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Implementation of Hospital-Wide Surge Plan to Reduce Emergency Department Length of Stay

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This Manuscript Partially Fulfills the Requirements for the

Doctor of Nursing Practice Program and is Approved by:

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University of St. Augustine for Health Sciences
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Abstract

Practice Problem: Suboptimal patient flow throughout the hospital has resulted in an increased length of stay (LOS) for emergency department patients and the potential for adverse events.

PICOT: In admitted and discharged emergency room patients (P), how does a hospital-wide surge plan (I) compared to current throughput plan (C) affect the length of stay (O) within 8 weeks?

Evidence: The literature evidence reviewed supported the implementation of a hospital-wide surge plan approach positively impacts the emergency room length of stay and patient outcomes.

Intervention: The primary intervention for this project was the implementation of a hospital-wide surge policy. Targeted interventions focused on protocols for all areas to expedite processes to improve throughput and decrease the LOS for ED admitted and discharged patients.

Outcome: While the post-data results did not have a statistically significant change in the ED length of stay (LOS) for admitted and discharged patients, the results nevertheless, demonstrated a significant clinical impact on hospital-wide throughput and clinical outcomes.

Conclusion: Using a hospital-wide surge plan effectively improves hospital throughput and can lead to a decrease in ED length of stay for admitted and discharged patients. This project helped the leaders implement new processes to improve collaboration and throughput in the organization.

Implementation of a Hospital-Wide Surge Plan to Decrease Emergency Department Length of Stay

Emergency department (ED) overcrowding is a global problem caused by a variety of factors throughout the hospital. Patients boarding greater than 8 hours rose approximately 130% (from 7% to 16%) from 2012 to 2019 according to the Association of Academic Chairs of Emergency Medicine (AACEM) (Kelen et al., 2021). The inability to move patients out of the ED promptly has resulted in increased length of stay LOS for admitted and discharged patients, patient safety concerns, and an increased risk of mortality (Morley, et al., 2018). Literature reviews have reinforced a hospital-wide multidisciplinary approach focusing on identifying problems, developing solutions, oversight of implementation, and evaluation of strategies as key to improvement in patient flow (Pasaresi, et al., 2020).

The development of a hospital-wide surge plan is an organizational structure that requires executive leadership involvement, data-driven management, hospital-wide coordinated strategic action plans, and accountability (Chang et al., 2018). The purpose of the project was the development and implementation of a hospital-wide surge plan to improve hospital throughput that would decrease ED length of stay for admitted and discharged patients. The implementation of a hospital-wide surge plan focused on specific action items for each department to improve hospital throughput resulting in a decreased LOS for admitted and discharged patients. The ability to timely place patients in the appropriate level of care was anticipated to improve patient and employee satisfaction and patient outcomes.

Significance of the Practice Problem

Suboptimal patient flow throughout the majority of hospitals has resulted in ED boarding of inpatients for several hours further contributing to ED overcrowding while increasing LOS for admitted and discharged patients (ACEP, 2016). The impact of ED overcrowding can result in negative outcomes for the patient, family, healthcare system, and society. The inability to effectively care for large volumes of patients in the ED can lead to safety concerns, a decrease

in quality of care, as well as legal and ethical concerns (Salway et al., 2017). An increase in negative outcomes for stroke, cardiac, and patients needing antibiotics has resulted due to ED overcrowding and a lack of receiving timely treatments (Salway et al., 2017).

Patients are more likely to have a negative outcome or adverse event during ED overcrowding resulting in the increased LOS for admitted and discharged patients. Studies have shown that ICU patients holding greater than six hours in the ED have an increased risk of mortality by 4.5% for those who board longer than 12 hours, and an increased LOS from 5.6 days to 8.7 days (Salway et al., 2017).

Hospitals failing to provide treatment or attempting to divert ambulance traffic to help eliminate further overcrowding run the risk of Emergency Medicine Treatment and Labor Act (EMTALA) violations, financial penalties, and potential medical malpractice suits. Hospitals are required by the EMTALA law to conduct a medical screening, stabilize and treat patients arriving to the emergency department regardless of the existing medical condition (ACEP, 2022). Patients leaving the facility without being seen represent approximately a $600- $800 loss in revenue, in addition to the financial loss of inpatient admissions (Salway et al., 2017). When a large influx of high acuity patients arrive at the ED for treatment, ethical dilemmas may occur as healthcare providers try to determine who to triage and treat. Emergency department staff and providers continue to face burnout and poor job satisfaction due to the constant stress of overcrowding leading to increased LOS for ED patients, and the inability to provide safe care (Kelen et al., 2021). A third of the hospitals in the United States have experienced ambulance diversion due to overcrowding and 50% of hospitals report on-going challenges with ED overcrowding (CDC, 2022).

The chief nursing officer (CNO) at the project site identified a significant problem with hospital throughput and ED overcrowding that has led to an increased LOS for admitted and discharged patients. The hospital regularly holds 10-15 admissions in the ED, and an average of 3-5 patients daily in the post anesthesia care unit (PACU) waiting for inpatient beds.

Currently, the Hospital's LOS for admitted patients is 404 minutes with a goal of 170 minutes, and 137 minutes for discharged patients with a goal of 75 minutes. The impact of poor hospital throughput and ED overcrowding has led to a decrease in patient and employee satisfaction. Delays in treatments, medication errors, and quality concerns have occurred as a result. The denials have led to financial losses for key service lines in the organization including cardiac and women's services. Ambulance diversions due to the high census have resulted in the local EMS bypassing the facility. Cardiac care requires timely interventions by EMS and hospital providers. Delays in treatment as a result of diversions can increase the short and long-term mortality rates, increase the need for more intensive treatments, and increased medical costs to the patient (Hsia et al., 2018). The hospital has experienced a decrease in EMS volumes due to the holds and lack of timely acceptance of patients transported to the organization. Targeted interventions focused on a hospital-wide approach including implementation of early discharges daily, evaluation of elective surgeries or admissions, and development and activation of a full capacity protocol when hospital capacity has exceeded safe levels can improve throughput and decrease the LOS for all patients (McKenna et al., 2018).

PICOT Question

In admitted and discharged emergency room patients (P), how does a hospital-wide surge plan (I) compared to current throughput plan (C) affect length of stay (O) within 8 weeks? Using a PICOT format helps clinicians in developing a research question to determine the effect of an intervention (Duquesne University, 2022).

Population

The population identified included all ED patients that will be admitted or discharged from the department.

Intervention

The goal of implementing a hospital-wide surge plan to improve throughput was anticipated to decrease the length of stay for admitted and discharged patients. The hospital-

wide surge plan is a comprehensive set of action plans for each code level developed. This included actions to expedite discharges and transfers for inpatient units, utilization of overflow areas, prioritizing ancillary services, and provide resources to the ED.

Comparison

The comparison of a hospital-wide surge plan compared to the current patient flow plan was evaluated. The current lack of a formalized process throughout the hospital to activate a surge plan has resulted in increased LOS for admitted and discharged patients in the ED.

Outcome

The expected outcome was to decrease the length of stay for admitted and discharged patients in the ED. The hospital dashboard was used to evaluate turnaround times (TAT) for ED metrics and other identified units impacting hospital throughput including, acute care, ICU, environmental services, lab, radiology, physical therapy, and physician throughput times. Shared responsibility for hospital throughput was the desired outcome leading to decreased LOS and improved patient outcomes.

Timing

The project occurred over a period of 8 weeks. The EBP project started with a baseline evaluating current throughput metrics of TATs for admitted and discharged patients' pre-implementation and post- implementation of the hospital-wide surge plan.

