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Emergency Department Triage Acuity Ratings: Embedding Esi Into the Electronic Medical Record

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EMERGENCY DEPARTMENT TRIAGE ACUITY RATINGS: EMBEDDING ESI
INTO THE ELECTRONIC MEDICAL RECORD

by

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Bachelor of Science
Lander University, 2009

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Submitted in Partial Fulfillment of the Requirements

For the Degree of Doctor of Nursing in

Nursing Practice

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DEDICATION

I dedicate this work to my husband, Jonathan. Without his unconditional love and support I would not have been able to finish this journey. His continuous encouragement and light-heartedness carried me through on the days I wanted to give up and his kind words celebrated every milestone along the way.

ABSTRACT

A need for improvement in the triage process was identified in the ED of a southeastern healthcare facility. Lewin's Change Theory guided the implementation of an evidence-based quality improvement project (QIP) to improve the efficiency of the triage process using and embedded Emergency Severity Index (ESI) triage acuity-level assistant template in the electronic medical record (EMR). The target interventions were ED throughput times, the number of patients left without being seen (LWOT), and RN satisfaction.

Methods included the implementation of education interventions for all ED RNs that included a presentation, use of ESI algorithm badges for each nurse, and weekly case scenarios, where each nurse assigned an ESI triage acuity-level, and provide a rationale for their decisions. Continuing education units were given for the completion of the set of scenarios. Methods that measured the target inventions included pre and post implementation comparison of ED throughput times and the number of LWOT patients. RN satisfaction with the newly embedded triage system was measured through pre and post intervention surveys.

The ED throughput times increased approximately 1.5 minutes in relation to the start of the triage process with the implementation. However, the ED throughput times improved for the patients in relation to the amount to of time patients waited from the completion of the triage process until they were placed in the patient care area, a decrease

of approximately 17 minutes. The number of LWOT patients decreased by 2.4% in the implementation period. Approximately 78% of ED nursing staff was satisfied with the EMR's embedded electronic, acuity assistance template. Embedding ESI" improved the efficiency of the triage process, reduced LWOTs and was favorably accepted by the RNs.

The QIP project provided evidence to support the use of an embedded ESI template to improve the efficiency of the triage process. Further research is needed to determine the impact of the electronic, acuity-level assistant template on accurate triage category patient outcomes.

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LIST OF ABBREVIATIONS

ADAPT ....Adaptive Process Triage system

AND.. Associate Degree in Nursing

ATS...Australian Triage System

BSN..Bachelor of Science Degree in Nursing

CTAS ....Canadian Triage and Acuity Scale

ED .... Emergency Department

EKG ....Electrocardiogram

EMS ....Emergency Medical Services

ESI...Emergency Severity Index

MSN.. Master of Science Degree in Nursing

Non-TT RN.. Non-Triage Team Registered Nurse

QIP ....Quality Improvement Process

PO ....By mouth

RN...Registered Nurse

TT RN .... Triage Team Registered Nurse

VS ....Vital Signs

CHAPTER 1

INTRODUCTION

Worldwide emergency departments (EDs) have adopted and implemented triage, which is derived from the French verb "trier", meaning to sort (Andersson, Omberg, & Svedlund, 2006). Across the world, EDs use triage to help sort and prioritize the care of patients (Göransson, Ehrenberg, Marklund, & Ehnfors, 2005). Triage is the starting point for documentation of patients and their needs, further assessments and treatments, reassurance and comfort, and communication with patients and their visitors in relation to the nature of the ED visit (FitzGerald, Jelinek, Scott, & Gerdtz, 2010). ED Registered Nurses (RNs) commonly complete the triage assessments and make triage acuity-level decisions in relation to the severity of the patients' medical conditions. Nursing practice in the ED triage setting requires solid clinical reasoning and accurate decision-making skills (Göransson, Ehnfors, Fonteyn, & Ehrenberg, 2008). For the benefit of patient safety and for a dependable ED triage system, it is crucial that triage RNs make accurate decisions regarding patient acuity-level decisions (Göransson et al., 2008). Inaccurate triage acuity-level decisions result in adverse events and deaths due to extended wait times with some patients experiencing more severe and life altering changes in their health statuses while they wait (Gilboy, Tanabe, Travers, & Rosenau, 2012).

The Importance of Triage Efficiency and Timeliness

The clinical decision-making utilized in ED triage is to ensure all patients, each presenting with various complaints, receive appropriate care within a timely manner (FitzGerald et al., 2010). It is critical that ED RNs complete a rapid, focused assessment on each patient, and assign an accurate triage acuity-level using a reliable and valid triage system (Gilboy et al., 2012). Inaccurate triage acuity-level decisions lead to devastating patient outcomes. The term "under-triage" is used to describe these patients because the triage acuity-level decisions are not as high as the patients' medical conditions warrant. "Over-triage" is the term used to describe patients who receive triage acuity-level decisions higher than what their medical conditions warrant. When patients are over-triaged scarce resources are utilized. ED beds are considered scarce resources. When all ED beds are inadequately occupied, open beds are unavailable for patients who present to the EDs with immediate life-threatening emergencies (Gilboy et al., 2012).

Current Use and Wait Times of Emergency Departments

There were 136 million visits to the United States of America's (USA) EDs in 2009 (Sebelius, Frieden, &Sondik, 2012). Locally, 31.4% of South Carolinians accessed their local ED for medical treatment in 2010 (State Health Facts, 2010a). Of the USA's 2008 ED visits, only 18% of patients were seen within 15 minutes of arrival to the ED. The average national wait time for a patient to be seen in the ED was 37.1 minutes (Burt &McCaig, 2006). Nationally, southern hospitals had a 50% higher incidence rate of patients who left without receiving medical treatment from a provider (LWOT) and were

less likely to admit patients to the hospital for further medical treatment than EDs

anywhere else in the nation (U.S. Department of Health and Human Services, 2010).

Various Triage Systems

Since all patients who enter the EDs are not considered emergent, do not need

care right away, or the same amount of medical resources as those patients that are

considered emergent, several triage systems have been developed to assist with the

decisions of patients' triage acuity-levels (FitzGerald et al., 2010). Triage systems also

help separate ED patients into various categories, often one through five, which

correspond to the maximum waiting time based on specific criteria of presenting clinical

urgency (Aacharya, Gastmans, & Denier, 2011). FitzGerald, Jelinek, Scott, and Gerdtz

(2010) stated that hospitals around the world commonly use the Australian Triage Scale

(ATS), the Canadian Triage and Acuity Scale (CTAS), the Emergency Severity Index

(ESI), or the Manchester Triage Scale (MTS). The three essential components of these

triage systems include the number of categories in the system, the terminology of the

categories, and the patient assignment category processes (FitzGerald et al., 2010). See

Appendix A for these triage systems and their components. The variety of triage systems

manifests the difficulties associated with triage decisions and the problems that surround

the development of a consistent triage approach (FitzGerald et al., 2010).

The Emergency Severity Index

The most commonly used ED triage system in the USA is the ESI triage system

(FitzGerald et al., 2010). The ESI triage system categorizes ED patients by both patient

acuity and patient resource needs. The ESI triage system assigns patients into five groups,

from acuity-levels one through five. There are four components that guide the RN toward the collection of appropriate information. Each component directs the RN to the next component until the determination of a triage acuity-level (Gilboy et al., 2012). See Appendix B for an example of the ESI triage system.

First, in the ESI triage system, the patient's acuity-level is assessed. In this first component the stability of the patient's vital signs (VS) or the potential loss of a limb or organ determines the acuity-level of the patient. An ESI acuity-level one decision is decided if the patient needs immediate life saving interventions. If the patient does not need immediate life saving interventions, then the RN continues to the second component. In this component, a high-risk situation, the new onset of confusion or lethargy, or severe pain warrants an ESI acuity-level two decision. However, if the patient does not meet an ESI acuity-level two, then the use of potential resources helps determine an ESI acuity-level decision in the third component. A resource is defined as the number of resources a patient is expected to consume in order for a disposition decision, discharge, admission, or transfer, to be reached. Examples of the ESI resources include lab work, simple tests, RN interventions, medications delivered via IV, intramuscular (IM) or nebulizer routes, specialty consultation, or simple procedures. Point-of-care testing, oral medication administration, tetanus immunization administration, history and physical aspects of the assessment, prescription refills, a phone call to a patient's primary care provider, simple wound care, wound rechecks are not considered resources. The ESI acuity-level three is considered if the patient potentially needs two or more medical resources. If the patient needs more than two medical resources, then the RN continues to the final component, the danger zone VS

component. In this fourth component, the patient's VS are reviewed in accordance with the VS criteria. If the VS are considered potentially dangerous, the RN should increase to an ESI acuity-level two. The danger zone VS criteria are different for the adult and pediatric patient populations and are part of the ESI triage system displayed in Appendix B. However, if the patient needs less than two resources the RN does not refer to the danger zone VS component. An ESI acuity-level four is decided if the patient needs only one resource. An ESI acuity-level five is decided if the patient does not need any resources. An estimate of the potential number of needed resources is typically determined based on the RN's previous experiences with patients who presented to the ED with similar injuries or complaints (Gilboy et al., 2012). Additional ESI triage system information in relation to the different ESI triage acuity-levels is discussed in Chapter Three.

Description of the Problem: Lack of Systematic Process to Facilitate Triage

The description of the problem is the lack of a systematic process to facilitate triage, which could lead to an inefficient triage process. The absence of a systematic triage approach and supporting documentation in the electronic medical record (EMR) could lead to ineffective ED triage processes. It was found that if a consistent triage system is used in the triage process, accurate acuity-level decisions are made more often than when a triage system is not utilized (Dallaire et al., 2012). It was also suggested that when RNs accurately follow a triage system, they make valid and reliable triage assessments and decide appropriate triage acuity-levels (Vance et al., 2005).

Inconsistent utilization of a common triage system could lead to the absence of a systematic process that could facilitate triage. In the previously mentioned Dallaire, Poitras, Aubin, Lavoie, and Moore (2012) study, after the initial education of how to accurately decide an acuity-level, experienced RNs often distance themselves from the triage acuity-level guidelines, assigning patient acuity-levels based on subjective judgment rather than the systematic triage system. The study also looked at inter-rater agreement between triage RNs without recent triage system training, and Dallaire et al. (2012) found that with experience RNs become more confident with triage performance tasks and gradually increase their distance from a formal application of the triage system. Eventually experienced RNs no longer refer to the triage system as a reference, but triage patients based on a holistic nursing approach and their clinical experiences over their nursing career. It was believed that experience does not improve the efficiency of triage decisions, but continuous training and recertification of training on the triage system improves the efficiency. It was suggested that through years of nursing practice, RNs might interpret and integrate the triage system differently from one another. The inconsistent referral to a triage system could lead to lower inter-rater reliability. With lower inter-rater reliability patient safety is a concern and the potential development of an ineffective triage process (Dallaire et al., 2012).

