Improving Triage Accuracy in the Emergency Department

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Improving Triage Accuracy in the Emergency Department

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NURS-653-02: Internship

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Section I: Abstract

**Problem:** High rates of patients being mis-triaged was occurring at Hospital X leading to poor patient outcomes and incorrect staffing levels.

**Context:** This quality improvement project took place at Hospital X’s emergency department. A stakeholder analysis and a microsystem assessment along with a staff survey was created in order to determine areas of improvement and staff responsiveness.

**Interventions:** Eight educational seminars were conducted along with Hospital X leadership and students created supplemental materials for the staff to use on a daily basis.

**Measures:** Two data pulls were conducted over the course of the quality improvement project; one prior to the interventions and one after in order to measure effectiveness. We also examined quantitative and qualitative data throughout the process that supports the original goal for the project.

**Results:** Post-intervention results showed that the rate of mis-triaged patients went from 23% down to 10.5%.

**Conclusion:** This project can be deemed successful and continuous education via retriage training and supplemental material with ongoing competency evaluations on the Emergency Severity Index is important in order to improve triage rates at Hospital X.

**Keywords:** quality improvement, emergency department, emergency, triage accuracy, mistriage, acuity, patients, Emergency Severity Index, Lewin’s Change Theory, badge buddy
Section II: Introduction

Emergency departments are the point of entry into a hospital; the department sees a wide range of acuity patients, from those needing minimal care to those requiring life saving interventions. In order to prioritize care of these patients, a triage process is utilized. There are various triage systems used depending on the emergency department. Hospital X Emergency Department utilizes the Emergency Severity Index (ESI) to triage their incoming patients. The Emergency Severity Index (ESI) is the most used triage scale in the United States, and it is the essential triage tool that is being used at Hospital X Emergency Department (Wolf et al., 2023). The ESI is “a 5-level triage acuity scale” that was developed “to evaluate the patient’s physiologic stability and risk for deterioration” (Wolf et al., 2023). In other words, this emergency triage tool helps “get the patient to the right resources at the right place and the right time” (Wolf et al., 2023). Despite this triage system being implemented to decrease poor patient outcomes, there are many situations where the triage system implemented is not proving to be effective. Despite initial triage training that nurses receive when working in an emergency department, there is a clear need for a structured, well communicated, and systematically implemented protocol and process leading to improvement in triage accuracy. It is imperative that triage accuracy be continuously evaluated in order to ensure that the most current and effective practices are implemented for improved patient outcomes. This thesis seeks to analyze and assess the application of Lewin’s Change Theory as it relates to improved triage accuracy at the Hospital X Emergency Department.

Problem Description

Hospital X in California is located in the Silicon Valley providing health care services across all stages of life to a diverse population (Hospital X, 2023). The Emergency Room at this
hospital consists of 40 patient beds and approximately 127 nurses. Nurse managers at Hospital X observed inaccuracies in patients being triaged from a preliminary chart pull done over the months of June and July of 2023. Therefore, this quality improvement (QI) project was implemented to address the triage inaccuracies in this microsystem through the implementation of new educational materials and supplemental resources, and analyze their effectiveness.

**Summary of the Emergency Severity Index**

The National Hospital Ambulatory Medical Care Survey (NHAMCS) defines the emergency department to be a hospital facility that is staffed 24 hours a day, 7 days a week, and provides unscheduled outpatient services to patients whose condition requires immediate care (Centers for Disease Control and Prevention, 2022). Because every person going to the emergency department needs care depending on how severe their injury or malady is (acuity level), identifying the patient's level of acuity is important in order to determine which patient should be seen first. The term “triage” is defined as an initial assessment of a patient in order to determine the urgency of their need for treatment, and what nature of treatment is required (Oxford, 2023). In other words, how quickly does this patient entering the emergency department need to be seen, and what resources will be used on this patient. Because every patient who enters the emergency department will be triaged, a standardized triage system is used to efficiently and effectively triage patients who enter the emergency room. Hospital X utilizes the Emergency Severity Index model created by the Emergency Nurses Association (Emergency, 2023). It’s a widely used and recognized tool that is used to prioritize patients based on the severity of their condition, and ensure that the patients who most urgently need care, are seen first; ESI streamlines the triaging process. This triaging requires an experienced emergency room health worker; the more practice with this tool, the faster a patient will be accurately triaged.
This triaging system works as so: A patient is considered high acuity if they are either a 1 or a 2. If a patient is labeled as a Level 1, that means they require immediate intervention and need treatment to prevent death (conditions are life threatening). If the patients are labeled as a Level 2, it means they are high acuity but their condition is not immediately life-threatening. If the patient is not labeled as high acuity (1 or 2), they will be evaluated for a Level 3, 4, or 5. In order to accurately triage a patient into a specific level, decision points (condensed into four questions), are used. Decision point A asks if the patient needs immediate, life saving intervention (is the patient dying?). If so, they will be Level 1. Decision point B asks if the patient should not wait for treatment. If yes, they would be a Level 2. Once it hits decision point C, it gets slightly more complicated. Here, we are asking how many resources the patient will need (i.e. labs, fluids, IV meds, etc). If the patient requires more than one, they will be a 3. If they require just one, they will be a 4. And if the patient requires none, they are a Level 5. The ESI plays a crucial role in providing a standardized approach to triage, and it ensures that patients receive appropriate and timely care based on their acuity level.

