Decreasing Door-to-triage Times in the Emergency Department

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Abstract

In the emergency department, patients who are waiting for triage present with potentially time-sensitive and life-threatening conditions. The period of time between arrival and triage is rarely discussed in the literature, and there are no established, evidence-based goals or standard recommendations. This project developed and implemented a novel algorithm designed to decrease door-to-triage (DTT) time to under 10 minutes by reallocating qualified nursing staff at peak triage times. The Plan Do Study Act quality improvement model was used throughout the project. Findings showed that staff responding to decompress triage based on algorithm triggers led to a decreasing trend in DTT times and a decrease in the rate of patients leaving without being seen by a provider over a 12-week implementation period. However, staff response was affected by barriers such as staffing, holding admission patients, not meeting algorithm conditions, and patient acuity. This project demonstrates the positive effects of decreasing and tracking time-to-triage in the emergency department setting on patients, staff, and healthcare systems. It also highlights barriers to timely triage and recommendations for further study.

Key words: triage, time-to-triage, door-to-triage time, triage response algorithm

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Section I. Introduction

Background

In 2020, over 3.6 million individuals sought care at an emergency department (ED) in the state of North Carolina (Sheps Center, 2022). High emergency department usage increases department congestion and individual patient wait times. Timely, appropriate care is fundamental for positive outcomes for patients experiencing emergencies. The Centers for Medicare and Medicaid Services (CMS) track specific time-based metrics to evaluate emergency department performance; however, door-to-triage times are not included (Houston et al., 2015). Door-to-triage refers to the time it takes to begin triage after a patient enters the emergency department. This waiting for triage can represent up to 30% of CMS-tracked door-to-doctor time (Houston et al., 2015). More importantly, in many emergencies, even seconds can improve patient outcomes.

Organizational Needs Statement

One of the high-risk periods during a patient's ED visit is while they are waiting to be triaged (Hansen et al., 2021). Waiting for triage has been described as a *hidden wait* in the emergency care process (Pryce et al., 2020). Triage is typically the first care patients receive after checking in to the emergency department. It is a process where clinical staff, usually registered nurses, collect data, assign patients an acuity level, and determine the next steps based on patient acuity, resources, and department status. Data obtained include chief complaints, pertinent medical history, vital signs, and mandatory screenings, such as fall risk assessments, suicide risk assessments, and abuse screenings (Houston et al., 2015). The triage process should only last a few minutes, but the time patients spend waiting to be triaged is often not considered (Hansen et al., 2021; Houston et al., 2015; Pryce et al., 2020; Reiter & Scaletta, n.d.).

Literature suggests patients should be triaged within 5 to 10 minutes from arrival to rule out time-sensitive, life-threatening emergencies, such as strokes or cardiac events (Houston et al.,

2015; Reiter & Scaletta, n.d.). At the facility where the project took place, the average time from patient arrival in the ED to initiation of triage for June 2022 was 14 minutes based on data audited from the electronic health record ([redacted], personal communication, July 8, 2022). This facility supports a project to achieve and sustain door-to-triage times of less than 10 minutes to meet evidence-based recommendations (Yancey & O'Rourke, 2021; Houston et al., 2015). At the organization, emergency nursing leadership has indicated that patients must be triaged within 30 minutes after arrival in the emergency department (2021). However, based on evidence, the organization is considering adjusting current guidelines and has set a goal to triage all patients within 10 minutes ([redacted], personal communication, July 8, 2022).

In addition to patient safety and outcomes, decreasing door-to-triage times addresses the Quadruple Aim described by Bodenheimer and Sinsky. The Quadruple Aim is a framework that medical institutions use to enhance performance. The four elements are "improving the health of populations, enhancing the patient experience of care, reducing the per capita cost of healthcare, [and] improving the work-life of those who deliver care" (Bodenheimer & Sinsky, 2014, p 573, 575). Decreasing wait times for triage allows for quicker assessment and intervention when emergencies present, improving health outcomes and, therefore, improving population health. Patient satisfaction is elevated because less time is spent waiting without a medical assessment, and care is started faster. Healthcare costs are reduced by averting patients from leaving before triage and preventing potential deterioration of a patient's condition while waiting for an initial assessment. Lastly, the work-life of healthcare workers is enhanced by promoting workflow efficiency resulting in effective triage processes and education. This efficiency will likely result in more appreciation from patients who have better experiences.

In addition to addressing the Quadruple Aim, decreasing door-to-triage times addresses objectives outlined in Healthy People 2030 by the Office of Disease Prevention and Health Promotion of the U.S. Department of Health and Human Services. Specifically, the goal of "reducing the proportion of emergency department visits with a longer wait time than recommended" (2021, para. 1). Healthy People 2030 reports that the latest data indicates that 19.2% of patients are waiting longer than recommended to see an emergency department provider and have established a goal to have under 12% of patients waiting longer than recommended based on acuity. Decreasing the time patients are waiting for triage can significantly affect this goal, as time-to-triage can represent up to 30% of the door-to-doctor time (Houston et al., 2015). It is currently challenging to compare door-to-triage times nationally or locally, as it is not widely reported or tracked (Houston et al., 2015).

There are several barriers to meeting the triage time goal. A root cause analysis of emergency department wait times at a Veteran's Affairs emergency department found that, at busier times, the volume of patients is too much for one triage nurse, and there is no alternate process during high-volume periods (Vashi et al., 2019). Additionally, the authors identified that nurses must complete "non-value-added documentation and travel" throughout the department between triaging patients (Vashi et al., 2019, p. e172). This speaks to the importance of streamlining and efficiently designing the triage area so that nurses do not have to leave to find supplies or other items they may need to accurately assess or begin treating a patient. Of note, the project partner organization has recently implemented nurses obtaining an additional waiver signature and requiring medical screening exams by an emergency department provider before patients return to the waiting room. The signature is designed to document that patients understand their right to a medical evaluation by an emergency department provider. A medical

screening exam refers to an abbreviated evaluation, usually by an advanced practice provider like a physician assistant or nurse practitioner. These screenings are designed to further rule out any life-threatening conditions and to initiate some preliminary orders that can be started while the patient waits in the waiting room. This process has complicated door-to-triage times as patients occupy triage rooms for medical screening exams. Organizational leadership agrees that new patients should not wait longer to be triaged because of this new process ([redacted], personal communication, July 8, 2022).

