Sepsis bundle care measures include first vital sign to lactate result within 60 minutes, lactate to antibiotic administration within 60 minutes, and antibiotic order to administration within 35 minutes. Working on this process, it is expected that the following issues are to be decreased: patient fallout, number of patient admissions due to sepsis, time to administer sepsis care bundle, and the inability for staff to identify sepsis.

**Methodology**

To properly evaluate the ED, a microsystem assessment and SWOT (strengths, weaknesses, opportunities, and threats) analysis were conducted. Among healthcare delivery systems, the clinical microsystem is where the quality of care is defined for an organization (Harris et al., 2018). The clinical nurse leader (CNL) has the ability to properly assess the microsystem to identify gaps and bring attention to systemic issues posing a threat to organizational values. With an emphasis on the 5 P’s (purpose, patients, professionals, processes, and patterns) a microsystem assessment aligns a better vision for quality improvement efforts to
initiate change (Harris et al., 2018). Assessments were conducted to properly analyze the microsystem for potential benefits for the later proposed interventions.

**Microsystems Purpose, Patients, & Professionals**

The microsystem assessment was used in conjunction with Dartmouth Clinical Microsystems ED workbook (Dartmouth-Hitchcock, 2001). The microsystems’ purpose is to provide high-quality care using a community-based approach (Harris et al., 2018). The quality improvement team has the purpose of serving the community by providing current evidence-based best practices. This San Francisco Bay area hospital is located in an area where patients are often underserved with a lack of resources. Patients being served in this microsystem are in need of advocacy being that underserved communities may be unable to advocate for themselves. Professionals of the microsystem consist of the individuals in the quality improvement team and staff working collaboratively to propel organizational values. The sepsis coordinator and ED nursing manager are the direct points of contact to drive change initiatives.

**Microsystem Processes**

Processes of the microsystem lie within the daily workflow of the ED. Workflow adaptions are crucial to implementing change. The current implementation of CMS SEP-1 sepsis bundle protocols is lacking due to various issues relating to workflow disruptions such as policy and procedure oversight during triage, poor provider compliance with CMS SEP-1 sepsis bundle recommendations, lack of nursing knowledge, and interdisciplinary communication. Understanding the workflow that occurs when a patient is positively screened for sepsis is important to help identify disruptions.

At triage, all patients are screened for sepsis using the SIRS criteria, and if patients have two or more adverse vital signs or pertinent sepsis markers further assessment is designated.
Patients are then asked if any previous or suspected infection occurs. If infection occurs patients are then assessed for signs of potential organ dysfunction which might present as an elevated lactate, creatinine, altered mental status, or hypotension. If present, the patient is considered positive for sepsis. This is then communicated to the ED sepsis alert response team (sepsis coordinator, primary physician, primary and secondary nurse, and pharmacist) to begin the CMS SEP-1 sepsis bundle. See appendix C for positive sepsis screen workflow.

The CMS SEP-1 sepsis bundle is time-oriented and goal-directed with the components of assessment occurring before the 3-hour mark of the positive screen and then reassessed before the 6-hour mark (Wang et al., 2020). At the 3-hour marker, initial lactate and blood cultures (prior to antibiotic administration) are collected. Then antibiotics are administered along with an intravenous bolus of lactated ringers (30ml/kg). At the 6-hour marker, the patient is reassessed by the primary nurse during which a repeated lactate is drawn and blood pressure assessment to identify the need for vasopressors. If the patient is still considered unstable by interdisciplinary teams, the patient is then admitted to the intensive care unit for further observation. See appendix D for sepsis workflow processes.

**Microsystems Patterns**

Identifying patterns in the microsystem can develop areas for improvement. To properly analyze the reason for patient fallouts and compliancy issues three-time related metrics were collected to help guide sepsis performance initiatives. First vital sign to lactate result within 60 minutes, lactate to antibiotic administration within 60 minutes, and antibiotic order to administration within 35 minutes are areas where compliance issues lie. A root cause analysis was conducted by the quality improvement to determine the cause and effect of microsystem-related issues. See appendix E for Root cause analysis.
The data studied from the fourth quarter of 2022 and the first quarter of 2023 shows compliance issues with the three-time related metrics. First vital sign to lactate result within 60 minutes only reached the baseline of 71% in October of 2022. However, lactate to antibiotic administration within 60 minutes has been above baseline (around 91%) for two consecutive quarters. With the lowest compliance percentage coming in December of 2022 at 86%. Antibiotic order to administration within 35 minutes showed benchmark scores of slightly above baselines excluding March 2023 due to data still being collected for that metric. After evaluating this data, the decision was made by the quality improvement team to use education as an intervention.

