Performance Improvement with Rapid Triage Implementation

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Abstract

Objective: To modify a US emergency department's front-end process with the goal of improving the door-to-provider time interval. The hospital employed a comprehensive data collection process at triage; the intent was to redesign the process and implement a rapid triage component. *Design:* This was a continuous quality improvement initiative utilizing the DMAIC method for process improvement. *Setting:* All patients presenting at an east-coast hospital's emergency department with 28,000 annual visits. *Results:* With all t-test p values less than 0.001, statistically significant improvements existed in all categories examined of both the entire ED patient population as well as when examining just patients arriving by a means other than ambulance. The time intervals with statistically significant improvements were door-to-triage, door-to-provider, and overall ED length-of-stay. Variation with triage categories in both the pre and post intervention groups when compared against the expected spread as published in the triage manual was noted. *Conclusions:* Rapid triage implementation was effective in producing statistically significant reductions in the identified time intervals. Future research is needed to further evaluate this impact on actual patient outcomes of specific patient populations, diagnoses and/or chief complaints. Further investigation about triage accuracy rates is also needed.

Performance Improvement with Rapid Triage Implementation

The Joint Commission previously determined that the emergency department (ED) is the most common site for hospital sentinel events due to care delays secondary to waiting and/or inefficient processes (Murrell, Offerman, & Kaufman, 2011). Although the sentinel alert had been retired in March 2016 (The Joint Commission, n.d.), The Joint Commission maintains a "Quick Safety" issue reinforcing the negative impact delays have on patient care and outcomes (The Joint Commission, 2015). The removal of care delays as a sentinel event alert is largely due to better patient front end processes, with the door-to-provider time decreasing every year since 2008 when the institutional average was 41 median minutes; (Emergency Department Benchmarking Alliance [EDBA], 2017). The median door-to-provider time in 2018 was twenty minutes; for EDs with 20-40k annual visits the metric was seventeen minutes (Emergency Department Benchmarking Alliance [EDBA], 2019). Despite these improvements, some EDs sustain antiquated processes that include bottlenecks resulting in care delays. One such outdated process is the inclusion of mandatory screening questions as part of the triage process. This occurs at some sites even when there are available treatment spaces for the patient in the department (Foley & Durant, 2011). The purpose of this project is to conduct a performance improvement initiative and implement a rapid triage process at an east-coast hospital ED; the goal of the process is to reduce door-to-triage and door-to-provider times.

Background

History of Triage

Triage originated outside health care, dating back many centuries to when farmers would sort through various types of produce as well as coffee beans, categorizing them by quality, ripeness, etc. (Mitchell, 2008). Its origins in medicine date to the Napoleon era, when a sorting

system determined priority for battlefield evacuation (Blagg, 2004). These rudimentary processes continued with minimal advancement in the next century, including the Civil War and other conflicts during the 1800s. Triage became widespread in World War I, although the emphasis at this time was not on survival rates, but rather focusing on who could be most quickly treated and released back to the battlefield to continue fighting (Blue Jay Consulting, LLC[BJC], 2014). While triage evolutions continued in military medicine from World War I through present day, its origin in U.S. civilian hospitals began during the late 1950s and early 1960s, out of response to an increasing volume of patients, for the treatment of non-urgent conditions. Facilities could not handle the increased volume with immediacy, thus hospitals needed a way to prioritize patients (BJC, 2014).

From the 1960s through the mid-1990s, US hospitals utilized a wide variation of methodologies across the country to triage patients. Three-level triage scales were the most predominant methods in the US. A trend towards standardization emerged in the early 2000s. A 2003 joint position statement by the American College of Emergency Physicians (ACEP) and the Emergency Nurses Association (ENA) stated,

> "ACEP and ENA believe that quality patient care would benefit from implementing a standardized emergency department triage scale and acuity categorization process. Based on expert consensus of currently available evidence, ACEP and ENA support the adoption of a reliable, valid, five level triage scale" (Gilboy, Tanabe, Travers, & Rosenau, 2011, p. 5)

Hospitals across the country began implementing ESI or CTAS. ACEP and ENA published an updated position statement in 2010 supporting the adoption of a five-level triage tool (American College of Emergency Physicians and the Emergency Nurses Association, 2017) as hospitals across the US continued to adopt ESI (Gilboy et al., 2011).

History of the Emergency Severity Index

The Emergency Severity Index triage system was originally developed in the US by two emergency physicians. With the outcome goal of getting the right patient to the right resources at the right place and in the right time, ESI's principle role is to facilitate prioritization based on the urgency of a patient's condition (Gilboy et al., 2011). Patients are assigned one of five ESI levels, which are:

1. ESI1: Immediate, life-saving intervention required without delay
2. ESI2: Patient that should not wait; high risk of deterioration or signs of a potential time-critical problem
3. ESI3: Stable patient requiring two or more resources
4. ESI4: Stable patient requiring one resource
5. ESI5: Stable patient requiring no resources

The algorithm is further depicted in Figure 1. There are four decisions points in the ESI algorithm to assist the nurse in assigning a triage level. They are:

1. Decision Point A: Is the patient dying? Do they require immediate lifesaving interventions?
2. Decision Point B: Is this a patient that can wait? Are they high risk? Is there new onset confusion/lethargy/disorientation? Are they in severe pain or distress?
3. Decision Point C: How many resources are needed?
4. Decision Point D: What are the patient's vital signs? (Gilboy et al., 2011). There were multiple revisions and refinements to ESI between 2002 and 2012. The most recent version, version 4, is listed as the 2012 edition with a November 2011 publication date (Gilboy et al., 2011).

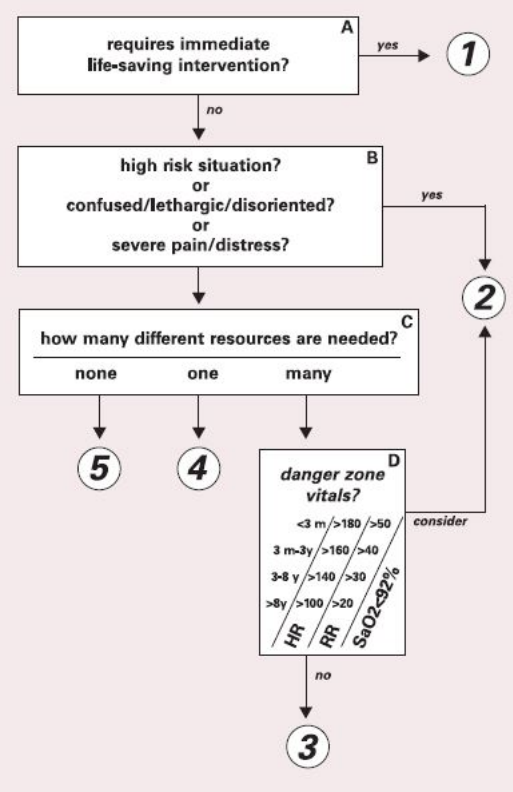

Figure 1. ESI Triage Algorithm, v.4 (Gilboy et.al., 2011, figure 4-1)

As of 2011, ESI's adoption in US hospitals was 56.9%. Various three level systems accounted for 25.5% of hospitals. ESI adoption was more prevalent in larger size hospitals, including academic institutions. Smaller hospitals and EDs with less than 25,000 annual visits reported more likely to be using un-validated triage scales (McHugh, Tanabe, McClelland, & Kare, 2011). While ESI is prevalent in the United States, it has been heavily critiqued in other countries such as the United Arab Emirates where one cross-sectional qualitative analysis identified emergency nurse concerns with perceived subjectivity and variability; specific concerns identified included lack of comprehensive criteria in decision point B. The article did not identify the presence/absence of an ongoing triage quality assurance program (Mistry et al., 2018). The Manchester Triage Scale (MTS), the Australian Triage Scale (ATS) and the Canadian Triage and Acuity Scale (CTAS) are three other 5-level triage tools that have

demonstrated validity and reliability. Other systems with less literature on validity and reliability include the Gruppo Formazione system in Italy, the Cape Triage Scale in South Africa, the Geneva Emergency Triage Scale, and the Taiwan Triage Scale, (Christ et al., 2010).

Significance

The goal of modern ED triage is to properly sort patients presenting for care. In an era of ED overcrowding, proper sorting and early identification of patients with immediate life threatening conditions and/or high risk for life threatening conditions is essential to providing timely interventions (Gilboy et al., 2011) ; it is also essential in minimizing risk for care-delay associated morbidity and mortality (Mowery et al., 2011).