Evidence-Based Practice Framework & Change Theory

Johns Hopkins evidence-based practice framework (JHEBP) was identified for use to guide the EBP project. It is known for using a powerful problem-solving approach for decision-making in the clinical setting (Johns Hopkins Medicine, 2017). The model provides tools and a three-step process, including practice questions, evidence, and translation (PET), to ensure the most current research is used to assist healthcare professionals in using EBP to identify and solve problems (Johns Hopkins Medicine, 2017). The practice question based on the identified problem of hospital throughput, helped develop the PICOT question guiding the EBP project. A

literature search was conducted to find the best evidence to support the plan to improve the LOS using a hospital-wide surge plan. The last phase, known as translation, utilized the findings from the evidence related to surge plans to create actions to put into practice.

Roger's five-stage diffusion of innovation theory supported the selected EBP project. Roger's theory explains how diffusing new knowledge is used to influence key stakeholders impacted by the change to gain adoption. The change theory analyzes how clinical behaviors are adopted and guides actions directed towards how the change contributes to increasing adoption (Mohammadi et al., 2018). The five stages include knowledge of a new idea, persuasion to accept the change, decision, implementation, and confirmation (Andrews, 2021). A hospital-wide surge plan requires the leaders in the organization to understand their role and support the process to maximize the outcomes to improve hospital throughput. Identifying the current problem, diffusion of new knowledge, and communicating the need for change, assisted in gaining acceptance. The development and execution of the plan required a collaborative approach to decision-making and practice changes to obtain maximum results for decreasing the LOS.

The various steps of the change theory were used throughout the development, implementation, and confirmation of the project. Knowledge included sharing the new idea of a hospital-wide surge plan with the key stakeholders. Persuasion is the specific information shared with the stakeholders related to the process and their role in obtaining buy-in and compliance. The decision is understanding the importance of implementing the surge plan by all stakeholders. Early adopters involved took actions to comply with the hospital-wide surge plan and support the process. The leaders throughout the organization worked collaboratively to take specific actions leading to improved hospital throughput with using a formalized surge plan. The final stage included confirmation of establishing the hospital-wide surge plan. Having the knowledge, resources to support the change, and adoption from stakeholders, the hospital-wide surge plan was successfully established and executed to help decrease the length of stay.

Evidence Search Strategy

A comprehensive search strategy was conducted to find reliable literature to support the PICOT question: In admitted and discharged emergency room patients (P), how does a hospital-wide surge plan (I) compared to current throughput plan (C) affect the length of stay (O) within 8 weeks?

The initial search included the use of keywords such as ED overcrowding, hospital-wide surge plans, patient flow, and bed management through the University of St. Augustine (USA) library and Google Scholar, providing over 750 articles for review. Keywords and Boolean operators were used to narrow the search, such as ED overcrowding AND hospital-wide surge plans AND hospital throughput. Databases such as CINAHL, ProQuest, and Pubmed were used to retrieve additional articles and further narrow the search. This included using advanced criteria limiting to full text, academic journals, and peer-reviewed published articles. Inclusion criteria included the English language, peer-reviewed, and academic articles within the past five years specific to ED overcrowding and hospital-wide surge plans. Exclusion criteria included articles with terms such as outpatient clinical settings, patient flow outside of the hospital setting, and ED triage process. Seventy-five articles were identified as appropriate for use. 40 of the non-duplicated citations were screened. After a thorough review of the titles and abstracts, 50 articles were excluded. This resulted in 25 articles identified as being appropriately related to the PICOT question. Using Google Scholar initially provided over 200 articles for review. Further narrowing the search with the use of keywords, allowed for 20 full text articles to be retrieved. Exclusion of duplicate articles from other databases led to a total of 15 articles for further review. The search process provided relevant articles to address the PICOT question for further evaluating the strength of the evidence presented.

Evidence Search Results

Articles were identified with solid evidence to support the PICOT question related to the effectiveness of implementing a hospital-wide surge plan using the above search criteria.

Twenty-five articles were reviewed, and ten research articles were selected as appropriate to keep for the EBP project. Five were identified as quantitative studies, two were mixed methods, two were systematic reviews, and one meta-analysis. The ten identified as high-quality and high-level articles were selected for use. The ten articles chosen supported the need for a hospital-wide surge plan to effectively impact throughput and decrease the length of stay for admitted and discharged patients.

A PRISMA diagram included in Figure 1 provides a summary of the evidence search result strategy used to obtain the final 10 articles for use. The Johns Hopkins EBP Model's recommendation tool was used to assess the strength and quality of each article. The Johns Hopkins Evidence-Based Practice tool is considered a strong tool that uses a problem-solving approach to assist in clinical-decision making for nurses and healthcare professionals (Johns Hopkins Medicine, 2022). Four articles were identified as Level 1, two articles Level II, and 4 Level III. All ten articles were identified as either A or B quality grade articles.

The development of a hospital-wide surge policy and its value in improving hospital throughput, decreasing the length of stay for admitted and discharged patients were evident in all the identified articles. In addition, the need for leadership support and engagement was another critical factor noted in the articles to achieve the goals of improved hospital throughput with an organization-wide approach. Outcomes identified from the development of a hospital-wide surge plan included decrease LOS, improve turnaround times for tests, early discharges, decreased medical errors, reduced readmissions, improved patient outcomes, patient, and employee satisfaction. A few of the identified articles provided specific action plans related to each area using the hospital-wide accountability approach. The research findings provided strong evidence to support the evidence-based project related to effectiveness of implementing a hospital-wide surge plan.

Themes with Practice Recommendations

After a literature review of available evidence, several themes were identified supporting the implementation of a hospital-wide surge plan to improve throughput and decrease the length of stay. A summary of the primary evidence to support the practice theme recommendations is provided in Appendix B. Long lengths of stay are due to hospital overcrowding because of the lack of bed capacity institution-wide (McKenna et al., 2018). Themes identified in the articles include effectiveness of implementing a hospital-wide capacity plan, focus on early and weekend discharges, use of a measurement tool, and stakeholder engagement. Additional themes include the impact of ED overcrowding resulting in an increased length of stay for admitted and discharged patients, and quality outcomes. Ten articles were identified sharing common themes related to the effectiveness of a hospital-wide approach to support the project.

Hospital-Wide Capacity Plan

Evidence in the literature shows that ED overcrowding, and increased LOS are related to hospital-wide factors and not solely to the ED processes. The development of a multidisciplinary team working parallel to expedite tests, provide treatments, improve turnaround times for EVS, and active bed management results in improved patient flow and reduced wait times (ACEP, 2016). Developing an effective surge plan includes utilizing tools to accurately assess surge levels using an input-throughput-output model, targeted action plans that obtain effective results, and contingency plans to address worsening surges (Kwok, et al., 2015).

Discharge Times

Delays in discharging patients negatively impact the facilities ability to efficiently accommodate the admission of patients. Implementing early discharge times opens beds on the inpatient floors allowing transfers from areas such as the ICU, PACU, and ED timely. Consistent discharge processes with an identified time early in the day and on the weekends leads to improvement of ED boarding and hospital LOS. Shifting discharge times earlier in the day to

precede peak admission times, results in lower peak occupancy in the hospital, resulting in a decrease in ED LOS (ACEP, 2016).

Surge Measurement Tool

Processes and tools must be in place to identify capacity problems and activate surge plans to resolve the impact of ED overcrowding**.** The implementation of a surge measurement tool with identified triggers to accurately gauge surge levels and causes allows for targeted actions in a surge plan. Using the National Emergency Department Overcrowding Study (NEDOC) scoring tool objectively assesses overcrowding based on scoring from 1-200. A higher NEDOC score indicates the severity of overcrowding. Using this tool will help trigger the activation of a surge plan and evaluate the effectiveness of actions taken as the NEDOC number decreases as hospital throughput, and boarding of patients improves (Ilhan, et al., 2020).

Stakeholder Engagement

Consistent themes noted in the articles reviewed demonstrated the positive impact of having key stakeholders fully engaged in the surge process. The executive leadership must ensure hospital overcrowding is a top priority and providing support is critical in improving throughput challenges (Chang et al., 2018). Setting expectations for performance goals, ensuring resources are provided to achieve the goals and being visible on the floor to monitor performance leads to improved throughput (Chang et al.,2018). A structured approach involving all stakeholders with accountability measures helped provide a consistent process to improve patient flow hospital-wide resulting in decrease LOS and improved patient outcomes.