**Gap Survey**

The quality improvement team wanted to gain more information on gaps in pattern metrics, therefore a staff survey was conducted. The survey was completed by 23% of nurses on staff. Staff had an average of 1-4 years of experience, and all worked on the day shift. Questions were asked about nursing knowledge of early sepsis recognition, confidence levels of EHR sepsis screening workflows, recommendations to decrease fallouts, and common workflow interruptions. Knowledge of early sepsis recognition and confidence in sepsis EHR workflows had high scores among the surveyed staff.

The most pertinent gap identified was collected by asking if staff believed that sepsis protocols could be improved to decrease patient fallouts. The average score was 2.88 out of 5 which suggests that the use of education could benefit staff. Common barriers that staff explained for areas of improvement were associated with physician order sets and lack of communication, lack of staffing during peak ED hours, and inability to gain intravenous access to patients. See the appendix F for survey questions and results.
SWOT Analysis

Strengths, weaknesses, opportunities, and threats (SWOT) determine how change can positively or negatively affect a microsystem (Harris et al., 2018). Internal and external factors that forward changes must be held with great priority when implementing microsystem alterations. Strengths in the microsystem are set internally before a change is made and are in place to add items for additional strengths. Strengths include sepsis quality improvement team, champion sepsis coordinator and ED nursing manager, hospital quality dashboard in place that tracks rates, and specific metrics of sepsis in the ED.

Weaknesses occur internally that commonly affect in-place workflows. Weaknesses in the microsystem include a lack of awareness from the nursing staff to identify necessary changes in sepsis prevention. Some staff has issues identifying CMS SEP-1 sepsis bundle protocols. Lack of emphasis and reinforcement for standardized practices. These common mistakes occur during triage and sepsis alerts. Poor physician support of current best practices is the largest issue in the microsystem. ED physicians often order the incorrect CMS SEP-1 sepsis bundles despite frequent correction from nursing staff.

Opportunities for improvement of change come externally from evidence-based practices. Opportunities include the reduced risk of sepsis, improvement of patient care and safety, hospital-wide commitment to quality improvement, tracking metrics on quality improvement indicators, and evidence-based practice of sepsis reduction. Threats to the microsystem can occur when implementing a new change.

Threatening aspects to this proposed project is lack of education retention of proposed changes among staff, limited time, staff, and resources to conduct change, and fast-paced busy
ED workflow that may interrupt bundle administration times. Identifying the SWOT of the project can offer help to implement change. See appendix G for SWOT analysis.

Return on Investment

A cost-benefit analysis was completed to determine financial costs and savings to implement the intervention. Using a PowerPoint video presentation and a poster displayed in the nursing staff room, allowed for intervention costs to be minimal for this project. The costs associated with interrupting workflow to discuss current practices, meetings with the quality improvement team, creating education materials, and distribution of deliverables equaled only the cost of time.

Sepsis can result in the highest cost per diagnosis nationally averaging $24 billion in hospital expenses (Paoli et al., 2018). A sepsis patient can cost a microsystem on average $16,324 (Sepsis without organ dysfunction), $24,638 (severe sepsis), and $38,298 (septic shock) annually (Paoli et al., 2018). The costs associated with the presentation of SIRS sepsis indicators at triage can cost healthcare systems $13,384 (Sepsis without organ dysfunction), $19,851 (severe sepsis), $31,704 (septic shock) (Paoli et al., 2018). With the cost of caring for sepsis being at an all-time high, it is an important time to invest in CMS SEP-1 sepsis bundle compliance education. The proposed education intervention has the opportunity to help decrease costs in the microsystem to ultimately help decrease mortality and morbidity rates. See appendix H for Cost-Benefit Analysis.