Rapid and accurate triage in EDs is a critical component of emergency nursing practice. There were 144.8 million U.S. ED visits in 2017 (EDBA, 2019); In 2008, only 18% of visits were seen within fifteen minutes. Under-triaging, the practice of assigning a less-acute designation than indicated, places patients at risk for worsening outcomes while waiting; over-triage, the practice of assigning a more-acute designation than indicated, uses scarce resources and limits bed availability for potential arriving critical patients (Gilboy et al., 2011). While lengthened door-to-intervention times have a clear negative impact on morbidity and mortality of certain emergency conditions such as myocardial infarction (Atzema, Schull, Austin, & Tu, 2011), stroke (Lau et al., 2010), sepsis (Mitzkewich, 2018), and traumatic injury (Mowery et al., 2011), the actual impact of ED front end wait times and overall lengths of stay for all emergency patients remains debated in the literature (Plunkett, Byrne, Breslin, Bennett, & Silke, 2011). Decreasing ED patient length of stay remains a key initiative for many hospitals as it is tied to the patient satisfaction component of value-based purchasing reimbursement (Walsh & Knott, 2010) as well as labor costs.

The Emergency Medical Treatment and Active Labor Act (EMTALA) requires all CMS participating hospitals to provide presenting patients with a medical screening exam and appropriate stabilization care. EMTALA ensures public access to emergency services, regardless of a person's ability to pay (Emergency Medical Treatment and Active Labor Act, 1986). As such, many poor and un-insured use EDs for non-emergency care (Pozgar, 2004). Consequently, timely and accurate triaging of patients is vital in US EDs.

Similar to the morbidity and mortality statistics discussed above, the cost of emergency services varies greatly based on patient condition, services provided, and hospital charges. Emergency visits generally range from $150-$3,000 depending on services provided, with the most acute of conditions costing as high as $20,000 (Hunt, 2019).

Operational Definitions

Emergency Departments are defined as, "A 24-hour location serving unscheduled patient population with anticipated needs for emergency medical care," (Agency for Healthcare Research & Quality [AHRQ], n.d., p. 5). EDs are located within a licensed hospital/medical center or may be free standing EDs (FSED). They may or may not be owned/part-of a larger health system that includes acute care hospitals (New York State Department of Health, n.d.).

Provider is defined as a Qualified Medical Provider (QMP) capable of performing a Medical Screening Examination (MSE) compliant with the EMTALA (Emergency Medical Treatment and Active Labor Act, 1986). QMPs vary from state-to-state and institution-to-institution but most often include and are limited to emergency physicians and emergency advance practice providers (APPs) including both nurse practitioners and physician assistants. For this purposes of this project, providers include QMPs at the implementation site, which are specifically limited to emergency physicians and emergency APPs.

Triage is defined as the process to prioritize incoming ED patients and to identify those who cannot wait to be seen (Gilboy et al., 2011). The word triage originates from the French word trier, which is literally translated as “to sort” (Mitchell, 2008).

Comprehensive data collection is defined as collecting information that is not relevant to the act of sorting. Examples of this include but are not limited to: lethality screening, tuberculosis screening, obtaining a medication history not related to the chief complaint, fall risk, immunization status, and domestic violence victim screening among others (Foley & Durant, 2011). Because triage processes vary based on setting, location, and situation, this project focused on triage operations in US EDs during normal operations; that is, operations that do not include disaster situations, mass casualty situations, and pandemic situations.

The Emergency Severity Index (ESI) is a five-level ED triage algorithm. It is primarily used by in the US by emergency nurses to sort patients waiting for initial provider evaluation after arrival (Gilboy et al., 2011).

The *door* timestamp is defined as the patient’s arrival time, as logged at the time of their quick registration on arrival by patient access.

The *triage* timestamp is defined as the time the nurse completes the triage process in the electronic health record.

The *provider* timestamp is defined as the provider’s time of first-contact with the patient, and is synonymous with when the provider assigns themselves to the patient in the electronic health record.

The Door-to-triage interval is the number of minutes between the door timestamp and the triage timestamp.

The Door-to-provider interval is the number of minutes between the door timestamp and the provider timestamp. “The door-to-provider interval is synonymous with the Centers for Medicare and Medicaid Services *Door to Diagnostic Evaluation by a Qualified Medical Provider* (OP-20) policy” (Centers for Medicare and Medicaid Services [CMS], 2018).

The Health Insurance Portability and Accountability Act (HIPAA) is the US Federal Law that largely protects patient privacy and confidentiality through regulation of how/when medical information can be shared/obtained.

Front-end process refers to an institution’s specific process implemented to receive, register, triage, and initiate provider evaluation. Although the terminology refers to a process as opposed to a time interval, the process start and ending points are synonymous with the door-to-provider interval.

“Left Without Being Seen” (LWBS) refers to patients that arrive at the ED for emergency care and subsequently leave prior to initial evaluation by a QMP. LWBS is also sometime referred to as “Leaving Without Treatment” (LWOT). LWBS is not synonymous with leaving against medical advice.

Clinical Problem Statement

Comprehensive data collection in triage is an antiquated triage process that bottlenecks the system and delays care. For example, non-ambulance arriving ED patients receiving care at EDs using a comprehensive approach to triage experience prolonged door-to-triage time; this prolonged time interval consequently results in a prolonged door-to-provider time interval.

Purpose/Aims

The purpose of this Quality Improvement project was to modify a US ED’s front-end process with the goal of improving the door-to-provider time interval. The ED utilized a

comprehensive data collection process during triage; the intent was to redesign the process and implement a rapid triage process.

Clinical Question

Does the implementation of a rapid triage process in a US east-coast ED result in improved aggregate door-to-triage and door-to-provider times for non-ambulance arriving patients?

Literature Review

A literature search was conducted using both Google Scholar as well as the Creighton University Library search engine, known as "Jay Search," that searches all Creighton University library holdings, most Creighton University licensed collections, and many open access resources (Creighton University, n.d.). JaySearch includes CINAHL and PubMed search engines, among others. Additional searches were conducted using Medline and ProQuest. Search terms included: *rapid triage, split-flow triage, streamlining triage, quick-look, improving door-to-provider, improving door-to-doctor, reducing door-to-provider, reducing door-to-doctor, immediate bedding,* and *direct bedding*. In addition to finding articles via search engines, individual attention was focused at reviewing triage related articles in the *Journal of Emergency Nursing* since 2010. Lastly, a re-review of existing triage-based articles, including grey literature, in a personal database was conducted. Seventy-one articles were extensively reviewed. Articles not included in the literature review included those that did not inherently focus on process to improve door-to-triage times; This included articles that more broadly discussed triage accuracy, intra and inter-rater reliability, triage qualifications, triaging specific patient populations, and specific triage screening tools, among others.

Common themes

Common themes that emerged from the articles meeting inclusion criteria included the rationale/need to decrease LWBS rates and to improve door-to-provider times. Within triage-specific literature there were discussions about various front-end methods that resulted in improving the LWBS rates and door-to-provider times. This included commentaries on improving the door-to-triage metric, evaluating whether triage was even needed in situations where there were open beds and an available provider, triage bottlenecks, immediate bedding, and direct bedding.

Successful methods for reducing door-to-provider times

A variety of methods were identified in the literature as being successful at decreasing the door-to-provider time metrics.

Hospitals across the country have been using and implementing variations of the innovative solutions Banner Health identified in its “Door-to-Doc” toolkit (Banner Health, n.d.). “Split-Flow” is a widely known process among US ED caregivers. Gaining utilization over the last five years, the process begins with an ambulatory arriving ED patient being quickly “split” by an emergency nurse into one of two or three tracks, depending on the institution. Although the process tracks vary by name and inclusion/exclusion criteria, they usually fit into one of three groups: (1) requiring immediate care, (2) vertical “not sick” care, and (3) rapid care, sometimes referred to as a “fast track” (Bish, McCormick, & Otegbeye, 2016). When properly implemented at an appropriate site, Split-Flow is effective at improving ED throughput metrics, including door-to-provider and median length of stay for treat-and-release patients (Harris & Wood, 2012), as well as improving patient experience scores (Bish et al., 2016).

Provider-in-Triage

"Placing a provider in triage (PIT) is an effective strategy to reduce door-to-provider times along with the reduction of left-without-being-seen rates (Moretz, 2019). It can also be paired with split flow (Pierce & Gomley, 2016). However, PIT is sometimes associated with an overall higher utilization rate and length of stay. Because of the size/volume of this ED in addition to a baseline low LWBS, PIT is not feasible for this project.

Immediate Bedding

Immediate bedding and direct bedding are fairly synonymous terms that describe a process where patients do not stop or wait for triage on arrival. Instead patients are taken directly to a treatment space where they are registered, and treatment begins. The process of triage in a physical location (triage room, triage area, etc.) only occurs when all the ED beds are full. Immediate bedding removes the act of sorting until it is necessary (Howard, 2011). Some also describe the process as "pull-till-full." Immediate bedding processes have improved patient length of stay, door-to-provider times, LWBS, and patient experience scores in adult EDs (Wolf, Delao, Perhats, Moon, & Zavotsky, 2018). The process in pediatrics specific EDs require additional research (Flood et al., 2015).

The bottlenecks of triage

Triage is a verb, not a noun; it is an action, not a location (Desseyn, 2017). However, while triage is fundamentally a process, it has evolved into also being a location in many US EDs. Bottlenecks often occur when it is operationalized as a location where most patients must stop prior to bed placement.