Literature suggests some potential solutions to decrease door-to-triage times. One solution involves pulling patients directly to open rooms and bypassing the triage area altogether (Vashi et al., 2019; Reiter & Scaletta, n.d.). The patient would be triaged by their primary nurse, and the triage nurse would await new patients. Additionally, increasing triage staff during the department's peak, or busiest, hours could improve times (Vashi et al., 2019; Pryce et al., 2020). Comprehensive triage system education and mentoring for triage nurses could also improve door-to-triage times and make nurses run triage more efficiently (Emergency Nurses Association, 2022; Reiter & Scaletta, n.d.).

As mentioned, CMS does not include arrival-to-triage times in its metrics; it tracks ED arrival-to-ED departure times and patients who leave without seeing a medical provider. Excessive waits for triage increase these numbers, potentially affecting reimbursement and patient safety. Therefore, emergency departments should track this metric to identify areas for improvement, with the end goal being to decrease further delays for patients receiving emergency treatment.

Problem Statement

The project site often does not meet the goal of triaging patients within 10 minutes of arrival in the emergency department and does not strategically track this metric in an effort to reduce it. During this period of time, the presenting patient's condition is unknown and potentially critical. Extended wait times to be triaged are experienced by patients at the project site, potentially increasing patient morbidity and hospital liability while decreasing patient satisfaction.

Purpose Statement

This project aims to develop and implement a standardized triage process using organizational standards, nursing input, data, and current evidence-based literature to decrease wait times between ED arrival and triage to less than 10 minutes for all patients. An algorithm was developed that can be easily followed by charge nurses, float nurses, or qualified ancillary staff when certain conditions are met. Rapid cycle improvement using the Plan Do Study Act (PDSA) framework was utilized to tailor the process for improvement.

Section II. Evidence

Literature Review

A review of the literature was performed to assess the current state of knowledge and strategies to decrease time-to-triage in the emergency department. The databases searched include Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, and Medline via Ovid. The keywords used in CINAHL were emergency room, emergency department, time-to-triage, triage time, and abbreviated triage. The MeSH terms for PubMed were emergency room, emergency department, time-to-triage, triage time, and abbreviated triage. Keywords for Medline via Ovid were time-to-triage. Only articles published within the last five years and available in English were considered, except for one landmark article. Considering these inclusion criteria, results from the three databases combined totaled 92 articles. Articles not available in full text, not directly related to the clinical question, or redundant articles were excluded. After applying the inclusion criteria and reading titles, ten articles were retained for use. The articles were read in their entirety and assigned a level of evidence using the seven levels of evidence as described by Ingham-Broomfield (2016). The levels of evidence of the retained articles ranged from level I to level VII.

Current State of Knowledge

Time-to-triage or arrival-to-triage time refers to the time a patient waits from the moment that they arrive in the emergency room lobby to the time their triage is initiated (Houston et al., 2015). Little research relates explicitly to this increment in patient wait time in the emergency department. The literature that is specific to arrival-to-triage times suggests that this time is an overlooked portion of total wait time (Hansen et al., 2021; Houston et al., 2015; Pryce et al., 2020). Additionally, this is a high-risk period for the patient as they have yet to be assessed (Hansen et al., 2021; Kienbacher et al., 2022; Reinhardt, 2017). The period between arrival and

triage can impact patient safety as ED staff is not yet aware of potential high-acuity patients presenting in the lobby until they are triaged (Reinhardt, 2017). This wait time contributes to the overall time it takes for patients to be seen by providers and, therefore, patient experience as the "length of time patient's wait to see a provider is an important driver of patient satisfaction" (Vashi et al., 2019, p. e169). Although there are no current specific guidelines relating to time-to-triage, the literature suggests that the optimal time from patient arrival to triage is ten minutes (Yancey & O'Rourke, 2021; Houston et al., 2015).

Current Approaches to Solving Population Problem(s)

The most common solution to decreasing time-to-triage was to increase staffing in triage, especially during busy times (Kienbacher et al., 2022). Shen and Lee (2020) studied improvement in door-to-triage times using the Plan Do Study Act framework. They completed four cycles with additional interventions each time. The first cycle involved refining and standardizing triage criteria; the second cycle involved placing the most experienced triage nurses in triage; the third and fourth cycles were centered around adding additional staff to triage. The authors report a decrease in average door-to-triage times from 18 minutes to 13 minutes from their quality improvement project. Specific findings from the third and fourth cycle reviews revealed that creating a triage nurse clinician role and securing additional nursing staff to adequately cover triage responsibilities contributed most significantly to the results. In another example, Vashi et al. (2019) demonstrated a 6.3-minute decrease in door-to-triage times after increasing the number of nurses in triage from one to two nurses during high patient volume periods, which they defined as 11:30 am to 8:00 pm. The authors also implemented a pull-to-full strategy when possible.

Pull-to-full is another strategy offered in the literature. Pull-to-full represents a process where patients are pulled directly to rooms if available (Vashi et al., 2019; Wolf et al., 2018). This process minimizes waiting room stays and eliminates stopping in the triage area, allowing patients to be triaged by their primary nurse. This process is effective in that it accomplishes the goal of triage: getting the patient to the right place at the right time to receive the right level of medical care and resources (Gandhi & Jothimani, 2019). The site where this project was conducted already implements this strategy when possible. It is rarely used because there are rarely open, staffed rooms. Of note, Kienbacher et al. (2022) suggest the unique approach of separating areas for triage of patients that arrive on ambulances and walk-in patients. This strategy relies on space, and as previously mentioned, space constraints at the partnering organization limit the usefulness of this approach.