**PICOT Statement**

A Patient, Intervention, Comparison, Outcome, and Time (PICOT) question was created at the start of this project in order to gain a better understanding of the improvement process. The PICOT question is as follows: Will an educational retraining of nursing staff on the Emergency Severity Index (ESI) with supplemental reference material help improve triage accuracy of emergency department patients compared to the original triage training? This project will analyze triage score data gathered over the course of 2023 for pre and post implementation of the ESI educational seminars and supplemental materials.
Search Strategy

A literature review was conducted over the month of September in order to collect relevant and timely research on the Emergency Severity Index. PubMed and the Cumulative Index to Nursing and Allied Health (CINAHL) databases were used to collect the research articles. A broad range of terms was initially used to start searching articles related to our project; terms like “finances in nursing” and “ESI” were too broad and needed to be reevaluated in order to find articles that served the purpose of the project. Eventually, inclusion criteria for this search included “quality improvement,” “emergency department,” “emergency,” “triage accuracy,” “mistriage,” “acuity,” “patients,” “Emergency Severity Index,” “Lewin’s Change Theory,” “protocol,” and “badge buddy.” The data range for articles was set between 2015 to 2023. In order to evaluate and grade the article's level of evidence, the Johns Hopkins Research Evidence Appraisal Tool was utilized (Dang et al., 2022).

Available Knowledge

After collecting multiple evidence-based articles around the ESI model and triage acuity in the emergency department, a comprehensive literature review (Appendix E) was conducted in order to support this quality improvement project and why effective staff re-education is vital to the improvement in triaging patients accurately.

Many hospitals utilize a method for improvement called a quality improvement project that is “crucial for the improvement of processes and practices at an institution” (Puri et al., 2020). Quality improvement projects must have a clear definition of the problem on which the quality initiative is focusing, and a goal for the project should be defined (Puri et al., 2020). Clinical evidence needs to be used throughout the development of the project and all staff members should be included in the improvement initiative, as is it extremely important for all
team members to feel empowered to contribute to the process of developing the initiatives and continuous improvement (Puri et al., 2020). This section includes a comprehensive review of studies that support this QI project and why the interventions used in the project are justified.

The triage of patients is more than just a number in a computer; it will affect the patients quality of care. This number follows the patient during their stay in the emergency room and will trigger the resources and personnel assigned to this patient, as well as the location the patient will receive medical assistance during their stay in the emergency room. An analysis was done on different emergency departments and the research revealed that patients triaged at a level 3 are becoming a significant part of the emergency department admission population and the resources used for them are similar to those triaged at levels 1 and 2. (Hocker et al., 2018). This finding is vital; not only is it important for the patients and their care, but the level at which they are triaged can determine financially how many resources are available and how much staffing is needed.

In another retrospective cohort study done in Northern California, results indicated that 32.2% of patients were being mis-triaged, and these inaccuracies lead to inappropriate resource allocation (Sax et al., 2023). Additionally, another article deemed valuable to this thesis consisted of an analysis of national emergency department data that was used to predict utilization of resources in emergency departments (Hocker et al., 2018). Research shown proves that patient acuity can have a significant impact on resource management. For example, “if a patient is classified as a mid-level (3) triage, they will require more resources and have higher indicators of acuity as those in triage levels 4 and 5” (Hocker et al., 2018). These findings are a strong case to why accurate acuity levels for patients are so important. Patients being mis-triaged at any level causes resources to function inappropriately, resulting in longer wait times, and delayed through-put of patients.
Not only does mistriaging affect resource allocation, it also affects patient outcomes. According to an article written in the International Journal for Advanced Nursing Practice, “under triaging patients [has] an increased potential for poor outcomes due to a lengthier waiting room stay, which results in delay of care” (Brosinski et al., 2017). Another study found in the Journal of the American Medical Association also found that not accurately assigning and identifying a critically ill patient is more likely to lead to “increased morbidity and mortality” (Sax et al., 2023). At Hospital X, part of the mission that the hospital encompasses is to heal, relieve suffering, and advance wellness. If a patient enters the emergency department seeking help and the outcome is increased morbidity or even death, the hospital is not upholding their mission and values, and the patient’s health is compromised. Overall, helping patients and having their best health in mind is always the goal, and it starts with entering the emergency department and being triaged correctly.

In order to identify triage patterns in emergency departments, the evaluation of current practice must take place. A single-center retrospective cohort study design was done in Brazil, and the study found that a fifth of all patients who were triaged with the Emergency Severity Index were found to be over or under triaged. The under triaging of these patients led to a more critical outcome. Even with extensive training, a large number of patients were still inaccurately triaged (Hinson et al., 2018). These findings are important because it provides rationale for ongoing training in order for the triage tool to be effective; one training at the beginning of hire is not sufficient when it comes to triaging patients. Another research article supports these findings; a literature search was conducted through BMC Emergency Medicine and the article found that refresher training is needed for emergency room nurses in order to improve triage accuracy (Tam et al., 2018). In this article, the nurses were evaluated using case studies and
found that the severity in about half the patients were not identified during triage (Tam et al., 2018). The nurses who participated stated that they had initial triage training upon hire and then had not had updated training since (Tam et al., 2018). This article is relevant because it discusses the implications of inappropriate triage and highlights the need for improvement on triage accuracy via refresher training and continuous evaluation of current practices (Tam et al., 2018). Practices and protocols need to be periodically reviewed in order to determine accuracy and reliability amongst the nursing staff. Any tool, especially a new tool, will only be as effective as the ongoing education and training provided to ensure a standardized practice of implementation.

In support of the above mentioned refresher training, another article written by BioMed Central Nursing compares traditional and non-traditional learning styles and its effect for ongoing competency in a healthcare setting (Javadi, 2023). This article analyzes how two groups of nurses were studied; one group had training on triage with a flipped classroom method, and the other group had training on triage via lecturing. The results of this study measured that after one month of education for both groups, the group with the flipped classroom method had a higher retention of the knowledge than the group with the traditional lecture method. These findings are significant to this project's intervention methods and suggest continuous recommended education. Managers at Hospital X should consider alternative classroom methods as the standardized way of teaching when creating initial and continuous training for staff regarding triaging patients.