Lastly, the lack of documentation support for the triage system in the EMR could lead to an ineffective triage process. If RNs do not chart their rationale for their triage decisions then other RNs might not understand why certain triage acuity-level decisions are made. Through the implementation of a documentation support system for RNs and their triage acuity-level decisions, all ED staff understands the rationale and importance

of triage acuity-level decisions. Supporting documentation also allows for a uniform, triage process approach (Dallaire et al., 2012).

Project Site: Southeastern United States Healthcare Facility

The project site for the quality improvement process (QIP) project is a healthcare facility located in the southeastern USA. This magnet designated healthcare facility is a Level II Trauma Center. The healthcare facility's ED treats approximately 160-200 patients per day. The ESI triage system is the triage system of choice for the ED within the healthcare facility. The QIP project took place June through August 2013. There were 24 medical doctor providers, ten physician assistant providers, and two nurse practitioners in the ED at the time of the QIP project. Approximately 110 RNs worked in the ED, with approximately 50 of those RNs as members of the ED triage team at the time of the QIP project. The triage team RNs triage patients on a continuous basis in the designated triage area within the ED. The non-triage team RNs triage patients who arrive to the ED via EMS and bypass the triage designated patient care area.

ED Throughput Times

Statistics for ED visits at the facility from 2009 to 2013 demonstrate the actual number of patients who entered the ED for treatment in these years. Figure 1.1 displays the patient population growth rate. Each year, from 2009 to 2011, the ED patient population experienced a growth in the number of patients who utilized the ED for treatment. However, in 2012, the growth rate decreased. In 2013, the patient population growth rate increased again. One reason for the increase is the average population growth rate for the county in which the facility is located rose 5.3% from 2000 to 2010,

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and more specifically rose 1.3% from April 2010 to July 2012 ("State and county,"

2013). Another reason for the ED patient population growth increase is the increase in the

number of patients who utilize the ED as their primary care facility.
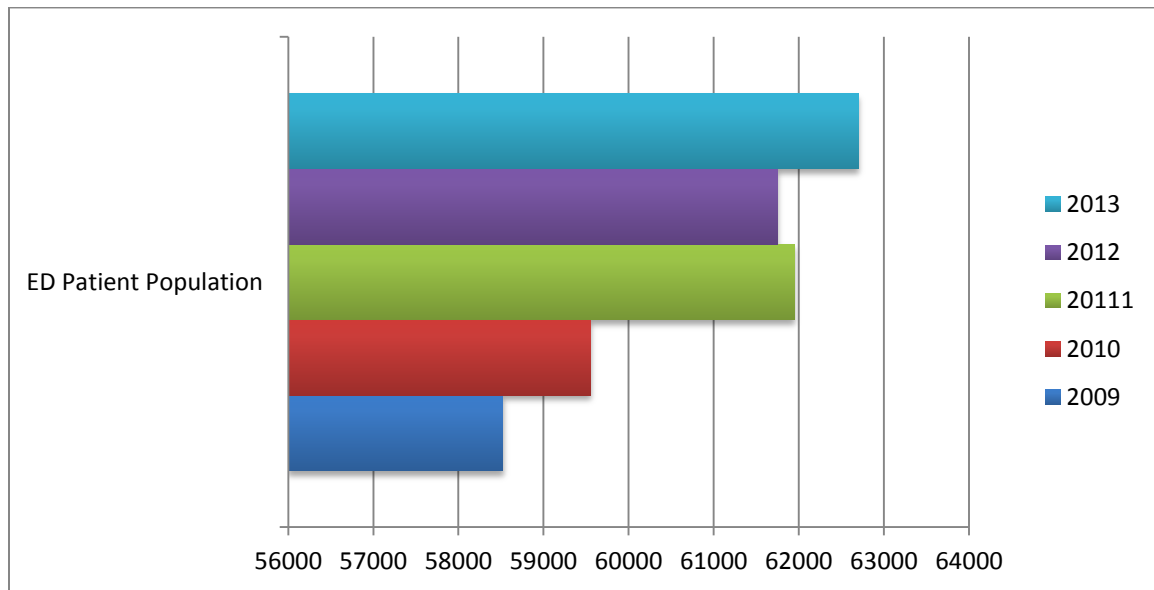
Figure 1.1   *ED Patient Population Growth Rate Over Time*

Number of LWOT Patients

"Left without being seen" (LWBS) is the phrase the facility refers to for their

LWOT patients. Table 1.1 displays the information for the time period approximately one

year before the QIP project. The actual number of LWOT patients prior to the

implementation of "Embedding ESI" for the months January 2013 through May 2013 is

in the table. These patients presented to the ED for treatment, completed the triage

process, waited in the post-triage waiting room, but were not seen by a medical provider.

Table 1.1

Number of LWOT Patients Pre-Implementation of the Project

Month and Year	Number of LWOT Patients
January 2013	383
February 2013	253
March 2013	411
April 2013	313
May 2013	276

ED RN Satisfaction

During a presentation at a Unit Council (UC) meeting and interview held in February 2012, several RN members of the UC questioned the triage process (Dryman, Louch, Thomas, Wald & Willingham, 2012). The UC reviews processes and problems within the ED, and develops and implements new polices and procedures. The UC meetings are different from staff meetings because only UC members are allowed to attend, whereas all ED staff can attend the staff meetings. The UC is an ED committee composed of approximately ten to fifteen RNs, two ED techs, and clerical staff. This committee allows new members to join annually. The purpose of the above mentioned presentation was to see how the RNs felt about the triage process and if the ESI triage system was accurately and uniformly utilized and documented. It was stated at the UC meeting, that the RNs did not access the ESI triage system table stored on the hard drive of the ED computers on a regular basis in the triage process. The UC members were also

aware and concerned that WellSoft, the electronic documentation system, did not provide specific documentation in relation to the ESI triage system components and felt change was needed in the documentation system (Dryman et al., 2012).

The Problem: Lack of Systematic Process to Facilitate Triage

The triage process at the facility lacked a standardized, systematic process. Briefly, a patient who came to the ED via a privately owned vehicle (POV) were greeted by a RN, referred to as the first RN, who decided an ESI acuity-level based on the patient's VS and chief complaint. The patient then proceeded through the registration process. After the registration process the patient was placed in the pre-triage waiting area. Next, a RN in the triage room, referred to as the second RN, completed the full triage assessment on the patient. Based on the triage assessment, the second RN chose to affirm or change the patient's previously decided ESI acuity-level. There were several problems with this procedure that led to the lack of a systematic process to facilitate triage in an accurate and timely manner. The problem included inconsistent use of the ESI triage system with every patient and the lack of supported documentation for the ESI triage system and RN rationale in the EMR, Wellsoft.

The triage acuity-level decisions were presumed byproducts of the ESI triage system. The RN manager at the time of the QIP project questioned the effectiveness of the triage process in terms of all nursing staff following the ESI triage system uniformly (DeAngelis, 2012). She was concerned that every RN did not use the ESI triage system consistently and in accordance with ED protocol (DeAngelis, 2012). The RNs needed to visualize the ESI triage system's four components in the triage process. The ESI triage

system was not posted as a visual aid within the triage designated patient care areas for ease of access in the duration of the triage process. The ESI triage system was stored on the hard drive of every computer, but approximately half of the RNs self-reported they did not utilize this reference in the triage process.

The ESI triage system was not part of the EMR at the healthcare facility. Although the nursing staff felt they used the ESI triage system when they triaged patients, there was not any documentation that supported the RN's utilization of the ESI triage system. The ESI triage system needed to be part of each patient's EMR at the healthcare facility. The RN manager was also concerned that Wellsoft did not allow RNs to document their rationale for triage acuity-level decisions in each patient's chart (DeAngelis, 2012).

Triage Processes and Procedures at the Southeastern Healthcare Facility

The facility's ED management team implements various processes to improve the efficiency of ESI acuity-levels decisions and the timeliness of the entire triage process. Every RN is required to document an acuity-level decision in relation to the ESI triage system. The various patient care areas within the ED help improve the patient flow and throughput. The RNs control the patient flow and assign patients to the patient care areas of the ED based on patients' acuity-levels or chief complaints. Once patients are triaged and placed in the waiting room, a policy for triage reassessment has been established and is followed by the triage team. The last intervention that the ED management team put into place for the assistance of throughput of patients during high volume times has been the implementation of protocols. Each of these interventions is designed to help patient flow, decrease the amount of time patients spend in the ED, decrease the number of

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LWOT patients, and increase patient satisfaction. See Appendix C for the triage policy and procedure.

The Emergency Severity Index (ESI).

The RNs are required to document triage acuity-level decisions in relation to the ESI triage system. A modified version of the ESI triage system is available as a reference for triage classifications within the ED. The modified table states that the expected number of resources for an ESI acuity-level five was "low"; however, the actual ESI triage system states "none" (Gilboy et al., 2012). The modified ESI table is found on the hard drive of each computer in the ED. It is not posted as a visual aid within the ED, nor is it posted in the ED triage designated area. Table 1.2 displays these modifications.

Table 1.2

Modified ESI Triage System Table

Triage Classification	Description	Expected Resources	Reassessment Parameters	Patient Complaint Examples
ESI Level 1	Unstable with obvious threat to life/ bodily function	High	Continuous	Intubated/ apneic/ pulseless/ or unresponsive
ESI Level 2	Threatened condition with likely but not necessarily obvious threat to life / bodily function	High; multiple, often complex, diagnostic studies, frequent consultation, continuous (remote)	Continuous remote monitoring; reassessments every 15 minutes until stabilized	Chest pain, probably due to ischemia, multiple trauma unless unresponsive, child with fever and lethargy,

		monitoring		disruptive psychiatric patient
ESI Level 3	Stable with threat to life, organ and/or bodily function unlikely but possible	Medium to high; multiple diagnostic studies; brief observation; complex procedure	Every hour	Abdominal pain or gynecologic disorders unless in severe distress
ESI Level 4	Stable with no threat to life and/or bodily function	Low; one simple diagnostic study, one simple procedure	Every hour	Closed extremity trauma, simple laceration, urinary tract infection, typical migraine
ESI Level 5	Stable with no threat to life and/or bodily function	Low; exam only	Every hour	Cold symptoms, minor burn, recheck

(DeAngelis, 2009).