Another solution offered in the literature is putting the most competent and efficient nurses in triage. As previously mentioned, in their study, Shen and Lee (2020) found sustained success in decreasing time-to-triage by refining triage criteria, placing more experienced nurses in triage, and adding additional triage nursing staff. Shen and Lee (2020) specifically suggest that placing "high-output" triage nurses in triage, especially during the busiest hours, can improve door-to-triage time. The authors found that some nurses triaged twice the number of patients in the same amount of time as other nurses. They refer to the faster nurses as having a higher output (Shen & Lee, 2020). The ability to triage more patients is often related to years in the emergency department, experience in triage, and education (Kumar et al., 2019). The Emergency Nurses Association recommends at least one year of emergency experience and specific triage education to effectively serve as a triage nurse (Wolf et al., 2018). This solution is already in place at the partnering organization as well. Standardization of the triage process is

also an essential piece of triage efficiency. This is evidenced by the work of Shen and Lee (2020). They showed not only a decrease in door-to-triage times but that nurses appreciated the standardization of triage that resulted from their quality improvement measures.

Evidence to Support the Intervention

Using the evidence-based suggestions of Kienbacher (2022), Shen and Lee (2020), and Vashi et al. (2019) of increasing staff in triage during peak hours with the importance of a standard process in mind, an algorithm was developed for the project site. Algorithms are often used as clinical pathways to guide care (Lawal et al., 2019). Clinical pathways are used to improve the standard of care for patients and help providers and caregivers make decisions when specific circumstances or conditions are met. These types of procedural algorithms are standard in medical care; in fact, more than 80% of US hospitals have implemented clinical pathways (Pugh-Bernard et al., 2019). The process of triage itself involves algorithm-based thinking relying on vital signs and patient presentation to assign acuity levels of patients (Ghandi & Jothimani, 2019). Standardized methods, such as clinical pathways and algorithms, have been promoted to reduce variation in care, decrease waste, and improve healthcare quality (Lawal et al., 2019).

For the project site, the intervention needed to be effective, come at no cost, and allow for flexibility. Additionally, staffing a new position was not currently an option. Therefore, an algorithm was developed to increase staff in triage during influxes of patients in real-time (see Appendix A). The algorithm was developed to guide charge nurses and float nurses on when to respond to help triage patients. The algorithm allows for standardization and indicates that when more than five patients are untriaged or more than five ambulances have arrived within the hour, response staff should be activated. This intervention will be most effective because it increases

triage staff as suggested by literature but does not require the partnering organization to hire additional staff or add another position during the intervention phase (Kienbacher et al., 2022; Shen & Lee, 2020; Vashi et al., 2019).

Evidence-Based Practice Framework

This project utilized the Plan Do Study Act (PDSA) framework for quality improvement. PDSA framework follows a four-stage cyclic learning approach to rapidly improve and was developed by Edward Deming and Walter Shewhart for quality improvement in industry (Taylor et al., 2013). The four stages came to be known as plan, do, study, and act (Deming, 1993). In the *plan* stage, a change is identified, the *do* stage implements the change, the *study* stage examines the success of the change, and the *act* stage identifies opportunities to advise the next cycle (Taylor et al., 2013). The developed algorithm was implemented with weekly data review for improvements in the plan.

In this project, the *plan* stage was the developed algorithm, the *do* stage was implementing the process of using the algorithm, the *study* stage happened weekly with data extraction and staff feedback, and the *act* stage included any necessary changes that were applied. Suggestions offered by stakeholders and clinical staff were documented and considered for improvement. Reinhardt (2017) emphasizes that nurses in the emergency department are uniquely stationed to identify quality and performance, recognize areas of improvement, and offer potential solutions. Therefore, feedback from stakeholders was valuable and increase staff support for the intervention. This implementation occurred over 12 weeks, with a final evaluation at the end of the 12-week period. The plan was evaluated according to the PDSA review process with the department director every three weeks during the implementation period, with a final meeting after the completion of the 12 weeks.

Ethical Consideration & Protection of Human Subjects

Before project approval, modules from the Collaborative Institutional Training Initiative (CITI) were completed. The principles outlined in the CITI modules were followed while developing the project and intervention, specifically, the principles of autonomy, beneficence, and justice, as outlined in the Belmont Report (CITI Program, 2017). Potential risks and benefits were also assessed. Risks could include a perceived increase in workload for charge nurses and potential conflict between involved staff. Benefits include a faster triage process, increased patient and employee satisfaction, and safer patient care. The intervention was standardized and designed to be equitable to everyone in the target population. No potential harm to participants has been identified, and no vulnerable populations, such as prisoners, children, or pregnant persons, are being studied. Individual privacy is protected as no identifiable information is being collected.

Based on the Quality/Research Self-Certification worksheet and survey from the University, the project was considered a quality improvement project, and no further University Institutional Review Board (IRB) review was required. This project required approval from the Nurse Research Council (NRC) for final hospital approval and determination of hospital IRB review exemption. The partnering organization determined that the project does not meet the definition of human research according to federal regulations.

Section III. Project Design

Project Site and Population

The project took place at a community hospital in Greensboro, North Carolina, that is part of a large, not-for-profit healthcare organization. The hospital is a facility with 175 inpatient beds, an emergency department, and an operating room. There are approximately 103 staff members in the emergency department at this facility. Facilitators for the project include supportive leadership, staff familiarity with triage, and a culture of teamwork in the department. Barriers that were anticipated to affect implementation included staffing concerns, staff motivation, and resistance to change. Staffing was expected to present the most significant concern as this facility has not been immune from the state and countrywide nursing shortage (Lynn, 2022).

Description of the Setting

The hospital houses a 29,000-square-foot emergency department that was renovated in 2012. This emergency department sees approximately 48,000 patients annually ([redacted], personal communication, October 25, 2022). It includes 25 private rooms, four triage rooms, five minor care rooms, five transition of care rooms, and a dedicated Computed Tomography (CT) and X-ray department ([redacted], 2022). The hospital is part of a larger health network that provides service to Guilford, Alamance, Rockingham, Forsyth, Caswell, Randolph, and surrounding counties. The hospital specializes in urology, cancer, sickle cell, and bariatric patients. Additionally, due to the proximity to the local behavioral health hospital, many behavioral health patients are served here.

Description of the Population

The project's population included registered nurses that function as charge, float, or triage nurses at the project site. This group included approximately 20 full-time, part-time, per

diem, and relief nurses. Education levels among these nurses ranged from associate to master's degrees. Physicians, advanced practice providers, volunteers, technicians, and non-clinical staff were excluded from the project population.