> "Patients come to the emergency department to see a provider. Processes that inherently slow presentation to provider time may compromise safety, as well as patient and staff satisfaction. Traditional triage as a place does not facilitate getting the patient to the provider quickly" (Howard, 2011, p. 597)

In many cases patients stop at a triage location to obtain clinical patient information when the department has an open bed and provider ready to see the patient. This process delays the door-to-provider time and prolongs the ED length of stay (Howard, 2011). Moreover, many screening questions are being asked at triage that are not even relevant to the act of sorting (Foley & Durant, 2011). These questions are often inserted into the triage process because: (1) staff compliance at any other point of care is lower, (2) a hospital quality department dictates that it shall be done in triage, or both. Care is delayed when there are a multitude of screening and data collection questions prior to a provider's evaluation when a treatment space is available. Larger hospitals that are nearly always over-capacity have instituted a pivot-nurse role to facilitate flow for arriving higher acuity patients while still obtaining all screening information on waiting patients. This is an effective technique in over-capacity EDs (Martin, 2012). One solution for implementation at medium and smaller facilities is the concept of rapid triage, stripping triage back down to its original intent: sorting (BJC, 2014).

Cautions in implementing rapid triage

Wolf et al. (2018) describe cautionary trends when implementing rapid triage. They identified hospitals triaging patients without any physiologic data. Concerns are raised about the impact such actions have on patient outcomes, stating there were, "Manipulations of the triage system to 'fix' problems in ED flow, rather than describing a standard application of a triage system" (Wolf et al., 2018, p. 265). In EDs both with and without rapid triage, wide variation in acuity and patient flow decisions were reported, with differences noted not only from one ED to another, but also based on which nurse was working in triage. The presence of an inter and intra-rater reliability quality monitoring program was largely absent (Wolf et al., 2018).

Theoretical Framework

This project was completed using the "structure-process-outcome" framework described by Donabedian (1988). This model has been frequently utilized by researchers as well as those in public policy to map out the mechanics of a particular situational process.

> "Structure refers to the context in which the care is delivered and includes elements such as the facility, equipment, and staffing. Processes are the actions taken to deliver care, such as testing, diagnosis, and treatment. Outcomes are the effects of the care delivered. This model states that structure affects process, and process affects outcome" (Coil et al., 2016, p. 730)

The Donabedian model suggests that there are differences in process to account for these outcome variations of door-to-provider times in various EDs. In this case a multidisciplinary performance improvement work team focused heavily on the process component as it related to yielding the desired outcome of improving door-to-triage and door-to-provider times (Donabedian, 1988).

Structure Component

Patient variables

Patients or their advocate most often self-select their arrival method. While some patients arrived via ambulance or emergency medical services via a dedicated separate entrance, most patients arrived through non-medical transportation means and request treatment at the ambulatory ED entrance on arrival. Additional variables included the volume of patients arriving within close proximity of other patients and the severity of their conditions.

Nursing variables

State laws vary on staffing requirements for ED triage. The Emergency Nurses Association has specific recommendations on triage qualifications, which include a one-year minimum of emergency nursing experience, completion of a comprehensive evidenced-based

triage course with subsequent clinical validation, and an ongoing triage competency validation process (Emergency Nurses Association [ENA], 2017). Modifying qualifications for nurses to triage was not in scope for this project. Also not in scope was evaluating the presence of inter and intra rater reliability among the nurses at this site. As such, while nurses should be triaging according to ESI, no mechanism was in place for this project to assure adherence to the algorithm. This project specifically examined streamlining the process to sort patients thereby effecting the door-to-provider time.

Institutional variables

While ESI has widespread adoption across US EDs, Electronic Health Record (EHR) documentation standardization varies greatly from one organization to another, as does institutional front-end process used for patient arrival and triage. The EHR platform and version is not changeable. However, institutional IT resources are available to make reasonable updates/changes to the EHR so that documentation aligns with the process.

Process Component

Patient variables

Arriving patients may present without a succinct and clearly defined reason for visit. It takes a skilled triage nurse to appropriately discern appropriate and relevant clinical information to expeditiously triage the patient.

Nursing variables

Nursing education and experience vary from one professional to another. Nurses also needed to be aware of inherent bias that may occur in their individual triage practice, as discussed in the ESI implementation manual (Gilboy et al., 2011). Staff compliance to the new process is variable in the process component.

Institutional variables

Institutional variables included department staffing compared to patient demand, leadership support and reinforcement of the process change. Additionally, it is the institutional process that sometimes create bottlenecks to facilitate patient flow (Desseyn, 2017, p. 375). This was the case at the facility identified for this project; the lengthy comprehensive nature of questions asked at triage created a bottleneck to getting the patient to an open bed. It delayed the door-to-provider time. The pre-intervention ambulatory arrival process for patients is further depicted in Figure 2; all of the items listed in Figure 3 were documented during the pre-intervention triage process.

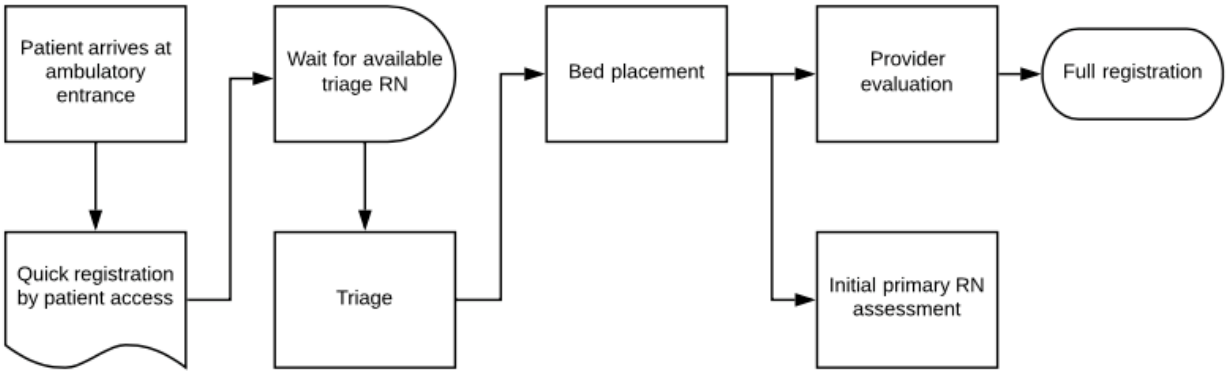

Figure 2. Pre-intervention front end process for arriving ED patients at ambulatory entrance.

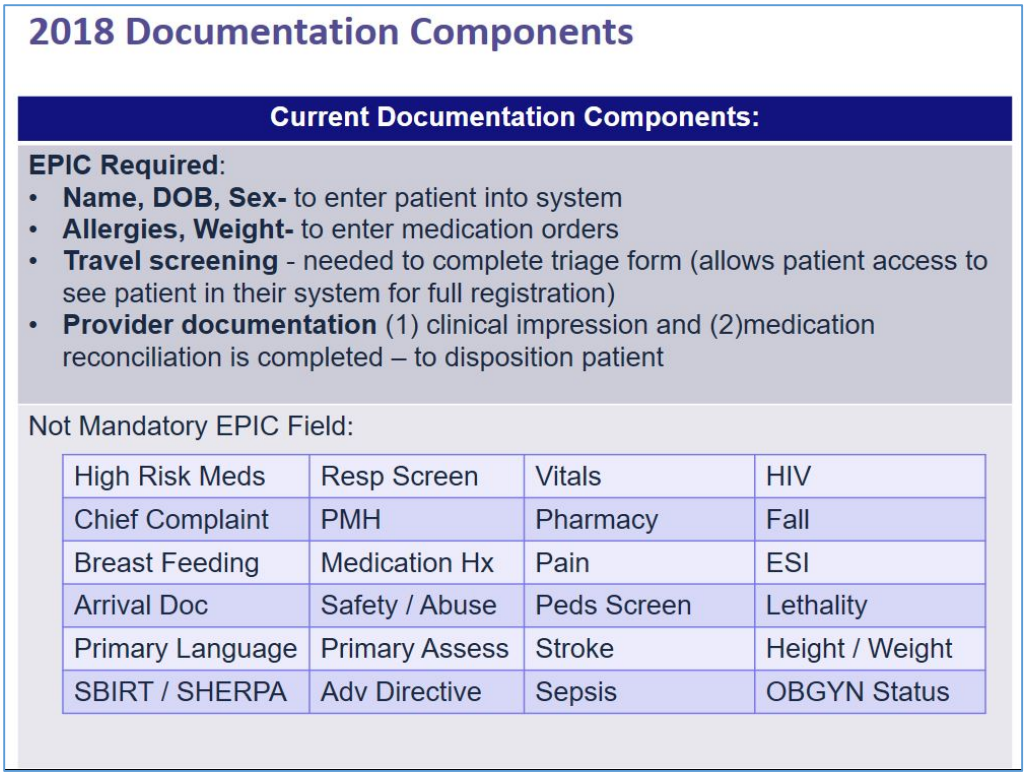

Figure 3. Documentation elements during pre-intervention triage process

Outcome Component

Outcome identification

The outcomes were door-to-triage and door-to-provider time intervals for ED patients arriving by any method other than ambulance. The desired outcome was an improvement in these time metrics compared to baseline.