Triage team.

The triage team is composed of approximately 50 RNs. The ED RN management team selects the RNs for the triage team based on eligibility criteria. A RN manager, assistant RN manager, or a charge RN may recommend a RN for the triage team. The RN must have worked in the ED for the previous six months with at least two years of ED nursing experience elsewhere, or have at least two years of work experience within the ED at the facility (DeAngelis, 2012).

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Area Assignment.

As rooms become available in the ED the patients in the post-triage waiting room are brought back to the patient rooms based on acuity-levels and time spent waiting for an available room. The areas of assignment in the ED include critical care, intermediate I/II/III, and minor care. See Appendix D for a diagram of the ED for the visualization of patient flow. See Table 1.3 for the different ED patient care areas and their patient capacity.

Table 1.3

Patient Care Areas and Their Associated Capacity

Patient Care Areas	Volume
Critical care/trauma	11 beds
Intermediate I/II	26 beds
Intermediate III	6 beds not open 24/7*
Minor Care	12 beds not open 24/7**
Triage area	2 benches utilized to triage patients and implement protocols in the triage designated area of the ED

(DeAngelis, 2009).

* Depends on staffing and volume of patients needing to be seen

** Open 0700 - 1900 hours

Patients who have been admitted to the hospital, but do not have a hospital room available, were moved to intermediate III if it was operational at the time of the QIP

project. Also, at the time of the QIP project, intermediate III was only open during high volume ED and hospital patient days and on days with adequate staffing.

Triage reassessment.

There are two conditions that warrant triage re-assessments of patients while in the post-triage waiting room. The first condition is a change in the patient's status. If while in the post-triage waiting room, a patient or his/her visitor feels that the patient's condition has worsened while in the post-triage waiting room, then he/she approaches the Emergency Business Office (EBO) staff, which alerts the second RN, who then re-triages the patient.

The other condition that warrants triage reassessments while the patients wait in the post-triage waiting room is the amount of time spent in the post-triage waiting room. According to the hospital's ED policy, specified time frames are determined for the re-assessment of patients by the presumed ESI acuity-levels. While in the post-triage waiting room, patients with an ESI acuity-level two need VS checked and documented every 15 minutes until stable. Patients with ESI acuity-levels three, four, or five need VS checked and documented every hour while in the post-triage waiting room. A pain scale rating and a triage reassessment note, containing only information that is on the triage reassessment note template, are documented in Wellsoft (See Appendix E). The second RN completes all triage reassessments.

Protocols.

Protocols, also referred to as standing orders by the ED staff, are implemented for patients presenting with common complaints. The purpose of the protocols is to

accelerate the delivery of care during periods of heavy patient volume. Protocols include abdominal pain/nausea and vomiting, shortness of breath/dyspnea, back pain, dysuria, headache, sore throat/earache, allergic reactions, chest pain, weakness/syncope/near syncope, seizure, depression/mental health/substance abuse/intoxication, epistaxis, eye injury/pain, extremity injuries, pelvic pain/female genitourinary (GU), hyperglycemia/diabetes mellitus with a documented recordable blood sugar >400, pain (any site or cause, meaning any site of pain such as headache or ankle; any cause meaning with or without injury to the site causing pain), influenza with suspected exposure, antipyretics for fever, sickle cell crisis, elderly patient with a temperature > 100.5, laceration, red swollen extremity that occurred atraumatic, and pediatric wheezing and shortness of breath. Appendix F displays the ED protocols.

Protocols are not implemented until the second RN documents a triage assessment. The second RN implements protocols in the triage room as he/she is completing the triage assessment. After the implementation of protocols, the patient is placed in the post-triage waiting room. However, if there is only one RN in triage or there are numerous patients in the pre-triage waiting area, then the second RN does not implement protocols before placing the patient in the post-triage waiting room. Instead, the second RN documents a triage assessment on each patient, and places each patient in the post-triage waiting room. After all the patients in the pre-triage waiting area have a documented triage assessment, patients from the post-triage waiting room are called back to the triage designated room by the second RN, or ED tech if applicable, and protocols are implemented. Once the implementation of protocols is complete, each patient is

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placed back in the post-triage waiting room where he/she waits for an open room in the appropriate patient care area.

Quality Improvement Process Project at the Southeastern Healthcare Facility

This paper describes the QIP project that was implemented at a healthcare facility for the exploration of triage practices. Additionally, this paper describes future recommendations for the improvement of the triage processes. The QIP project used Lewin's *Change Theory* as a guide for the recommendation of these suggestions. Evidence based practice changes were utilized in the ED after the completion of an extensive literature search, discussed in Chapter Two. The development of a precise clinical question assisted with the development and literature search of the QIP project.

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PICO, Definitions, and Description

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The PICO Question

A very focused mnemonic "PICO" helped in the precise wording of the clinically related question to answer to the clinically perceived problem (Glasper & Rees, 2013). The PICO mnemonic is defined as:

   P- patient population and problem

   I – intervention

   C- comparison

   O- outcome

(Glasper & Rees, 2013).

The PICO question's patient population portion is precisely identified and problem

specific (Melnyk & Fineout-Overholt, 2011). The intervention is an actual change

mechanism that can potentially improve the previous process (Glasper & Rees, 2013).

The comparison and outcome portions of the PICO question are similar to the measurable

goals (Glasper & Rees, 2013). Additionally, a PICO question helps with related literature

searches in narrowing down the search terms and related articles (Glasper & Rees, 2013).

The PICO question addressed with this QIP project is: "In the emergency

department setting, does the implementation of an electronic, acuity assistance template

embedded in the EMR and completed by ED RNs improve the efficiency, decrease the

number of LWOT patients, and improve RN satisfaction of the triage process in the adult

patient population?"

Definitions

Numerous definitions have been used in this paper for the description of the

background of the problem, the triage process and procedures, and the QIP project. Table

1.4 lists the terms with their associated definitions and reference sources.

Table 1.4

Terms and Definitions Associated with the QIP Project

Term	Definition	Reference
Assessment	The first step of the nursing process; orderly collection of information concerning the patient's health status	Estes, 2006

Chief complaint	Symptom or problem that causes the patient to seek health care	Estes, 2006
Disposition discharge home	The medical provider has examined the patient, reviewed all tests/lab work, treated the patient and is now stating it is medically safe to the best of his/her ability for the patient to be discharged home via ambulatory means, EMS, or POV	DeAngelis, 2012
Disposition admission	The medical provider has examined the patient, reviewed all tests/lab work, treated the patient and is now stating it is medically safe to the best of his/her ability for the patient to be admitted to the hospital for further treatment and/or tests and/or procedures	DeAngelis, 2012
ED RNs: First nurse, referred to in the healthcare facility's policy and procedure as Triage nurse	The first RN who greets each patient who presents to the ED for treatment via POV	DeAngelis, 2012
Second nurse, referred to in healthcare facility's policy and procedure as Triage assessment nurse	The second RN who completes the triage assessment on each patient that arrives via POV or EMS	DeAngelis, 2012
ESI level one	Acuity assigned to unstable with obvious threat to life/	Gilboy et al., 2012

	bodily function patients	
ESI level two	Acuity assigned to threatened condition with likely but not necessarily obvious threat to life / bodily function patients	Gilboy et al., 2012
ESI level three	Acuity assigned to stable with threat to life, organ and/or bodily function unlikely but possible patients	Gilboy et al., 2012
ESI level four	Acuity assigned to stable with no threat to life and/or bodily function patients	Gilboy et al., 2012
ESI level five	Acuity assigned to stable with no threat to life and/or bodily function patients	Gilboy et al., 2012
Left without treatment patients (LWOT patients)	Patients who have completed the triage process, been assigned an acuity-level according to the ESI triage system, but have left the ED without being seen by a provider	DeAngelis, 2012
Nurse satisfaction	The personal, RN satisfaction of the embedded ESI template in the triage palate on a likert scale from very dissatisfied to very satisfied	Culley, 2013
Primary assessment nurse	RN who primarily takes care of patient once patient is placed in an ED room where the patient waits and is treated by a medical	DeAngelis, 2012

	provider	
Registration process	Process where emergency business office (EBO) staff verifies the patient's identity, places the patient's insurance information and emergency contact information in the patient's EMR, and places a hospital bracelet on the patient's wrist	DeAngelis, 2012
Triage assessment	The first assessment completed on each patient and includes the history of present illness, review of vital signs, and other information gathered on the triage palate	DeAngelis, 2012
Triage palate	Area within the EMR where the patient's history of present illness, home medications, past medical history, surgical history, allergies, vaccination status, menstrual cycle status, primary care provider, height, weight are obtained	DeAngelis, 2012
Triage room	Designated room in the ED where the triage process takes place; the triage palate of the EMR is completed	DeAngelis, 2012

Description

This QIP project focuses on the electronic placement of the ESI triage system template into the RN's note section of the EMR for potential improvements associated with the efficiency of the triage process. The first RN, the second RN, and/or the primary assessment RN were encouraged to utilize this template. The ED RNs potentially addressed and documented all four components of the ESI triage system in a uniform manner. Additionally, the second RN who felt a change of a patient's acuity-level was warranted also documented their rationale through the utilization of this electronically embedded ESI triage system. Although the RN management team encouraged and required its use, all RNs did not utilize the template 100% of the time.

The facility's previous triage process was reviewed and recommendations for the education of the nursing staff on the use of the new assessment and documentation template was decided. Additionally, an implementation procedure was also discussed and decided with Lewin's *Change Theory* as a guide. Self-reflection surveys were used as tools for the determination of the RNs' perspectives about the new process. The ED throughput times, number of LWOTs, patient and RN satisfaction scores were reviewed pre and post implementation.

Framework Guiding the QIP and Literature Searches Process

Kurt Lewin developed a three-step change model for the change process of human systems entitled *Change Theory,* displayed in Figure 1.2. The three steps of the model are unfreeze, change, and refreeze (Kritsonis, A, 2011). The model requires the previous learning to be rejected and replaced by the human systems involved (Kritsonis, 2011).

The first stage of Lewin's *Change Theory* is unfreeze, where it is recognized that a change needs to take place and employees are willing to attempt new processes (Kritsonis, 2011). In the change stage, the change is executed. This change executed becomes a permanent change during the refreeze stage.