Project Team

The project team consisted of a project lead, a faculty advisor, a project site champion, and a Clinical Nurse Specialist who functioned as an organizational research council representative and DNP project navigator. The project lead's role was to research, develop, and implement the project, as well as to collect and evaluate data and disseminate any findings or conclusions. The faculty advisor served as an expert scholarly resource for the project lead. The project site champion is the director of the emergency department where the project took place. This individual provided leadership support for the intervention, opportunities to educate the department, and access to certain performance data. Lastly, the Clinical Nurse Specialist helped guide the project lead through compliance with the healthcare organization's research requirements and approval process.

Project Goals and Outcome Measures

The goal of this project was to decrease wait times from arrival to triage to less than 10 minutes for all patients seeking emergency care. An algorithm was developed which implements a standard triage response process using organizational standards, nursing input, and current evidence-based literature (see Appendix A). The project was evaluated after implementation for effectiveness related to decreased door-to-triage times. The stages of the project followed the Plan Do Study Act model (Taylor et al., 2013). Success was measured by recording weekly time-to-triage times during the intervention and comparing them to the 10-minute goal. Additionally, overall staff and stakeholder response to the intervention and any suggestions listed in the

barriers section of the triage response log (see Appendix B) was considered when evaluating success.

Description of the Methods and Measurement

This project was focused on quality improvement in the time patients spend waiting for triage. The algorithm (see Appendix A) outlined conditions in which certain experienced staff will respond to triage to assist the triage nurse in getting patients assessed. It was designed to be used by the charge nurse or float staff, who are experienced nurses that are already in the department. The conditions were met when greater than five untriaged patients were in the lobby or more than five ambulances had been sent to triage in the last hour. The algorithm criteria were developed with stakeholder input because no current suggestions were found in the literature; therefore, conditions were open to change throughout the review cycles. After the designated staff member responded and helped triage catch up, responding staff resumed their other job duties. Responding staff were asked to document when and how long they responded to triage and any barriers preventing them from activating the process.

This activation was tracked with a data collection tool completed by response staff. This tool included the date and time, the number of untriaged patients in the lobby, the number of ambulances to triage in the last hour, whether staff responded, and barriers to that response (see Appendix B). Mean door-to-triage times were extracted weekly from the metrics section of the electronic medical record (EMR). These metrics were inserted into the weekly data collection Excel table (see Appendix C).

Discussion of the Data Collection Process

Data was collected by the project lead using a tool that was developed for triage response staff to document when the triage algorithm conditions were met and what happened (see

Appendix B). Data tools were collected weekly for analysis, as well as data from the EMR. Data collected from the EMR included the mean time-to-triage at the project site, the mean patient census that week, the mean patient acuity level that week, the mean time-to-triage at all facilities in the system for that week, and the rate of patients that left without being seen by a provider that week. This data and any suggestions or barriers documented were entered into a Microsoft Excel spreadsheet for storage and further analysis (see Appendix C).

Implementation Plan

The implementation of the project was guided by the Plan Do Study Act framework for quality improvement. The intervention was an algorithm that triggered staff response to help decompress triage when certain conditions were met. Staff were educated about the intervention at the emergency department's January staff meeting. For the first week of implementation, education was included in the department's huddle message, read at the beginning of each shift. At the beginning of implementation, a detailed email was sent to charge, triage, and float nurses. Lastly, a copy of the algorithm was posted at the charge desk throughout the twelve-week intervention phase.

Timeline

Project implementation began January 22, 2023, and continued for twelve weeks until April 15, 2023. Data were collected, documented, and evaluated weekly. The plan was evaluated with the project site champion every three weeks during the implementation period. Weekly rounding was performed with staff to collect feedback and suggestions about the intervention. Data and staff suggestions were considered to advise any changes at the meetings with the site champion for the next three-week cycle using the Institute for Healthcare Improvement's PDSA worksheet (IHI, 2017) (see Appendix D). The project's final evaluation occurred at the end of the

twelve weeks when weekly data was compared and measured against the 10-minute goal. A complete timeline can be found in Appendix E.

Section IV. Results and Findings

Results

Data gathered included the mean door-to-triage time (DTT), department census, patient acuity, left-without-being-seen rate (LWBS), and staff comments. Daily data points were gathered weekly at the project site, and weekly averages were calculated. It is important to note that at week six PDSA, the triggering numbers in the algorithm were changed from five to four. Overall, a decreasing trend was observed in DTT over the course of implementation (see Appendix F). For comparison, prior to project implementation, DTT averaged 13 minutes for the month of December 2022 and 14 minutes in November 2022. The average DTT over the 12 weeks of project implementation was 9.7 minutes.

Week one's average DTT was 11 minutes, ranging from 9 to 13 minutes. Weeks two and three were 10 minutes with a range of 9 to 13 minutes and 9 minutes with a range of 7 to 11 minutes, respectively. The highest DTT was week four at 12 minutes, with a range of 10 to 15 minutes. Week five was at 10 minutes, ranging from 7 to 14 minutes. Weeks six and seven were 8 minutes, ranging from 6 to 10 minutes and 7 to 9 minutes, respectively, compared to weeks eight and nine average at 10 minutes, ranging 8 to 12 minutes and 6 to 13 minutes. A decrease was noted in week ten, with DTT averaging 9 minutes, ranging from 7 to 12 minutes, and in week eleven, with a DTT average of 8 minutes, ranging from 6 to 11 minutes. Lastly, week twelve had an 11-minute DTT, ranging from 7 to 15 minutes (see Appendix G).

The mean census ranged from 105 to 115 over the twelve weeks. However, Mondays were most frequently the day with the highest patient census. The average census for those Mondays was 134 patients. Tuesdays and Thursdays also often had higher census throughout the 12 weeks (see Appendix G.) The left-without-being-seen (LWBS) rates for each week were also recorded. The LWBS rate average over the 12 weeks of implementation was 1.25%. For

comparison, before project implementations, LWBS rates were higher at the facility. The average LWBS rate for November 2022 was 4%, and for December 2022 was 5.5%. Weeks one, eleven, and twelve were 2%. Weeks two, three, five, six, nine, and ten were 1%. Week four was 3%, and weeks seven and eight were 0%.