With the above mentioned critical need of triaging patients accurately in order to decrease poor patient outcomes, an investigation of finding additional literature that would be helpful in improving triage accuracy was conducted. Further research revealed a new AI system invented named KATE. The sole purpose of the invention aims to more accurately give patients a triage
acuity score and have better detection of high-risk clinical conditions when patients are being assigned a triage level (Kate, 2023). This tool could be extremely useful in the emergency department where a high rate of mistriaging is apparent and the need to improve patient outcomes is warranted. It is reasonable to assume that this AI device could aid the department by bringing down mistriaging rates.

The reviewed literature establishes the importance of developing an evidence-based project that will improve triage accuracy through effective education and implementation of continuous training, therefore improving patient outcomes and subsequently, allowing for appropriate resource allocation.

**Rationale**

Kurt Lewin’s Change Theory three-stage model of unfreezing, change, and refreezing, will serve as the model used to implement change in this microsystem (Lewin’s, 2020). The Kurt Lewin’s Change Theory Model is a three-stage model with three major concepts: driving forces (unfreezing), restraining forces (change), and equilibrium (refreezing) (Lewin’s, 2020). The “driving forces” is a push that causes the changes to occur. In this case, a noticeable amount of patients being mis-_triaged caused a need for a change in the department. This is also referred to as the “old problem”. This discovery caused a shift in the status quo; something needed to be done in order to improve accuracy of triaged patients. Then, movement in the unit can happen; an educational zoom webinar was conducted for all emergency room nurses in order for them to be up-to-date on the new Emergency Severity Index model. Then, badge buddies were distributed to aid the nurses on the floor when it comes to triaging. Finally, the established change needs to become a new habit, also known as unfreezing the status quo. This theory is extremely important when implementing a project onto a hospital unit; the end goal is to improve
safety of the patient so an organized plan driven by a well known theory is needed. We implemented the badge buddies and also put up unit posters in order to unfreeze the previous status quo and remind the unit staff of the new learning.

The first step in the model is unfreezing; in this stage, identification of an old problem is addressed. In this case, the Hospital X Emergency Department is identifying that there is a high percentage of patients being mis-triaged in the emergency department. This high number of patients being incorrectly triaged was identified by management. The high number of patients being mis-triaged led to poor patient outcomes to a misallocation of resources and insufficient staffing. The conclusion was, the emergency room nurses were not being re-educated on the triage tool and were failing to meet the standards used in order to triage a patient correctly. This practice led to inaccurately triage patients, and is therefore, identified as the “unfreezing” element.

The next stage in Kurt Lewin’s Change Theory model is the change phase. This involves identifying the thoughts, feelings, behavior of the current ineffective practices and determining the change leading to the intentional implementation of the new change practice, thereby, letting go of old patterns. (Lewin’s, 2020). The change phase began with a google survey (Appendix B) collecting nurses' thoughts, feelings and behaviors relating to triaging patients and their comfortability with using the ESI model. The survey results led to the identification of a problem, however, they were not able to identify the root cause.

Lastly, the third and final phase of the model is the refreezing stage. This incorporates establishing a new status quo. The refreezing stage began with required educational zoom webinars for all of the emergency room nurses. After the educational zoom webinars were completed, the badge buddies (Appendix D) (“a small, plastic card that attaches to an employee’s
name badge”) were distributed to establish standard practice (Hipaa, 2011). The badge buddies included the ESI algorithm visible for every nurse to use during their shifts. Without this implementation, it can be very easy for nurses to fall back into the old problem that originally needed to be changed. In order to anchor the change and make the education of the ESI version 5 standard practice, data will be collected following implementation in order to see how successful the educational trainings were. The most important part of the final stage of Lewin’s model is acknowledging and celebrating the change that has taken place. This increases driving forces away from the old practices and establishes the new practices.

**Specific Project Aim**

The specific project aim was to improve triage accuracy rates to under 10% by the end of November with the use of the Emergency Severity Index (ESI), version 5. A survey was distributed to the nurses and data was collected prior to the education over zoom on the ESI version 5 to the emergency room nurses and then new data was collected after the zoom webinars and distribution of badge buddies, as well as a secondary follow up survey. The purpose of the second data collection served to evaluate whether the triaging of patients improved in accuracy, and the follow up survey was to evaluate the feelings of then nurses post implementation in order to ensure compliance and enthusiasm for the new status quo.
Section III: Methods

Project Overview

A Plan, Do, Study, Act (PDSA) cycle was structured in order to organize this project. A PDSA method is “the best way to test a change that is implemented” (U.S., 2020). Using the four steps in the PDSA method allows for guided thinking, breaking down the steps into tasks, evaluating the outcome, and improving on the change (U.S., 2020). Using internal data shared by Hospital X Emergency Department manager, a specific aim statement and a PICOT question were developed. A preliminary survey was sent out in order to gain understanding of the unit relating to ESI and triaging. From there, a Gantt Chart (Appendix H) was constructed to determine the project’s timeline and essential elements of the change project. Subsequently, a literature review was conducted, and a microsystem assessment was created using the 5 P’s, a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis (Appendix F), Root Cause Analysis (fishbone diagram, Appendix G), and a stakeholder analysis. A data pull of patients’ acuity levels from January 2023-April 2023 was done in order to gain solid data regarding the accuracy of triage scores. From the data collection, a plan was developed in order to implement continuous interactive education of the Emergency Severity Index model. Educational seminars with case studies were mandatory to all emergency department nurses and badge buddies were distributed following the seminars to aid the nurses on the floor when making triage decisions. After one month following the education seminars and badge buddy distribution, a second data pull was conducted in order to examine if the new practices were being implemented and whether these were beneficial. Then, a cost benefit analysis was created to demonstrate how the hospital would benefit from the implemented change. Lastly, continuous monitoring is planned to ensure fidelity with the new model.
**Microsystem Assessment and Stakeholder Analysis**

