Improving Timely Sepsis Care through Staff Education Within the Emergency Department

Spencer Forest

University of San Francisco, forest.spencer@gmail.com

Follow this and additional works at: https://repository.usfca.edu/capstone

Part of the Critical Care Nursing Commons, and the Interprofessional Education Commons

Recommended Citation
Forest, Spencer, "Improving Timely Sepsis Care through Staff Education Within the Emergency Department" (2023). Master's Projects and Capstones. 1491.
https://repository.usfca.edu/capstone/1491
Improving Timely Sepsis Care through Staff Education Within the Emergency Department

Spencer Forest
School of Nursing & Health Professions, University of San Francisco
NURS 653 – Clinical Internship
Dr. Bob Patterson
May 4, 2023
TABLE OF CONTENTS

Section I: Title and Executive Summary

<table>
<thead>
<tr>
<th>Title</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>4</td>
</tr>
</tbody>
</table>

Section II: Introduction

<table>
<thead>
<tr>
<th>Problem Description (PICO)</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available Knowledge</td>
<td>7</td>
</tr>
<tr>
<td>Rationale</td>
<td>8</td>
</tr>
<tr>
<td>Specific Aim</td>
<td>10</td>
</tr>
</tbody>
</table>

Section III: Methods

<table>
<thead>
<tr>
<th>Context</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Benefit Analysis</td>
<td>13</td>
</tr>
<tr>
<td>Intervention</td>
<td>14</td>
</tr>
<tr>
<td>Study of Intervention</td>
<td>15</td>
</tr>
<tr>
<td>Measures</td>
<td>15</td>
</tr>
<tr>
<td>Ethical Considerations</td>
<td>16</td>
</tr>
</tbody>
</table>

Section IV: Results

Section V: Discussion

<table>
<thead>
<tr>
<th>Summary</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conclusion</td>
<td>18</td>
</tr>
</tbody>
</table>

Section VI: References

Section VII: Appendices
Appendix A: SEP-1 Bundle Protocol 25
Appendix B: Annotated Bibliography 26
Appendix C: Survey for Sepsis Protocols Improvement 32
Appendix D: 5P Assessment 38
Appendix E: SWOT Analysis 39
Appendix F: Fishbone Diagram 40
Appendix G: Cost Benefit Analysis 41
Appendix H: Bundle Compliance Metrics 42
Appendix I: Process Map 44
Appendix J: Statement of Determination 45
Abstract

Problem: This quality improvement project aims to increase SEP-1 sepsis bundle compliance among nursing staff at a 16-bed emergency department through targeted continual staff education on sepsis screening and best practices. Currently, the unit is experiencing cases of sepsis fallout and is not meeting the 90% threshold on three treatment metrics as defined by the institutional sepsis bundle time goals. Bundle compliance that adheres to the time goals decreases incidences of sepsis fallout and overall days in the hospital, while increasing positive patient health outcomes.

Context: A microsystem assessment was completed along with a staff gap survey to determine areas of improvement in delivery of timely and quality sepsis care. Review of microsystem data and survey results indicated that continual staff education could have a positive impact on SEP-1 bundle compliance.

Intervention: An educational video and printed poster focused on best practices for sepsis identification, screening, and bundle compliance was delivered to emergency department staff.

Measures: The outcomes measures were the three SEP-1 bundle metrics for delivery of sepsis care: first vital to lactic acid results, lactic acid result to antibiotic administration, and antibiotic order to administration.

Results: Post-intervention results were inconclusive due to project time restraints.

Conclusions: The project can be deemed successful due to the backing of a multidisciplinary team and for building a foundation for future research.

Keywords: sepsis, SEP-1 bundle, compliance, emergency department, education, screening
Section II: Introduction

Modern healthcare organizations are in a constant state of change. The delivery of care is continually adapting alongside new technologies, changes to best practices, and the implementation of new improvement initiatives. As laid out in the American Nurses Association’s (ANA) 2023-2025 Strategic Plan, it is imperative for “nurses to innovate and lead in in dynamic and complex practice environments” (American Nurses Association, n.d.-a, para 2). The Clinical Nurse Leader (CNL) is positioned to act as a change agent by applying evidence-based research to lead quality improvement initiatives on a microsystem level. As unit-level leaders within complex care delivery systems, the CNL can affect continued change by promoting an environment of continuous improvement and applying evidence-based practice to change initiatives (Bender, et al., 2019).

Sepsis is a potentially fatal condition that is defined by severe organ dysfunction due to dysregulated inflammatory response to infection (Jarczak et al., 2021). Clinically, sepsis is a serious condition that affects over 1.7 million US adults and contributes to ~33% of all deaths during hospitalization (Centers for Disease Control and Prevention, 2022). Given the severity of the condition, emergency departments (ED) are on the front lines of sepsis identification and treatment, with over 850,000 annual sepsis cases present in EDs, of which 70% of cases require hospitalization, and 25% of those hospitalizations necessitate admittance to an Intensive Care Unit (Wang et al., 2017). Due to the severity of the condition and the complexity of care required, sepsis is estimated to be the costliest condition for in-hospital treatment, causing a significant healthcare burden (Hajj, et al., 2018).