Intervention

Using current evidence-based practices, an 11-slide PowerPoint video presentation and poster were created under the direction of the sepsis coordinator and ED nursing manager. The focus was to educate staff on recognizing the presentation of sepsis at triage under the SIRS
criteria, current best practices of CMS SEP-1 sepsis bundle, patient advocacy measures, and recommended next steps for action. Presenting staff the studied quarterly metrics for first vital sign to lactate result within 60 minutes, lactate to antibiotic administration within 60 minutes, and antibiotic order to administration within 35 minutes was important to help visualize where improvement is needed. Highlighting the last quarter of 2022 (October, November, and December) and first quarter of 2023 (January, February, and March).

For current best practices, the team categorized the evidence using the acronym SIIA (Screen, Identify, Implement, and Act). Screening patients using the organizational screening tool via EHR at triage. Identifying sepsis by physiological triggers such as diaphoresis, abnormal temperature, rigors, confusion, tachycardia, and tachypnea. Implementing sepsis resuscitation bundle by obtaining blood cultures, administering antibiotics, measuring serum lactate, managing 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. Applying the sepsis bundles on the 3rd and 6th hour of sepsis diagnosis.

By identifying that staff were experiencing issues related to physician communication and their inability to use correct CMS SEP-1 sepsis bundle order sets, content regarding patient advocacy and standardized communication were added to the education modalities. Using the Simon et al. (2020) study, which used the implementation of scripted communication tools as part of a coordinated response team effort to improve time of sepsis treatment. Before the education modalities were sent out to staff, they were first approved by the sepsis coordinator and ED nursing manager. The PowerPoint video presentation was then distributed to staff via email and the poster was displayed in the ED nursing staff room.
Recommendations of next steps were used in educational materials to summarize the proposed interventions. It was suggested to continue to educate staff new to the microsystem along with continuing to re-educate current staff on current evidence-based best practices. Re-education should be done annually. Being able to ask for assistance on sepsis recognition and bundle administration is important, therefore it was stressed to ask for assistance if needed when caring for a potential sepsis case. The conclusion of the education modalities praised staff for their commitment to patient care by highlighting current strengths as seen in the data. See Appendix I for process map.

**Study of the Intervention**

Baseline metrics of first vital sign to lactate result within 60 minutes, lactate to antibiotic administration within 60 minutes, and antibiotic order to administration within 35 minutes attained from the fourth quarter of 2022 and the start of the first quarter of 2023 is to be further studied. The population in which the data was collected were patients who had screened positive for sepsis at triage. To properly study the effectiveness of interventions, data collected in the second quarter of 2023 will spot changes in practice. If goals are not met, leadership must update interventions and reassess to identify ways to promote change.

**Results**

The intervention was implemented at the beginning of the second quarter of 2023. The entirety of the project occurred during the first 16 weeks of 2023. The education modalities were sent out to staff at the end of April 2023. Therefore, compliance with the three-time related sepsis bundle metrics for quarter two of 2023 is not attainable currently. It is projected that the evaluation of 2023 quarter two data will show outcome measures of the intervention. To properly
identify the effectiveness of the interventions resurveying staff could be completed to see any improvement outcome measures of CMS SEP-1 sepsis bundle compliance.

The suspected outcome of interventions was to increase nursing staff compliance of CMS SEP-1 sepsis bundle to 90% and above. Moore et al. (2019), implemented a similar nurse-driven quality improvement project with an emphasis on the timeliness of lactate results, blood cultures, and antibiotic administration. This project was able to increase staff compliance from 30% to 80% using an education intervention (Moore et al., 2019). Using this evidence-based project and after analyzing the upward trend of the three-time related sepsis bundle metrics, it is projected that compliance will increase in the microsystem over the next several quarters after the intervention.

Another suspected outcome was to increase staff knowledge on the importance of early recognition and treatment of sepsis to prevent patient fallouts. Patient fallouts can occur due to the fast-paced environment of the ED workflow. The use of effective communication between physicians and nursing staff was a barrier associated with CMS SEP-1 sepsis bundle compliance. Therefore, antibiotic order to administration within 35 minutes data may stay at baseline or decrease in compliance due to the physician’s inability to order correct CMS SEP-1 sepsis order sets. The hope is that the proposed standardized communication techniques suggested in the intervention may assist in those metrics staying above baseline.