Length of Stay

Ineffective hospital throughput leads to ED overcrowding and impacts the LOS for admitted and discharged patients. ED overcrowding leads to longer LOS for patients and considered a key indicator of monitoring emergency quality of care. Increased LOS has been associated with delays in clinical decision making, delays in care, medication errors, adverse

events, patient, and employee dissatisfaction (Mentzoni, et al., 2019). Effective surge plans allow for timely placement of patients in the appropriate care setting and timely treatment. Ineffective management of bed capacity and overcrowding delay timely treatments increasing the risk for adverse events, increased LOS, lost revenue, and increase risk of mortality (Rasouli, et al., 2019).

Practice Recommendations

Based on thorough literature reviews, the implementation of a hospital-wide surge plan approach answers the PICOT question: In admitted and discharged emergency room patients (P), how does a hospital-wide surge plan (I) compared to current plan (C) affect length of stay (O) within 8 weeks? The recommended intervention to implement a hospital-wide surge plan didn't exist in the clinical setting. Findings from multisite studies provide consistent evidence recognizing ED overcrowding is a hospital-wide problem that needs a multi-disciplinary approach, in driving quality improvement (Chang et al., 2018). The interventions have demonstrated improvement in hospital throughput, decreasing the length of stay for admitted and discharged patients. Addressing the cause of ED overcrowding improves the healthcare delivery systems processes, efficiency, quality care, and fiscal performance (Rasouli et al., 2019). Based on the strength and quality of the supporting evidence from 10 of the 25 articles graded as high quality, all supported the implementation of a hospital-wide surge plan will improve LOS for admitted and discharged ED patients.

Setting, Stakeholders, and Systems Change

The setting for this EBP project was implemented in an 80 -bed acute care, full-service hospital located in Frisco, Texas. The organization is a joint venture hospital between two large healthcare systems in North Texas. It is a faith-based nonprofit health system with a service area consisting of 16 counties. The organizational structure consists of the president, chief nursing officer (CNO), chief medical officer (CMO), and chief quality officer (CQO). The mission is to improve the health and well-being of the people and communities served.

Organizational Need

The organizational need for this project was identified during a meeting with the CNO, discussing current throughput metrics and transfer denial data. Based on the facility's LOS metrics and denials, it was determined that throughput hospital-wide was a significant issue that needed to be addressed. The current data shows an increase in the LOS for admitted and discharged patients. The CNO agreed the EBP change project was appropriate. An overview of the project was discussed with the CMO, nursing directors, and ancillary service leaders, who also agreed the project was needed and would benefit the entire hospital.

Stakeholders and Organizational Support

The identified stakeholders included the organizational leaders, the hospital president, CNO, CMO, clinical nurse managers and directors, physicians, house supervisor, bed control liaison, and frontline staff**.** Additional stakeholders included ancillary managers and directors from lab, radiology, EVS, respiratory, and rehab services**.** To gain support a presentation to discuss the project and benefits to patient care and the organization was conducted by the project lead with key stakeholders. Weekly updates with current metrics were shared with the organizational leaders to track progress of hospital throughput. Each stakeholder's active engagement and support was critical to the success of the throughput project.

Interprofessional Collaboration

The EBP project is considered a mesosystem change as it impacted the entire hospital. New processes and accountability for all areas throughout the hospital required an interprofessional collaboration for the surge plan to effectively improve throughput. An interprofessional collaboration approach involves individuals from two or more professional backgrounds meeting, developing processes, and practicing together with the patient at the center of the care decisions (Prentice et al., 2015).

Creating a formalized process and surge policy will allow the organization to continue the EBP project. The ability to review metrics daily through formalized dashboards will provide

the leadership team the ability to evaluate the ongoing effectiveness of hospital throughput. In addition, it will allow the leaders to evaluate the LOS for admitted and discharged patients, the ability to receive transfers timely, and support service line growth strategies.

SWOT Analysis

A strengths, weaknesses, opportunities, and threat (SWOT) analysis was conducted to assess the organizational needs, located in Appendix D. The strengths of the facility included senior leadership support, large ED for a small hospital, strong patient experience culture and patient satisfaction metrics, and engaged physicians. Weaknesses noted at the facility included inpatient bed shortage, inconsistent frontline staff leadership in ED and OR, start-up JV hospital with challenges post pandemic, and inconsistent processes for access and throughput in all areas. The opportunities identified for the project included improved hospital-wide culture related to access and throughput processes, increased bed capacity, increased referrals from outlying centers, sustained patient, physician, and employee satisfaction, and development of effective hospital-wide access and throughput committee. Threats to the organization included loss of referrals due to denials from outlying facilities, competitors capturing market share for critical service lines, and financial losses including performance penalties.

Implementation Plan with Timeline and Budget

Project Overview

The proposed EBP change project was expected to improve patient flow throughout the hospital to accommodate patients needing admission internally and externally. Additionally, the LOSs anticipated to be reduced for admitted and discharged patients throughout the hospital. This would ultimately improve the quality of care and outcomes for all patients in the facility.

The project’s vision was to implement a proactive process that will create bed capacity to help facilitate patient placement, improve acceptance of transfers, improve the quality of patient care, and the organization’s fiscal performance. Developing a surge policy checklist helped guide the hospital leaders in developing and updating their plans for responding to a significant

surge event, as well as provide tools to guide action plans. An example of the hospital surge plan checklist is attached in Table 1. The project was expected to reduce admission delays, from 404 minutes to 202 minutes for admitted patients and 170 minutes to 85 minutes for discharged patients. The hospital currently tracks and reports these metrics, against national benchmark goals of 170 minutes for admitted patients and 75 minutes for discharged patients.

Project Objectives

The objective of this project was to improve hospital throughput at an acute care hospital to decrease the LOS for admitted and discharged patients. The short-term objectives included improved LOS metrics for admitted and discharged patients as evidenced by a 50% decrease in the LOS metrics within the 8-week project trial. The long-term objective of the project was to implement sustained hospital-wide practice changes that improve throughput and decrease the LOS for admitted and discharged patients meeting the hospital benchmarks. The long-term objectives will be evidenced by sustained improvement of LOS metrics of 90% consistently as measured by dashboards. The project included the following specific objectives to achieve the goals:

1.) Baseline throughput metrics for LOS for admitted and discharged will be assessed prior to start of project. Metrics will be monitored and shared with leaders on a weekly basis.
2.) 100 % of leaders, physicians, and front-line staff will be educated on the new throughput process, and surge policy by week 2 to start the project.
3.) 90% of discharges will occur by 2 pm daily for all in patient areas.
4.) 100% of leaders will have score cards with throughput metrics to review on a weekly basis starting week 3.
5.) LOS for admitted and discharged patients will improve by 50% by end of 8 weeks of project.

Project Plan

Roger's five stage change theory assisted in identifying the throughput problem. Additionally, the change model sparked new ideas for the surge policy and allowed for acceptance and compliance of the change by all stakeholders. The use of the Johns Hopkins model in conjunction with Roger's theory was utilized as the framework for the project. The Johns Hopkins Model is an effective evidenced-based practice model that helps identify the practice problem related to the LOS, identify best practices supported by evidence and translate the findings into daily practice to achieve the goals. Following Roger's five step theory, a detailed plan for providing knowledge, steps taken to gain acceptance, decision-making, implementation phase, and plan for confirming compliance with the plan change are included in Appendix C. The advantages of using Roger's theory brings awareness of a situation, identifies a need, increases communication, providing an opportunity to resolve issues, and creating a safety culture. The success of this project relied on teamwork among multiple stakeholders from nursing, ancillary, physicians, and executive team members.