Current standards for ED treatment of sepsis outlined by the Surviving Sepsis Campaign (SSC) include the implementation of a sepsis bundle that contains four treatment elements:
measurement of lactate, blood cultures drawn before antibiotic administration, antibiotics administered, and administration of IV fluids (Evans at al., 2021). The Centers for Medicare and Medicaid Services (CMS), commonly refers to the above treatment modalities as the SEP-1 bundle, which requires treatment within three hours of sepsis identification, and six hours if the lactate level is shown to be elevated (Alexander, at al., 2022). Given the need for timely bundle completion to achieve optimal health outcomes for septic patients, it is critical that ED nurses have a strong foundational understanding of the signs and symptoms of sepsis to shorten the window between screening and treatment.

The microsystem site for this project was a 16-bed ED in San Francisco, CA. This ED is part of a larger hospital system with an organizational initiative to increase sepsis bundle compliance by ED staff. To improve each of the treatment metrics elements outlined by the SEP-1 bundle (Appendix A), continual quality improvement efforts are needed to ensure bundle compliance metrics are being met and quality patient care is being delivered to patients within the EDs.

**Problem Description**

ED’s are commonly the initial care environment for patients with sepsis. Through early recognition, screening, and initiating early care interventions, ED nurses play an important role in providing timely treatment. Many ED nurses are supported by their healthcare systems with tools to assist in screening patients for sepsis and standardizing care protocols upon identification (Wang et al., 2017). At the project site these sepsis care protocols exist in the form of an integrated Electronic Health Record (EHR) sepsis screening tool and initiated order bundle protocol upon a positive screen as seen in Appendix A. In addition, the larger organization has a dedicated Sepsis Coordinator position to support improvement initiatives aimed at improving
Improving Timely Sepsis Care through Staff Education Within the Emergency Department

Despite the assistive tools and institutional support, many of the sepsis treatment metrics within the ED are not meeting the performance benchmarks established by the larger hospital organization.

These measured metrics include staff compliance percentages for the following: first vital to lactic acid result within 60 minutes, lactic acid result to antibiotic administration within 60 minutes, and antibiotic order to administration within 35 minutes. In addition, total number of sepsis fallout incidences within the ED are recorded each month. A microsystem audit of the unit data as seen in Appendix B, shows significant areas of improvement in sepsis bundle compliance. Research shows that hospitals who show consistent SEP-1 bundle compliance have better patient outcomes, including decreased length of stays, readmissions, and patient mortality (Alexander et al., 2022), and that nursing staff knowledge of early sepsis identification during screening is a critical aspect of sepsis bundle utilization (Rechter, et al., 2022). At the project site, review of monthly sepsis bundle metrics and year over year comparisons indicated the need for further analysis of the nursing staff’s understanding of sepsis screening and proficiency with the current bundle processes, with an aim to support staff through continual education in efforts to increase overall SEP-1 bundle compliance.

Available Knowledge

Review of current evidence and literature related to improving sepsis bundle compliance was guided by the following PICOT question. In patients who are treated for sepsis in an emergency department (P), how does continued nursing education on sepsis screening and current best practices related to SEP-1 bundle usage (I), compared to current care practices (C), change SEP-1 bundle compliance (O), over a three-month period (T).
Literature Review

A focused review of literature was performed to evaluate the available evidence and research for continual staff education on sepsis screening and SEP-1 bundle compliance. Articles ranging from January 2017 – January 2023 were searched for within the databases of CINAHL, The National Library of Medicine, and PubMed. Search queries were performed with the following keywords and phrases: sepsis screening, emergency department, SEP-1, sepsis bundle, and nursing education. Ten relevant articles were found that met the criteria for inclusion in the project. Review of the available literature showed an abundance of high-quality research that supported the project interventions and goals. The project was guided by evidenced based research that had strong quality measures including large sample sizes control trials. Review of the literature showed that staff education interventions related to sepsis screening have positive correlations to improved bundle compliance metrics and overall patient health outcomes. Continued review of the research can be found in Appendix B.

Rationale

This project utilized Lewin’s Change Theory as the guiding change model. Lewin’s Theory provides a framework for identifying the factors responsible for influencing current processes and practices. The theory posits that identification of influencing factors is the first step in creating change, and that strengthening or diminishing these factors will drive successful change. It consists of three concurrent stages: Unfreezing, Moving, and Refreezing (Shirey, Maria R., 2013). Utilization of this framework assisted project stakeholders in assessment of current influencing factors on the unit, while aligning with the project’s aim of improving SEP-1 bundle compliance.
In the unfreezing stage, a change agent begins the process of recognizing the current problem and the need for change. During this stage, stakeholders initiate a discovery phase to identify current processes and factors that are either positively or negatively impacting change (Shirey, Maria R., 2013). By assessing current influences such as workflow patterns, staff experience, and familiarity with tools and processes, the project leaders can determine what is preventing change from occurring and what can be implemented to affect future outcomes. During the unfreezing phase of this project, a group of six masters nursing students met with two organizational stakeholders who recognized that nursing staff were not meeting SEP-1 compliance metrics. The students and stakeholders formed the leadership group tasked with unfreezing the current status quo. Using the change model as guidance, the group utilized a gap survey sent to ED nursing staff to assess which influencing factors were affecting the unit’s sepsis workflow. The results of this survey served as the foundation from which the group initiated their change project. Survey results can be seen in Appendix C.