Charge nurse response and barriers were tracked on the charge nurse response logs (see Appendix B). Of the 33 charge nurse responses related to response barriers, 18 (56%) reported that the most common reason for not responding to triage was that the algorithm conditions were unmet, compared to 8 (24%) related to staffing concerns. This included the charge nurse having patients of their own, closing rooms, or having to assist staff in other areas. Other barriers identified: 4 (11%) were due to critical patients, 2 (7%) patients being held for admissions in the ED, and 1 (2%) related to heavy traffic response (see Appendix H). Based on charge nurse logging, triage responses happened between zero to five times per day, averaging once per day. A charge nurse or qualified staff nurse responded to triage a total of 75 times throughout implementation based on the algorithm triggers.

Discussion of Major Findings

Overall, a decreasing trend was observed in DTT over the implementation of the triage response algorithm. Based on the data collected, week four had the highest DTT, LWBS, and on average, more acute patients; however, the patient census was relatively average at 110 patients. Additionally, weeks four and twelve had the most triage responses, indicating that triage needed more help during these weeks. Charge nurse responses on the response log indicated that holding admission patients was a considerable barrier during week four that may have contributed to the increase in the DTT and LBWS. At week twelve, the department experienced the highest average acuity.

Weeks six, seven, and eleven had the lowest DTT times at eight minutes, with patient censuses of 105, 108, and 110, respectively. In addition to having the lowest average DTT times, these weeks also required fewer triage responses (see Appendix I). This indicates that the conditions were met less often during these weeks, and a response was needed less frequently. Findings from the project suggest that there are more driving factors than patient census in emergency room wait times to be considered.

Regarding patient census, Mondays, Tuesdays, and Thursdays were the busiest days of the week. Weekends were never the busiest days of the week, suggesting that more focus could be placed on Monday through Thursday when planning staffing. Additionally, based on tracked responses, the algorithm conditions were most often met between the times of 12 pm to 5 pm and 7 pm to 11 pm.

Staffing was frequently cited as a barrier to triage response. This finding was consistent with findings in the literature that the most common solution in decreasing time-to-triage was to increase staffing in triage (Kienbacher et al., 2022). Other strategies mentioned in the literature are using the pull-to-full method and assigning more experienced nurses in triage. Both of these strategies were already used in the department and were in place throughout the twelve weeks. Regarding nursing experience, department policy is that nurses have at least one year of emergency experience prior to working in triage. This experience requirement aligns with the Emergency Nurses Association recommendation of at least one year of emergency experience to effectively serve as a triage nurse (Wolf et al., 2018).

As previously mentioned, little data focuses on door-to-triage time, as it is not a regularly tracked metric. No tool or process was found in the literature, which led to the development of the triage response algorithm used in this project. The lack of an established guideline in the

literature led to the development of the 10-minute goal, which was based on expert suggestions, discussion with the project site leadership, and perceived realistic outcomes (Yancey & O'Rourke, 2021; Houston et al., 2015).

Section V. Interpretation and Implications

Costs and Resource Management

One of the goals of this project was to rework existing staffing to limit financial implications. By using the charge nurse or other qualified nurse that was already on site, no additional staff was added. Additionally, no supplies were purchased. However, this project added another responsibility to the charge nurse position, which may impact charge nurse satisfaction and, potentially, retention.

Without the benefit of the student labor as the project lead, this project would have cost around 125 hours spent in research, development, collaboration, staff education, implementation, management, project revisions, and analysis of findings. This project would cost about $4,375 in personnel costs considering the average RN hourly rate of $35 at this site (see Appendix J). Additionally, this project pulled charge nurses to triage during peak hours which may have impacted the time they had to complete their other job duties. For comparison, staffing an additional nurse in triage would cost $5,880 weekly, while the cost of reallocating current staff would cost nothing upfront. It should be considered, however, that reallocation of current staff could produce unintended costs related to altering current job duties, such as staff attrition, staff availability, or workplace satisfaction for those assigned to respond to triage.

Delays in care can be quite costly for an organization. It is difficult to predict the economic effects of quicker assessment of patients as treatments vary in price. One example of a time-sensitive emergency is a stroke. Kunz et al. report that every 10 minutes that care is delayed in acute ischemic stroke adds $10,915 in cost (2020). Earlier recognition of this condition in just one patient could cover the cost of reimplementation of this project design at the organization.

Implications of the Findings

The implications of decreased time spent waiting for triage in the Emergency Department (ED) should improve the quality of care received by patients, improve nursing workflow, and help the organization meet the Quadruple Aim in healthcare. The impact of monitoring and decreasing door-to-triage times will be felt immediately, as earlier intervention in even one critical patient could save their life. This metric requires continued attention by the organization.

Implications for Patients

As mentioned, the period between arrival and triage can impact patient safety as patient acuity is unknown in the lobby until they are triaged (Reinhardt, 2017). Positive health outcomes in several emergencies are time-sensitive. In addition to patient safety, decreasing the overall time it takes for patients to be seen by providers improves the patient experience. Literature accounts that the "length of time [that] patients wait to see a provider is an important driver of patient satisfaction" (Vashi et al., 2019, p. e169). Decreasing time to triage also discourages patients from leaving without being seen by a provider.

Implications for Nursing Practice

Improvement in patient safety is also crucial in nursing practice implications, as safety is a major goal of nursing. Additionally, assessing and sorting patients sooner leads to improved throughput in the department. Based on comments collected throughout implementation, staff appreciated the sense of teamwork and "help" provided by the triage response. Specifically, triage nurses stated that it made peak triage times "less overwhelming." Developing teamwork and interprofessional communication could improve work satisfaction and, potentially, nurse retention.

Impact for Healthcare System(s)

Considering healthcare systems, improved throughput times can positively affect hospital reimbursement and recognition. Accounting that the Centers for Medicare and Medicaid Services (CMS) track specific time-based metrics to evaluate emergency department performance, decreasing door-to-triage time is of interest to the organization (Houston et al., 2015). Quicker initiation of care could contribute to decreased elopements. Lastly, based on data obtained from this project, some suggestions for staffing could be made. For example, the algorithm conditions were most often met between the hours of 12 pm and 5 pm and 7 pm and 11 pm. Additionally, the patient census was highest on Mondays, Tuesdays, and Thursdays. Using this information, leadership could prioritize extra staff at these times to improve door-to-triage times.