The first step was to provide knowledge related to the current LOS problem identified at the facility through a formal presentation to the executive team and leaders. Information related to the long LOS's negative impact to delays in care, adverse events, medication errors, transfer denials and fiscal penalties was shared during the presentation. The project demonstrated the need for the change to be effective. Next, to obtain buy-in from the team, specific benefits related to implementing the hospital-wide surge plans' impact on the LOS were shared during the presentation. The executive team made the decision mandating all leaders to comply with action items included in the surge plan. Successful implementation of the plan involved providing education to all stakeholders. Education about the project, surge policy, measured metrics, and how outcomes would be shared via the hospital dashboard were included. To successfully obtain buy-in and implement the process, feedback from the

stakeholders was obtained initially and throughout the project. The final process for adoption and sustainment of the project included demonstrating improvement for LOS metrics and patient outcomes shared with the stakeholders. As a result, clear expectations of compliance with the surge plan and ongoing monitoring of metrics would be expected.

Schedule of Activities and Timeline

The detailed schedule of activities is shown in Appendix C.

Week 1-2: Hold meeting with all leadership and staff to initiate the project.

- Provide education on the surge policy, and action plans to decrease LOS for each area.

Week 3:

- Implement surge policy process. Begin monitoring LOS metrics for admitted and discharge patients.

Week 4-8:

- Weekly review of metrics and meeting with key stakeholders to review progress and address any barriers.

Resources and Budget

The project required minimal costs for implementation as many of the required resources were currently in place. The primary costs for the project was directly related to training hours for front-line charge nurses, supervisors, and team leads from the ancillary departments. The expenses are included in Table 3. Training required 30-minute sessions, with a total of 4 sessions to accommodate staff on all shifts. In addition, a 1-hour training session occurred for the leadership team consisting of managers and directors.

Project Manager

The successful implementation of the project required the project manager (PM) to have a clear understanding of the team dynamics, possess effective communication skills, be well organized, and demonstrate excellent follow-through. This project was led by the project manager under the executive sponsorship of the CNO. Communication with all leadership

members, physicians, and front-line staff regarding the project plan, surge policy, and action items for everyone will be provided at the start of the project and weekly updates will be provided to track progress. The PM performed weekly meetings with key stakeholders to identify any barriers and address concerns with the project. The feedback obtained was used to make improvements to the EBP project and policy. Weekly meetings included a review of the metrics obtained for each area per the dashboard.

Results

This EBP change project established a formalized hospital-wide surge process to improve throughput and decrease the LOS for admitted and discharged patients from the ED. The project evaluated the LOS metrics for all admitted and discharged patients from the ED. The use of a surge checklist assisted leaders with the development and implementation to expedite patient flow during a significant surge as shown in Table 1. The tool used to track the data contained LOS metrics for admitted and discharged patients from the ED. A hospital scorecard was also used by leaders to track set metrics for TAT's in each area impacting patient care. Stakeholders for the project included managers, directors, staff in nursing and ancillary departments, and physicians. The inclusion criteria used all staff with direct patient care responsibilities, managers, directors from all nursing and ancillary departments, and physicians with admitting and discharging privileges.

Continuous evaluation of the key metrics monitored took place throughout the entire project. The process provided the project lead and key stakeholders the ability to monitor the impact of the project weekly. The information obtained from the leaders related to any barriers and the metrics allowed the team to make adjustments to overcome any barriers. The data collected was reviewed each week with the preceptor and leadership team to ensure the project was progressing to meet the LOS metrics. Consistent monitoring of compliance with the surge policy and project plan allowed the leadership team to identify issues with the plan, make

adjustments, and maintain leadership support. The project was supported by the leadership team from the beginning and throughout the entire project.

Data Collection

The LOS for admitted and discharged patients were obtained from the EMR and documented, using the data collection tool in Table 2. Pre-implementation data was collected from the hospital dashboard for the current LOS metrics for admitted and discharged patients. The data for the LOS for admitted and discharged patients was obtained daily from the EPIC computer system through an automated report sent each morning. The project lead and ED Director reviewed the LOS metrics and shared them weekly with all leaders. Providing the data weekly allowed the leaders to see current performance and compare it to the defined targets for LOS metrics.

Data Analysis

The data collected from the EMR was automatically populated on the hospital dashboard daily for dissemination to all managers and directors. The project lead, chair of the hospital throughput committee, and CNO had oversight of the data collected and validated metrics being reported. A weekly report was generated and shared with facility leadership through a combination of online and face-to-face meetings by the project lead and preceptor**.**

Integrity and Validity of Data

The coders reviewed and reconciled all LOS times daily to ensure the data captured was accurate. Any discrepancy noted in the LOS metrics was immediately reconciled with the ED charge nurse to close out any outlying records. This ensured accurate discharge times were captured for all patients' LOS. The outcome data was collected, measured, and reported in numeric values in the same consistent method to provide reliability. No patient identifiers were used to collect, measure, or store during the project. Data collected was based on specific numeric throughput metrics evaluating LOS for all departments. All data was stored electronically on the hospital dashboard via a secure hospital network requiring personal identity

verification and a password to log in. The presentations, documents, and dashboards were password protected to access.

Statistical Analysis

A software system known as Intellectus Statistics was used to conduct a comprehensive evaluation of the data collected (Intellectus Statistics, 2022). Pre- and post-LOS metrics were obtained from the EMR and entered in Intellectus for evaluation of the project outcomes. The data collected is included in Appendix E. A two-tailed paired sample t-test was conducted to evaluate if the mean difference of the LOS for pre-admitted and post-admitted, and pre-discharged and post-discharged ED patients was significantly different from zero. A Shapiro-Wilk test was conducted for both data sets to determine if the differences in the data could have been produced by a normal distribution (Razali & Wah, 2011). The results of both sets of data suggested the possibility that the differences in the pre and post metrics were produced by a normal distribution could not be ruled out, indicating the normality assumption for both sets were met (Razali & Wah, 2011). The outcomes were measured the same based on identified targets to provide reliability in the data integrity. A p-value of 0.05 was used to determine the statistical significance of the change. Using the p-value to measure the probability that the hypothesis of implementing a surge plan will reduce the LOS will determine if the findings are significant to demonstrate the project was effective.

Outcomes Measures

For this project, the outcome measures were to decrease the LOS for admitted and discharged ED patients. A reduction of 20 minutes or greater in the LOS for admitted and discharged times would be considered statistically significant. The ED LOS for admitted patients pre and post-implementation was not found to be statistically significant, based on an alpha value of .05, $t(7)=2.30$, $p=.055$ as indicated in Table 3. The ED LOS for discharged patients pre and post-implementation was not found to be statistically significant based on an alpha value of 05,$t(7)=0.77$, $p=.469$ as indicated in Table 4. Although statistical significance was not

demonstrated for the project's primary goal of decreasing LOS, the results nevertheless, demonstrated a significant clinical impact on hospital-wide throughput and clinical outcomes. The hospital-wide surge plan allowed for patients to be placed in the appropriate care setting promptly, ultimately improving patient outcomes and satisfaction. Outcome measures for decreasing the LOS are important indicators of the quality-of-care patients receive in the hospital setting**.** Decreasing the LOS is associated with decreasing the chance of an adverse event, preventing delays in treatment, risk of hospital-acquired infections, lower mortality rates, and improved patient, employee, and physician satisfaction (Baek,et al., 2018). A logic model is attached in Table 5.

Process Measure

To effectively achieve the intended outcomes, steps were implemented to activate the process for changes to utilize the hospital-wide surge policy. Process measures reviewed included monitoring compliance with discharge times daily, TAT for testing, room cleaning, time to accept report, and compliance with the goal for admitted patients' LOS times. After the hospital-wide surge plan was established the team members were provided education on the process, and the dashboard with throughput metrics used to evaluate the effectiveness of the processes put in place to achieve the goals.