In the moving phase of the change model, new objectives and procedures are implemented in efforts to affect future change and to achieve improved outcomes (Shirey, 2013). Through survey response analysis, this project saw an opportunity for SEP-1 bundle compliance improvement through continual staff education on current best practices and transparency in current performance metrics. During this stage of the model staff education interventions were implemented to reinforce knowledge of sepsis screening and unit-based bundle compliance protocols.

In the refreezing stage, the change model seeks to reinforce and stabilize the new behavior patterns which have been positively affected by the past stages. This stage can be considered as the new equilibrium in which improved outcomes are recognized and new
Improving Timely Sepsis Care through Staff Education Within the Emergency Department

Processes become part of institutional change (Shirey, 2013). Through new knowledge and an enhanced skillset drawn from the educational interventions, staff will establish new behavior patterns and exhibit increased bundle compliance, creating a new environment of care and a new baseline for data metrics.

Specific Aim Statement

This project’s specific aim is to increase compliance with the three measured time goals in the SEP-1 sepsis bundle at a 16 bed ED in San Francisco. This process begins with assessing the nursing staff’s clinical knowledge of sepsis screening and proficiency with the current sepsis protocol. It continues with providing continual staff education to address knowledge gaps. The process ends when institutional benchmarks of 90% compliance are seen in quarterly data. By working on this process, the project expects to improve patient outcomes, decrease incidence of sepsis fallout, and reduce cost of treatment for the hospital. It is important to work on this now because current compliance rates are below the 90% threshold which is leading to inadequate treatment processes and contributing to incidences of sepsis fallout.

Context

To provide context to the project, a microsystem assessment was performed utilizing the 5P’s model, in addition to a SWOT analysis. According to the Institute for Excellence in Health and Social Systems (2010), “a clinical microsystem is a small, interdependent group of people who work together to regularly provide care for specific groups of patients”. Using the 5P framework, project leaders began the process of supporting change by evaluating the clinical microsystem through five categorical metrics: purpose, patients, professionals, processes, and patterns. The 5P assessment is summarized below and can be referenced in Appendix D.
Improving Timely Sepsis Care through Staff Education Within the Emergency Department

Purpose

The microsystem is a 16-bed, 24-hour Level 2 Geriatric Emergency Department which utilizes specialty trained staff to deliver quality geriatric-focused care. In addition to geriatric care accreditation, the unit provides emergency care to patients experiencing serious injuries or other medical conditions requiring immediate intervention. As it relates to sepsis, the unit’s purpose is to provide timely and quality sepsis screening and treatment for septic patients. Treatment within the ED should adhere to bundle protocols for patient stabilization and to prevent further necessity for higher acuity treatment.

Patients, Professionals, Processes

The patients who are treated for sepsis at the project site include any admissions who are experiencing any of the typical physiological signs and symptoms shown in the unit sepsis screening protocol in Appendix A. As a level 2 Emergency Department certified in geriatric care, the patient population skews older and as a result is prone to presenting with positive sepsis screens. The professionals that comprise the treatment team include a total of 35 registered nurses spread over three eight-hour shifts (day, evening, night) along with one physician during day shift, two during evening, and one during night. Guiding nursing staff procedures and unit-based sepsis policy include a Nursing Manager and Sepsis Coordinator. The process for sepsis care begins with triage and the use of sepsis screening tools. If the screen is positive, the nurse will notify the rapid response team RN or charge nurse who will then repeat the screen, notify the medical director, and initiate the sepsis order set, concluding with documentation of all interventions. Observed patterns at the project site showed inconsistent compliance with the SEP-1 order bundle goal of 90% across all institutional benchmarks. Communication with stakeholders involved in sepsis improvement revealed that nurses were not completing the sepsis
Improving Timely Sepsis Care through Staff Education Within the Emergency Department

current screening tool, while qualitative interviews with ED RN’s indicated there was ineffective MD-RN communication upon a positive sepsis screen and subsequent treatment.