A “5 P” microsystem assessment was implemented to evaluate the improvement that is needed in this emergency department. The “5 P’s” include purpose, patients, professionals, processes, and patterns. The purpose of Hospital X Emergency Department is to give quality care to the patients who enter seeking medical attention. Using the ESI triage model, the aim is to better prioritize patients based on the severity of their medical condition, and ensure that the most critical patients are seen first. The patients served at Hospital X are "people of all ages" and are seen "24 hours a day, every day" (Hospital X, 2023). The patients seen are from a diverse background ranging from those with life-threatening emergencies to those with less critical medical maladies. The Hospital X Emergency Department has a diverse multidisciplinary team that consists of (but not limited to) physicians, nurses, respiratory therapists, technicians, registration, and other support staff. The professionals working together on this specific quality improvement project are the student nurses from the University of San Francisco, the triage nurses at Hospital X, and the nursing managers. This triage process also will include training for the nurse assigning the patients a triage score, whether they get screened and go through registration when they enter the emergency department, or if they are coming in by ambulance and being triaged by the primary nurse. The process for triaging patients coming in through the hospital emergency entrance starts with the screener nurse and the patient goes to registration. Then, a nurse is assigning the patient a triage score using the ESI model in the appropriate treatment area after identifying if the patient has life-threatening symptoms. Based on the patient's level of acuity, the level of intervention will differ. The goal is to accurately assess each patient and assign them to the correct acuity level so appropriate intervention can be made. The assessment of these patients will also determine patterns for resource allocation and data
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Analysis. These both give feedback to the professionals looking to make adjustments wherever needed.

In any healthcare initiative, understanding and analyzing the attitudes and concerns of various stakeholders is crucial for successful implementation. Analyzing the ESI triage acuity process in an emergency department involves a wide range of stakeholders; an analysis will be made in order to identify and project the attitudes of key patients, professionals, groups, and relative organizations. First, the patients are the center of healthcare, and their attitudes are central to our analysis. They seek prompt and effective care at the emergency department, and they assume the implemented triage system identifies their priority care effectively. The healthcare professionals (nurses and physicians) are vital to the process as they are responsible for the accuracy of the triage system. They are open to accept any implementation that will more accurately prioritize critical patients. The managers of the emergency department will seek efficient resource allocation that will improve patient outcomes. They could be concerned if the cost of implementation and training are high for the initial costs. Successful implementation of ESI triage acuity in the Hospital X Emergency Department requires an understanding of all stakeholders involved. Balancing the attitudes and expectations of all stakeholders is essential for improved patient outcomes in the Hospital X Emergency Department.

Plan, Do, Study, Act Cycle

During the initial planning phase of this project, a meeting was held with the clinical instructor and the students involved in this project. The first task was creating a PICOT question and specific aim statement that would be the general basis of this project. Then, a staff survey (Appendix B) and a QR code (Appendix C) were created in order to gain an preliminary understanding of where the staff nurses were comfortability wise and regarding the Emergency
Severity Index model. A QR code was created for this survey and put onto a poster which was placed around the unit. USF students brought incentive (pizza) for more staff participation with the survey. Then, USF students and managers of the emergency unit planned mandatory educational seminars introducing the Emergency Severity Index model with all unit nurses. During the planning phases the project group met in order to create a plan to collect data from epic; it was determined that 400 patient acuity levels from January 2023-April 2023 would be analyzed and compared with the ESI model, and see if the acuity level originally assigned was accurate. Every patient seen in the emergency department of the selected month was put into a google spreadsheet and then an algorithm was submitted that ensured the randomization of 400 patients' scores being selected for review.

Out of the 127 nurses working on the unit, 37 responded to the google survey which is 35% response rate of the nurses working on the unit. This survey showed that more than half of the participating nurses felt comfortable correctly assigning patients a triage score and that they often correctly identify a patient's acuity level. However, the same nurses also believe that the unit is not doing a good job with training nurses with the triage system, and almost all agree that an inservice training for the Emergency Severity Index (ESI) model would be beneficial to the department as a whole. Based on the survey data, it was determined that educational seminars would benefit the unit in the implementation of the Emergency Severity Index model to more accurately triage patients. In addition, a badge buddy reference card (Appendix D) was created for every individual nurse to have and a poster version of the same model was provided for the unit.

In the third phase of the PDSA cycle, the data from before the interventions was collected and compared with the data collected after the implementation period. This second data pull
showed that the implementation portion of this project worked and the accuracy of patients being triaged was better than before the implementation period.

In the final stage of the PDSA cycle, the accuracy of the assigned acuity level of patients will be continually monitored by the nurse manager at random shifts and days to ensure fidelity to the new model. An educational seminar will be mandatory for all new nurses, and refresher courses will be implemented annually. Badge buddies and unit reminders will continue to be available. If positive change is not occurring, necessary adjustments will be implemented.

**Root Cause Analysis**

Hospital X identified an issue with their triage scoring, and a Root Cause Analysis (RCA) was performed to determine the potential reasons for this problem. A fishbone diagram (Appendix G) was created in order to show the brainstorm of potential reasons for the mistriaging of patients. What was first identified were the areas of measurement and environment. Then materials, staff and patients were looked into as potential causes. Finally, methods and machines were looked at as potential root causes. From the analysis of the fishbone diagram, it was determined that the application of the ESI model was the actual root cause. After the initial brainstorm, there was a realization that it was deeper than the staff and patients or machines; the actual method of delivering the education and refreshing the knowledge proved to be the root cause. This fishbone diagram highlighted the potential problems associated with triage inaccuracy for this unit specifically; examples of some problems included, lack of materials to reference when assigning a triage number, improper education around the ESI algorithm, and understaffed environment, and lack of resources available on the unit. Overall, this RCA helped determine what changes needed to be made on the unit to help improve triage accuracy scores.
Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis

A Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis (Appendix F) was created in order to “help assess internal factors that might affect the business (strengths and weaknesses) and external factors (opportunities and threats)” (The State of Queensland, 2023). Some strengths that were identified at Hospital X are that they are an AACN Magnet hospital and they are also a 2023 ENA Lantern Award Recipient (Hospital X, 2023). This is important because the Emergency Association only awards this to emergency departments that show “exceptional and innovative performances in leadership, practice, education, advocacy, and research” (Emergency, 2023). Some weaknesses that were identified are that the department is currently under-triaging patients, there are long wait times for patients entering the emergency department, there are limited nurses staffed, and there is a lack of triage education. Opportunities recognized in the SWOT analysis are that improvements in triage accuracy can happen, which can lead to a reduction in wait times and an improvement of nursing staffing numbers. Threats recognized in the SWOT analysis are the staff compliance numbers, and any financials needed to implement educational courses and badge buddies needs to get approval. There was also some initial staff resistance as predicted with any new change coming into a unit that has been functioning the same for a while.