Summary

Several key findings were attributed to the positive effect of the quality improvement project. The use of the microsystem assessment was advantageous in identifying areas in the microsystem where gaps in CMS SEP-1 sepsis bundle compliance occurred. This was in conjunction with the three-time related sepsis bundle metrics that were collected from previous
quarters. The collaborative nature in which the quality improvement team worked benefited the implementation of interventions. Having the support of the microsystem’s leaders allowed for the education modalities to be distributed to staff efficiently. Key findings were associated with outcomes of education interventions being delayed and taking longer than expected to see improvement in metrics.

The efforts to achieve a 90% compliance of first vital sign to lactate result within 60 minutes, lactate to antibiotic administration within 60 minutes, and antibiotic order to administration within 35 minutes did not reach the project's aim. Results to measure intervention outcomes are to come in the second quarter of 2023. Despite the inability to view metrics for improvement, a step was taken in the right direction to further the practice of early recognition and timely administration of CMS SEP-1 sepsis bundles.

Lessons were learned after assessment and intervention on the difficulties to produce a change in the microsystem. The microsystem assessment must be thorough to properly identify gaps. Staff may not be accustomed to attending or participating in change initiatives, which was a factor resulting in low survey results. The fast-paced workflow of the ED allows for interruptions in the proper bundle compliance. Learning that the ED physicians commonly order the wrong sepsis bundle set was challenging when making education materials because of the differences in practice. Although results are still yet to come the project initiatives would still be considered a success. After a review of evidence, it is shown that change when implementing an education-based intervention may take time to see in practice. The shared vision of the quality improvement initiatives from staff and interdisciplinary teams led to the success of this project.
Recommendations

The implementation of staff education on recognizing the presentation of sepsis at triage under the SIRS criteria, current best practices of CMS SEP-1 sepsis bundle, patient advocacy measures, and recommended next steps for action is recommended for all new staff along with annual re-education for current staff. To see improvement from post-intervention data the implementation of education modalities should be toward the early stages of the project. The use of surveys helps assess current practices, but using more incentives for staff may increase participation in surveys. Future projects may benefit from finding a unit champion (charge nurse or enthused floor nurse) to promote the intervention to increase compliance. Collaborating with physicians during microsystem assessment may help in understanding their workflow when it comes to sepsis bundle order sets.

Conclusions

This project took strides in benefiting the early recognition and treatment of CMS SEP-1 bundle sepsis care at a microsystem level. Although the results of the intervention are minimal, the project should still be considered a success. Compliance with the timely sepsis initiatives studied is expected to increase within the ED. On an organizational basis, the same sepsis workflow is used among all hospitals in the network. The interventions implemented have the opportunity to reach other hospitals to help with their sepsis bundle compliance. With the current leadership at the microsystem level, this project can be sustained by continuing to use patient-centered staff education. The organization's effort to support current evidence-based best practices will result in positive patient outcomes related to sepsis among all hospitals in the network.
The implementation of evidence-based education for nursing staff may increase compliance with the timely administration of CMS SEP-1 sepsis bundle care. The assessment of this project suggests that the need for education on sepsis protocols is prevalent among all nursing staff members. Education modalities with an emphasis on early sepsis recognition, treatment, improving communication among interdisciplinary teams, and recommendation to increase compliance were the driving force for interventions. Evaluating data metrics of lactate results within 60 minutes, lactate to antibiotic administration within 60 minutes, and antibiotic order to administration within 35 minutes are pivotal to identifying gaps in compliance. The complexities of sepsis management in the healthcare continuum are constantly evolving and the best way to combat increasing mortality rates is by keeping staff educated on sepsis protocols.
References


https://doi.org/10.51894/001C.37707


Appendix A

Quarterly Benchmark Data

Quarter 4 2022 metrics

<table>
<thead>
<tr>
<th></th>
<th>First Vital to Lactic Acid Result within 60 minutes</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>
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</table>

Quarter 1 2023 metrics

<table>
<thead>
<tr>
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<th>First Vital to Lactic Acid Result within 60 minutes</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>January</td>
<td>59%</td>
<td>94%</td>
<td>83%</td>
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<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>

*Data not completely compiled for March 2023

Average Compliance of three-time related sepsis metrics = 79%
Appendix B

Lewin’s Change Theory

1. Recognize the need for change
2. Determine what needs to change
3. Encourage the replacement of old behaviors and attitudes
4. Ensure there is strong support from management
5. Manage and understand the doubts and concerns