**SWOT Analysis**

A SWOT analysis is a strategy tool that assesses the strengths, weaknesses, opportunities, and threats of an organization to determine both areas of improvement and positions of strength (Teoli, at al., 2022). This tool was utilized by the project team to assess the unit for both improvement opportunities and core strengths, which can be seen in Appendix E. Conclusions drawn from the SWOT analysis showed areas of strength such as institutional support for sepsis quality improvement initiatives through personnel dedicated to sepsis and investment in tools to track sepsis measures. Conversely, the analysis showed that despite the institutional support there was a lack of awareness among nurse to identify necessary changes and quality improvement initiatives and poor communication between interdisciplinary teams while treating positive sepsis screens. Through utilization of the unit’s foundational strengths, and recognition of the areas of improvement, the SWOT analysis revealed opportunities for change. These changes include forming a commitment to hospital wide quality improvement initiatives to reduce the risk of sepsis and initiating evidence-based practice through nurse education on screening, treatment, and prevention. Furthermore, threats to change were identified that would have to be considered before interventions. These threats included staffing inconsistencies, limited staff resources for change initiatives, and operating within a fast-paced and busy ED which add to sepsis bundle workflow interruption.

Before implementing change interventions, the project group completed a root cause analysis to determine the determine the most areas of nursing practice in which change will be most impactful. This was completed through the microsystem assessment, SWOT analysis, and
with the results of the staff gap survey. The results of the root cause analysis can be reviewed through a fishbone diagram in Appendix F.

**Cost Benefit Analysis**

To ensure that this quality improvement project could be implemented and that all interventions would be fiscally responsible and a positive return on investment, a cost benefit analysis was performed. The costs of implementing the project were compared to the potential savings associated with reduced sepsis cases. The deliverable educational interventions for the project came in the form of an eight-minute video designed to be watched by nursing staff during regular shift hours or during shift changes, along with a poster posted in the staff breakroom designed to be viewed as needed. As the educational video and poster were created and printed with the resources of the students involved in the project, there were no upfront costs to the organization for implementation.

Current studies show that sepsis produces the highest cost burden for hospitals, with costs increasing drastically with increasing severity and length of stay (LOS) (Paoli, et al., 2018). This research showed that sepsis costs $16,324 per hospitalization, with costs increasing with severity to $24,638 for severe sepsis, and $38,298 for septic shock. Corresponding daily hospital costs for severity were $1,830, $2,193, $38,298 (Paoli, et al., 2018). Critical to mitigating these costs is timely diagnosis and treatment which decrease condition severity and patient LOS. Given the project aim to initiate timely treatment in accordance with the SEP-1 bundle and to decrease overall incidences of sepsis fallout, there is an opportunity for significant cost savings with successful implementation. See Appendix G for the Cost Benefit Analysis.
Intervention

During the pre-intervention phase of the project, the group met with the organizational sepsis project stakeholders to identify the organizational needs, project goals, and path forward for unit-based change. The group decided on a pre-intervention gap survey circulated to the ED nursing staff to assess demographics, experience, and potential areas for change interventions. This survey and its results are seen in Appendix C.

After review of the survey results and unit-based sepsis bundle compliance metrics (see Appendix F), the group identified an opportunity to increase SEP-1 bundle compliance through continual staff education. With approval from the project stakeholders, the group completed an educational presentation in the form of a PowerPoint and scripted recorded video to be reviewed by the nursing staff. In addition, an educational poster was printed and posted in the staff breakroom for further review. The educational content of both the video and the poster highlighted best practices for sepsis screening, SEP-1 bundle implementation, and sepsis related tips for patient advocacy. Furthermore, the slides educated staff on the unit’s current bundle compliance performance metrics to identify gaps in practice and to set goals for areas of improvement. The video was distributed to staff with a signed attestation to ensure viewing and integrated within the unit’s continual education for new staff, while the poster was put up in the staff breakroom for further reinforcement and reference.

The project was guided by The Plan-Do-Study-Act (PDSA) Methodology, a commonly used tool for healthcare improvement, which according to Christoff (2018) is “a commonly used tool for healthcare improvement” which utilizes a “four step model for improving a process” (para 2). The Plan portion of the cycle was completed through the microsystem assessment and identification of gaps in practice through the staff survey, culminating in the creation of the
educational interventions. The Do portion of the cycle was completed through the delivery of the video and poster to the ED nursing staff. Due to project time constraints, the Study and Act cycles were not completed, however the PDSA cycle can continue once next quarter’s bundle compliance data is obtained. Review of the 2023 second quarter data will show whether the intervention was successful in changing SEP-1 bundle compliance metrics, leading to the act phase which can determine if the educational interventions should be continually implemented for future use. A process map of the project steps and interventions can be seen in Appendix I.

**Study of Intervention**

Prior to the intervention, the unit saw inconsistency in meeting its quarterly benchmarks for the SEP-1 bundle compliance as seen in Appendix G. Pre-intervention review showed that the unit saw compliance ranging from 57%-100% in both the last quarter of 2022 and the first quarter of 2023. Due to project time constraints, data has not been obtained for the second quarter of 2023. To study the effectiveness of the project interventions it is recommended that project stakeholders review that data to see if the staff is meeting the 90% compliance threshold. Qualitatively, the project was received with an overwhelmingly positive response from both the sepsis coordinator and the ED charge nurse, who have recommended the video be shown to ED nursing staff across the hospital network.