Cost-Benefit Analysis (CBA)

A Cost Benefit Analysis (CBA) (Appendix J) was created in order to determine if the benefits of implementation outweigh the costs of the improvement strategies. From this analysis, it was determined that correct triaging of patients can actually affect a hospital's budget. For this project specifically, costs are also associated with the yearly refresher training; the nurses leading the educational zooms are paid for their time, as well as all the nurses are
mandated to attend. It was estimated that the average hourly salary of the nurses attending the training is $91 and each the training was one hour. The total being spent for every nurse to attend the training is calculated to be $11,558. Therefore, the hospital has to compensate the nurses for their hour of time done outside of work. This will be an annual expense but will vary depending on the numbers of nurses hired each year. Another cost calculated was the compensation a veteran nurse at the hospital would receive for taking time outside of work to create a new educational curriculum for the unit that was taken from the Emergency Nurses Association website and the fee from the website to access the original material. This totaled to be around $2,712. Smaller costs calculated by students included $333 for 150 badge buddy reference cards, unit posters, quick response (QR) codes for survey submissions, all totaling $193. The total costs calculated by USF students estimated $14,796.

Even with this project costing a significant amount, Hospital X will benefit greatly if initial triaging of patients is accurate. According to a study done in the Official Journal of the Society for Academic Emergency Medicine, there were “increasing mean charges per patient with increasing ESI acuity” (Wiler et al., 2011). This signifies that there is a moderate correlation between an ESI assigned triage level and billing charges. According to the same study, most patients were assigned a triage score of 3 on the ESI scale. This is the case for most hospitals, but, the more acute the patient is on the ESI scale, the higher the patient billable is. Specifically at Hospital X, each triage level has an assigned value of billing points; level one is 20 points, level two is 15 points, level three is 10 points, level four is five points, and level five is zero points. Points are assigned to the patient throughout their treatment and if a patient obtains more than 251 points, they are billed at a higher rate because they would be considered more critical. Because the unit was found to be under-triaging 16.25% of patients, they are effectively losing
money due to inaccurate billing criteria all because of inaccurate triaging. There are also increased costs for the department when there are excessive wait times in the waiting room or mortality that could result in a patient decompensating because they were not triaged accurately. Improving triage accuracy will generate more consistent income for Hospital X and justify spending the initial costs calculated in this project as benefits far exceed the initial costs. Improving triage accuracy will generate more consistent income for Hospital X and justify spending the initial costs calculated in this project as benefits far exceed the initial costs.

**Timeline**

In order to gain an accurate representation of our project planning and timeline, a Gantt Chart (Appendix H) was created (What, 2023). This tool assists with planning and scheduling of this project and also helps monitor our professional progress (What, 2023). In all, this Gantt chart represents a visualization of the project from August 2023 through December 2023.

**Intervention**

The two major interventions of this project were educational virtual webinars on implementing ESI model onto the unit and badge buddy reference cards. The zoom webinars were mandatory for every emergency department nurse and occurred over a period of 8 sessions. Each session went over the same powerpoint and discussed the ESI model 5 and ended with case study scenarios for the nurses to practice assigning triage numbers. It was also mandatory that each nurse needed to take a post examination on ESI triaging and pass with a 100%. The badge buddy reference cards were created for each emergency department nurse to have and carry on shift after they attended the virtual educational session. The purpose of the reference card is to reiterate and reinforce what was learned, and have the information easily accessible on each
person. This allows for the nurse to make quick triage decisions with the badge to reference, and not having to go off memory or guessing.

**Study of Intervention**

In order to see if the educational webinars on ESI model and the supplemental material of a badge buddy reference card given to all nurses was successful in giving more accurate triage scores to patients, a second data pull of patient triage scores will be done for the month of October. This will give a loose representation of if the implementation portion of this project was successful. This second data pull was similar to the first where 400 randomized patients for each student were examined looking at the original triage score assigned and seeing if the score accurately matched the ESI triage algorithm. With this study of the intervention, students were expecting that the accuracy of assigned triage numbers per patient would rise.

**Measures**

Including the randomized data pull of the month of October, students working on the QI project will send out a second google survey to the nurses in order to measure their same feelings and attitudes towards assigning triage post intervention. This data will be documented anonymously, and is helpful in measuring the effectiveness of online training and badge buddy reference cards because in order for it to be successful, attitudes and mindsets must change (refreezing new protocol to become standard practice). Challenges that are still arising are important to document as well; if something is not working after implementation, the study of why that is must be considered so that it can be changed and updated. That is part of the Plan, Do, Study, Act cycle and it’s very important to keep monitoring the unit's success with triage scores so that implementation can continue to be successful. If challenges arise, then necessary adjustments will be made. Due to the students' time constraints, we were only able to measure
one month of implementation, but this will be a continuous process that management will monitor quarterly.