1. Plan the changes
2. Implement the changes
3. Help employees to learn new concept or points of view

1. Changes are reinforced and stabilized
2. Integrate changes into the normal way of doing things
3. Develop ways to sustain the change
4. Celebrate success
## Appendix C

### Sepsis Protocol for Positive Sepsis Screen

**SW#**

<table>
<thead>
<tr>
<th>Task #</th>
<th>Responsible Operator</th>
<th>Task Description (Include hands-on, TD, and signals from other staff to complete task)</th>
<th>Task Cycle Time</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td><strong>ED Triage Nurse</strong></td>
<td>1. Triage patient per “ED Triage Standard Work” and identifies patient through positive sepsis screen 2. Notify Charge RN of Positive Sepsis Screen, let Charge RN know if patient is PUI 3. Document evaluation in “RN Sepsis Flowsheet” 4. Initiate RN “Suspected Sepsis in Triage Standardized Procedures (2740)” in EPIC type “Sepsis” in search bar, scroll to bottom, click “High”</td>
<td>5 min</td>
<td></td>
</tr>
</tbody>
</table>
| **2** | **Charge RN** | 3-1. Identify room number and calls **ED Sepsis Alert**  
- YVC/MAC: Voice call: Push Button and say “Broadcast to ED” + “sepsis alert, room number” + 9 local broadcast in ED  
- DAY: “High” in “Sepsis” for the Operator; Inform operator to overhead “sepsis alert, room number” + 9 local broadcast in ED | 1 min |  |
| **3** | **Triage Tech/ ED Triage RN** | 3-1. Room Patient | 1 min |  |
| **4** | **ED Sepsis Alert Response Team** | 4-1. Respond to Sepsis Alert (Response Team includes the following):  
- MD  
- Primary RN  
- Pharmacist (only if on shift at VHC, if on duty at Pharmacy will not enter the room)  
- RN Tech (if available)  
- 2 RN (if available) | 4 min |  |
| **5** | **MD** | 5-1. Evaluate patient, determine need for antibiotics and fluids.  
5-2. Use the MD Orders:  
- ED SIRS Suspected Sepsis (10027) or **ED Sepsis Shock (10033)**, as appropriate. | 15 min |  |
| **6** | **ED Primary Nurse** | 5-4. Follow “Suspected Sepsis in Triage Standardized Procedures (2740)”, concurrent with MD evaluation and order:  
- Establish IV  
- Draw labs (blood culture, chem panel)  
- Administer 4 L, Lactate Ringer bolus |  |  |
| **6** | **ED Primary Nurse** | 6-1. Run the lactate in the Point of Care Testing device if available and notify MD of results verbally.  
6-2. Confirm that there is a 5-hour repeat order for lactate, if the initial result is greater than 3.5 g | 4 min |  |

**SW#**

<table>
<thead>
<tr>
<th>Task #</th>
<th>Responsible Operator</th>
<th>Task Description (Include hands-on, TD, and signals from other staff to complete task)</th>
<th>Task Cycle Time</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7</strong></td>
<td><strong>ED MD</strong></td>
<td>7-1. Re-evaluate decision to order antibiotics and fluids bolus 7-2. Document contraindications for antibiotics and fluids as appropriate using standard language from Smart Phrase <strong>“SEPSISBOLUSCONTRAINICATIONS”</strong> 7-3. <strong>If</strong> patient has a non-infectious process, document that “sepsis diagnosis is ruled out” i.e., cardiogenic shock, renal failure.</td>
<td>1 min</td>
<td></td>
</tr>
<tr>
<td><strong>8</strong></td>
<td><strong>ED Primary Nurse</strong></td>
<td>8-1. If antibiotics ordered, notify Pharmacist of high priority ANTIBIOTIC order for SEPSIS patient requiring quick verification.</td>
<td>3 min</td>
<td></td>
</tr>
<tr>
<td><strong>9</strong></td>
<td><strong>Pharmacy</strong></td>
<td>9-1. Verification of antibiotics (if ordered)</td>
<td>5 min</td>
<td></td>
</tr>
<tr>
<td><strong>10</strong></td>
<td><strong>Primary Nurse</strong></td>
<td>10-1. Administer broad spectrum antibiotics first (if ordered) 10-2. Notify MD of the 1st Lactate Result (from Lab) 10-3. Evaluate fluid responsiveness (consider NICOPE assessment) 10-4. Ensure contingency fluids had been administered, and administer additional fluids ordered by MD as appropriate. 10-5. Fill out nursing handoff (Smart Phrase <strong>“NursingSepsishandoff”</strong> in Epic). If a decision was made to transfer patient to other units.</td>
<td>15 min</td>
<td></td>
</tr>
</tbody>
</table>
| **11** | **ED MD** | 11-1. Disposition patient as appropriate given clinical state  
11-2. REAASSESS fluid status (based on VS, lactate acid and/or bedside ultrasound, NICOM, urine output) and revise/preserve antibiotics as needed, AND DOCUMENT using Smart Phrase **“sepsisassessment”**. | 5 min |  |
| **12** | **MD** | 12-1. ICU Consult or ED/ICU MD to MD discussion recommended for transient or persistent hypotension and initial lactate 3.4 mmol/L. (Smart Phrase **“sepsisassessment”**) 12-2. Disposition for admitted patients to the floor or telemetry per hospitalist and ED MD discussion. |  |
Appendix D