**Measures**

Evaluation of the project can be measured through the SEP-1 bundle compliance metrics outlined in Appendix H. This data is obtained by the sepsis coordinator and shared with the ED nursing manager. The group recommends continual review of these metrics to determine success
of the project and to evaluate the effectiveness of continual staff education on sepsis screening and overall SEP-1 bundle compliance measures.

**Ethical Considerations**

The project group acted with the ethical consideration of Provision 4 of the American Nurses Association’s (ANA) Code of Ethics, which states that “The nurse has authority, accountability, and responsibility for nursing practice; makes decisions; and takes action consistent with the obligation to promote health and to provide optimal care” (ANA, 2015). SEP-1 bundle compliance is important in providing evidence-based and optimal care to patients experiencing the physiological effects of a potentially fatal health condition. The project’s goal of increasing bundle compliance within a microsystem aligns directly with the ethical standards of providing quality nursing care and promoting health of patients. The project did not have any ethical considerations or conflicts of interest regarding its implementation and study of data. A statement of determination indicating the project is an evidence-based quality improvement project and does not involve human subjects, as seen in Appendix J.

**Results**

The results of this project cannot be determined at time of writing due to time restraints in collecting post intervention data. It is recommended by the project group that analysis for the second quarter data of 2023 be measured in the following SEP-1 bundle compliance metrics: first vital to lactic acid results, lactic acid result to antibiotic administration, and antibiotic order to administration. Pre-intervention data showed that the ED nursing staff did not meet the institutional threshold of 90% compliance in these metrics. If review of the second quarter 2023 data shows that these metrics are meeting the 90% threshold, it could be concluded that staff
education interventions were successful in closing the knowledge gap for ED staff in sepsis screening and SEP-1 bundle compliance.

**Summary**

Sepsis is a potentially fatal condition that requires accurate screening and timely interventions to ensure positive patient outcomes and to decrease the cost burden for the hospitals delivering care. Supported by institutional quality improvement goals, this project identified the need for continual ED nursing staff education to close the gap between current practice and the delivery of quality sepsis care through SEP-1 bundle compliance. Due to the inability for the project group to analyze the post-intervention data, it is inconclusive to determine whether the project was a success. The project met its pre-intervention planning goals and the educational interventions were given support by the project stakeholders. It is necessary to continually review post-intervention data to determine if the educational interventions were successful in increasing bundle compliance metrics.

Although post-intervention data remains to be collected, there are indications from similar studies that staff education focused on SEP-1 bundle compliance has been effective increasing the quality of sepsis care. One study by Threatt (2020) utilized staff education on proper use of a sepsis screening tool and the importance of providing quality sepsis care, showing that education interventions lead to a 5.9% decrease in sepsis related mortality. Furthermore, a study showed that a sepsis quality improvement initiative that utilized an education campaign including videos and printed materials helped contribute to a reduction in sepsis mortality by 4.5% (Alnababteh, et al., 2020).
The project successfully utilized many quality improvement tools to complete the plan and do stages of a PDSA cycle. Through a detailed microsystem assessment and data analysis, the project group identified areas for continual improvement in delivering quality sepsis care. This assessment can be used as a foundation for future quality improvement projects at this emergency department or other care delivery environments that treat sepsis. Furthermore, the educational video was backed by current evidence-based research that educates staff on best practices in sepsis care, which is applicable to a multitude of care settings.

Lessons were learned through the project planning, implementation, and retrospective study. At the heart of the project’s success was a shared patient-focused vision to improve the timeliness and quality of sepsis care. Having strong multidisciplinary support from both ED staff and the larger hospital system was paramount to implementing this quality improvement project. However, coordination between multiple stakeholders lead to extended communication times that conflicted with project timelines and contributed to the project’s limitations.

**Conclusion**

This project can be deemed successful due to the completion and delivery of institutionally supported and evidence-based education to ED staff who are the first to treat sepsis. We believe that continual education on best-practices and unit-based tools will lead to improved SEP-1 bundle compliance metrics and in turn, improved patient outcomes. Currently, there is support from the project stakeholders to share the video with more staff, and if it is shown to be successful, the educational deliverables can easily be shared with other emergency departments within the hospital network. This project is important because it laid a foundation for further research and quality improvement initiatives. For the project to remain successful,
future stakeholders will need to continually keep staff educated on recent best-practices and continue to improve SEP-1 bundle compliance to meet institutional benchmarks.
References


Improving Timely Sepsis Care through Staff Education Within the Emergency Department


Improving Timely Sepsis Care through Staff Education Within the Emergency Department