Relevant outcome implications

ED inefficiencies and delays result in nearly four million ED patients annually that leave before being seen by a provider (Welch & Savitz, 2011). Many emergency conditions are time-sensitive, and delays increase morbidity and mortality (Welch & Savitz, 2011). Timeliness of care strongly coordinates with overall length of stay as well as patient satisfaction (Bernstein, Arnosky, & Asplin, 2009; Sayah, Rogers, Devarajan, Kingsley-Rocker, & Lobon, 2014).

Methods

Design

This was a continuous quality improvement initiative utilizing the DMAIC method for process improvement. DMAIC stands for Define, Measure, Analyze, Improve, and Control (Moran, Burson, & Conrad, 2017). A performance work team was formed consisting of ED nursing/medicine leaders and ED staff. All staff were invited to attend the work team meetings.

Define

The opportunity for improvement was reducing the door-to-triage and door-to-provider times in an east coast United States ED through implementation of a rapid triage process. This was achieved through process redesign and relocating most questions currently asked in triage to the patient's treatment space for completion by the primary nurse.

A health-system wide multidisciplinary performance improvement team was formed which included ED nursing leadership, a consulting service including three emergency nurse leaders, educators, staff, and providers. The DNP student comprised one of the consulting service emergency nurse leaders functioning in an expanded role due to their doctoral studies. The student led the team that worked on merging six separate ED triage policies to develop one system-wide triage policy, which was subsequently reviewed and approved by the health system's lead Chief Nursing Officer and Chief Clinical Officer. Key elements of the new policy included: (1) the removal of specific time intervals based on assigned ESI level, (2) emphasis that triage is a process and not a location, and (3) focus on rapidly sorting patients to get them in front of a provider as quickly as possible.

The previously listed documentation components in figure 2 were reconfigured by the group into three different components: (1) primary triage, (2) screenings, and (3) primary

assessment. The policy outlines that the "primary triage" section of the EMR be completed during the triage process on arrival. Recalling the recent concerns addressed by Wolf et Al. (2018), primary triage did include obtaining vital signs for all patients. Screenings were completed by the RN at the earliest opportunity after triage. Primary assessment was completed by a RN at the earliest opportunity after their placement in a treatment space. The reconfiguration components are detailed in figure 4.

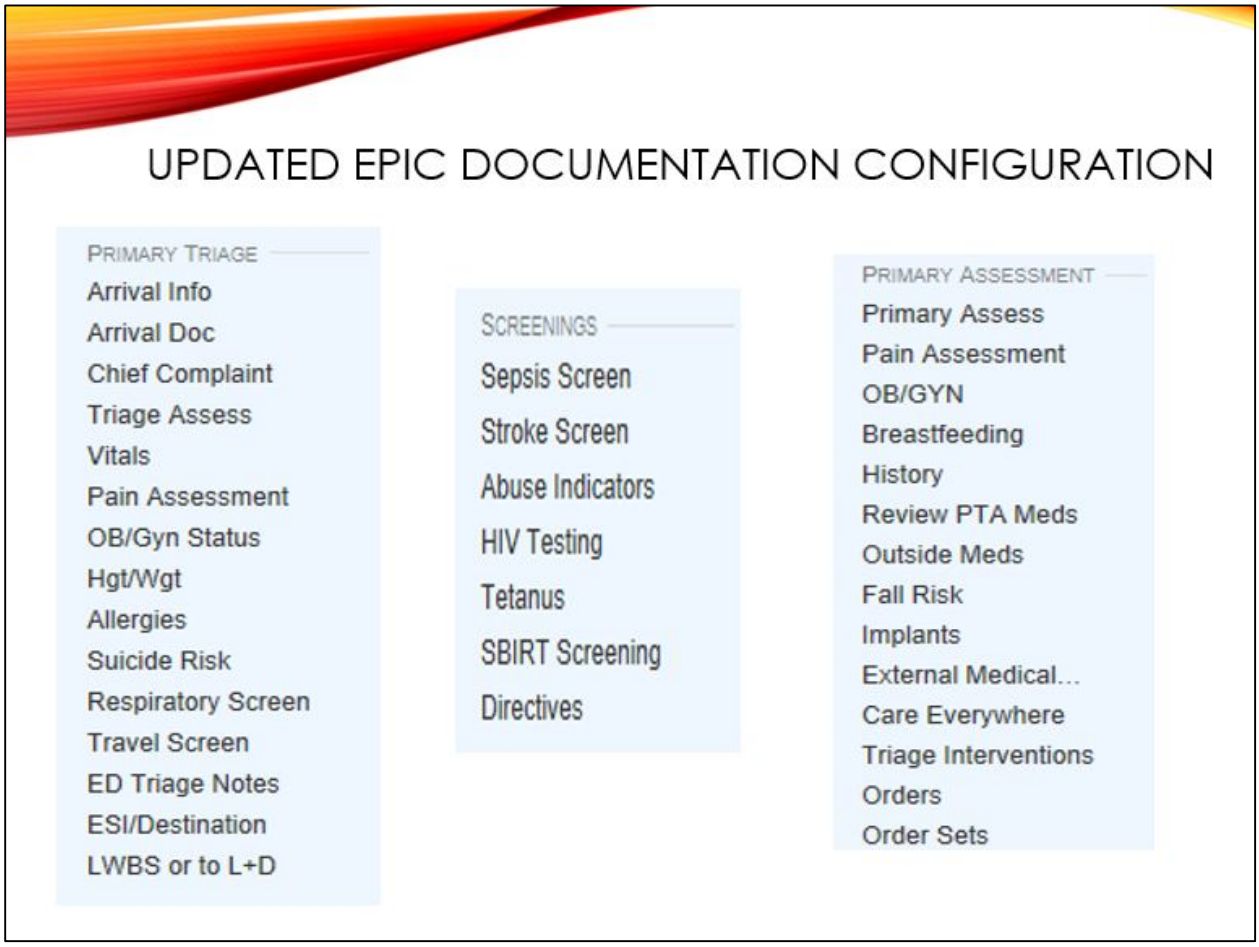

Figure 4. Updated computerized documentation configuration

Measure

The pre-implementation state of the process in the ED for non-ambulance arriving patients included quick registration by a patient access staff member followed by triage by an

emergency nurse. The ED utilized a comprehensive method to triage the patient. Patients were then classified according to ESI. The data to measure included door-to-triage and door-to-provider time intervals. These two time intervals were measured for a three-month period prior to any consultants arriving on-site and then compared to the same three-month period one-year later; specifically, August, September, and October 2019 were compared against the same months in 2018. The intervention and process change occurred in July 2019. The year-over-year comparison was done to control any concern for seasonality. These two intervals were measured by examining the minimum, Q1, Q2, Q3, maximum, mean, and standard deviation. Patient characteristics for the time period were also examined including volume, overall ESI distribution, and disposition distribution such as percentage of discharges and percentage of patient admissions to the hospital.

Analyze

Pre-implementation workflows were obtained through a work team staff-participatory process. The team determined what components were needed for the act of sorting, and what components must remain at the first contact component due to other regulatory or process restrictions. For example, did the state require travel screening of all patients in the first encounter? Were certain documentation elements hard-stops in the electronic medical record that prevent others from documenting in the record? An example of this might have included a requirement that Allergies must be documented prior to any medications order entries.

Improve

The next step in the process following systemization and policy/process consolidation was site-specific work teams to discuss site-specific logistics and implementation at each site. This project focused on just one of the six sites in the health system.

The site-specific work team was guided by the DNP student through a series of meetings to streamline the triage process, shifting items not essential to sorting or other hard-stops as identified above to be obtained by the patient's primary nurse after bed placement. Focus was placed on the patient's best interest, which is getting the patient to the provider as expeditiously as possible.

The DNP student was responsible for overseeing and guiding the entire project; this included leading the system-wide meeting in collaboration with client leads as well as overseeing the site-specific lead. The site-specific work team was empowered with site-specific logistical decision-making authority. Examples of this include determining what staff member escorted patients from arrival space to their treatment room, where the locus of control of bed assignment lied, etc. The DNP student supported the Go-Live process through active rounding, shadowing, and facilitation of the process change.

Control

The team met at regular intervals in the weeks that followed the initial implementation of the new process. Frequent rounding and observations in the department occurred to respond to questions/inquiries, troubleshoot unforeseen flow challenges or unanticipated bottlenecks, and provide ongoing education and reinforcement of the process change.

Following implementation and resolution of outstanding post-go-live issues that arise, the process was finalized; leadership reinforcement and hardwiring continued in perpetuity. Key Performance Indicators were shared with staff in huddles on a daily basis.

Population

The population was all ED patients presenting for treatment at the implementation site that did not arrive by ambulance. Ambulance patients were excluded from this project as they

have a different arrival process/experience. ED staff, with particular attention to ED nurses, remain responsible for implementing the new process and providing feedback to the triage performance improvement work team as part of the ongoing DMAIC process and quality improvement initiative.