Balancing Measures

While the goal of the project was to decrease the LOS for admitted and discharged patients, it is essential to ensure actions were taken to prevent other areas of the hospital from being negatively impacted. Balancing measures are essential as they reflect any unintended consequences of the change designed to improve the new process resulting in new problems in another area (IHI, 2022). The balancing measures included evaluating delays in admission times for all areas such as PACU, ICU, Medical-Surgical areas, and direct admits. Other balance measures evaluated included readmission rates and any adverse events related to LOS times. Due to the short time frame of the project, the financial impact was not able to be

fully determined. However, the project benefits for financial performance and clinical outcomes of patients will be monitored by the facility long-term.

Financial Measures

The project was designed to have minimal labor costs for training, as noted in Table 6. No additional resource costs were identified to implement or sustain the project. The financial impact due to increased LOS and lack of bed capacity can potentially result in lost revenue for transfer denials, diverting EMS traffic, LWBS, and surgery cancellations. The data was monitored throughout the project to evaluate any financial losses or gains because of the project strategies to improve bed capacity. No increase in financial resources or losses were noted during the short time frame of the project.

Sustainability Measures

The project was able to demonstrate improvements in patient flow, LOS, and processes for the organization that can easily be sustained. The development of the surge plan, dashboards, and creating a culture of accountability and transparency with data will assist leaders in managing the process long term. As new employees enter the organization, ongoing education related to the surge policy and the employee's role will be necessary. Long-term sustainability of the surge policy can easily be measured through the tools and processes developed for the project.

Impact

The goal of this project was to address the issues with ED throughput impacting the LOS metrics for admitted and discharged patients by utilizing a process for a hospital-wide surge plan. Many factors were identified throughout the hospital impacting throughput and leading to delays in patient transfers. Throughout the 8-week implementation of the surge plan, practice changes positively impacted patient flow. As previously mentioned, there wasn't a statistical significance demonstrated for the project's primary goal of decreasing LOS, the results nevertheless, demonstrated a significant clinical impact on hospital-wide throughput and clinical

outcomes. Before the project implementation, not all areas in the hospital were actively involved in actions to improve hospital throughput and assist with expediting admissions from the ED.

The project increased the awareness that ED throughput is a hospital-wide problem requiring all team members to be actively involved in the process. It assisted the leaders in identifying gaps in communication, needed resources, accountability for timely discharges, and a method to monitor real-time TAT metrics in all departments. The surge plan positively impacted collaboration among all departments, and improved communication, and processes related to patient flow. Using data to show evidence to support the actions of a hospital-wide surge plan's impact on the LOS metrics allowed all staff and leaders to see how their actions positively impacted throughput. As a result of the project the lab implemented new processes to prioritize blood draws in the ED and results were made available for discharging physicians on the floors.

The radiology department put a process in place to work with case managers and prioritize testing reports for the ED patients to expedite dispositions. The development of dashboards to monitor TAT metrics allowed the leaders to identify gaps and adjust resources to meet the trends in volumes. The project had several other positive impacts hospital-wide including expediting discharges from the floors earlier in the day, decreasing the hospital LOS, decrease in transfer denials, and increased the ability to accept transfers. Employee and physician satisfaction has been positively impacted by the collaboration and focus on a hospital-wide surge plan. The project has the potential for long-term positive impacts on clinical outcomes by having patients in the appropriate care setting to receive care. Decreasing the LOS for all patients, preventing adverse events, preventing transfer denials, and ambulance diversions all will lead to improved financial performance for the hospital.

In order, to continue to improve the practice problem, there should be an ongoing review of the identified metrics and a process to monitor accountability with the checklist of requirements for all areas to meet the individual unit action plans. No additional funding will be

required to sustain the project long-term. However, ongoing education will be needed for new employees and as adjustments are made to the process. The development of the hospital throughput committee will provide on-going oversight of the process, monitoring of dashboards and metrics, and review of compliance to sustain the process. Continued monitoring of the interventions as well as outcomes will help the hospital leadership sustain and disseminate the successful surge process throughout the organization.

Dissemination Plan

The results of the project were disseminated internally and externally by the project lead. The initial project results were shared in a presentation to the CNO and ED Director including the project outcomes and discussion of next steps for sustainment. Additionally, a presentation of the project was shared during the regular scheduled monthly throughput meeting, including nursing and ancillary leaders within the organization. The presentation included a power point with a summary of the project, outcomes, and specific recommendations for sustainment of the project. Externally the project will be presented through an oral dissemination to faculty and peers at the University of Saint Augustine for Health Sciences (USAHS). In addition, the project results will be shared externally on the USAHS institutional repository Scholar Works Open Access Repository (SOAR).

Externally an abstract will be submitted for a poster and podium presentation to the Emergency Nurses Association (ENA) and American Organization of Nurse Leaders for regional and national conferences.

Conclusion

The intent of this evidence-based project was to create a hospital-wide surge plan to decrease the LOS for admitted and discharged patients in an acute care facility. The development of a detailed plan involving all key stakeholders with set actions, identified metrics, and processes to monitor accountability was critical for the successful implementation of the project and long-term sustainment. While the project did not demonstrate statistical significance

with the primary goal of decreasing the LOS during the 8 weeks, the results demonstrated a significant clinical impact on hospital-wide throughput and clinical outcomes. In addition, having the bed capacity allows the organization the ability to care for more patients by accepting increased transfer referrals, capacity to increase surgical and EMS volumes. Literature supports the implementation of a hospital-wide surge plan can decrease the LOS and have a positive impact on clinical outcomes. The implementation of the detailed surge plan checklist, set metrics, and having a tool that easily tracks data from the EMR provided a structured approach to address the throughput challenges and improve processes at the facility long-term.

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Table 1

Hospital Surge Plan Checklist

Overview

Purpose: The purpose of the Hospital Surge Plan Checklist is to assist hospital leaders in developing and/or updating their plans for response to a significant surge event, as well as to provide tools, examples, and guides to assist with plan development and implementation.

Definition of Surge:

A Surge Event is a significant event or circumstances that impact the healthcare delivery system resulting in excess demand over capacity and/or capability in the hospital.

Surge Plan Options: A hospital's Surge Plan may be incorporated into its Emergency Operations Plan (EOP), be an addendum to the EOP, or may include a series of policies, procedures and protocols referenced in the EOP. Many of the elements that should be addressed in developing Surge Plans may already be included in the EOP or other hospital plans, policies, procedures, or protocols. It is not intended that these documents be duplicated in the hospital's Surge Plan, but that surge be addressed in the EOP and other documents and the documents themselves be referenced in the Surge Plan.

Surge Plans and policies/procedures should address internal and external communication regarding current emergency status for surge levels, regulatory status, the type, scope and expected duration of an event, and escalation and de-escalation as new information is received. The strength of a good plan is to have adequate detail to allow implementation by staff that may not be very familiar with the plan. Job action sheets, task checklists and other tools for activating and implementing the surge plan can be developed for this purpose.

Using the Checklist: The individual(s) responsible for leading the surge meeting should review the Hospital Surge Plan Checklist to ensure that their plans incorporate each item listed. It may be helpful to the user to jot notes where the specific item is addressed.