There are three concepts of *Change Theory*, driving forces, restraining forces, and equilibrium (Kritsonis, 2011). Driving forces are forces that push for change in the potential direction of change (Kritsonis, 2011). Driving forces cause the desired outcome and a shift in the equilibrium in the direction of change (Kritsonis, 2011). Restraining forces are forces that push in the opposite direction of the driving forces. Restraining forces hinder a person from the desired change and cause a shift in the equilibrium that hinders change (Kritsonis, 2011). Equilibrium is a state where driving forces and restraining forces are equal and change does not occur (Kritsonis, 2011). The equilibrium is raised or lowered by the driving and restraining forces. It is imperative that the driving forces and restraining forces are analyzed before implementation of a planned change (Kritsonis, 2011).
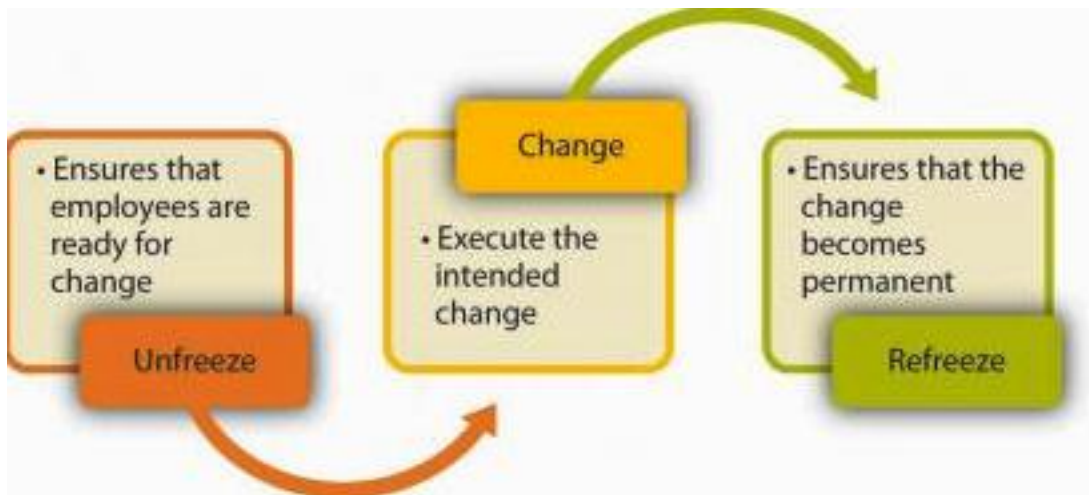
Figure 1.2   *Modified Visual Aid of Lewin's Change Theory*

 (*Beehive*, 2012).

Conclusion

It is crucial that triage RNs make accurate decisions for a dependable ED triage process and for the benefit of patient safety (Göransson, Ehnfors, Fonteyn, & Ehrenberg, 2008). Research shows that more experienced RNs, with recent triage training and utilization of a triage system, complete more accurate triage assessments than RNs without experience, recent training, or referral to a triage system (Dallaire et al., 2012). This QIP project aims to address the lack of a systematic approach and aims to facilitate triage efficiency and timeliness through the implementation of an embedded ESI triage system template into the EMR of ED patients.

CHAPTER 2

LITERATURE REVIEW

This chapter describes the literature search process that surrounded the development of the QIP project. The Evidence-based project (EBP) suggestions for the QIP project and intervention were found after various sites were searched. Lewin's *Change Theory* guided the search process. Literature searches were completed and selected articles were kept for further review and placed into tables for easier comparison. Below, the in-depth search process is described. The stages of the search process are presented with the findings from the literature that guided the QIP project intervention.

The ED triage process has been studied and reviewed from various aspects for years. The aspects surrounding these literature searches were those that related to the reliability of the triage system and the core characteristics of triage RNs and how they impacted the efficiency of the triage process. Several literature searches focused on one triage system in particular, the ESI triage system, for its reliability with supported studies. Specific EBP guidelines and recommendations that influenced the triage process were additional focuses of these literature searches. From the knowledge gained with the selected articles, a QIP project was developed.

General Overview of Literature Searches

To determine if there was evidence concerning the efficiency of the initial ED triage assessment, in-depth and comprehensive literature searches were completed. Inclusion and exclusion criteria were established prior to the literature searches for easily identified applicable studies (Melnyk & Fineout-Overholt, 2011). The PICO question guided the searches for high-quality evidence. Lewin's *Change Theory* served as a framework for the searches and organization of the articles. The articles were categorized into the three stages of the model: unfreeze, change, and refreeze. If applicable to the QIP project, articles were saved for further review.

The Unfreeze Stage of Literature Searches

The unfreeze stage relates to searches that highlight the areas of improvement within the ED triage process. In the unfreeze stage of literature searches, articles related to ED triage were searched. "Emergency department," "triage," "accuracy," "reliability," or "assessments" were the initial search terms applied for the location of pertinent results related to the efficiency of triage assessments. Several other searches included the phrase "reliability of the triage assessment." When the search term "reliability" was utilized, the search term "accuracy" was excluded. "Accuracy of patient acuity" and "accuracy of triage assessment" were also used but yielded few useful results. Various combinations of the search terms were applied on several different search engines for the location of relevant articles. First, basic keyword searches related to the ED and triage were completed for a needed change supported through literature. Table 2.1 displays a complete list of keywords utilized in the unfreeze stage of the searches.

Table 2.1

Unfreeze Searches' Keywords

Keywords for the Unfreeze Searches
Accuracy
Accuracy of patient acuity
Accuracy of triage assessment
Emergency department
Reliability
Reliability of triage assessment
Triage

The Change Stage of Literature Searches

The change stage relates to what change is needed for the improvement of the triage process. A key element of the change stage is the adherence to the triage system by all nursing staff. In the change stage of the literature searches, articles related to triage systems utilized in EDs around the world were searched and saved for further review. Particular attention was given to articles that utilized the ESI triage system. Articles related to the triage systems and how triage assessments were documented in the EMR were also searched. These articles were vital for a concrete QIP change. Table 2.2 displays a complete list of keywords and keyword combinations for the change searches.

Table 2.2

Change Searches' Keywords and Keyword Combinations

Table 2. Keywords and Combinations for the Change Searches	
Keywords	**Keyword Combinations**
Acuity	Accuracy of triage + emergency severity index
Acuity ratings	Emergency severity index + triage + acuity ratings
Acuity template	Emergency severity index + triage template + software
Emergency Severity Index	Emergency severity index + triage template
Software	Emergency severity index+ template
Triage assessment	Triage + template
Triage template	Triage + acuity template

The Refreeze Stage of Literature Searches

In the refreeze stage it is crucial for the location of supported evidence that influences and encourages a new, sustainable, and daily change for staff members in their practice. Articles were searched that related to process improvements for the reduction of wait times and the number of LWOT patients. There were numerous supported evidence articles on the triage assessment processes with published recommendations on the improvement of wait times. An example suggestion was the implementation of protocols or standing orders. In the refreeze stage of literature searches, patient satisfaction and patient safety were also critical aspects of the triage process. Table 2.3 shows a complete list of keywords utilized in the refreeze stage of the literature searches.

Table 2.3

Refreeze Searches' Keywords

Table 3. Keywords and Combinations for the Refreeze Searches
Keywords
LWOT
Patient elopement
Patients leaving without treatment
Triage times
ED patient satisfaction and ED triage

Advanced Search Techniques

Several advanced search techniques were applied to the search process. Keyword searches and title search techniques were completed first. As suggested by Melnyk and Fineout-Overholt (2011) the results yielded were broadened and search terms located in the abstract or body texts of the articles were also reviewed. Lastly, the simple keyword search technique was utilized and all synonyms were included to avoid missed articles (Melnyk & Fineout-Overholt, 2011).

Not all of the literature searched with selected search terms yielded pertinent information. For example, when the literature searched included only two search terms "emergency department" and "triage," the results yielded articles related to the triage process within the field prior to hospital arrival. When the term "accuracy of triage assessment" was searched, the results yielded guidelines that pertained to the

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appropriateness of the triage process for patients who presented to the ED with specific

signs and symptoms of potentially indicated life-threatening illnesses. Examples of these

life-threatening illnesses were cerebral vascular accidents and myocardial infarctions.

These articles were excluded from this QIP literature review because the focus of the

PICO question is the general adult population with a variety of chief complaints.

Additionally, the ESI triage system only focuses on four specific components. Chief

complaints are not part of these components; therefore, chief complaint studies were

excluded.

Inclusion and Exclusion Criteria

The searches were limited to studies published in the English language within the

past ten years. Additionally, only adult patients' triage assessments conducted in the ED

setting were included in the inclusion criteria because the focus of the search was on

adult patients above the ages of 18 years of age. Results related to triage assessments

completed by ED physicians or paramedics were excluded because the PICO question

focused on the RNs who triaged patients in the ED setting. Articles that were not

pertinent to the efficiency of the initial triage assessment were not saved for further

review. Appendix G displays a table of inclusion and exclusion criteria with rationales for

each.

Sources of External Evidence

Sources of evidence in the digital format were searched first and included:

Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medline

(EBSCO), Cochrane Library, the Joanna Briggs Institute, ISI Web of Knowledge, Ovid,

ProQuest Dissertations and Theses, and PubMed-Medline (Melnyk & Fineout-Overholt, 2011). As suggested by Melnyk and Fineout-Overholt (2011), the search was broadened and included the Agency for Healthcare and Research Quality (AHRQ), American Academy of Emergency Medicine (AAEM), Centers for Disease Control and Prevention (CDC), and Google scholar search engines. For the inclusion of evidence-based clinical practice guidelines and related documents, the American College of Emergency Physicians (ACEP), the Federal Emergency Management Agency (FEMA), the National Guideline Clearinghouse, and the Society for Academic Emergency Medicine (SAEM) websites were also searched but did not yield resourceful results pertinent to the search criteria (Melnyk & Fineout-Overholt, 2011). The majority of articles that pertained to the PICO question were descriptive studies, measurement studies, and expert opinions and were kept for further review and development of the QIP project. Appendix H displays a complete list of the search engines searched and their results.

Analysis of the Literature

The Scottish Intercollegiate Network Guidelines (SIGN 50) was used for the appraisal of the guidelines reviewed for this project (SIGN 50: A guideline developer's handbook, 2011). The evidence was organized around the three stages of Lewin's *Change Theory*. Evidence tables that related to each stage of Lewin's *Change Theory* were developed. The evidence tables provided an organized method for review of the selected articles.

Guideline Analysis of the SIGN 50 Method

The quality of evidence for guidelines was graded in relation to SIGN 50, displayed as a table in Appendix I. SIGN 50 was utilized as a quick reference guide. SIGN 50 has two significant methods for the review of literature, the levels of evidence and the grades of recommendation. The highest rating level of evidence, "1++", is considered "high quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias". The lowest rating level of evidence, four, is considered an expert opinion. The grade of recommendation relates to the strength of the evidence on which the recommendation is based. It does not reflect the clinical importance of the recommendation (SIGN 50: A guideline developer's handbook, 2011).