**Ethical Considerations**

A variety of ethical considerations were used in this quality improvement project including voluntary participation with any surveys, maintaining HIPAA when looking at patient data, and full disclosure of results. Examples of this include only pulling data from the patients chart that was deemed absolutely necessary; full name, date of birth, and medical record number were excluded from our search. Only the last name, first initial, chief complaint, vital signs, and original triage score were looked at. We also did not open charts that gave a “break-the-glass” warning before opening, as this signified confidential information that we should not be looking at.
Section IV: Results

A second data pull of 400 randomized patients looked at from October 16th to November 16th yielded desirable results. Our goal as a group was to reach a triage accuracy rate of 10%. After the data pull, it was calculated that triaging in Hospital X’s Emergency Department went from 23% down to 10.5%. This included the rate of under triaging going down from 16.25% down to 6.5% and the rate of over triaging went down from 6.75% to 4.25%. These findings are extremely positive and show that the educational webinars and supplemental materials are helpful to the staff when triaging patients. The post-survey for the staff received 28 responses (22% of staff) and found that more than half thought they were triaging patients correctly, and more than half thought that they were receiving adequate triage education. This changed from the previous survey sent out before the educational seminars where less than half of the participants of the survey stated that they were getting adequate education around triaging.
Section V: Discussion

A decrease in the amount of patients being mis-triaged in the emergency department at Hospital X proves that continuous education is necessary in order to decrease mistraging rates. Educational webinars reteaching about the Emergency Severity Index and supplemental material (badge buddies and unit posters) are helpful in decreasing the percent of patients being mis-triaged. Although this project had a time constraint and implementation could only be measured over one month, the hope is that our data and findings will support the annual education of the Emergency Severity Index and all new staff will receive a badge buddy reference card. This continuing education will allow for the triage inaccuracy rate to be decreased. If staff are finding that levels of mistriaging are rising again, the leadership team at Hospital X will adjust the PDSA cycle accordingly.

Limitations

During the course of this project, there were some limitations that impacted the study. The first major limiting circumstance was that the project began with a time constraint. Our project was limited to less than 6 months for the entire process. This made it so that we were only able to assess the efficacy of implementation through our retroactive chart analysis of one month. The second big limitation is the fact that we, as students, were tasked with comparing a triage score assigned to the actual triage score that the patient should be assigned based on the ESI model 5; however, we were not trained on triaging patients and the whole concept was very new to us. However, students had a meeting with an experienced nurse on the unit and a brief overview on how to triage patients using the ESI algorithm was given. This mini training from the experienced nurse helped students be more confident in using the algorithm solo. Another limitation was the low staff participation on our pre-intervention survey. Despite these
limitations, this study provided valuable insight for the nursing managers on the unit, and will guide further nurse training and education.

**Summary**

The leadership team at Hospital X found a high percentage of mistriage rates within their emergency department. The nursing students from USF sought thorough examination of patient percentages and USF students helped implement educational seminars and supplemental material around triaging patients using the Emergency Severity Index model. Students developed a PICOT question, microsystem assessment, staff surveys, supplemental material, and conducted data analysis. Initiation of the Plan, Do, Study, Act cycle commenced and was presented to the unit's leadership. Data was shown that with the educational seminars and supplemental material, mistriaging rates decreased. USF nursing students recommend continuous annual education on the Emergency Severity Index triaging tool using a flipped classroom in order to ensure that staff is retaining the information. Nursing students also recommend the KATE AI software that “enables clinicians to deliver optimal patient care by accurately differentiating clinical risk in real-time at triage” (Kate, 2023). It is recognized that this software is expensive for the unit, but that in the future it is a good option if budget allows.

**Conclusion**

This quality improvement project at Hospital X is deemed successful due to the 23% to 10.5% decrease of patients being mis-triaged in the emergency department after the implementation of the educational webinars and the distribution of the badge buddy reference cards and the in unit posters. Students participating in the project believe that continual annual education on the Emergency Severity Index model will aid in continuing to see a decrease of mistriaged patients in the future. Further research will be necessary in order to make sure that the
annual education is appropriate and yielding reduced mistriage rates for the unit. This project was very important to the unit as the project stakeholders are extremely interested in continual education revolving around triaging patients because every patient who is accurately triaged can receive the care they need based on their medical needs and allow the staff to treat each patient appropriately.
Section VI: References


Hospital X. Our mission and values. (2023, August 7). Hospital X. https://www.elcaminomedical.org/about-us/our-mission


*What is a Gantt chart?.* (2023) APM. https://www.apm.org.uk/resources/find-a-resource/gantt-chart/#:~:text=A%20Gantt%20chart%20is%20a,helps%20project%20professionals%20monitor%20progress.


Section VII: Appendices

Appendix A

Statement of Determination

Student Project Approval: Statement of Determination

Title of Project
Improving Triage Accuracy in an Emergency Department

Brief Description of Project:
The aim of this quality improvement project will be focused on improving triage accuracy in the emergency department at Hospital X. An educational program on the ESI version 5 algorithm will be implemented, badge reference cards and posters will be developed, and surveys to the staff will be sent out. A pre data pull of patients will be done in order to look at the rate of patients being mis-triaged. After the training sessions, a new set of chart pulls will occur to be compared with the previous data. An analysis of the surveys and chart data will be conducted in order to see an improvement in triage accuracy, and allow for the ongoing assessment of the potential impact on patient outcomes and the allocation of staffing resources.

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.

Comments:

Signature of Supervising Faculty:

12/8/23

Signature of Student: Joselyn Silverman  Date: 11/30/2023
Appendix B

Pre-Intervention Questionnaire

ED: ESI Pre-survey

Hello ED Staff,

We are graduate nursing students at the University of San Francisco and are participating in research on triage accuracy in the Emergency Department. Thank you for your responses, they are greatly appreciated!

rvharrington@dons.usfca.edu Switch account

Not shared

* Indicates required question

How often do you feel that you accurately assign patients in triage ESI levels 1 and 2? *

- Never
- Rarely
- Sometimes
- Often
- Always
How often do you feel that you accurately assign patients in triage ESI levels 3 through 5?

- Never
- Rarely
- Sometimes
- Often
- Always

As a department, how often do you believe patients are being appropriately triaged?