Setting

The setting is one east coast ED with 28,000 annual visits. The ED resides within a 200-bed community hospital, part of a larger six-hospital faith-based health system. All six EDs use ESI, though their processes vary from site to site. St. Catherine's is not a trauma center, nor does it provide interventional cardiology services. The ED cost center is budgeted 55.8 FTEs. According to the staffing plan, 35.8 FTEs are direct-care RNs; this is based on the traditional 1FTE = 2,080 worked hours' calculation. The health system utilizes an alternative calculation whereby 1FTE = 1,950 worked hours. As such the budget is 59.4 and 38.2 respectively. Direct care nurses are scheduled for twelve hour shifts with day and night shifts starting at the 7 o'clock hour and a mid-shift beginning at 11:00AM. The hospital contracts an ED provider group for emergency provider coverage; this is staffed with both physicians and physician assistants (PA). The total weekday coverage hours are 52, twelve of which are covered by a PA. The total weekend coverage hours are 51, sixteen of which are covered by a PA.

Ethical Considerations

Streamlining front-end processes is common for quality improvement projects in hospitals across the country. Appropriate solutions vary due to physical plant structure, hospital/ED size, staffing, specific state and/or institutional guidelines, among other factors. Many other EDs have transitioned from comprehensive processes to a form of rapid triage. In addition to the commonality of this practice, this study was implemented with the support of

Berkeley Research Group, LLC. Also supporting the project was the health care organization's executive sponsor, who held the duals roles of system Chief Financial Officer and an Executive Vice President. The project proposal was submitted to the Creighton University Institutional Review Board IRB), assigned project number 1451019-1, and was determined that IRB review was not required (appendix A). Specifically, it was determined through administrative review that the project does not meet the definition of research under 45 CFR 46.102(d). Access to relevant data occurred through the HIPAA compliant platform. There was no access to personally identifiable patient information. The student did not have access to the EHR.

Measurement Methods

In addition to descriptive statistics, data was analyzed within the construct of a pre- and post-intervention analysis to assess the impact of the process improvement project. Time was measured in minutes and the data utilized came from a third-party HIPAA compliant analytics platform. Contractual agreements already existed between the hospital and third-party vendor that is providing the analytics platform for other performance improvement initiatives.

Data Collection Procedures

Raw data was sent by health system information technology personnel to a third-party vendor on a monthly basis via a HIPAA compliant platform. HIPAA compliant data was obtained from this platform in both aggregate and raw format; none of the data for the throughput metrics had unique patient identifiers.

Results

Visit Characteristics

As detailed in table 1, total ED volume in the pre-intervention and post-intervention periods were 6,920 and 6,749 visits respectively; this represented an average daily volume of 75.2 and 73.4 patient visits. Total ED volume decreased 2.5% when comparing the pre-intervention and post-intervention time periods. To evaluate volume and time metrics of patients arriving at the ambulatory entrance, a separate analysis was conducted excluding ambulance arrivals. The total volume for the non-ambulance arrival patient group was 4,769 pre-intervention and 4,616 post-intervention; this represented an average daily volume of 51.8 and 50.2 patients per day. Non-ambulance arrival volume decreased 3.2% when comparing the two periods.

Table 1

Visit characteristics

		All ED Patients			ED Patients Excluding Ambulances		
		Pre	**Post**	**% Change**	**Pre**	**Post**	**% Change**
Volume		6,920	6,749	-2.5%	4,769	4,616	-3.2%
Average Daily Volume		75.2	73.4		51.8	50.2	
ESI Distribution	1	0.9%	1.7%	88.9%	0.1%	0.6%	500.0%
	2	14.1%	15.8%	12.1%	12.1%	14.0%	15.7%
	3	69.0%	67.7%	-1.9%	68.1%	66.8%	-1.9%
	4	15.0%	13.7%	-8.7%	18.3%	17.1%	-6.6%
	5	0.5%	0.7%	40.0%	0.7%	1.0%	42.9%
Disposition	Admission	42.4%	43.0%	1.5%	34.1%	34.8%	2.1%
	Discharge	53.7%	53.3%	-0.6%	61.9%	61.7%	-0.5%
	Transfer	0.5%	0.8%	58.8%	0.5%	0.8%	69.6%
	LWBS	0.9%	0.7%	-23.5%	1.1%	0.8%	-31.5%
	AMA	1.5%	1.3%	-11.6%	1.5%	1.2%	-17.4%

There were increases in ESI level 1 and level 2 percentages of both the cohorts of all patients and those only arriving by means other than ambulance. Disposition breakdown remained relatively the same, with increases in transfer rates with concurrent improvement LWBS and AMA rates noted.

Data Analysis

Data was analyzed using common statistical measurements of central tendency. These included arithmetic mean, standard deviation, minimum, q1, median, 13, and maximum values. A *t*-test was used to determine the presence or absence of statistical significance when comparing the pre and post intervention groups.

Throughput Metrics

There was no decrease in median door-to-triage times. However, mean door-to-triage times for both all ED patient and the non-ambulance arrival patient cohort decreased. There was a 39.1% and 38.2% narrowing in the standard deviations respectively; maximum triage times reduced by 151 minutes in both cohorts.

Although there were minimal changes in median door-to-provider times, mean times decreased from 21.3 minutes, SD=21.1 to 18.6 minutes, SD=18.5 for all patient arrivals; this represents a 12.7% and 12.4% improvement respectively. For patients not arriving via ambulance, mean times improved from 23.5 minutes, SD=22.3 to 19.9 minutes, SD=19.7. This represents a 15.2% and 11.7% improvement respectively.

Overall mean and median ED length of stay decreased by 7.7% and 12.1% respectively, with a 22.5% narrowing of the standard deviation. Performance metrics are further detailed in Table 2.

Table 2

Intervention performance metric results

		All ED Patients			ED Patients Excluding Ambulances		
		Pre	**Post**	**% Change**	**Pre**	**Post**	**% Change**
Door-to-Triage	min	0.0	0.0	0.0%	0.0	0.0	0.0%
	q1	1.0	1.0	0.0%	1.0	1.0	0.0%
	median	2.0	2.0	0.0%	1.0	1.0	0.0%
	q3	3.0	3.0	0.0%	3.0	2.0	-33.3%
	max	362.0	274.0	-24.3%	362.0	274.0	-24.3%
	mean	4.0	2.9	-27.7%	3.9	2.6	-32.3%
	SD	10.0	6.1	-39.1%	10.3	6.4	-38.2%
Door-to-Provider	min	0.0	0.0	0.0%	0.0	0.0	0.0%
	q1	9.0	8.0	-11.1%	10.0	8.0	-20.0%
	median	15.0	13.0	-13.3%	17.0	14.0	-17.6%
	q3	26.0	23.0	-11.5%	29.0	25.0	-13.8%
	max	377.0	226.0	-40.1%	377.0	226.0	-40.1%
	mean	21.3	18.6	-12.7%	23.5	19.9	-15.2%
	SD	21.1	18.5	-12.4%	22.3	19.7	-11.7%
Overall LOS	min	2.0	2.0	0.0%	2.0	2.0	0.0%
	q1	161.0	155.0	-3.7%	141.0	137.0	-2.8%
	median	260.0	240.0	-7.7%	233.0	221.0	-5.2%
	q3	386.0	346.0	-10.4%	357.0	320.0	-10.4%
	max	4,025.0	3,920.0	-2.6%	4,025.0	3,920.0	-2.6%
	mean	320.2	281.3	-12.1%	295.4	260.9	-11.7%
	SD	279.7	216.8	-22.5%	279.1	210.4	-24.6%

ESI and Disposition percentages do not sum 100% as some patients had no ESI assigned and some patients had disposition codes of insubstantial percentage

The *t*-test correlation coefficient was used to establish the presence or absence of statistical significance with this project. The *t*-test calculation and results are further detailed in Table 3.

Table 3

T-Test Calculations

Unpaired T-Test Results		Door to Triage All Patients	Door to Triage Excluding Ambulances	Door to Provider All Patients	Door to Provider Excluding Ambulances	Overall LOS All Patients	Overall LOS Excluding Ambulances
Pre-Intervention (Aug-Oct '18)	Mean	4.0	3.9	21.3	23.5	320.2	295.4
	SD	10.0	10.3	21.1	22.3	279.7	279.1
	n	6,920	4,769	6,920	4,769	6,920	4,769
Post-Intervention (Aug-Oct '19)	Mean	2.9	2.6	18.6	19.9	281.3	260.9
	SD	6.1	6.4	18.5	19.7	216.8	210.4
	n	6,749	4,616	6,749	4,616	6,749	4,616
Intermediate Calculations	t	7.7407	7.3163	7.9472	8.2784	9.0726	6.7456
	df	13667	9383	13667	9383	13667	9383
	st. err of dif	0.142	0.178	0.34	0.435	4.288	5.114
Results	p	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	CI	95%	95%	95%	95%	95%	95%
	From	0.821	0.951	2.033	2.746	30.476	24.451
	To	1.379	1.649	3.367	4.454	47.324	44.549

When comparing all ED patients from the pre-intervention period against the post intervention period, mean door-to-triage times decreased from 4.0 (SD=10.0) to 2.9 minutes (SD=6.1, $p < 0.001$), mean door-to-provider times decreased from 21.3 (SD=21.1) to 18.6 minutes (SD 18.5, $p < 0.001$), and overall patient ED length-of stay decreased from 320.2 (SD=279.7) to 281.3 minutes (SD=216.8, $p < 0.001$). When examining just patients arriving by a means other than ambulance, mean door-to-triage times decreased from 3.9 (SD=10.3) to 2.6 minutes (SD=6.4, $p < 0.001$), mean door-to-provider times decreased from 23.5 (SD=22.3) to 19.9 minutes (SD 19.7, $p < 0.001$), and overall patient ED length-of stay decreased from 295.4 (SD=279.1) to 260.9 minutes (SD=210.4, $p < 0.001$).