Hospital Surge Plan Checklist

Administrative Nursing Supervisors (NAME)

*** C-Completed IP-In Progress NS- Not Started**

Status*	Notes	Plan Elements
		• Collaborates with PACU Charge Nurse to review cases and available beds.
		• Collaborates with Inpatient, ED, ICU and OR to make appropriate bed assignments
		• Evaluate Staffing and alternate locations for inpatients holding in ED
		• Internal notification/communications and staff call-back protocols (e.g., call trees, contact information, etc.).
		• All non-essential meetings cancelled
		• Incoming ED/Inpatient transfer requests declined at the direction of the Administrator on Duty (AOD)
		• Activation of resource management system including inventory, tracking, prioritizing, procuring, and allocating of resources.
		• Coordinate resourcing areas of need when Labor Pool is not open

EMERGENCY DEPARTMENT

*** C-Completed IP-In Progress NS- Not Started**

Status	Notes	Plan elements
		• NEDOCS Score every 2 hours and as needed
		• Supplies. Charge Nurse evaluates need for additional stretchers, portable monitors and IV pumps.
		• Collaborates with Administrative supervisor on plan to staff and cohort ED admit holds
		• ED leadership participates in High Census Bed Meeting and reports on ED census, admit holds in ED and department needs (equipment, sitters, etc.)
		• Arrange transport for patients with room assigned within 30 minutes of bed ready.
		• In addition to NEDOCS score, CN assesses: ○ # in WR ○ # boarding ○ Sitter needs ○ Equipment needs
		• Evaluate ED staffing ratios to maximize space/care delivery

Hospital Surge Plan Checklist

Acute Care *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Evaluate staff for next 12 hours
		• Supervisors/Nurse Managers to assist with discharges/admissions, etc.
		• Prepare for accepting ED admits into overflow beds
		• ED Unit Secretary/Charge Nurse to fax inpatient hold list to pharmacy, lab and dietary at 0400 and 1600
		• Move two (2) patients pending discharge to discharge lounge by 11 am as appropriate
		• Potential discharge waiting for test results and consults are reviewed and action taken to expedite discharges.
		• Verify all discharges are discharged from system upon discharge to facilitate cleaning by EVS
		• Eliminate “No fly zones” for admitted patients

PERI-OP *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Evaluate staff for next 12 hours
		• Supervisors/Nurse Managers to assist with discharges/admissions, etc.
		• Determine plan for holds in PACU

ICU *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Evaluate staffing for next 12 hours
		• Supervisors/Nurse Managers to assist with discharges/admissions, etc.

Hospital Surge Plan Checklist

Care Transition Manager *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Report barriers securing discharge arrangements (Insurance verification, placement, DME)
		• Cancel non-essential meetings

Physicians (Intensivists/Hospitalist, CMO) *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Surgeons round on potential discharges before going to OR
		• Expedites reading of diagnostic tests
		• Formal notification of hospitalists to round early and expedite discharges as appropriate.
		• ED Medical Director to evaluate need for additional physicians/call in oncoming physician early

Administration *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• CNO/AOD or designee make rounds on inpatient units, ICU, and ED
		• Consider transferring critical care patients to other facilities
		• Consider activating HICS
		• Consider evaluating surgery schedule to eliminate elective procedures
		• Contact Medical Staff services to notify community physicians of hospital status
		• Consider activation of Labor Pool

Hospital Surge Plan Checklist

Environmental Services *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Supervisors round in all areas for visual inspection of unoccupied dirty beds.
		• Supervisors prioritize cleaning of inpatient beds (discharges, STAT cleans)
		• Maintain direct communication with administrative supervisor/unit Charge Nurse regarding STAT cleans.
		• Pull staff from non-essential areas to clean inpatient dirty beds
		• Increase/replenish linen par on each unit
		• Eliminate inpatient room clean/refresh on day of discharge “prioritize cleaning discharged rooms”

Materials Management *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Deliver additional supplies for patient monitoring/care
		• Stock alternative inpatient care areas with needed supplies for patient/monitoring/care
		• Prepare additional code carts for back up

Medical Imaging/Special Procedures *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Prioritize procedures that are identified as pre-discharge as first procedure.
		• Consider activating on-call staff
		• Prioritize ED diagnostic needs
		• Consider rescheduling outpatient elective imaging appointments
		• ED exams from waiting room will be performed. Patients who receive contrast will be performed and then monitored in triage IV start chair for 10-15 minutes post contrast. These patients do not take priority over patients in ED rooms or patients pending discharges.

Hospital Surge Plan Checklist

Transports/Mission Control *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Prioritizes transport for discharged patient or ED admits
		• Designated transporter to be assigned to ED

Respiratory Services *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Assess ventilator needs and additional equipment needs.
		• Maintain staffing levels based on workloads.
		• Prioritize procedures/education for patients identified for discharge.

Rehab Services (PT, OT) *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Patients that are scheduled for discharge are prioritized by the supervisor to be seen ASAP by appropriate discipline (PT/OT)

LAB *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Phlebotomist to draw labs on all inpatients holding in the ED and alternative inpatient hold areas.
		• Assign dedicated phlebotomist to ED

Hospital Surge Plan Checklist

Pharmacy *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Release all medications for inpatient holds and distribute appropriately in 12-hour blocks.
		• Prepare additional trays for code carts.

Hospital Surge Plan Checklist

IT services *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Ensure adequate supply of Vocera devices in ED and alternative inpatient hold areas.
		• Evaluate mobile workstations in ED and alternative inpatient hold areas for functionality.

Risk Management/Patient Experience Manager *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Round in ED lobby with patients.
		• Round on inpatient holds in ED and in alternative inpatient hold areas.
		• Assist in managing patient complaints in real time.

Nurses in non-patient care areas *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Be prepared and available to assist in ED or Inpatient Units with transport, vital signs, and all other nursing functions congruent with skill level.
		• Assures that all areas of responsibility have implemented area specific plan to accommodate capacity issues.
		• Prioritize staffing needs and send appropriate staff to labor pool for 2–4-hour blocks.
		• Available staff to support clinical areas as directed by labor pool with duties on Acute Care Task list.

Hospital Surge Plan Checklist

Labor Pool *** C-Completed IP-In Progress NS- Not Started**		
Status	**Notes**	**Plan elements**
		• Labor Pool will prioritize needs based on available resources.
		• The Labor Pool Supervisor will consult with the House Supervisor regarding prioritizing needs during high census.
		• Evaluate standing requests and fill as staff are available.

Notes:

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Table 2

Emergency Department Scorecard

ED Metrics	Target	August	September	October	November	December
Disposition to Discharge	25	23	22	22	23	25
Arrival to Room	8	7	7	8	8	8
Arrival to Physician	10	4	15	17	19	17
Median LOS for admitted patients	170	334	360	274	326	384
Median LOS for discharged patients	75	170	168	166	166	170
Left without being seen (LWBS)	1.0%	1.7%	1.5%	1.5%	1.3%	1.5%

Table 3

Two-Tailed Paired Samples t-Test for the Difference Between Pre_Admitted_LOS_ED and Post_Admitted_LOS_ED

Pre_Admitted_LOS_ED		Post_Admitted_LOS_ED				
M	*SD*	*M*	*SD*	*t*	*p*	*d*
357.88	76.84	288.88	39.08	2.30	.055	0.81

Note. N = 8. Degrees of Freedom for the *t*-statistic = 7. *d* represents Cohen's *d.*

Table 4

Two-Tailed Paired Samples t-Test for the Difference Between Pre_Discharged_LOS_ED and Post_Discharged_LOS_ED

Pre_Discharged_LOS_ED		Post_Discharged_LOS_ED				
M	*SD*	*M*	*SD*	*t*	*p*	*d*
172.62	13.81	167.75	14.83	0.77	.469	0.27

Note. N = 8. Degrees of Freedom for the *t*-statistic = 7. *d* represents Cohen's *d.*

Table 5

Logic Model

Inputs	Outputs	Outcomes
Staff	Education	Increased awareness
Mangers/Directors	Surge Plan	Accountability
Executive Leaders	Turnaround Times	Decrease LOS
Physicians	Facilitate communication	Improved fiscal performance
Dashboards		Satisfaction
		Improved Outcomes