### Appendix A

**SEP-1 Bundle Protocol**

<table>
<thead>
<tr>
<th>Task #</th>
<th>Responsible Operator</th>
<th>Task Description</th>
<th>Task Cycle Time</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ED Triage Nurse</td>
<td>1. Triage patient per “ED Triage Standard Work” and identifies patient through positive sepsis screen&lt;br&gt;2. Notify Charge RN of Positive Sepsis Screen, let Charge RN know if patient is PUI&lt;br&gt;3. Document evaluation in “NI Sepsis Flowchart”&lt;br&gt;4. Initiate RN “Sepsis In Triage Standardized Procedures”[794]” in EPIC (type “Sepsis” in search bar, scroll to bottom, click “Temp”)&lt;br&gt;5. Identify room number and call ED Sepsis Alert&lt;br&gt;6. YCMAC: Voice path button and say “Broadcast to ED” + “sepsis alert, room number” – local broadcast in ED&lt;br&gt;7. DAVN Out 44444 for the Operators. Inform operator to overhead “sepsis alert, room number” – local broadcast in ED</td>
<td>5 min</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Charge RN</td>
<td>3. Identify room number and call ED Sepsis Alert&lt;br&gt;4. YCMAC: Voice path button and say “Broadcast to ED” + “sepsis alert, room number” – local broadcast in ED</td>
<td>1 min</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Triage Tech/ ED Triage RN</td>
<td>3. Room Patient</td>
<td>1 min</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>ED Sepsis Alert Response Team</td>
<td>3. Room Patient</td>
<td>1 min</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>ED Sepsis Alert Response Team</td>
<td>3. Room Patient</td>
<td>1 min</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>ED Sepsis Alert Response Team</td>
<td>3. Room Patient</td>
<td>1 min</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>MD</td>
<td>3. Evaluate patient, determine need for antibiotics and fluids&lt;br&gt;4. Use the MD Orders: ED SIRS Suspected Sepsis[292] or ED Sepsis Shock[295], as appropriate.</td>
<td>15 min</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>ED Primary Nurse</td>
<td>3. Follow “Sepsis In Triage Standardized Procedures”[794]”, concurrent with MD Evaluation and order: Lactate in the Point of Care Testing device if available and notify MD of results verbally.</td>
<td>4 min</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Pharmacy</td>
<td>3. Review fluid resuscitation (consider NICOM assessment)</td>
<td>5 min</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Primary Nurse</td>
<td>3. Evaluate fluid resuscitation (consider NICOM assessment)</td>
<td>15 min</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>ED MD</td>
<td>3. Document contraindications for antibiotics and/or fluids as appropriate using standard language from Smart Phrase “SEPSEMPHIBLISTICATIONS”</td>
<td>5 min</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>MD</td>
<td>3. If patient has a non-infectious process, document/confirm that “sepsis diagnosis is INAPPROPRIATE” i.e. cardiovascular shock, renal failure.</td>
<td>4 min</td>
<td></td>
</tr>
</tbody>
</table>

**SEP-1 Bundle Protocol**

<table>
<thead>
<tr>
<th>Task #</th>
<th>Responsible Operator</th>
<th>Task Description</th>
<th>Task Cycle Time</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>ED MD</td>
<td>2. Re-evaluate decision to order antibiotics and/or change fluid bolus&lt;br&gt;3. Document contraindications for antibiotics and/or fluids as appropriate using standard language from Smart Phrase “SEPSEMPHIBLISTICATIONS”&lt;br&gt;4. If patient has a non-infectious process, document/confirm that “sepsis diagnosis is INAPPROPRIATE” i.e. cardiovascular shock, renal failure</td>
<td>1 min</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>ED Primary Nurse</td>
<td>2. If antibiotics ordered, notify Pharmacist of high priority ANTIBIOTIC order for SEPSIS patient requiring quick verification.</td>
<td>3 min</td>
<td></td>
</tr>
</tbody>
</table>
Appendix B

Annotated Bibliography


This article assesses the effect of sepsis improvement programs in emergency departments using benchmarks and guidelines set by the Surviving Sepsis Campaign (SSC). The article analyzes various intervention programs that aim to educate staff, increase compliance with bundle protocols, and standardization of care. The research in this study contributed to the project intervention through concluding evidence that multidimensional performance improvement programs increase compliance with sepsis care protocols.


Through analysis of two retrospective cohort studies, this article looks at the effectiveness of targeted education for staff on the use of an electronic health record sepsis tool. By comparing two patient cohorts, one which received care from staff who had targeted sepsis tool education, and one which did not, the study concludes that targeted tool education increases staff compliance and patient centered outcomes. The
Improving Timely Sepsis Care through Staff Education Within the Emergency Department

studies presented relevant conclusions that support the project intervention of continued staff education as a tool for increasing staff sepsis bundle compliance.


The author analyzes the use of a evidence-based ER nurse Sepsis Identification Tool and its effect on sepsis bundle compliance and completion times, patient mortality, and length of stay. During huddles and rounds, ER nursing staff were given direction and education by leadership on the implementation of the tool and asked to implement it in their care.