Three evidence tables were created to assist with the organization of selected articles in accordance to the three stages of Lewin's *Change Theory*. Valuable concepts from each article were used as the remaining headings for the evidence tables. The evidence tables include a brief reference with the author's last name and year of publication as the first column. The type of research design and SIGN 50 quality rating are listed in the next column. The article's findings, threats to validity and reliability, and conclusions are the headings for the third, fourth, and fifth columns respectively. Throughout the tables, abbreviations and acronyms were utilized for more space efficiency. Appendix J displays a complete list of abbreviations and acronyms used in the evidence tables' Appendices K-M.

Selected Articles

Several different articles were critiqued using the SIGN 50 method in relation to the PICO question. The articles selected were chosen for this process because of their importance in relation to either triage efficiency from the RNs' assessment or the validity of the triage system used by the RNs. Due to the nature of the PICO, there were no pertinent random control trials or meta-analysis articles. The articles that met the inclusion criteria included one ethical analysis, three cross sectional analysis, four cohort studies, three case control studies, five descriptive and comparative studies, four case analysis, one experimental, two case scenarios, two systematic reviews, one randomized control trail, one expert opinion, and one retrospective convenience study.

Summary of Review of Literature

Valuable information related to the PICO question and the efficiency of triage was found in the literature. The literature showed that various triage systems are utilized around the world (FitzGerald et al., 2010). While they affect some aspects of the patients' acuity-level decisions, they do not affect other areas such as billing and reimbursement (Wiler et al., 2011). It was also noted that no two RNs triage the same (Göransson, Ehrenberg, Marklund, & Ehnfors, 2006). The reliability of triage systems, efficiency of triage acuity-level decisions, and the inter-rater agreement scores were observed in several studies. The educational background and years of experience were also points of interest in several studies.

Triage Systems

The literature reviewed verified that the ED triage systems commonly utilized are those discussed in Chapter One, the ATS, CTAS, ESI, and MTS triage systems (Gilboy et al., 2012; Grouse, Bishop, & Bannon, 2009; Göransson, & von Rosen, 2011; Storm-Versloot, Ubbink, Kappelhof, & Luitse, 2011). The development of an international triage system with potential benefit was suggested but warranted further research (FitzGerald, 2010). The ESI triage system was deemed reliable, valid, and easy to use (Eitel, Travers, Rosenau, Gilboy, & Wuerz, 2003; Gilboy et al., 2012). It was also found that ESI triage system users were satisfied in most incidents, and the use of the ESI triage system improves the accuracy of the triage acuity-level decisions in most cases (Singer, Infante, Oppenheimer, West, Siegel, & Bethesda, 2012). It was found that the utilization of the ESI triage system increases the number of appropriate triage designations, decreases the length of stay, reduces the number of LWOT patients, and improves patient satisfaction scores (Selman, Baines, Stancil, & Caprio, 2006; Wuerz, Travers, Gilboy, Eitel, Rosenau, & Yazhari, 2008). Objective factors, from an experienced triage RN perspective, combined with factors already delineated in ESI Version 4, also lead to triage improvement in less experienced RNs (Garbez, et al., 2011). However, one study found that the implementation of the ESI triage system did not affect triage to treatment times (Swailes, Rich, Lock, & Cicotte, 2009).

Furthermore, it was found that other triage systems, such as the five-level triage system known as Adaptive Process Triage (ADAPT), is not as reliable (Göransson, et al., 2011). In one study, numerous patients were triaged as both stable and unstable using the ADAPT triage system (Göransson, et al., 2011). Farrohknia, Castrén, Ehrenberg, Lind,

Oredsson, Jonsson, Asplund, and Göransson (2011) suggested the validity of triage

systems is supported only with limited research. Farrohknia et al. (2011) felt that more

research is needed about how important VS and chief complaints are in triage systems

and how these factors relate to the medical prognoses of patients.

Inter-rater Agreement Scores of RNs

The inter-rater agreement of triage RNs' decisions was compared in several

studies using various triage systems. It was found that the inter-rater agreement of triage

decisions varies, which limit the efficiency of the triage assessment (Dallaire et al., 2012;

Göransson et al., 2005). RNs' variability of acuity-level decisions lead to the question of

patient safety (Göransson et al., 2005). In a particular study of five experienced RNs,

inter-rater acuity-level decisions of RNs were compared and ranged from fair to good

(Dallaire, Poitras, Aubin, Lavoie, & Moore, 2012). An observed variation in assigned

acuity level decisions resulted in delay for patient treatment and various other

complications. This observation posed the concern about how a triage system is applied,

utilized, and evolved overtime in each RN's experience (Dallaire et al., 2012).

While many studies focused on the reliability of the triage systems, van Stel and

van Wulp (2009) felt the reliability of triage systems is lower than reported because the

measures of correlation, or Kappa, used in these studies increase the inter-rater agreement

scores but do not account for the high percentage of inaccurate triage decision

agreements. Van Stel and van Wulp (2009) reviewed the literature and developed a new,

triage-weighted Kappa that more adequately represents the inaccurate triage decisions

made by most RNs that lead to the high inter-rater agreement scores. The new Kappa was

applied to previous triage system reliability studies. Thirty-three related studies were

reviewed. Van Stel and van Wulp (2009) found that the triage-weighted Kappa was lower in all of these studies with a mean difference of 0.17 (range 0.04-0.32). After the mis-triage decisions were recalculated, using the new triage-weighted Kappa, van Stel & van Wulp (2009) felt the severity of mis-triage decisions are appropriately documented.

ED Throughput Times, LWOTs, and Patient Satisfaction

It was suggested that ED overcrowding causes extended wait times, increases the number of LWOT patients, and a number of patient satisfaction issues (Murrell, Offerman & Kauffman, 2011). It was also suggested that during high volumes of ED patients, RNs do not always have enough time for the accurate completion and documentation of a thorough triage assessment (Murrell, Offerman & Kauffman, 2011). Additionally, it was found that prolonged ED wait times result in increased number of LWOT patients, are associated with clinically significant delays in care, and decrease patient satisfaction (Healthy People 2020, 2012). An increase in the wait time potentially causes deterioration of patients while they wait (Gilboy et al., 2012). Patient safety is also a crucial consideration with the triage process and ED overcrowding (Sun, 2010).

It was suggested that a standardized triage system could allow for the treatment of patients in accordance with the urgency of their condition by ED staff. With overcrowded EDs, an efficient triage system is necessary (Dallaire et al., 2012). When a triage system is utilized appropriately, patient safety improves because high volumes of patients are triaged appropriately and receive medical attention in a timely manner. By moving patients through the ED triage process rapidly, the potential efficiency improvements

enhance the ED patient satisfaction scores and potentially decrease the number of patients who leave the ED without treatment from a medical provider (Sun, 2010).

Educational and Background Experience of RNs

Literature and practice guidelines suggested, but did not specify, that triage RNs need clinical nursing background experience, documentation skills, and communication skills for accurate triage assessments in the ED (Aacharya et al., 2011; Bitterman, 2009; Dallaire et al., 2012; Göransson et al., 2008; Howlett & Atkinson, 2012). The educational and nursing experience backgrounds of triage RNs were compared in several studies. After several hours of education, a study found that the acuity-level decisions by novice RNs are just as reliable with the ESI triage system as the acuity-level decisions by experienced RNs with refresher training sessions of a different triage system (Worster, Gilboy, Fernandes, Eitel, Eva, Geisler, & Tanabe, 2004). This study manifests the importance of educational training of the triage systems (Worster et al., 2004). It also shows how education affects triage system reliability and inter-observer agreement scores (Worster et al., 2004). Bitterman (2009) also suggested in an expert opinion article, that RNs with higher levels of experience or education triage more accurately than RNs with less experience or education. However, due to the nature of the article there are no statistics to support this idea (Bitterman, 2009).

Throughout the literature, there were several different factors that influenced RNs' triage decisions. Göransson et al., (2006) suggested that RNs utilize different, important decision-making processes as a reflection of their personal characteristics to triage patients. However, the exact characteristics or decision-making processes that

compliment an expert triage RN remain unknown (Göransson et al., 2006). Yet,

Göransson et al., (2006) noted the more clinically experienced RNs score higher on triage

accuracy than those without clinical experience, but it is not a significant difference

(p=0.002). The RNs who had more than five years of general nursing experience triaged

accurately 58.5% of the time (Göransson et al., 2006). The RNs who had less than five

years of general nursing experience triaged accurately 57.3% of the time (Göransson et

al., 2006). The RNs who had more than five years of ED nursing experience accurately

triaged patients 58.5% of the time (Göransson et al., 2006). Triage RNs who had less than

five years of ED nursing experience accurately triaged 56.3% of the time (Göransson et

al., 2006). In a case control study, with a SIGN 50 quality rating of 2-, Göransson et al.

(2006) investigated the personal characteristics and the accuracy of triage RNs' triage

decisions. There were 423 RNs from 48 different hospitals who assigned triage acuity-

levels to 18 patient case scenarios using the CTAS triage system (Göransson et al., 2006).

The CTAS system was chosen for this study because it was internationally supported in

literature for Sweden at the time of the study (Göransson et al., 2006). As a result, the

intrapersonal characteristics, such as decision-making processes, may have played a role

in triage accuracy since there was not a relationship between a RN's personality and an

accurate triage assessment (Göransson et al., 2006). Also, a small correlation (p=0.008)

was seen amongst triage accuracy and those RNs with more general nursing experience

and more ED experience (Göransson et al., 2006). The small correlation between triage

accuracy and nursing experience could not identify experience alone as a reason for the

dispersion of triage accuracies (Göransson et al., 2006). Further research with an

emphasis on the decision making process is suggested to identify and describe a RN's characteristics essential to an accurate triage assessment (Göransson et al., 2006).

However, Göransson et al. (2006) found in the previously mentioned case control, SIGN 50 quality 2- study that educational training does not make a significant difference in the efficiency of triage acuity-level decisions. In this study, RNs who received triage education triaged 57.7% of patient case scenarios accurately. RNs who had not received triage education triaged 57.6% of patient case scenarios accurately. Göransson et al completed a follow-up study that used the previously collected data collection. The follow-up study was a SIGN 50 quality 3, descriptive and comparative study. Content analysis of data was completed. Purposive sampling was used for the selection of 16 RNs participants from the previous, Göransson et al. 2006 sample of 423 RNs. From the previous study, those RNs with the highest and lowest triage accuracy scores were selected. Eight RNs from each group were selected to participant. Five patient scenarios were developed and used. It was suggested further research is needed for the determination of the influence of education and contextual information in triage acuity-level decisions (Göransson et al., 2008).