Discussion

The purpose of this Quality Improvement project was to implement rapid triage in a US ED's front-end process with the goal of improving the door-to-provider time interval. With all *t*-test p values less than 0.001, statistically significant improvements existed in all categories examined of both the entire ED patient population as well as when examining patients arriving by a means other than ambulance. The time intervals with statistically significant improvements were door-to-triage, door-to-provider, and overall ED length-of-stay. Therefore, this initiative achieved its desired outcomes.

Discussion and relevance of findings

Triage distribution

While examining the basic patient demographics in this study, triage distribution variations were noted as an incidental finding. Specifically, there was variation on the percentage composition of each with triage category in both the pre and post interventions groups when compared against the expected spread as published in the ESI manual, as illustrated in figure 5 (Gilboy et al., 2011). This also varies from the average ED distribution published in January 2020 and reflective of 2017 visits (Centers for Disease Control and Prevention [CDC], 2020, table 7). Further investigation into triage accuracy at this facility is warranted. It is hypothesized that quality controls of triage accuracy, such as ongoing competency evaluation and the establishment of inter and intra-rater reliability may be lacking.

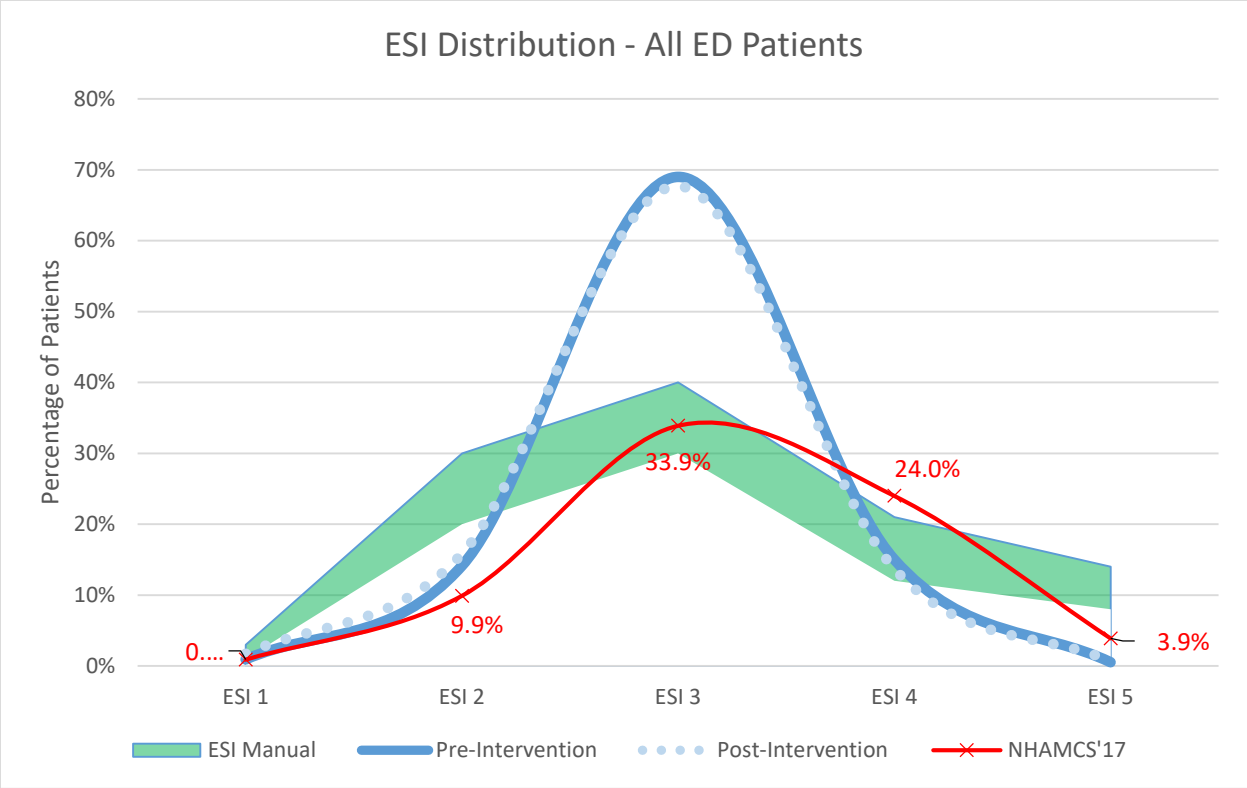

Figure 5. ESI Distribution

Leading through change

The health-system multidisciplinary performance improvement team, comprising of emergency leaders from the various sites, was highly effective. The core functions of the new policy, as referenced in pages nineteen and twenty, were quickly agreed to by participants. One of the strategies that proved most effective in the combination of policies was having each site review all six policies and come to the sessions discussing things they liked in the policies of the other sites; consistent with concepts of positive psychology (Ted Talks, 2011), this put each participant in a positive mindset to explore the opportunities other sites had to offer as opposed to a mindset trying to retain their own process/policy. Positive affirmations were repeated throughout the dialogue to maintain an optimistic outlook on the process change, with the intent of doing the right thing for the patients served. One of the challenges in working with the system

wide group was the degree of success that was achieved in eliminating unnecessary questions in the primary triage process. The team was successful in moving 21 of the 36 documentation elements out of the primary triage component; however, this means that fifteen documentation elements still existed (figure 4).

There were several cultural challenges that existed. Most of the hospital staff, including the nurses, operated under a collective bargaining agreement. The nurses' union was preparing to enter contract renegotiations at the time of this project; a framework of shared governance, staff-led performance improvement indicatives, and/or Porter-O'Grady & Malloch's (2010) concepts of quantum leadership were foreign to the department staff and performance improvement team. Leadership and staff also had negative memories of working with a prior consulting firm that provided workforce advisory services; overcoming this mindset to provide quality improvement implementation services was an ongoing endeavor. Exposing these aforementioned concepts was an ongoing point of dialogue in discussions in addition to the actual change that needed to occur. Repeated education on the differences between Aqwunobi's (2019) concepts on advisory and implementation consulting services was also needed. The environment necessitated significant effort in attempting to form a helping-trusting relationship with the participants, a concept central to Watson's (1985) theory of caring.

Future Implications for clinical practice

Improving time intervals

Rapid triage implementation was effective in producing statistically significant improvements in door-to-triage, door-to-provider, and overall ED length of stay time metrics for both the all ED patient group as well as evaluating just patients arriving by a method other than ambulance. What was not evaluated in this study was the impact of this improvement on actual

patient outcomes. For example, did it result in more timely treatment for patients with sepsis or severe sepsis? Did it result in quicker administration of breathing treatments to patients with breathing difficulties and needing breathing treatments? Future research is needed to further evaluate this impact on actual patient outcomes on specific patient populations, diagnoses and/or chief complaints.

The future of ESI

Although there is limited evidence regarding triage accuracy, it is estimated that appropriate adherence to ESI and assigning triage categories may be as low as sixty percent. (McFarlane, 2019). Causes of this may be multi-factorial including but not limited to: lack of an ongoing triage quality control program, lack of education, implicit bias of the individual triage nurse, culture of triaging the department instead of the patient, and triage bias secondary to moral distress (Wolf et al. 2018).

There is widespread concern with the reporting that triage inaccuracies may occur as high as forty percent of the time (McFarlane, 2019). Furthermore, ESI has not been updated since 2012 and there is growing concern in the profession that an update is long overdue. Last fall the ENA acquired ESI from the Agency for Healthcare Research & Quality (Emergency Nurses Association [ENA], 2019). By acquiring ESI, ENA can position appropriate content-experts and take the lead in conducting necessary research to determine what revisions of ESI are needed. Once revised, ENA can also develop a standardized education product and process by which all emergency nurses can be educated. Systematic quality assurance programs can also be developed and standardized for implementation. The decision to acquire ESI was a strategic way to improve and standardize care delivery, improve patient care, and potentially enhance revenue for ENA.