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Table 6

Implementation EBP Project Budget

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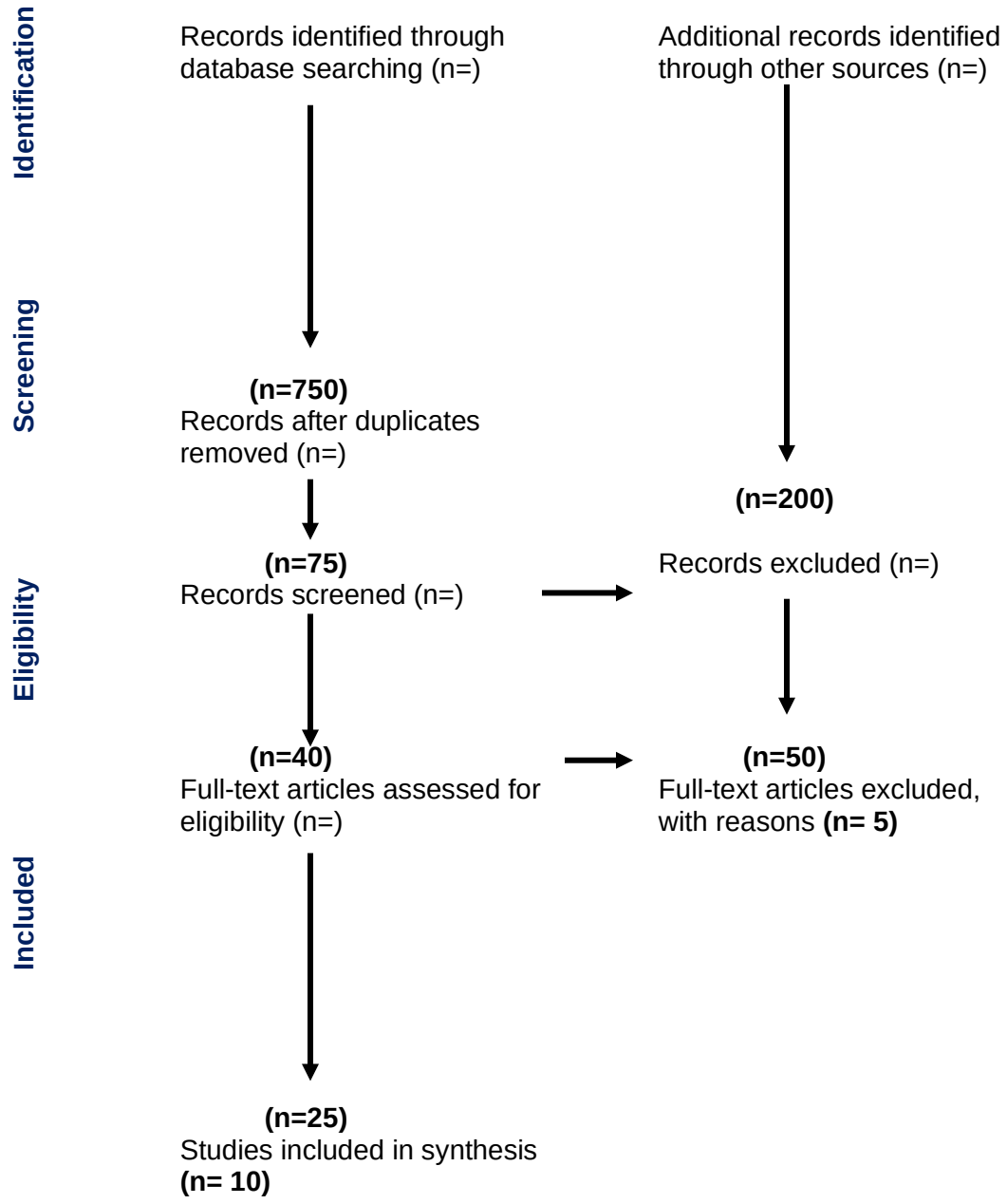
Budget

EXPENSES	Cost per Hour	Quantity (Hours)	Total Cost
Direct Training Hours			
Charge Nurses	$40	38	$1,520
Nursing Supervisors	$45	9	$405
Admin Supervisors	$40	8	$320
Ancillary Team Leads	$30	15	$450
Estimated Total Expenses			**$3,015**

Figure 1

PRISMA Flowchart



Note. Prisma flow chart diagram from “Preferred Reporting Items for Systematic Reviews and Meta-analyses: The PRISMA Statement,” by D. Moher, A. Liberati, J. Tetzlaff, & D.G. Altman,

2009, Annals of Internal Medicine, 151(4), p.267 (http://dx.doi.org/10.7326/0003-4819-151-4-200908180-00135). Copyright 2009 by The American College of Physicians.

Appendix A

Summary of Primary Research Evidence

Citation	Design, Level Quality Grade	Sample Sample size	Intervention Comparison	Theoretical Foundation	Outcome Definition	Usefulness Results Key Findings
Pesaresi, C., Migliara, G., Pavia, D., & De Vito, C. (2020). Emergency department overcrowding: a retrospective spatial analysis and the geocoding of accesses: a pilot study. *ISPRS International Journal*, 9(10), 579. https://www.mdpi.com/2220-9964/9/10/579/htm	Quantitative Level I I Quality A	**Sample size:** N-9544	ED overcrowding cause. Implementation of proactive healthcare system surge approach.	Not mentioned in article	Proactive action plans to address throughput will decrease ED overcrowding.	Access to care and appropriate use of services to create proactive approach in care and prevent overcrowding due to unnecessary use of healthcare systems.
Chang, A., Cohen, D., & Sun, B. (2018, April). Hospital strategies for reducing emergency department overcrowding: a mixed-methods study. *Annals of Emergency Medicine*, 71(4), 497-505. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5828915/	Mixed method Level III Quality B	**Sample size:** N-12	Hospital-wide coordinated strategies to improve patient flow.	Not mentioned in article	Engaged leaders/staff. Accountability for all leaders to improve ED overcrowding and	Staff engagement Improved patient outcomes Decreased LOS and ED overcrowding

					hospital throughput.	
Salway, R.J., Valenzuela, R., Shoenberger, J., Mallon, W., & Viccellio, A. (2017, March), Emergency department (ED) overcrowding: evidence-based answers to frequently asked questions. *Science Direct,* 28(2), 213-219. https://www.sciencedirect.com/science/article/pii/S0716864017300354	Quantitative Descriptive Level III Quality B	**Sample**: Metrics evaluated (LOS, LWBS, Medical errors) **Sample size**: Not specified in article.	Implementation of full capacity plan to include every department in the hospital and all healthcare providers.	Not mentioned in article	Full capacity protocols to include early discharges, daily/ weekend discharge plans, expediting tests, and overflow strategies.	ED overcrowding results in increased LOS, LWBS, decreased quality of care, mortality, and financial implications.
American College of Emergency Physicians (ACEP) (2016). Emergency department overcrowding: high impact solutions. https://www.acep.org/globalassets/sites/acep/media/crowding/empc_crowding-ip_092016.pdf	Descriptive Quantitative Level III Quality A	**Sample:** Metrics evaluated **Sample size:** **n**ot mentioned	Leadership, physicians, staff, and bed management team Activate surge protocols using NEDOC to address ED overcrowding.	Not mentioned in article	Surge protocol using NEDOC scoring to activate full capacity plan to improve patient flow, outcomes, metrics. **Plan :** Quick registration process, Kiosk, Provider at Triage, Fast track area, Active bed management, D/C lounge.	Effective surge protocol results in improved metrics, TAT's, and patient/staff satisfaction.