- Never
- Rarely
- Sometimes
- Often
- Always

Do you agree the current triage training by the department is sufficient for orienting new triage nurses?

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree
Do you believe an inservice education program on the new ESI version 5 algorithm will positively improve triage efforts in the department? *

- Very unlikely
- Unlikely
- Neutral
- Likely
- Very likely

Briefly describe your understanding of the negative impact under-triaging has in your department.

Your answer

Please provide any suggestions you may have to help improve triage accuracy in your department.

Your answer

Submit

Clear form

Never submit passwords through Google Forms.

This form was created inside of Students & Alumni DonsApps. Report Abuse

Google Forms
How often do you feel that you accurately assign patients in triage ESI levels 1 and 2?

37 responses

- Never: 67.6%
- Rarely: 8.1%
- Sometimes: 24.3%

How often do you feel that you accurately assign patients in triage ESI levels 3 through 5?

37 responses

- Never: 75.7%
- Rarely: 13.5%
- Sometimes: 10.8%

As a department, how often do you believe patients are being appropriately triaged?

37 responses

- Never: 35.1%
- Rarely: 62.2%
Do you agree the current triage training by the department is sufficient for orienting new triage nurses?
37 responses

Do you believe an inservice education program on the new ESI version 5 algorithm will positively improve triage efforts in the department?
37 responses
Appendix C

Research Survey QR Poster

Graduate nursing students at the University of San Francisco are conducting research on triage accuracy in the Emergency Department. We would greatly appreciate your participation!
Appendix D

“Badge Buddy”

High Risk Vitals

<table>
<thead>
<tr>
<th>Age</th>
<th>HR</th>
<th>RR</th>
<th>Consider ESI level</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 mo</td>
<td>&gt; 150</td>
<td>&gt; 40</td>
<td>1 or 2</td>
</tr>
<tr>
<td>1 - 12 mo</td>
<td>&gt; 180</td>
<td>&gt; 66</td>
<td></td>
</tr>
<tr>
<td>1 - 3 yr</td>
<td>&gt; 140</td>
<td>&gt; 40</td>
<td></td>
</tr>
<tr>
<td>3 - 12 yr</td>
<td>&gt; 120</td>
<td>&gt; 30-35</td>
<td></td>
</tr>
<tr>
<td>&gt; 12 yr</td>
<td>&gt; 100</td>
<td>&gt; 20</td>
<td></td>
</tr>
</tbody>
</table>

SpO2 < 92%

Resources

**Resources**
- Labs (blood, urine)
- ECG
- Xray
- CT
- MRI
- Ultrasound
- IV fluids
- IV/IM/nebulized medications
- Specialty consultation
- Simple procedure (I&D, repair, urinary catheter)
- Complex procedure (conscious sedation)

**Not Resources**
- Hx and physical exam (including palvo)
- Point-of-care testing
- Saline or heparin lock
- PO medications
- Tetanus immunizations
- Prescription refills
- Call to primary care provider
- Simple wound care (dressings, recheck)
- Crutches, splints, slings

**Note:** 2+ tests from the same department count as a single resource; i.e., a CBC and UA are counted as 1 resource, a CT and MRI are counted as 2 resources.
## Appendix E

### Literature Synthesis Table

<table>
<thead>
<tr>
<th>Study Authors</th>
<th>Objective &amp; Design</th>
<th>Sample &amp; Setting</th>
<th>Results</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinson, Martinez, Schmitz, Toerper, Radu, Scheulen, Stewart de Ramirez, &amp; Levin (2018)</td>
<td>A single-center retrospective cohort study design was done to examine emergency department triage patterns.</td>
<td>This study included 96,701 adult patients at a hospital in Brazil who visited the emergency department between January 1, 2013 to September 15, 2015.</td>
<td>A fifth of all patients who were triaged were found to be over or under triaged. The under triaging of these patients led to a more critical outcome. Even with extensive training, a large number of patients were still inaccurately triaged.</td>
<td>Level III (Dang et al., 2022)</td>
</tr>
<tr>
<td>Hocker, Gerardo, Theiling, Villani, Donohoe, Sandesara, &amp; Limkakeng (2018)</td>
<td>A multi-year secondary analysis was conducted to describe emergency department resource usage trends.</td>
<td>An analysis of 100,962 emergency department visits was conducted from the National Hospital Ambulatory Medical Care Survey (NHAMCS).</td>
<td>The research revealed that patients triaged at a level 3 are becoming a significant part of the emergency department admission population and the resources used for them are similar to those triaged at levels 1 and 2.</td>
<td>Level II (Dang et al., 2022)</td>
</tr>
<tr>
<td>Sax, Warton, Mark, Vinson, Kene, Ballard, Vitale, McGaughey, Beardsley, Pines, &amp; Reeds (2023)</td>
<td>A retrospective cohort study was created to assess the rate of mistriage in the emergency department.</td>
<td>5,315,176 patient encounters in 21 different Kaiser Northern California emergency departments were collected.</td>
<td>Mistriage occurred in 32.2% of the emergency department encounters, 3.3% being under triaged and 28.9% being over triaged. Training needs to focus on limiting critical triage inaccuracies and improving resource allocation.</td>
<td>Level III (Dang et al., 2022)</td>
</tr>
<tr>
<td>Takaoka, Ooya, Ono, &amp; Kakeda</td>
<td>A parallel randomized</td>
<td>23 different triage nurses</td>
<td>The results in the study showed that the</td>
<td>Level I (Dang et al., 2022)</td>
</tr>
<tr>
<td>Year</td>
<td>Methodology</td>
<td>Number of Articles</td>
<td>Outcome</td>
<td>Level</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>2021</td>
<td>A control trial was carried out in order to evaluate the effectiveness of the Emergency Severity Index (ESI) vs. the Japan Triage and Acuity Scale (JTAS).</td>
<td>9</td>
<td>Emergency Severity Index scale was associated with higher accuracy of triage decisions than the Japan Triage and Acuity Scale.</td>
<td>V</td>
</tr>
<tr>
<td>Tam, Chung, &amp; Lou (2018)</td>
<td>A literature search was done with four different databases to determine different triage accuracy.</td>
<td>9</td>
<td>After review of the 9 studies, all methods from each study revealed a 60% triage inaccuracy rate. This inaccuracy rate presents a need for improvement on triage accuracy via training.</td>
<td>V</td>
</tr>
</tbody>
</table>