Separately, the development of machine-based-learning and other artificial intelligence tools can potentially add value to: improve triage accuracy, improve patient outcomes, better understand how actions lead to outcomes in emergency care. One company reports an ability at its pilot facility to improve triage accuracy by 26.9% for all patients, and reported a 93.2% accuracy in high acuity patients. The product implementation also resulted in over 500 high risk patients avoiding the waiting room, a 2.23-hour length of stay for patients admitted to the ICU with sepsis, and 250 patients identified by the computer as a candidate for redirection to fast track. The results are currently going through a peer review process for formal scholastic publication (Mednition, 2019)

In December 2019, ENA and Mednition announced plans to partner to (1) use available information to appropriately update ESI in its next update, and (2) evaluate the role artificial intelligence can plan in future triage processes and/or quality controls. (Emergency Nurses Association [ENA], 2019)

Limitations of the Study

Limitations of the study included scope limitation. The process focused strictly on transitioning the triage process to obtaining just sufficient information to sort the patient according to ESI. Extraneous data collection and screening questions, as defined above were removed from the triage process and being reassigned to the treatment component of care to be completed by the patient's primary nurse. Because of this narrow limitation in process change, some other elements were not assessed. These included but were not limited to: inter and intra rater reliability with adherence to ESI standards, plant redesign to enhance flow, direct bedding and the introduction of advanced triage protocols when clinically appropriate.

While the relevance of improving door-to-triage, door-to-provider, and overall length of stay has been documented, this study did not evaluate actual patient-level outcomes from the new process. That is, a decreased door-to-antibiotic times for septic patients, or a reduced morbidity/mortality rates, among others. Furthermore, while reduced lengths-of-stay can translate to decreased labor needs and reduced labor costs, this was not part of this study as fixed staffing levels were embedded in the organization's collective bargaining agreement drastically minimizing the opportunity to flex staffing to patient demand.

Summary

Rapid triage implementation was effective at this one facility in producing statistically significant improvements in door-to-triage, door-to-provider, and overall ED length of stay time metrics for both the all ED patient group as well as evaluating just patients arriving by a method other than ambulance. Future research is needed to further evaluate this impact on actual patient outcomes on specific patient populations, diagnoses and/or chief complaints. The hospital's ESI distribution, both pre- and post-intervention varied significantly from expected ranges referenced in the ESI manual. Further investigation about triage accuracy rates as well as the impact this process has on door-to-intervention metrics and patient outcomes is needed.

References

Agency for Healthcare Research & Quality. (n.d.). Emergency department performance measures and benchmarking summit: the consensus statement. Retrieved from https://qualityindicators.ahrq.gov/Downloads/Resources/Publications/2006/EDPerformanceMeasures-ConsensusStatement.pdf

Atzema, C. L., Schull, M. J., Austin, P. C., & Tu, J. V. (2011, September). Temporal changes in emergency department triage of patients with acute myocardial infraction and the effect on outcomes. *American Heart Journal*, *162*(3), 451-459. https://doi.org/10.1016/j.ahj.2011.05.015

American College of Emergency Physicians and the Emergency Nurses Association. (2017). Triage scale standardization. Retrieved from https://www.ena.org/docs/default-source/resource-library/practice-resources/position-statements/supported-statements/triage-scale-standardization.pdf?sfvrsn=a940caa_4

Aqwunobi, A. C. (2019). *An insider's guide to working with healthcare consultants*. Chicago, IL: ACHE Management Services.

Banner Health. (n.d.). Door-to-Doc toolkit. Retrieved April 28, 2019, from https://www.bannerhealth.com/about/innovation/door-to-doc-toolkit

Bernstein, S., Arnosky, D., & Asplin, B. (2009). The effect of emergency department crowding on clinically oriented outcomes. *Academic Emergency Medicine*, 16(1), 1-10.

Bish, P. A., McCormick, M. A., & Otegbeye, M. (2016, March). Ready-JET-Go: split flow accelerates ED throughput. *Journal of Emergency Nursing*, *42*(2), 114. https://doi.org/10.1016/j.jen.2015.06.003

Blagg, C. R. (2004). Triage: Napoleon to the present day. *Journal of Nephrology*, *17*, 629-632.

Blue Jay Consulting, LLC (2014). *Essentials of triage and the ESI* [Lecture notes]. Retrieved from Blue Jay Consulting, LLC website: www.bluejayconsulting.com

Centers for Disease Control and Prevention. (2020). 2017 NHAMCS emergency department summary tables. Retrieved from https://www.cdc.gov/nchs/data/nhamcs/web_tables/2017_ed_web_tables-508.pdf

Centers for Medicare and Medicaid Services. (2018). Hospital outpatient quality reporting program. Retrieved from https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/HospitalOutpatientQualityReportingProgram.html

Christ, M., Grossmann, F., Winter, D., Pflegefachwirtin, D., Bingisser, R., & Platz, E. (2010, December 17). Modern triage in the emergency department. *Deutsches Arzteblatt International*, *107*(50), 892-898. https://doi.org/10.3238/arztebl.2010.0892

Coil, C. J., Flood, J. D., Belyeu, B. M., Young, P., Kaji, A. H., & Lewis, R. J. (2016, June). The effect of emergency department boarding on order completion. *Annals of Emergency Medicine*, *67*(6), 730-736. https://doi.org/dx.doi.org/10.1016/j.annemergmed.2015.09.018

Creighton University. (n.d.). JaySearch. Retrieved May 11, 2019, from https://creighton-primo.hosted.exlibrisgroup.com/primo-explore/search?vid=01CRU&sortby=rank&lang=en_US

Desseyn, P. (2017, July). Triage is a process, not a destination. *Journal of Emergency Nursing*, *43*(4), 375. https://doi.org/10.1016/j.jen.2017.03.015

Desseyn, P. (2017, July). Triage is a process, not a destination. *Journal of Emergency nursing*, *43*(4), 375-377. https://doi.org/dx.doi.org/10.1016/j.jen.2017.03.015

Donabedian, A. (1988, September 23-30). The quality of health care. How can it be assessed? *Journal of American Medical Association*, *260*(12), 1743-8. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/3045356

Emergency Department Benchmarking Alliance. (2017). *Emergency department performance measures final report 2016*. Retrieved from https://www.edbenchmarking.org

Emergency Department Benchmarking Alliance. (2019). Emergency department performance measures initial report 2018. Retrieved from https://www.edbenchmarking.org

Emergency Medical Treatment and Active Labor Act, 42 U.S. Code § 1395dd (Legal Information Institute 1986).

Emergency Nurses Association. (2017). Position statement: triage qualifications and competency. Retrieved from https://www.ena.org/docs/default-source/resource-library/practice-resources/position-statements/triagequalificationscompetency.pdf?sfvrsn=a0bbc268_8

Emergency Nurses Association. (2019, December 18). *ENA partners with Mednition to accelerate evolution of triage* [Press release]. Retrieved from https://www.ena.org/press-room/articles/detail/2019/12/18/ena-partners-with-mednition-to-accelerate-evolution-of-ed-triage

Emergency Nurses Association. (2019, October 23). *Emergency Nurses Association acquires ESI triage program* [Press release]. Retrieved from https://www.ena.org/press-room/articles/detail/2019/10/23/emergency-nurses-association-acquires-esi-triage-program

Flood, R., Szwargulski, P., Qureshi, N., Bixby, M., Laffey, S., Pratt, R., & Gerard, J. (2016, October 5). Immediate bedding and patient satisfaction in a pediatric emergency

department. *The Journal of Emergency Medicine*, *50*(5), 791-798. https://doi.org/10.1016/j.jemermed.2015.10.008

Foley, A. L., & Durant, J. (2011, September). Let's ask that out front: health and safety screenings in triage. *Journal of Emergency Nursing*, *37*(5), 515-516.

Gilboy, N., Tanabe, T., Travers, D., & Rosenau, A. (2011). *Emergency Severity Index (ESI): a triage tool for emergency department care, version 4. Implementation handbook 2012 edition.* Rockville, MD: Agency for Healthcare Research and Quality.

Harris, M., & Wood, J. (2012, December). Resuscitate ED metrics with split-flow design. *Healthcare Financial Management*, 76-79. Retrieved from http://eds.a.ebscohost.com.cuhsl.creighton.edu/

Hinson, J., Martinez, D., Schmitz, P., Toerper, M., Radu, D., Scheulen, J., ... Levin, S. (2018, January 15). Accuracy of emergency department triage using the Emergency Severity Index and independent predictors of under-triage and over-triage in Brazil: a retrospective cohort analysis. *International Journal of Emergency Medicine*. https://doi.org/10.1186/s12245-017-0161-8

Howard, P. K. (2011, November). Do we need triage? *Journal of Emergency Nursing*, *37*(6), 597. https://doi.org/10.1016/j.jen.2011.08.008

Hunt, J. (2019, March 12). Average cost of an ER visit. *The Balance*. Retrieved from https://www.thebalance.com/average-cost-of-an-er-visit-4176166

Kolcaba, K. Y. (2003). *Comfor theory and practice: a vision for holistic health care and research*. New York, NY: Springer Publishing Company.