Sustainability

The algorithm remains available to staff at the project site. The most challenging aspect of sustaining this intervention will be changing the culture of the department with a new workflow. Leadership has approved incorporating the response algorithm into the charge nurse standard work to facilitate this culture change. Leadership will also use staffing suggestions from this project to encourage optimal staffing resources when possible. The low cost of using this process is also sustainable, as it focuses on the reallocation of current staff, and no additional staff or supplies are needed.

Dissemination Plan

Results from the project were presented at the University College of Nursing DNP Presentation Day on July 11, 2023. A poster presentation was provided at the site in late July 2023, and findings were reviewed with the project site's Nursing Research Council (NRC). Results were submitted to department leadership for posting as part of the department's True

North metrics. The final paper was submitted to the University Scholarship repository for public access. Lastly, the submission of an abstract to the *Journal of Emergency Nursing* can be considered as these results could benefit emergency departments in other health systems.

Section VI. Conclusion

Limitations and Facilitators

There were several limitations identified throughout the implementation of this project. These limitations were noted during week three, six, and nine PDSA cycles. At week three, the most significant limitation noted was that charge nurses expressed that they did not have time to document triage responses in real-time. Charge nurses were encouraged to log responses and barriers when possible to improve compliance. At week six, some charge nurses forgot to log and required follow-up. At week nine, there was some noted fatigue with the logging, but logging was consistent. No changes were made to the logging document throughout the project. One of the most limiting factors was that charge nurses were self-reporting, and data would have been more robust if there had been an outside, unbiased way of tracking response. Staffing was also consistently mentioned as a barrier in the charge nurse logs, which was expected given the state and countrywide nursing shortage (Lynn, 2022). Lastly, the inherent unpredictability of the emergency department is a limitation, as pandemics, mass casualties, higher patient acuity, and inpatient capacity are beyond control.

Facilitators contributing to project success included a supportive leadership team and partner site. There was also a cooperative team of charge nurses and an existing culture of teamwork in the department. Additionally, staffing in the emergency department is flexible. The staffing matrix utilizes mid-shift staff to increase staff numbers during traditionally busier times of the day and closes rooms at traditionally less busy times. Emergency staff is accustomed to opening and closing rooms, responding to help with critical patients, and to surges in patient census.

Recommendations for Others

Based on experience from the implementation of this project, there are some recommendations for those looking to decrease the time patients are waiting to be triaged in the emergency department. One primary suggestion would be developing an outside way of tracking the use of the algorithm. Although charge nurses logged on most shifts, data would be more robust if there was an external validation that they were responding appropriately. Additionally, charting or informatics systems may be able to incorporate a documentation tool in the electronic medical record. This could allow for alerts to be triggered and the generation of compliance tracking reports. Information technology support could be involved in future projects to improve data accuracy.

Another consideration is that this project was performed at a relatively small emergency department. If used at a larger location, the triggering numbers in the algorithm may need to be changed, although the basic idea could be used on larger scales. Regarding workflow, in addition to pull-to-full strategies and experienced triage nurses, a larger department would likely require additional staff, as charge nurse responsibilities differ.

The project is sustainable to promote long-term system impact. Changing the standard of work for charge nurses at the partnering organization illustrates the sustainability of the algorithm in the department. Additionally, addressing the Quadruple Aim by decreasing door-to-triage time "improves the health of populations, enhances the patient experience of care, reduces the per capita cost of healthcare, [and] improves the work-life of those who deliver care" to promote sustainability (Bodenheimer & Sinsky, 2014, p 573, 575).

Recommendations Further Study

Further study on arrival to triage time in the emergency department is recommended.

Literature is lacking on a guideline for arrival to triage time. Professional bodies have an opportunity to look at this metric and make a recommendation to improve patient safety and throughput. The author also recommends tracking the DTT metric and including it when considering patient throughput. This novel triage response algorithm is flexible and could be used and altered to be used in other emergency departments.

This project is likely not applicable in other settings, as the emergency department is unique in seeing people based on acuity. However, there may be potential for adjustment and use in an urgent care setting. Although urgent care is often based on appointments or check-in time, they have a triage process that could allow nursing staff to recognize something that needs to be sent out to a higher level of care, like the emergency department. As a result, urgent care could also benefit by considering their door-to-triage times.

Final Thoughts

As discussed previously, arrival to triage time is a hidden wait time that patients experience and can present a safety concern. This project involved developing an algorithm to trigger nurse response in an effort to decrease this time to less than 10 minutes. This project successfully recorded a decreased trend in the time patients spent waiting to be triaged. Implementation of this project also noted a decrease in the average left-without-being-seen rate. These downward trends improve the experience of patients, the workflow of nurses, and the financial well-being of the health system. Most importantly, reducing this time allows for quicker recognition of life-threatening emergencies and faster initiation of life-saving interventions, which is the essence of emergency nursing.

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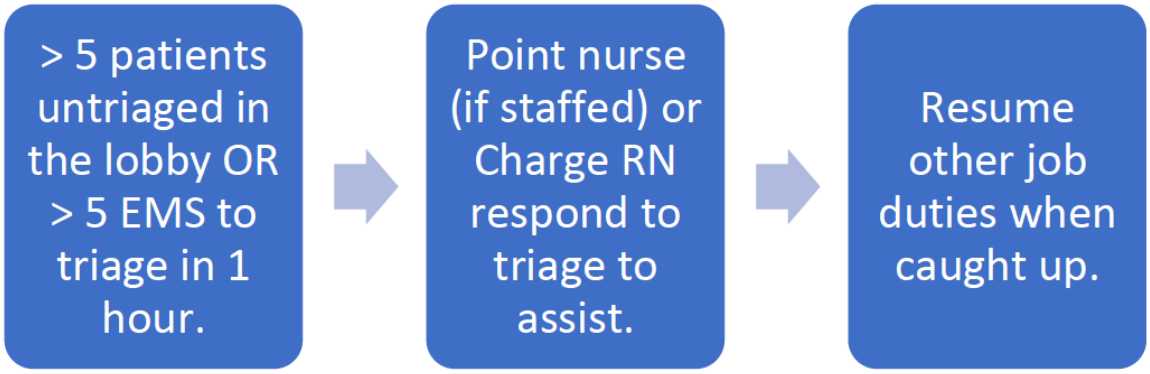
Appendix A

The Triage Response Algorithm and Resource Flyer

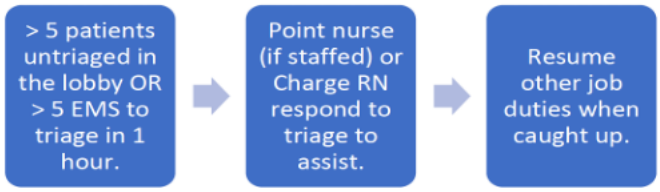


- See provided log sheet to fill out when conditions are met, and the algorithm is used. If you are unable to respond, please note why. There is no penalty; it is important to identify barriers.
- The goal is to have our average "waiting before triage" times at 10 minutes or less.
- Please feel free to contact Jake for any questions or suggestions.
- Jake: jake.talkington@[redacted].com or see me in person on most weekend nights.