By evaluating data from both pre and post-implementation of a Sepsis Identification Tool, the study saw use of the tool lead to across the board improvements in triage time, time to obtain lactate and blood cultures, and time to administer antibiotics. Additionally, it showed a decrease in patient mortality, while no change in length of stay. The outcomes measured in this study directly relate to the project through its conclusion that education based interventions have positive outcomes on sepsis tool compliance.


[https://search.proquest.com/docview/2754897395](https://search.proquest.com/docview/2754897395)

Researchers tested the implications of a modular online sepsis education program on the knowledge gain of Registered Nurses (RN) and Patient Care Technicians (PCT) in
identifying and treatment of sepsis on a medical surgical unit. Education was provided in the form of online modules. As an interventional study, the researchers used pre- and post-test assessments of both nurses and PCA’s to evaluate knowledge gain related to the module content through test scores. Evaluation of the scores indicated that the educational interventions increased staff knowledge gain related to sepsis identification and treatment.


Through an online cross-sectional survey distributed to RNs across four emergency departments, the researchers aimed to assess RN knowledge of sepsis and their resulting perspectives about caring for patients with sepsis. Through assessment of sepsis knowledge and long form qualitative responses, the researchers concluded that there were significant gaps in knowledge for the ED nurses surveyed and that education is a critical component for implementing sepsis bundles. This study is relevant to the project through its use of staff surveys as an assessment tool to implement change.


The objective of this study was to improve sepsis bundle adherence rates among medical-surgical nurses. Through a 3-phase program, the project consisted of data collection,
interactive training sessions with nurses, and a pre-test where nurses assessed by their knowledge of sepsis, early recognition, and sepsis protocol standards. Phase 4 of the project evaluated the results and put in place an action plan that consisted of laminated sepsis lanyards for nursing staff and educational posters placed in charting areas. Conclusions from this study proved relevant to the project in that continual nursing staff education is an effective method to improve departmental sepsis performance metrics.


In this article, the authors review the effectiveness of early sepsis detection and what the subsequent timely interventions have on survivability in septic patients. By using the framework and definitions of sepsis issued by the Society of Critical Care Medicine, the authors review the effectiveness of early interventions such as screening, early identification, and early administration of antibiotics and fluids to increase patient health outcomes. This study was relevant to the project as it related to sepsis bundle compliance quality improvement programs with an education component increase overall bundle compliance.

The authors of this study hypothesize that implementing an education program for nurses utilizing the quick-Sequential Organ Failure Assessment (qSOFA) would increase the rate of sepsis screening, while improving time to treatment metrics. The sepsis education initiative as given to over 1,000 nurses by 2 sepsis education nurses who rounded on different units. Through the review of 30 pre- and 30 post-education sepsis patients, the authors reviewed differences in time to recognition, time to antibiotics, and overall antibiotic compliance for the units. The authors conclude that the positive changes in the defined metrics showed that an extensive sepsis-based education initiative is a great tool to improve sepsis patient outcomes, which pertains directly to the improvement project of continual staff education.


The authors of this study implemented a simulation program designed to assess and educate nursing staff on the clinical-decision making skills for a potentially septic patient. The authors used a pretest and posttest to determine knowledge gained and retained through the simulation education. The study showed that nurses showed statistical improvement in knowledge, including: identification of vital sign changes, assessment of perfusion, and time frame initiation for sepsis treatment. The authors conclude that modal and diverse education beyond learning management systems can have increased effectiveness for nursing staff education. Although this study utilized simulation as an educational tool, its conclusions
proved relevant to initiating educational interventions as effective tools for increase staff knowledge of sepsis screening.

https://search.proquest.com/docview/1929674571

The authors of the study aimed to implement a sepsis screening and notification protocol in two hospitals, which were identified as lacking a universal protocol and necessary nursing education to provide early care for septic patients. Education was given to staff through unit sepsis champions who focused on signs and symptoms, use of SBAR communication to physicians, and use of a sepsis screening tool. The authors used a pre- and post-survey to assess knowledge of sepsis signs and symptoms, which saw an increase of 50% in nursing knowledge after intervention. Additionally, there was a significant reduction in time to provider notification. The authors concluded that sepsis identification can be improved with tools, education, and support which directly relates to the improvement project.
Appendix C

Survey for Sepsis Protocols Improvement

1. What is your highest degree?

- ADN: 0
- BSN: 4
- MSN: 4
- DNP: 0

2. How long have you been working at CPMC 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: 5
- PM: 2
- NOC: 0
- Per Diem: 1
- Part-time: 4
- Full-time: 1
- Traveler or Temporary: 0
4. How many years have you been an RN?

<table>
<thead>
<tr>
<th>Experience</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 year</td>
<td>1</td>
</tr>
<tr>
<td>1-4 years</td>
<td>1</td>
</tr>
<tr>
<td>5-10 years</td>
<td>4</td>
</tr>
<tr>
<td>10+ years</td>
<td>2</td>
</tr>
</tbody>
</table>

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 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

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?

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/manpower.</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.

4. Responses

<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 fallouts.