Rasouli, H., Esfajamo. A., Nobakht, M., Eskandari, M., Mahmoodi, S., Goodarzi, H., & Farajzadeh, M. (2019, August 28). Outcomes of crowding in emergency departments; a systematic review. *Archives of Academic Emergency Nursing*, 7(1), 52. https://pubmed.ncbi.nlm.nih.gov/31602435/	Descriptive, Systematic Review Level II Quality B	**Sample size**: N-58	Evaluation of ED overcrowding causes and outcomes to patients holding in the ED. Joanna Briggs Institute Meta-Analysis of Statistics and Review Instrument for studies used.	Not mentioned in article	Outcome of multiple individual patients and health-care related challenges comprehensively assessed. Increase effectiveness of healthcare service delivery centers evaluated (LOS, LWBS, Diversion, medical errors).	A hospital-wide operational plan and actions by all leaders will help improve patient throughput, decrease emergency department overcrowding, LOS, LWBS, and decrease negative outcomes for patients holding
Kwok, E., Geymonat, C., Peters, K., Bickerton, K., Mackenzie, T., Lamothe, R., Mayer-Lalonde, A. & Gatien, M. (2015, November). A novel emergency department surge protocol implementation of a targeted response plan. *Journal of Clinical Outcomes Management.* https://www.mdedge.com/jcomjournal/article/147112/emergency-medicine/novel-emergency-department-surge-protocol.	Descriptive Level III Quality Grade B		Development of hospital-wide surge plan and resource reallocation impact on throughput. Implemented validated input-throughput-output model for surges with identified action plans.	Not mentioned in article. Article does follow Rogers 5-step diffusion theory	Overall effectiveness of surge protocol. ED protocol led to effective containment during daily high surges despite	Implementation of hospital-wide surge protocol led to more effective response and management of high surges.

					increase in hospital occupancy.	
McKenna, P., Heslin, S., Viccellio, P., Mallon, W., Hernandez, C., & Morley, E. (2018, April, 7). Emergency department and hospital crowding: causes, consequences, and cures. *Clinical and Experimental Emergency Medicine*, 6(3), 189-195. https://www.ceemjournal.org/m/journal/view.php?number=238	Mixed method Level I Quality Grade B	**Sample size**: Not identified in article.	Early discharges by noon on inpatient floors. Weekend discharge plan for medicine and surgical patients and impact on ED LOS/hospital throughput.	Roger's 5-step Innovation Diffusion Theory	Boarding decreased from 30 patients on average to almost zero with a year: LOS	Targeted action plans to address admissions, discharge time expectations daily and on weekends are all critical for improving hospital wide throughput.

Legend:

- ED: Emergency Department
- LOS: Length of Stay
- NEDOCS: National Emergency Department Overcrowding Scale
- TAT: Turn around Times
- Metrics evaluated include turnaround time for tests, room turnaround times for cleaning, LOS for admitted and discharged times, mortality rates, and medical errors.

Appendix B

Citation	Quality Grade	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Usefulness/Recommendation/ Implications
Morley, et al., 2018 Morley, C., Unwin, M., Peterson, G., Stankovich, J., & Kinsman, L. (2018, August 30). Emergency department crowding: a systematic review of causes, consequences, and solutions. *PLOS ONE* https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0203316	Quality B Level I	Cause and consequences of, and solutions to emergency department overcrowding?	**Databases:** Medline, CINAHL, EMBASE, Web of Science **Terms:** Emergency department overcrowding, congestion, AND, OR Consequences, harm, outcomes, negative impact	**Inclusion:** **q**uantitative, qualitative, and mixed method studies from January 2000—June 2018 **Exclusion**: Pediatric ED's	Quantitative and Random control trials Focus on causes and consequences	Identify causes of overcrowding: Discharge times Patient flow in ED **System-wide solutions**	Focused approach to address throughput
Nascimento Rocha, et al., 2021 Nascimento Rocha, H., Milhome da Costa Farre, A., & de Santana Filho (2021, March 31).	Quality B Level I	Does ED boarding cause negative outcomes?	**Databases:**PubMed, CINAHL, Google Scholar, SCOPUS, LILACS **Terms:** emergency department, boarding, adverse events.	**Inclusion**: cohort or case control studies that evaluated adverse events in patients holding in ED. **Exclusio**n: Patients not being admitted or holding.	Meta-Analysis of observational studies in Epidemiology checklist	Boarding in Eds may be related to increase in adverse incidents and events.	Evidence suggested that ED boarding increases unfavorable outcomes.

Citation	Quality Grade	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Usefulness/Recommendation/ Implications
Adverse events in emergency department boarding: a systematic review. Journal of Nursing Scholarship, 53(), 458-467. https://doi.org/10.1111/jnu.12653			**Bolean advanced search:** Emergency room OR emergency department OR adverse events OR medical errors OR access blocks				
Badr, S., Nyce, A. & Rachoin, J. (2022). Measures of emergency department crowding, a systematic review. How to make sense of a long list. *Open Access Emergency Medicine. 14(5), 1-11.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8742612	Quality B Level I	Identifying metrics that trigger when ED is overcrowded.	**Database**: Pubmed, **Keywords**: ED, ER, waiting room, boarding, occupancy, volume, length of stay Emergency Department and overcrowding English from **Time:** 1/1/1990- 12/1-2020	**Inclusion:** All types of studies (retrospective, prospective, qualitative, quantitative) **Exclusion:** Simple surveys Review papers Opinions Letters to editors Case reports	Final analysis included 90 studies	Perception of how busy or overwhelmed felt secondary to ED overcrowding, was less studied than the quality of care and mortality outcomes.	Definition of crowding measures. Metrics to measure to assess ED overcrowding.

Citation	Quality Grade	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Usefulness/Recommendation/ Implications

Legend:

ED: Emergency Department

ER: Emergency Room

Appendix C

Project Schedule

	NUR7801								NUR7802								NUR7803							
Activity	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15
Meet with preceptor	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Prepare project proposal	X	X																						
Discuss plan with preceptor and obtain approval		X																						
Identify key stakeholders			X																					
Receive buy in from Directors, Managers, Executive team			X																					
Complete SWOT analysis			X																					
Conduct risk			X																					

	NUR7801								NUR7802								NUR7803							
Activity	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15
assessment																								
Prepare Budget Proposal				X	X																			
Prepare Project Proposal		X	X	X	X	X	X	X																
Develop surge policy checklist			X	X	X																			
Development of dashboards				X	X	X	X	X																
Meet with key stakeholders	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Present draft surge policy, metrics to be measured, and project plan		X	X						X															
Finalize project process								X		X														
Obtain project implementation								X																

	NUR7801								NUR7802								NUR7803							
Activity	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15
approval																								
Educate front-line staff, physicians, leadership on new process/policy									X															
Begin Project implementation										X														
Conduct PDSA cycles during project										X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Monitor throughput delays, LOS for admitted and discharged patient's metrics.										X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Obtain feedback from staff and key stakeholders											X	X	X	X	X	X	X	X	X	X	X	X	X	X
Discuss findings with Preceptor											X	X	X	X	X	X	X	X	X	X	X	X	X	X

	NUR7801								NUR7802								NUR7803							
Activity	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15
(CNO) and action plans																								
Prepare findings to present to staff and key stakeholders.																		X	X					
Prepare presentation for facility with findings and next steps.																			X	X				
Present presentation with project results to leadership.																					X			
Prepare for dissemination																						X		
Submit project results for publication/dissemination																							X	
Submit final project																								X

. **SWOT Analysis** **Appendix D**

Strengths	Senior leadership support	Large ED for small hospital	Strong Patient experience culture and patient satisfaction metrics	Engaged physicians
Weakness	Startup JV hospital – challenges post pandemic	IP bed shortage	Inconsistent frontline staff leadership in ED and OR	Inconsistent processes for access and throughput in all areas
Opportunities	Improved hospital-wide culture related to access and throughput processes	Improved hospital-wide patient access and throughput metrics	Increased referrals from outlying centers	Sustained patient, physician, and employee satisfaction
Threats	Loss of referrals	Loss of market share for key service lines in competitive environment	Financial losses- including penalties for performance	

Appendix E

Pre and Post Implementation Turnaround Times

Week	Pre-Admitted LOS	Post-Admitted LOS	Pre-Discharged LOS	Post-Discharged LOS
One	404	297	188	188
Two	451	295	175	182
Three	267	239	170	159
Four	237	337	159	156
Five	312	270	176	143
Six	403	353	192	171
Seven	415	285	171	166
Eight	374	255	150	177

Legend:

LOS-Length of Stay