Appendix B

Triage Response Log

Triage Response Log: Charge to fill out when conditions are met.



Date	Time	# Untriaged in Lobby	# EMS to triage in last hour	Did staff respond?	Barriers to response

Appendix C
Weekly Data Collection Table

	Dates	Mean DTT	Mean Census	Mean Acuity	System DTT	LWBS rate	Comments
Week 1							
Week 2							
Week 3							
Week 4							
Week 5							
Week 6							
Week 7							
Week 8							
Week 9							
Week 10							
Week 11							
Week 12							

Appendix D

IHI (2017) PDSA Worksheet

Template: PDSA Worksheet

Objective:

1. Plan: Plan the test, including a plan for collecting data.

Questions and predictions:

-
-

Who, what, where, when:

Plan for collecting data:

2. Do: Run the test on a small scale.

Describe what happened. What data did you collect? What observations did you make?

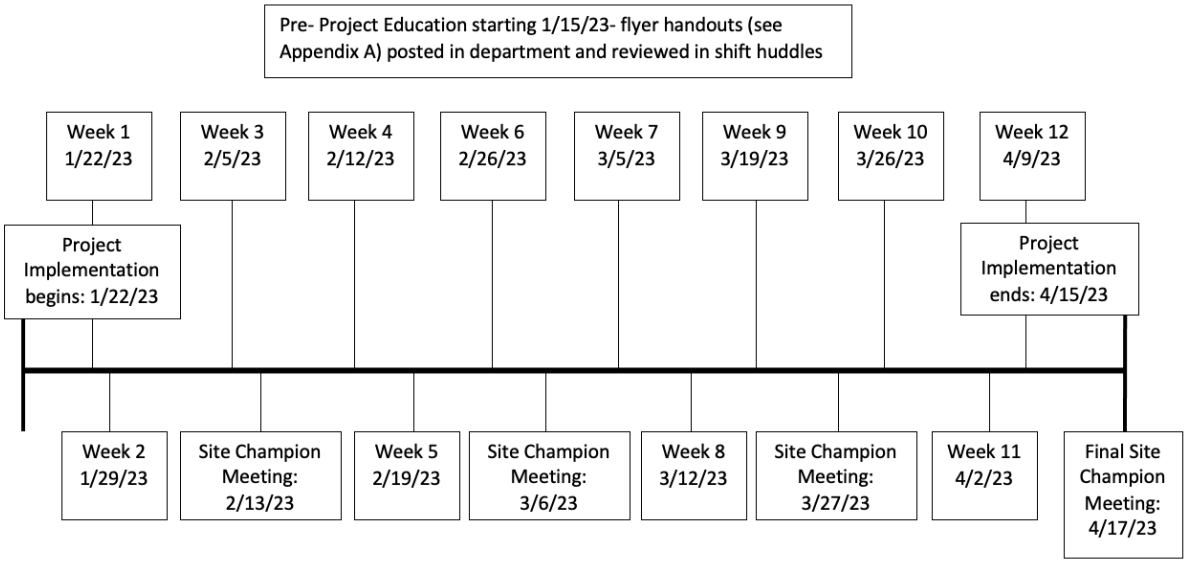
3. Study: Analyze the results and compare them to your predictions.

Summarize and reflect on what you learned:

4. Act: Based on what you learned from the test, make a plan for your next step.

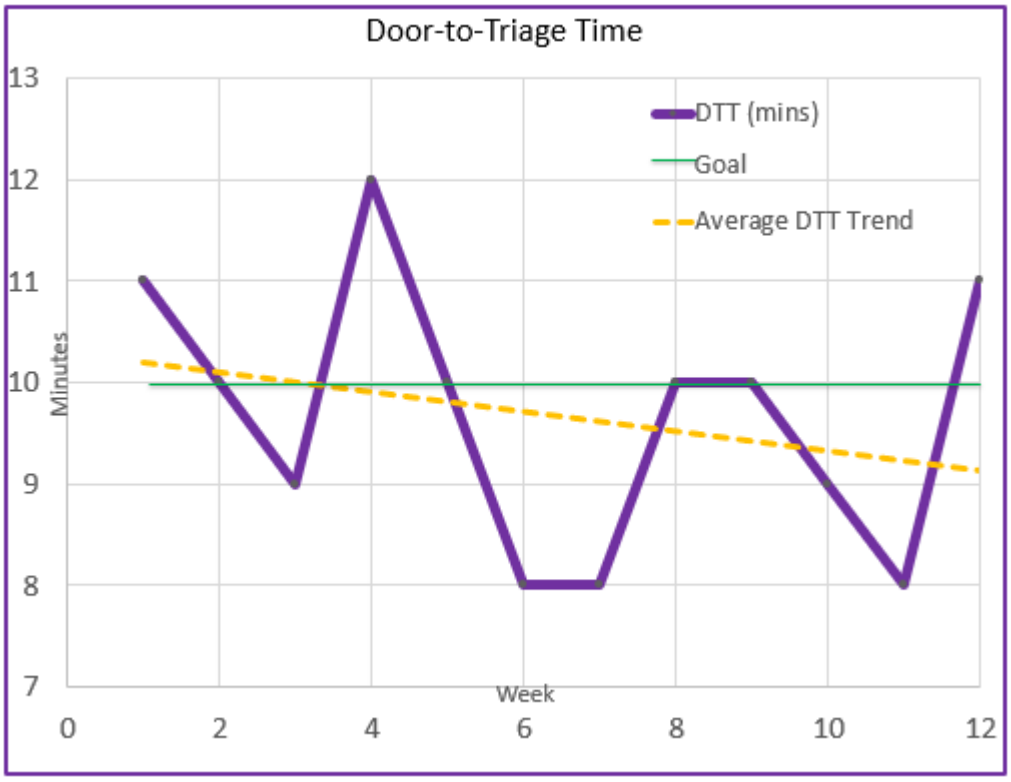
Determine what modifications you should make — adapt, adopt, or abandon:

Appendix E
Timeline



Appendix F

DTT Trend Graph



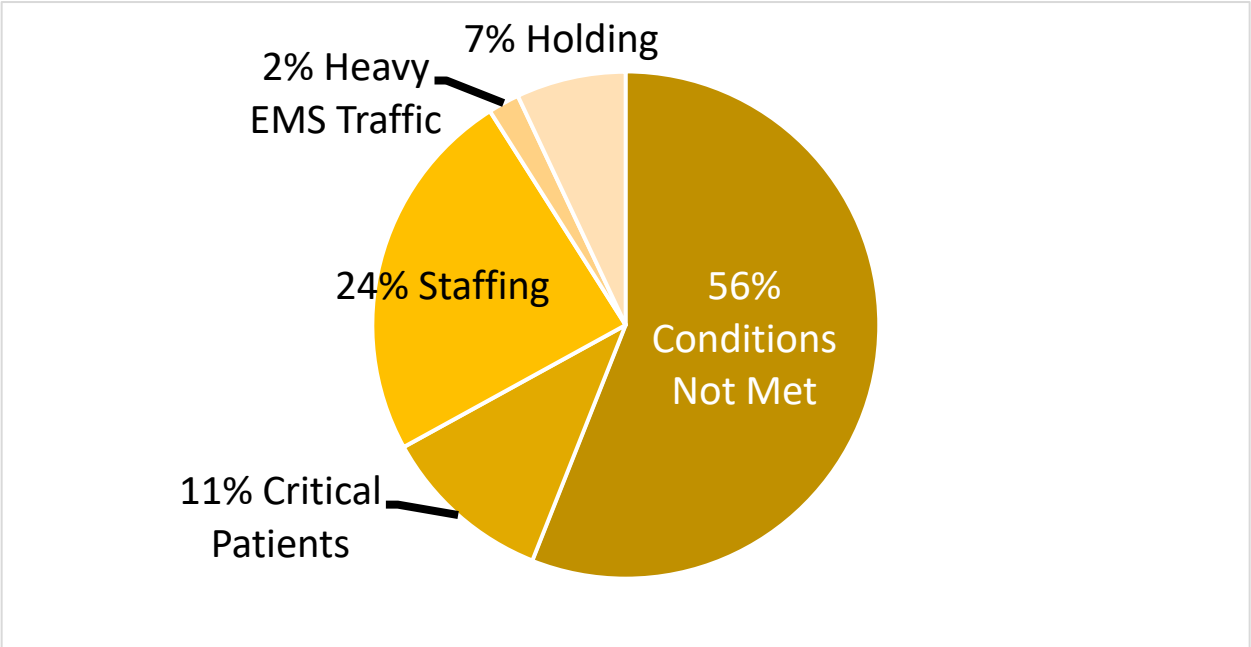
Appendix G

Completed Data Collection Table

	Dates	Mean DTT (Range)	Mean Census	Mean Acuity	System DTT	LWBS rate	Comments
Week 1	1/22-1/28	11 min (9-13)	115	3.02	12 mins	2%	after this week, educated charge nurses that they could log after their shifts Monday busiest at 143 visits
Week 2	1/29-2/4	10 min (9-13)	113	3.09	12 mins	1%	Monday busiest at 135 visits
Week 3	2/5-2/11	9 min (7-11)	114	3.05	13 mins	1%	PDSA: Will continue to accept and review suggestions from staff. No major changes were made for this cycle as everyone was still getting used to the process. We decided to continue close follow-ups and frequent check-ins with the charge nurses to encourage and support the implementation of the process. Thursday busiest at 130 visits
Week 4	2/12-2/18	12 min (10-15)	110	2.98	11 mins	3%	boarding and staffing struggles this week Monday busiest at 128 visits
Week 5	2/19-2/25	10 min (7-14)	108	3.06	11 mins	1%	well staffed Thursday busiest at 126 visits
Week 6	2/26-3/4	8 min (6-10)	108	3.03	11 mins	1%	PDSA: Will increase sensitivity of algorithm trigger from 5 untriaged in lobby or 5 EMS in 1 hour down to 4 for both starting with Week 7. Monday busiest at 132 visits. Saturday unusually low census at 69
Week 7	3/5-3/11	8 min (7-9)	105	3.03	10 mins	0%	2 triage nurses expressed appreciation of the help during peak times. Tuesday busiest with 122 visits
Week 8	3/12-3/18	10 min (8-12)	115	3.04	12 mins	0%	Tuesday busiest at 141 visits, Sunday unusually low with 79 visits
Week 9	3/19-3/25	10 min (7-13)	111	2.99	9 mins	1%	PDSA We decided to continue close follow-ups and frequent check-ins with the charge nurses to encourage and support the implementation of the process with the new sensitivity of the algorithm. Thursday busiest at 130 visits
Week 10	3/26-4/1	9 min (7-11)	114	3.02	11 mins	1%	Monday busiest at 133 visits
Week 11	4/2-4/8	8 min (6-11)	110	3.04	9 mins	2%	Tuesday busiest at 148 visits
Week 12	4/9-4/15	11 min (7-15)	111	2.95	11 mins	2%	Friday busiest at 123 visits. Higher acuity patients on Friday.

Appendix H

Barriers to Triage Response



Appendix I

Response, Census, and DTT Comparison Graph

Appendix J
Itemized Budget

Item	Quantity	Cost	Total
Project Staff	125 hours	$35/ hour	$4,375
Printing	18 sheets	$0.02	$0.36
Potential Additional Nurse in Triage	168 hours/week	$35/ hour	$5,880