Conclusion

In conclusion, the results of the literature search yielded valuable and useful information. The literature review provided an evidence-based approach to address the PICO question. There were numerous findings on the triage assessment process and ways for the improvement of wait times through the utilization of triage systems. The literature indicated the importance of ED RNs' accurate triage decisions and assignments to the appropriate acuity-levels because the main goal of triage is to decipher those patients who

can wait to be seen by a provider from those patients who cannot wait (Göransson et al., 2008). The literature also suggested educational training and continuous visualization of the chosen triage system improves the triage process. The literature provided the evidence-based for the implementation of a QIP project to potentially improve the efficiency of the triage process.

CHAPTER 3

METHODS: DESIGN, IMPLEMENTATION, AND EVALUATION OF OUTCOMES

Chapter Three describes the details of the QIP project design and implementation. A QIP project intervention, also referred to as "Embedding ESI", was developed as an intervention to improve the efficiency of the previous triage process at a southeastern USA hospital. This QIP intervention embedded the ESI triage system in the EMR software program. As the literature suggested, through the consistent use of the ESI triage system, patients have a greater potential for placement in the valid categories for the needed care within the appropriate timeframe (Eitel, et al., 2003). Lewin's *Change Theory* assisted with the implementation phase of the QIP project for the effective placement of these suggestions. A thorough review of the literature, previously described in Chapter Two, guided the QIP project. The QIP project is a continuous process that improves healthcare in a continuous cycle ("What is Quality", 2013). The Institute of Medicine lists six aims of improvement with a QIP ("What is Quality", 2013). The six aims include patient safety, effective services based on scientific knowledge, patient centered care, reduced patient time delays, efficient use of energy, ideas, and supplies, and equitable care provided to all patients ("What is Quality," 2013).

Setting

At the QIP project setting, the southeastern USA hospital, the main focus of "Embedding ESI" was the ED's triage process. At the QIP project site, the ESI triage system was already utilized as the ED's standard triage system of choice. From the literature search review, its simplicity and reliability as a triage system in addition to the recommendation from the American College of Emergency Physicians and the Emergency Nurses Association manifest its necessity as the continued triage system of choice for the QIP project site (McHugh et al., 2011; Singer et al., 2012). As previously mentioned, the EMR software program utilized in the ED at the time of the "Embedding ESI" was WellSoft.

The ED management team and the ED UC reviewed the triage process previously in place within the ED prior to the QIP project implementation. The ED management team gave approval for the implementation of "Embedding ESI". The ED's UC voted, approved, encouraged, and supported the implementation as well. The QIP project did not meet the specifications for an Institutional Review Board (IRB) review. Approval from the IRB was not necessary because the primary aim of the QIP project was to train a student (*Human subject research*, 2013). Monthly patient case scenarios were emailed, but were for educational purposes only (*Human subject research*, 2013).

PICO and Outcomes for Measurement

As previously described, the PICO question for this QIP project is: "In the emergency department setting, does the implementation of an electronic, acuity assistance template embedded in the EMR and completed by ED RNs improve the

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efficiency, decrease the number of LWOT patients, and improve RN satisfaction of the triage process in the adult patient population?" A needed intervention for the improvement of the efficiency of the triage process at the QIP project site was manifested. ED throughput times, the number of LWOT patients, and RN satisfaction scores were the target interventions for the QIP project. These target interventions were measured as a result of the PICO question.

Implementation Process

The implementation process involved embedding the ESI triage system template into the EMR by WellSoft. From the review of the literature, several EBP suggestions were made for the improvement of the triage process. These concepts were applied to the QIP project development. "Embedding ESI" was piloted for Summer 2013 and went live in the ED's EMR on June 1, 2013. Figure 3.1 displays the visual aid for the timeline of implementation.
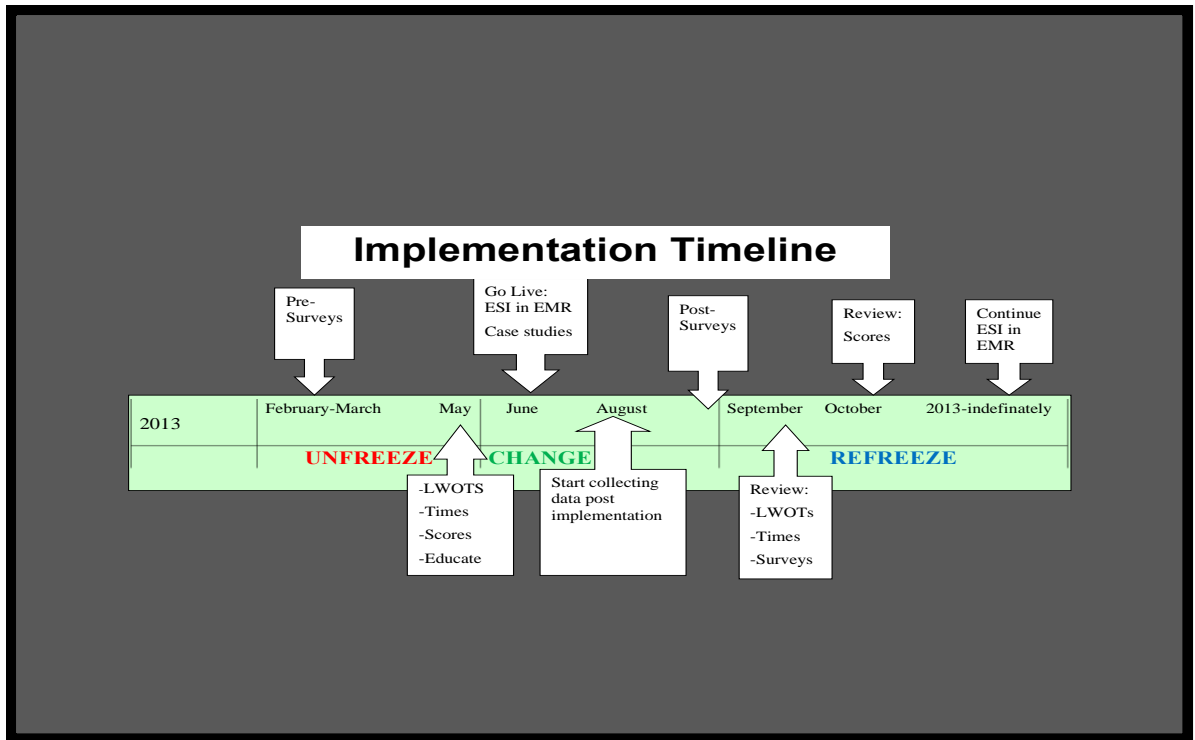
Figure 3.1   *Implementation Timeline*

Figure 3.1 shows the preparation for the QIP project at the healthcare facility. ED

throughput times and the number of LWOT patients' data collection for the QIP project

began in March 2013 and ended in August 2013. The self-reflection surveys in regards to

the triage process before "Embedding ESI" were distributed to all RNs and returned by

some RNs in the months of February through March 2013. Self-reflection surveys in

regards to the triage process after "Embedding ESI" were distributed to all RNs and

returned by some RNs in September 2013. The target intervention results were reviewed

in October 2013. The change was continued indefinitely.

The ED management team and UC members served as the "super-users" for the

project. Within the local ED, the term "super-user" was applied to a group of staff

members who were trained and educated on key changes to assure the new change was

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carried out by all staff members. Super-users have been used previously to train staff on

new equipment and new documentation techniques. Super-users educated and reinforced

the change of triage documentation and completion of the ESI template on a continuous

basis. All ED triage RNs, as well as all ED RNs who completed a triage note on EMS

arrival ED patients, were encouraged to participate in the project.

Framework that Guided the QIP Project

Lewin's *Change Theory* guided the QIP project development and implementation.

Figure 3.2 displays another modified visual aid of Lewin's *Change Theory*. Successful

unfreezing was achieved by the utilization of three methods-increase driving forces,

decrease restraining forces and routinely encouraging change (*"Change Theory Kurt*

Lewin", 2011). The hospital's ED UC members served as the driving forces that

encouraged the utilization of the ESI click-and-drop template in Wellsoft. A restraining

force was the lack of rationale for a triage acuity-level in accordance with the ESI triage

system within Wellsoft. The management team decreased negative actions or comments

that regarded the implementation. The UC members and management team developed

strategies that routinely encouraged the implementation. Monthly emails with case

scenarios for all the ED RNs were sent out for the encouragement and reinforcement of

the impact and importance of uniform documentation and accurate utilization of the ESI

triage system.

Change was the second stage of Lewin's *Change Theory*. In this stage the process

of changing people's thoughts, feelings, or behaviors into a more productive pattern is

utilized (*"Change Theory Kurt Lewin"*, 2011). In relation to the QIP project, the

implementation of the ESI click-and-drop template into the EMR was the RN's behavioral change. The RN staff was encouraged to utilize the electronically embedded ESI system in each patient's EMR as the initial triage acuity-level was set, reviewed and/or changed. The RN staff's feelings potentially changed through this stage as the RNs liked or disliked the new documentation method of the ESI triage acuity-levels. Lastly, RNs' thoughts and concerns of the importance of an accurate, uniformly documented ESI triage acuity-level potentially changed.