**Table:**

- **Year (2021):**
  - Control trial was carried out in order to evaluate the effectiveness of the Emergency Severity Index (ESI) vs. the Japan Triage and Acuity Scale (JTAS).
  - From numerous emergency departments in Japan were recruited for the study and registered with the University of Hospital Medical Information Network Clinical Trial Registry in Japan.
  - Emergency Severity Index scale was associated with higher accuracy of triage decisions than the Japan Triage and Acuity Scale.

- **Tam, Chung, & Lou (2018):**
  - A literature search was done with four different databases to determine different triage accuracy.
  - 9 articles were reviewed covering a time period between January 2008 to August 2018. Studies were taken from 4 different databases.
  - After review of the 9 studies, all methods from each study revealed a 60% triage inaccuracy rate. This inaccuracy rate presents a need for improvement on triage accuracy via training.
Appendix F

Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis

**SWOT ANALYSIS**

- **STRENGTHS**
  - AACN Magnet Designation
  - 2023 ENA Lantern Award recipient for innovation in leadership, practice, education, advocacy and research
  - Previous success with quality improvement initiatives, such as the implementation of Flapatch to improve sepsis outcomes

- **WEAKNESSES**
  - Under-triaging of patients
  - Long wait times to triage and rooming
  - Staff culture challenges
  - Lack of formal triage education
  - Limited staff

- **OPPORTUNITIES**
  - Improve accurate triage according to ESI guidelines
  - Reduce wait times
  - Improve nursing assignments by accurately assessing unit acuity
  - Increase nursing knowledge

- **THREATS**
  - Staff buy-in
  - Availability of adequate and effective staff education
  - Financial barriers and necessary approval from CNO for expenditures
Appendix G

Root Cause Analysis: Fishbone Diagram
### Appendix H

**Gantt Chart**

<table>
<thead>
<tr>
<th>TASK TITLE</th>
<th>START DATE</th>
<th>END DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Initiation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Initiation Meeting with CI and Leadership</td>
<td>8/22/2023</td>
<td>8/22/2023</td>
</tr>
<tr>
<td>Statement of Determination</td>
<td>9/9/2023</td>
<td>9/16/2023</td>
</tr>
<tr>
<td><strong>Project Planning</strong></td>
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<tr>
<td>Pre-Survey Development</td>
<td>8/30/2023</td>
<td>9/5/2023</td>
</tr>
<tr>
<td>QR Flier Creation</td>
<td>9/5/2023</td>
<td>9/5/2023</td>
</tr>
<tr>
<td>Badge Buddy Creation</td>
<td>9/11/2023</td>
<td>9/20/2023</td>
</tr>
<tr>
<td>Posters Creation</td>
<td>9/12/2023</td>
<td>9/20/2023</td>
</tr>
<tr>
<td>Pre-Data Collection</td>
<td>9/11/2023</td>
<td>9/26/2023</td>
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<tr>
<td>Post-Survey Development</td>
<td>10/26/2023</td>
<td>10/26/2023</td>
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<tr>
<td>Post-Data Collection</td>
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<td>11/16/2023</td>
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<tr>
<td><strong>Project Implementation</strong></td>
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<tr>
<td>Pre-Survey Posted</td>
<td>9/11/2023</td>
<td>9/25/2023</td>
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<tr>
<td>Educational Webinars</td>
<td>9/26/2023</td>
<td>10/16/2023</td>
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<tr>
<td>Badge Buddy Distribution</td>
<td>10/26/2023</td>
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</tr>
<tr>
<td>Poster Distribution on Unit</td>
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<td>Post-Survey Posted</td>
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<td>11/16/2023</td>
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<td><strong>Project Evaluation and Synthesis</strong></td>
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<td>Data Analysis</td>
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<td>11/17/2023</td>
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<tr>
<td>Project Poster Presentation</td>
<td>12/14/2023</td>
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</tr>
</tbody>
</table>
Appendix I

Plan, Do, Study, Act Cycle

- Continue to monitor triage accuracy
- Consider altering education style (ie flipped classroom) or adding AI to triage
- Follow up staff survey
- Assess triage accuracy for improvements

- Assess baseline triage accuracy
- Staff survey
- Create education content and materials
- Educate nurses on latest ESI algorithm
- Distribute education materials (badge buddies, posters)
## Appendix J

Cost Benefit Analysis Table

<table>
<thead>
<tr>
<th>Developmental Costs</th>
<th>Calculations</th>
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<tbody>
<tr>
<td>Student Costs</td>
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<tr>
<td>QR Code</td>
<td>$35 per month x 2 = $70</td>
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<tr>
<td>Promotion of Survey</td>
<td>$10.83 x 6 pizzas = $65</td>
</tr>
<tr>
<td>Posters</td>
<td>$29 x 2 = $58</td>
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<tr>
<td>Hospital Costs</td>
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<tr>
<td>Badge Reference Cards</td>
<td>$2.22 x 150 = $333</td>
</tr>
<tr>
<td>Lead Nurse - Hourly Salary</td>
<td>$108 x 24 hr = $2,592</td>
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<tr>
<td>ENA ESI Training (Membership price)</td>
<td>$120</td>
</tr>
<tr>
<td>Nurses Attendance</td>
<td>$91.01 x 127 = $11,558.27</td>
</tr>
</tbody>
</table>

**Total Costs: $14,796**