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

6 Responses

<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>MD’s 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!

2 Responses

<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 plasmalyte should be the standard fluid stocked and used in the ED</td>
</tr>
</tbody>
</table>
Appendix D

5P Assessment

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

**Patients**
ED patients who suffered 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**
- Inconsistent compliance with meeting CMS SEP-1 bundle goal of 90% across all benchmarks
- Feedback that nurses were not completing sepsis screening tool
- Ineffective MD-RN communication
Appendix E

SWOT Analysis

**Strengths**
- Sepsis quality improvement team
- Collaborative participation from the ED sepsis coordinator and manager
- Hospital Quality Dashboard in place that tracks rates of Sepsis in the ED and select wards, comparing them to CA and USA averages.

**Opportunities**
- Reduce the risk of Sepsis
- Improvement of patient care and safety
- A hospital-wide commitment to quality improvement
- Tracking metrics on quality improvement indicators
- Evidence-based practice on Sepsis reduction, patient and nurse education

**Weaknesses**
- Lack of awareness from the nursing staff to identify necessary changes in sepsis prevention.
- Lack of emphasis and reinforcement for standardized practices.
- Poor Physician support of current best practices (incomplete bundle order sets).
- Poor communication between Physicians and nurses.

**Threats**
- Lack of education retention of proposed changes among staff.
- Limited time, staff, and resources to conduct change.
- Fast-paced busy ED workflow that may interrupt bundle administration times.
Appendix F

Root Cause Analysis
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><strong>Net savings</strong></td>
<td><strong>$2,940</strong></td>
<td><strong>$4,787</strong></td>
<td><strong>$6,594</strong></td>
</tr>
</tbody>
</table>
Appendix H

Bundle Compliance Metrics

<table>
<thead>
<tr>
<th></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 2022</td>
<td>100%</td>
<td>86%</td>
<td>100%</td>
</tr>
<tr>
<td>November 2022</td>
<td>60%</td>
<td>90%</td>
<td>70%</td>
</tr>
<tr>
<td>December 2022</td>
<td>71%</td>
<td>85%</td>
<td>75%</td>
</tr>
</tbody>
</table>

**OFIs in ED**

October- None

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

December- 1 Repeat lactate (Time Zero 0735a)
Improving Timely Sepsis Care through Staff Education Within the Emergency Department

<table>
<thead>
<tr>
<th></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>January 2023</td>
<td>59%</td>
<td>94%</td>
<td>83%</td>
</tr>
<tr>
<td>February 2023</td>
<td>60%</td>
<td>92%</td>
<td>77%</td>
</tr>
<tr>
<td>March 2023</td>
<td>68%</td>
<td>100%</td>
<td>57%</td>
</tr>
</tbody>
</table>

**OFIs in ED**

January - None
February - None
March - TBD
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

- 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

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

If the goals are met, then continue to provide support to nursing staff
If the goals are not met, need to re-evaluate the PDSA cycle and make appropriate changes

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

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

Statement of Determination

Project: Statement of Determination and Non-Research Determination Form

Student Name: Spencer Forest

Title of Project: Improving Timely Sepsis Care Through Staff Education

Brief Description of Project

This project aims to improve the timeliness of sepsis care through nursing staff education at a mid-sized Bay Area Emergency Department. By educating nursing staff on early sepsis identification, unit protocols, and evidence-based research on best practices, we aim to improve the overall timeliness of sepsis care given on the unit.

- Data that Shows the Need for the Project:
- Aim Statement: This project aims to improve the timeliness of sepsis care at a small Bay Area Emergency Department. This process begins with staff education on sepsis screening, best practices, and unit-based sepsis bundle protocols. The process ends with improved time-based sepsis care metrics of: vital signs to lactic acid lab results, lactic acid results to antibiotic administration, and antibiotic order to administration. As well as reduction in overall sepsis fallout incidents. By working on this process, we expect overall improvement in sepsis care delivered to patients at the Emergency Department. It is important to work on this now because of measured sepsis care metrics that do not meet departmental goals.
- Description of Intervention(s): Staff education through educational video shown to all current and new staff on sepsis identification and screening, unit based metrics, and unit-based bundle protocol compliance.
- Desired Change in Practice: Increased staff understanding on sepsis screening and identification, increased compliance with unit-based sepsis bundle orders and protocols.
- Outcome measurement(s): Improved times and compliance in: first vital to lactic acid results, lactic acid result to antibiotic administration, and antibiotic order to administration.

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.

Comments:

---

**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>X</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>X</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>X</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>X</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></td>
<td>X</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>X</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>X</td>
<td></td>
</tr>
</tbody>
</table>
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.

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.”

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. Holmman, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.

STUDENT NAME (Please print):

Forest Spencer

Signature of Student:

Spencer Forest

DATE 05/09/2023

SUPERVISING FACULTY MEMBER NAME (Please print):

Dr. Patterson

Signature of Supervising Faculty Member:

DATE 4/17/2023