The last stage of Lewin's *Change Theory* was the refreeze stage. In this stage strategies are used to encourage the RNs to recognize the new pattern as the standard operating procedure (*"Change Theory Kurt Lewin"*, 2011). In relation to the QIP project, the embedded ESI click-and-drop template in the EMR potentially continued as part of every ED patient's chart. The majority of RNs visualized and thought through the four components of the ESI system with every patient that was triaged.
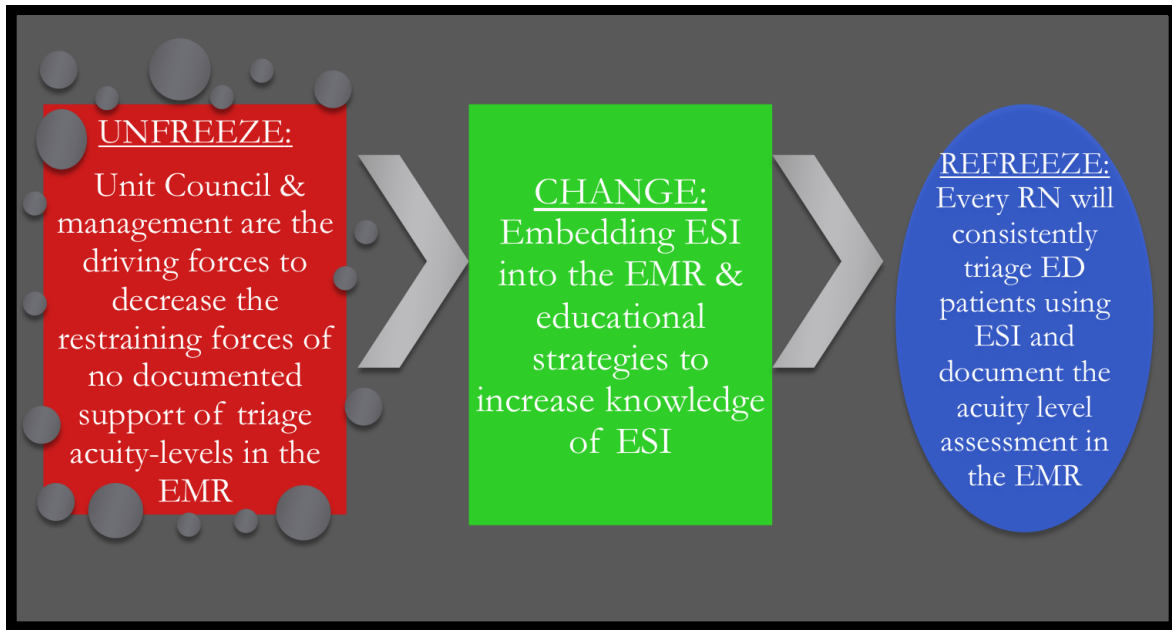
Figure 3.2   *Lewin's Change Theory Model in Relation to the QIP project*

Design of the Implementation (Procedure)

The EBP concepts assisted in the design of the implementation and included the

continuous visualization of the ESI triage system while the triage acuity-level decision

was made (Sun, 2010). The design of "Embedding ESI" included the development of the

ESI triage system into a click-and-drop template within the EMR. The click-and-drop

template was added to the nurse's note section of the EMR in the chart field allotted for

the triage note. When the RN clicked on the adult triage tool on the triage screen, there

was an ESI template added to the nurse's triage screen. With new patients, RNs were

encouraged to use the four components of the ESI triage system for the decided acuity-

level. The first component addressed is the ESI acuity-level one. If the patient needed

immediate life saving interventions, then the patient is marked an ESI acuity-level one,

taken immediately to the critical care area, and a report is given to a RN in that patient

care area. Figure 3.3 displays the location in the EMR of Embedded ESI Triage System

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Template. Figure 3.4 displays the first component of the ESI triage system click-and-drop

template.

Figure 3.3   *Location in the EMR of Embedded ESI Triage System Template*

Figure 3.4   *First Component of the ESI Triage System Click and Drop Template*

The ESI acuity-level-two decisions are based on the history and assessment

findings indicative of sentinel symptom complexes that signaled high-risk or potentially

high-risk situations (Gilboy et al, 2012). These patients are ones that ED staff potentially

would give the ED's last bed to (Gilboy et al, 2012). The three aspects of this component

are high-risk situations, new onset of confusion or disorientation or lethargy, or severe

amount of pain. The severe pain aspect of this component is not only the patient's rating,

but also the RN's clinical observation. Examples of ESI acuity-level two patients include

patients who experience a syncope episode, hemophilia patients with possible acute

bleeds, patients with suicidal ideations, patients with the signs and symptoms of

meningitis, patients who experience seizures with a prolonged postictal period, or

patients with moderate to severe lower airway obstruction (Gilboy et al, 2012). The

second component of the ESI click-and-drop template is in Figure 3.5.
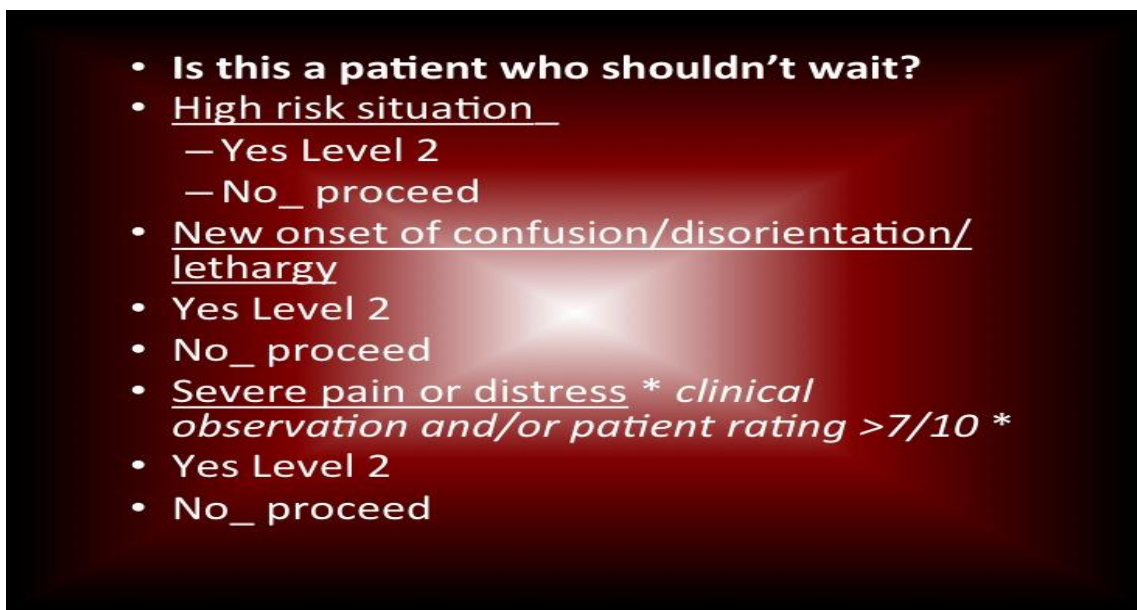
Figure3.5   *Second Component of the ESI Triage System Click and Drop Template*

The next component of the ESI triage system click-and-drop template is the

number of resources needed. If the RN immediately knows the patient needs more than

one resource, the RN precedes to the next component of the ESI triage system, the danger

zone VS component. If the RN feels the patient needs one or no resources, the acuity-level is assigned as warranted.

The most important aspect of the needed resources component is the recognition of needed ESI resources (Garbez, Carrieri-Kohlman, Stotts, & Chann, 2011). The recognition of the different levels of resource utilization among the ESI acuity-levels is critical for the appropriate assignment of triage acuity-levels (Garbez et al, 2011). Examples of the ESI resources include lab work such as blood work or urinalysis. Simple tests also count as a single resource such as an electrocardiogram (ECG), radiographic film (X-ray), computed tomography (CT) scan, magnetic resonance imaging (MRI), or ultrasound angiography. The RN interventions such as intravenous (IV) fluids count as one resource. Medications delivered via IV, intramuscular (IM) or nebulizer routes are considered one resource for each administered medication. A specialty consultation is considered one resource. Simple procedures such as a laceration repair or Foley catheter placement is one resource. A complex procedure such as conscious sedation is considered two resources (Gilboy et al, 2012).

Point-of-care testing, such as a blood glucose level, saline or heparin lock (hep-lock) IV placement, oral medication administration, or tetanus immunization administration, even if administered post-exposure as a prophylactic measure, are not considered resources. The history and physical aspects of the assessment, prescription refills, or a phone call to a patient's primary care provider are not considered resources. Simple wound care or wound rechecks do not count as a resource. The returned demonstration of a set of crutches, a splint, or a sling is not considered an ESI triage

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system resource (Gilboy et al, 2012). Figure 3.6 shows the third component of the ESI triage system click-and-drop template.
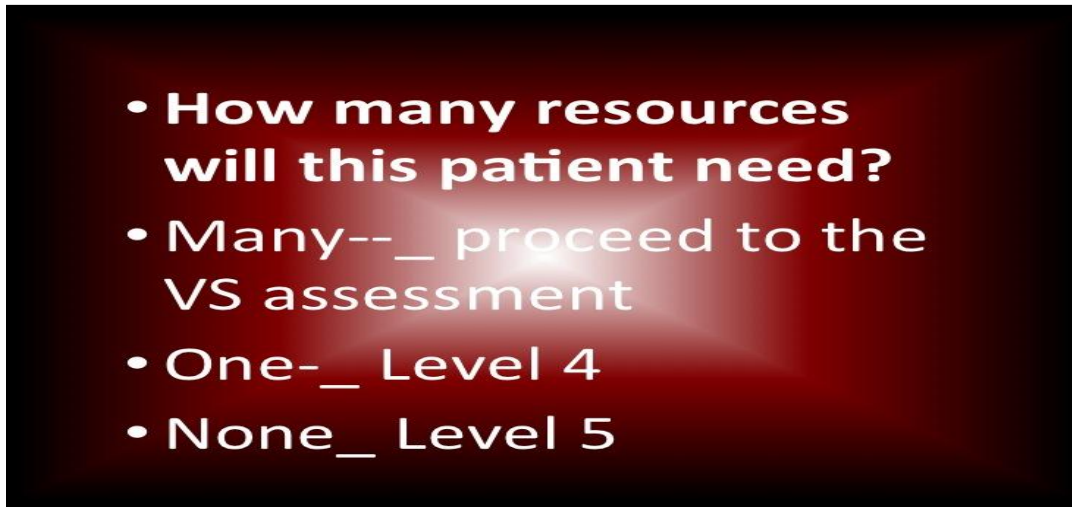
Figure 3.6   *Third Component of the ESI Triage System Click and Drop Template*

The last component of the ESI triage system click-and-drop template is the danger zone VS component. These VS are what ESI suggests are critical enough for the RN to reassess the patient. However, the RN also uses his/her nursing judgment and intuition when the acuity-level decisions are made. The experienced RN determines whether the patient meets criteria for the ESI triage acuity-level two based on the patient's past medical history, current medications, and subjective and objective assessment which include the patient's general appearance. This decision is based on the RN's clinical judgment and knowledge of normal VS parameters for all ages and the influential factors such as medications and past medical history. The RN assesses the patient's heart rate, respiratory rate, and oxygen saturation. From the patient's VS assessment, a triage acuity-level is determined. An ESI acuity-level two is considered if the VS are in the danger

zone area (Gilboy et al., 2012). Figure3.7 shows the fourth component of the ESI triage

system click-and-drop template.