Sepsis Guidelines

SEPSIS GUIDELINE

Initiate Sepsis Bundle
- Evaluate Vitals, Confirm sepsis
- Clock starts when all 3 criteria are met:
  - SIRS + infection suspected/confirmed + organ dysfunction is documented

3-HOUR GOALS
- Establish IV/IO, obtain weight
- Measure lactate
- Draw blood cultures (ideally before antibiotics, document draw time)
- Start broad spectrum antibiotics
- If hypotensive or lactate >4 give rapid bolus 30 mL/kg IVF (min rate 1L in 30 min)
- If initial lactate >2, check again after fluids (within 4 hours of time zero)

6-HOUR GOALS
- Septic Shock Screen: If initial lactate >4 or persistent hypotension after IVF bolus, document “septic shock”
- Pressors for persistent hypotension (goal MAP >65 mmHg)
- Document reassessment of volume status and tissue perfusion in Septic Shock Reassessment Note

SIRS Criteria
- 2 OR MORE present?
  - □ Temp >38 or <36°C
  - □ Heart Rate >90 bpm
  - □ Resp Rate >20
    - ○ Or PaCO2 <32 mmHg
  - □ WBC >12K or <4K
    - ○ Or >10% bands

Known or Suspected Infection?
- □ Bloodstream, Pneumonia, Skin tissue, Wound, UTI, Bone/Joint, Endocarditis, Abdominal, Meningitis, Other

Organ Dysfunction?
- Any of the following:
  - □ Lactate >2 mmol/L
  - □ Altered Mental Status
  - □ Creatinine >2 mg/dL
  - □ Hypotension
  - □ Hypoxia (>94%)
  - □ Mechanical Ventilation
  - □ T bili > 2
  - □ Platelets < 100
  - □ INR > 1.5 or aPTT > 60
Appendix E

Root Cause Analysis

Communication
- Ineffective communication between MD-RN, ED-Pharmacy, and ED-Lab
  - Delay in enacting sepsis protocol

Antibiotics
- Hard needle stick or inability to obtain IV access
  - Ordered antibiotics not available on the unit

Staffing
- Unpredictability of the ED census
  - Low staffing

Gaps in Knowledge
- Low confidence in identifying signs and symptoms of sepsis
  - Low confidence in enacting the sepsis protocol

Fallouts
- Medications, such as antibiotics and fluids, not available on the unit
  - Lactic acid results not available

Deviation from Bundle Set Order
- MD orders differ from the CMS SEP-1 bundle

Consistent gaps in practice in the SEP-1 Bundle
Appendix F

Gap Survey Results

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

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

3. What is your Primary Shift & employment status?
   - AM: 4
   - PM: 5
   - NOC: 4
   - Per Diem: 1
   - Part-time: 1
   - Full-time: 0
   - Traveler or 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.
   - Average Rating: 4.13

6. Please rate your knowledge of early warning signs of sepsis.
   - Average Rating: 4.25

7. When triaging I am able to:
   - Complete entirety of screening: 7
   - Identify infection appropriately: 8
   - Call sepsis alert when needed: 8
   - Use drive phrase when charting: 3
   - Ensure timely and appropriate o...: 7

8. What is the average time it takes you to complete the sepsis screening section in epic?
   - < 5 minutes: 8
   - 5-10 minutes: 0
   - 10-25 minutes: 0
   - 25-35 minutes: 0
6. Please rate your knowledge of early warning signs of sepsis.