Lau, A. Y., Soo, Y. O., Graham, C. A., Woo, W. K., Wong, E. H., Leung, H., ... Leung, T. W. (2010, December). An expedited stroke triage pathway: the key to shortening door-to-

needle time in delivery of thrombolysis. *Hong Kong Medical Journal*, *16*(6), 455-62. Retrieved from https://www.hkmj.org/system/files/hkm1012p455.pdf

Martin, M. (2012, January). A pivot nurse at triage. *Journal of Emergency Nursing, 38*(1), 104-105. https://doi.org/10.1016/j.jen.2011.09.021

McFarlane, K. (Producer). (2019, December 31). AOEN Episode 32: acts of defiance, a how-to with Lisa Wolf. In *Art of Emergency Nursing* [Audio podcast]. Retrieved from https://podcasts.apple.com/us/podcast/art-of-emergency-nursing/id1460741717

McFarlane, K. (Producer). (2019, September 5). Episode 21: Airway before self-actualization, part two with Lisa Wolf. In *Art of Emergency Nursing* [Audio podcast]. Retrieved from https://podcasts.apple.com/ca/podcast/aoen-episode-21-airway-before-self-actualization-part/id1460741717?i=1000448761589

McHugh, M., Tanabe, P., McClelland, M., & Kare, R. K. (2011, December 23). More patients are triaged using the Emergency Severity Index than any other triage acuity system in the United States. *Academic Emergency Medicine*. https://doi.org/10.1111/j.1553-2712.2011.01240.x|

Mednition. (2019, September 25). *Machine learning startup to debut healthcare industry's first real-time, AI-powered triage solution for emergency clinicians at Emergency Nursing 2019 conference* [Press release]. Retrieved from https://www.businesswire.com/news/home/20190925005218/en/Mednition-Introduces-KATE%E2%84%A2

Mistry, B., Balhara, K. S., Hinson, J. S., Anton, X., Othman, I. Y., Latif E'nouz, M. A., ... De Ramirez, S. S. (2018, July). Nursing Perceptions of the Emergency Severity Index as a

triage tool in the United Arab Emirates: a qualitative analysis. *Journal of Emergency Nursing*, *44*(4), 360-367. https://doi.org/10.1016/j.jen.2017.10.012

Mitchell, G. W. (2008, September). A brief history of triage. *Disaster Medicine and Public Health Preparedness*, *2*(51), 54-57. https://doi.org/10.1097/DMP.0b013e3181844d43

Mitzkewich, M. (2018, September). Sepsis screening in triage to decrease door-to-antibiotic time. *Journal of Emergency Nursing*. https://doi.org/10.1016/j.jen.2018.08.002

Moran, K., Burson, R., & Conrad, D. (2017). *The doctor of nursing practice scholarly project: a framework for success* (2nd ed.). Burlington, MA: Jones & Bartlet Learning.

Moretz, J. (2019, March). *Models of ED arrival processes: which is best for you?* Paper presented at the Southeastern Seaboard Symposium, Virginia Beach, VA. Retrieved from https://us.huddle.com/workspace/784113/files/#/7189313

Mowery, N. T., Dougherty, S. D., Hildreth, A. N., Holmes, J. H., Chang, M. C., Martin, R. S., ... Miller, P. R. (2011, June). Emergency department length of stay is an important predictor of hospital mortality in trauma activation patients. *Journal of Trauma*, *70*(6), 1317-25. https://doi.org/10.1097/TA.0b013e3182175199.

Murrell, K. L., Offerman, S. R., & Kaufman, M. B. (2011, May). Applying lean: implementation of a rapid triage and treatment system. *Western Journal of Emergency Medicine*, *2*, 184-191. Retrieved from https://escholarship.org/uc/item/48v0z89n

New York State Department of Health. (n.d.). Free standing emergency departments. Retrieved from https://www.health.ny.gov/facilities/public_health_and_health_planning_council/meetings/2013-09-13/docs/feds_background.pdf

Pierce, B. A., & Gomley, D. (2016, November). Are split flow and provider in triage models in the emergency department effective in reducing discharge length of stay? *Journal of Emergency Nursing*, *42*(6), 487-491. https://doi.org/10.1016/j.jen.2016.01.005

Plunkett, P. K., Byrne, D. G., Breslin, T., Bennett, K., & Silke, B. (2011). Increasing wait times predict increasing mortality for emergency medical admissions. *European Journal of Emergency Medicine*, *18,* 192-196. https://doi.org/10.1097/MEJ.0b013e328344917e

Porter-O'Grady, T., & Malloch, K. (2018). *Quantum leadership: creating sustainable value in health care* (5th ed.). Retrieved from http://www.amazonbooks.com

Pozgar, G. D. (2004). *Legal aspects of health care administration* (9th ed.). Sudbury, MA: Jones and Bertlett Publishers, Inc.

ReferencesAgency for Healthcare Research & Quality. (n.d.). Emergency department performance measures and benchmarking summit: the consensus statement. Retrieved from https://qualityindicators.ahrq.gov/Downloads/Resources/Publications/2006/EDPerformanceMeasures-ConsensusStatement.pdf

ReferencesAtzema, C. L., Schull, M. J., Austin, P. C., & Tu, J. V. (2011, September). Temporal changes in emergency department triage of patients with acute myocardial infraction and the effect on outcomes. *American Heart Journal*, *162*(3), 451-459. https://doi.org/10.1016/j.ahj.2011.05.015

Sayah, A., Rogers, L., Devarajan, K., Kingsley-Rocker, L., & Lobon, L. F. (2014, April 14). Minimizing ED waiting times and improving patient flow and experience of care. *Emergency Medicine International*, *2014*(). https://doi.org/dx.doi.org/10.1155/2014/981472

Singer, R. F., Infante, A. A., Oppenheimer, C. C., West, C. A., & Siegel, B. (2012, March). The use of and satisfaction with the Emergency Severity Index. *Journal of Emergency Nursing*, *38*(2), 120-126. https://doi.org/10.1016/j.jen.2010.07.00

Ted Talks (Producer). (2011, May). TedxBloomington. In *The happy secret to better work* [Video podcast]. Retrieved from https://www.ted.com/talks/shawn_achor_the_happy_secret_to_better_work?utm_campaign=tedspread&utm_medium=referral&utm_source=tedcomshare

The Joint Commission. (2015). Preventing delays in treatment. Retrieved from https://www.jointcommission.org/assets/1/23/Quick_Safety_Issue_Nine_Jan_2015_FINAL.pdf

The Joint Commission. (n.d.). Sentinel event alert, issue 26: delays in treatment. Retrieved from https://www.jointcommission.org/sentinel_event_alert_issue_26_delays_in_treatment/

Walsh, M., & Knott, J. C. (2010). Satisfaction with the emergency department environment decreases with length of stay. *Emergency Medicine Journal*, *27*(11), 821-8. https://doi.org/dx.doi.org.cuhsl.creighton.edu/10.1136/emj.2009.079764

Watson, J. (1985). *Nursing: the philosophy and science of caring*. Niwot, CO: University Press of Colorado.

Welch, S., & Savitz, L. (2011). Exploring strategies to improve emergency department intake. *The Journal of Emergency Medicine*, *43*, 149-158. https://doi.org/10.1016/j.jerermed.2011.03.007

Wolf, L. A., Delao, A. M., Perhats, C., Moon, M. D., & Zavotsky, K. E. (2018, May). Triaging the emergency department, not the patient: United States emergency nurses' experience

of the triage process. *Journal of Emergency Nursing, 44*(3), 258-266. https://doi.org/10.1016/j.jen.2017.06.010

Appendix A:

Creighton University IRB Determination Letter

Creighton UNIVERSITY

Institutional Review Board

2500 California Plaza • Omaha, Nebraska 68178
phone: 402.280.2126 • fax: 402.280.4766 • email:
irb@creighton.edu

DATE:	July 11, 2019
TO:	Nicholas Chmielewski, MSN, BSN
FROM:	Creighton University IRB-02 Social Behavioral
PROJECT TITLE:	[1451019-1] Performance Improvement with Rapid Triage Implementation
SUBMISSION TYPE:	New Project
ACTION:	IRB REVIEW IS NOT REQUIRED
EFFECTIVE DATE:	July 11, 2019
EXPIRATION DATE:	
TYPE OF REVIEW:	Administrative Review

Thank you for your submission of New Project materials for this project. The following items were reviewed in this submission:

- Creighton - IRB Application Form - Creighton - IRB Application Form (UPDATED: 06/11/2019)
- Other - College of Nursing Internal Review Approval.pdf (UPDATED: 06/4/2019)
- Proposal - Chmielewski_Nicholas_07-11-2019.pdf (UPDATED: 07/11/2019)

It has been determined that this project does not meet the definition of research under 45 CFR 46.102(d). IRB review is not required.

We will retain a copy of this correspondence within our records.

If you have any questions, please contact Kathleen Stibbs at (402) 280-2126 or kathleenstibbs@creighton.edu. Please include your project title and reference number in all correspondence with this committee.