Average Rating: 4.25

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

Average Rating: 4.13

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

Average Rating: 4.00

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

Average Rating: 2.88

7. When triaging I am able to:

- Complete entirety of screening: 7
- Identify infection appropriately: 8
- Call sepsis alert when needed: 8
- Use dot phrase when charting: 3
- Ensure timely and appropriate o...: 7

8. What is the average time it takes you to complete the sepsis screening section in epic?

- <5 minutes: 8
- 5-10 minutes: 0
- 10-25 minutes: 0
- 25-35 minutes: 0
## Appendix G

**SWOT Analysis**

<table>
<thead>
<tr>
<th></th>
<th>Favorable/Helpful</th>
<th>Unfavorable/Harmful</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Internal</strong></td>
<td><strong>Strengths</strong>&lt;br&gt;• Sepsis quality improvement team&lt;br&gt;• Collaborative participation from ED sepsis coordinator and manager&lt;br&gt;• 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><strong>Weaknesses</strong>&lt;br&gt;• Lack of awareness from the nursing staff to identify necessary changes in sepsis prevention.&lt;br&gt;• Lack of emphasis and reinforcement for standardized practices.&lt;br&gt;• Poor Physician support of current best practices (incorrect bundle order sets)</td>
</tr>
<tr>
<td><strong>External</strong></td>
<td><strong>Opportunities</strong>&lt;br&gt;• Reduce risk of Sepsis&lt;br&gt;• Improvement of patient care and safety&lt;br&gt;• A hospital-wide commitment to quality improvement&lt;br&gt;• Tracking metrics on quality improvement indicators&lt;br&gt;• Evidence-based practice on Sepsis reduction, patient and nurse education</td>
<td><strong>Threats</strong>&lt;br&gt;• Lack of education retention of proposed changes among staff&lt;br&gt;• Limited time, staff, and resources to conduct change.&lt;br&gt;• Fast-paced busy ED workflow that may interrupt bundle administration times.</td>
</tr>
</tbody>
</table>
Appendix H

Cost-Benefit Analysis

<table>
<thead>
<tr>
<th></th>
<th>Sepsis</th>
<th>Severe Sepsis</th>
<th>Septic Shock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cost per case annually</td>
<td>$16,324</td>
<td>$24,638</td>
<td>$38,298</td>
</tr>
<tr>
<td>Costs of positive screen at triage</td>
<td>$13,384</td>
<td>$19,851</td>
<td>$31,704</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><strong>$2,940</strong></td>
<td><strong>$4,787</strong></td>
<td><strong>$6,594</strong></td>
</tr>
</tbody>
</table>
Appendix I

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

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

Create a PowerPoint presentation

Record a voice over of the PowerPoint for a video presentation

Submit the video presentation for feedbacks

Distribute the video presentation to the nursing staff

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

Update the bulletin board with a poster of this QI project
Statement of Determination and Non-Research Determination Form

Student Name: Gregory Trevino

**Title of Project:** Improving timely sepsis care through staff education

**Brief Description of Project**

- Data that Shows the Need for the Project
- Aim Statement
- Description of Intervention(s)
- Desired Change in Practice
- Outcome measurement(s)

After review of organizational data, San Francisco Bay Area emergency department has sepsis rates higher than state and national averages. The aim is to improve clinical practices of sepsis with the use of education in form of a poster/video. With this, we can properly educate staff on the current sepsis protocols to ultimately decrease patient fallouts.

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>Y</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>Y</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>Y</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</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>Y</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>Y</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>Y</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>Y</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>Y</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>Y</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):**

Gregory Trevino
Signature of Student:

Gregory Trevino

DATE 4/5/2023

SUPERVISING FACULTY MEMBER NAME (Please print):

Dr. Patterson

Signature of Supervising Faculty Member

DATE 5/7/2023