Figure 3.7   *Fourth Component of the ESI Triage System Click and Drop Template*

Educational Interventions

Additional implementation design techniques included educational opportunities

for all ED nursing staff. The triage education focused on the appropriate utilization of the

triage system and documentation of pertinent information (Aacharya et al., 2011;

Andersson et al., 2006; Bitterman, 2009; Eitel et al., 2003; FitzGerald et al., 2010; Gilboy

et al., 2012; Howlett & Atkinson, 2012; &Tanabe, Gimbel, Yarnold, Kyriacou, & Adams,

2004). A PowerPoint presentation that described the QIP project & intervention was

developed and presented to all ED staff. The ESI handbook by Gilboy et al. (2012)

assisted with the educational concepts. The ESI triage system was also placed in each of

the triage rooms in a triage notebook for easy access and reference. Badges with the ESI

triage system were also given to all nursing staff. The badges were worn behind their

name badge for a quick reference to the ESI triage system. Figure 3.8 shows the front view of the badge given to all RNs and Figure 3.9 shows the back view of the badge (Gilboy et al, 2012).

There were ten staff meetings. The staff meetings were staggered to address all members of each shift and were held in the multiple days in the month of May 2013. The meetings were mandatory; there were no make-up sessions. For the few select staff that missed the meeting, a one-on-one educational meeting was scheduled. Each meeting lasted approximately one hour. Each "Embedding ESI" session lasted approximately ten to fifteen minutes. Sign-in sheets were kept for staff attendance. The presentations were addressed to all staff, which included RNs, RN assistants, and clerical staff. The DNP student gave the presentation. The presentation emphasized the importance and effectiveness of an efficient, systematic triage system process. Each staff member was educated on the access to the template and the documentation protocol with the new embedded ESI triage system click-and-drop template.

From the review of the ESI handbook, selected case studies were applied to the QIP project design. The RNs were asked to read each patient case scenario, assign an ESI triage acuity-level, and provide a rationale for the triage acuity-level decision. The RNs either emailed the responses or turned in a hardcopy response to the student's mailbox in the ED break room. Continuing education credit was provided to all RNs that completed one hundred percent of each monthly case set of the patient case scenarios. After the end of each month, the student returned the correct answers with rationales supported by the ESI handbook to the RNs via emailed responses. The correct answers and rationales were determined from the ESI handbook. Appendix N includes the monthly patient case

scenarios questions. Appendix O includes the monthly patient case scenario answers

with rationales. Lewin's Change Theory guided the education interventions. Figure 3.10

shows Lewin's *Change Theory* in relation to the educational interventions of the QIP

project.
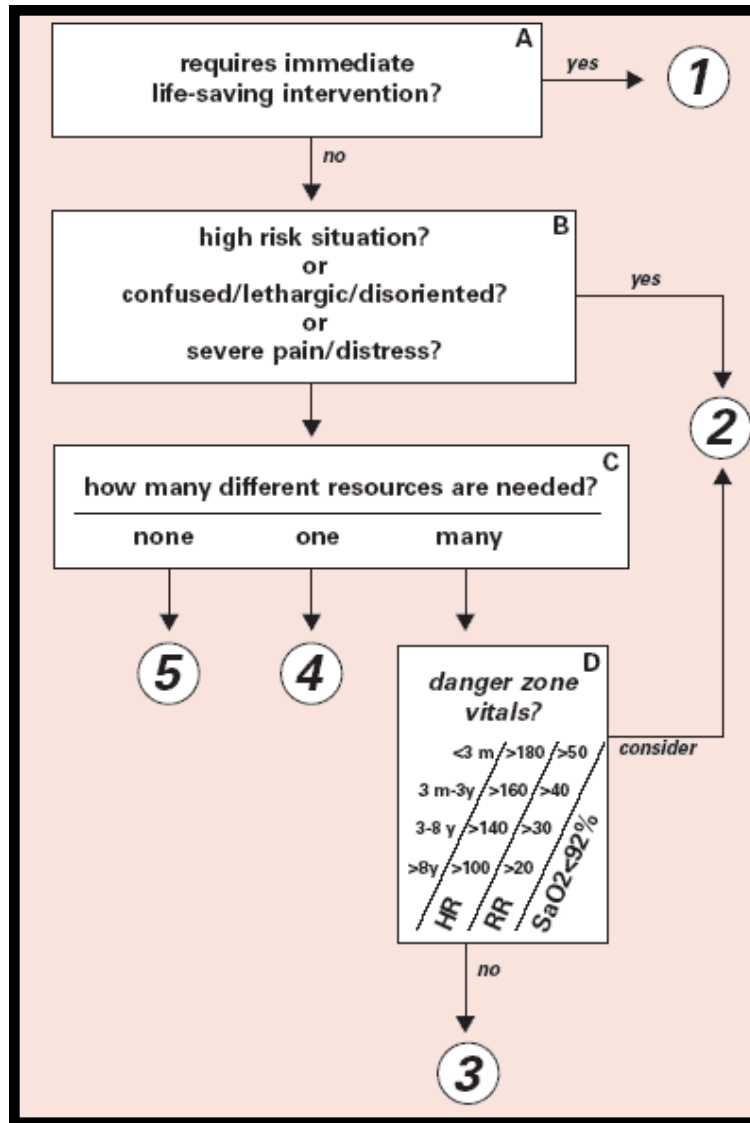
Figure 3.8   *The Front View of the ESI Triage System Badge*

Notes:

A. Immediate life-saving intervention required: airway, emergency medications, or other hemodynamic interventions (IV, supplemental O2, monitor, ECG or labs DO NOT count); and/or any of the following clinical conditions: intubated, apneic, pulseless, severe respiratory distress, SPO_2<90, acute mental status changes, or unresponsive.

Unresponsiveness is defined as a patient that is either:
  (1) nonverbal and not following commands (acutely); or
  (2) requires noxious stimulus (P or U on AVPU) scale.

B. High risk situation is a patient you would put in your last open bed.

Severe pain/distress is determined by clinical observation and/or patient rating of greater than or equal to 7 on 0-10 pain scale.

C. Resources: Count the number of different types of resources, not the individual tests or x-rays (examples: CBC, electrolytes and coags equals one resource; CBC plus chest x-ray equals two resources).

Resources	Not Resources
• Labs (blood, urine) • ECG, X-rays • CT-MRI-ultrasound-angiography	• History & physical (including pelvic) • Point-of-care testing
• IV fluids (hydration)	• Saline or heplock
• IV or IM or nebulized medications	• PO medications • Tetanus immunization • Prescription refills
• Specialty consultation	• Phone call to PCP

• Simple procedure =1
    (lac repair, foley cath)
• Complex procedure =2
    (conscious sedation)
	• Simple wound care
	    (dressings, recheck)
	• Crutches, splints, slings

D. Danger Zone Vital Signs
Consider uptriage to ESI 2 if any vital sign criterion is exceeded.

Pediatric Fever Considerations
1 to 28 days of age: assign at least ESI 2 if temp >38.0 C (100.4F)

1-3 months of age: consider assigning ESI 2 if temp >38.0 C (100.4F)

3 months to 3 yrs of age: consider assigning ESI 3 if: temp >39.0 C (102.2 F), or incomplete immunizations, or no obvious source of fever

© ESI Triage Research Team, 2004 – (Refer to teaching materials for further clarification)

Figure 3.9   *The Back View of the ESI Triage System Badge*
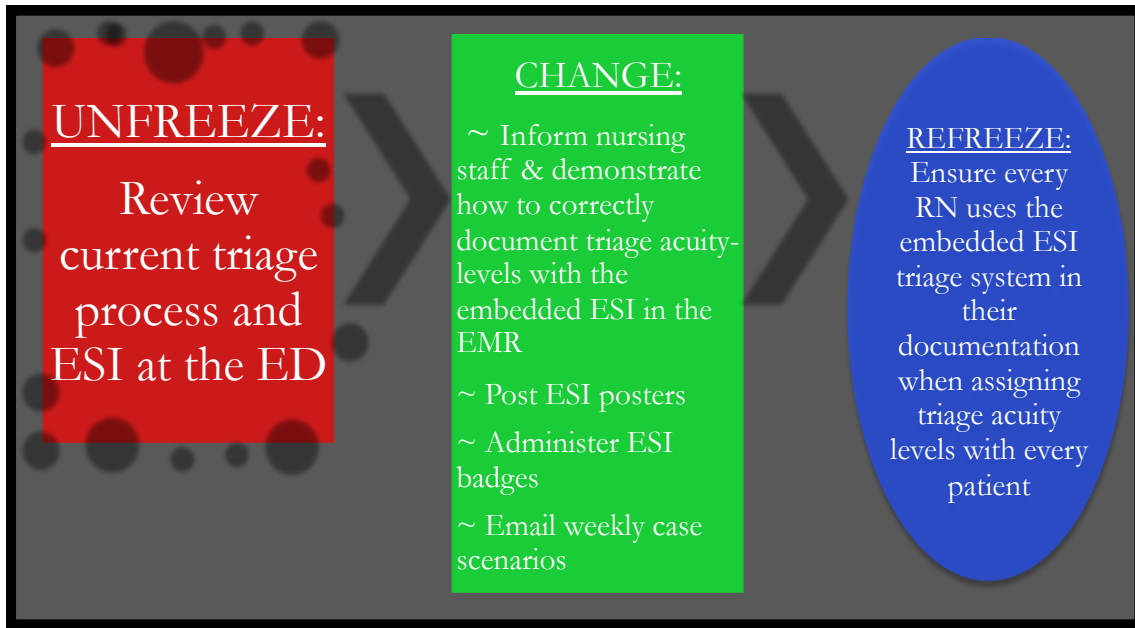
Figure 3.10   *Change Model in Relation to the QIP Project's Educational Interventions*

Target Interventions and Methods

"Embedding ESI" in the EMR had one main goal, the improvement in the efficiency of the ED triage process. "Embedding ESI" in the EMR had three target interventions: the improvement of ED throughput patient times in the ED, a decrease in the number of LWOT patients, and an improvement in the RN satisfaction of the triage process. The relationship between RN satisfaction and efficiency is that if RNs are satisfied understand the importance of an accurate acuity-level, they will more than likely try to utilize the triage system more accurately, which improves efficiency. The ESI triage system click-and-drop template was designed and placed in the EMR for the facilitation of the achievement of the QIP project objectives. Methods that monitored the target inventions included before and after implementation comparison of ED throughput times and the number of LWOT patients. The method that monitored the RN satisfaction intervention

included RN self-reflection surveys completed before and after "Embedding ESI" was impeded in Wellsoft. Figure 3.11 corresponds with Lewin's *Change Theory* and the QIP project intervention targets.
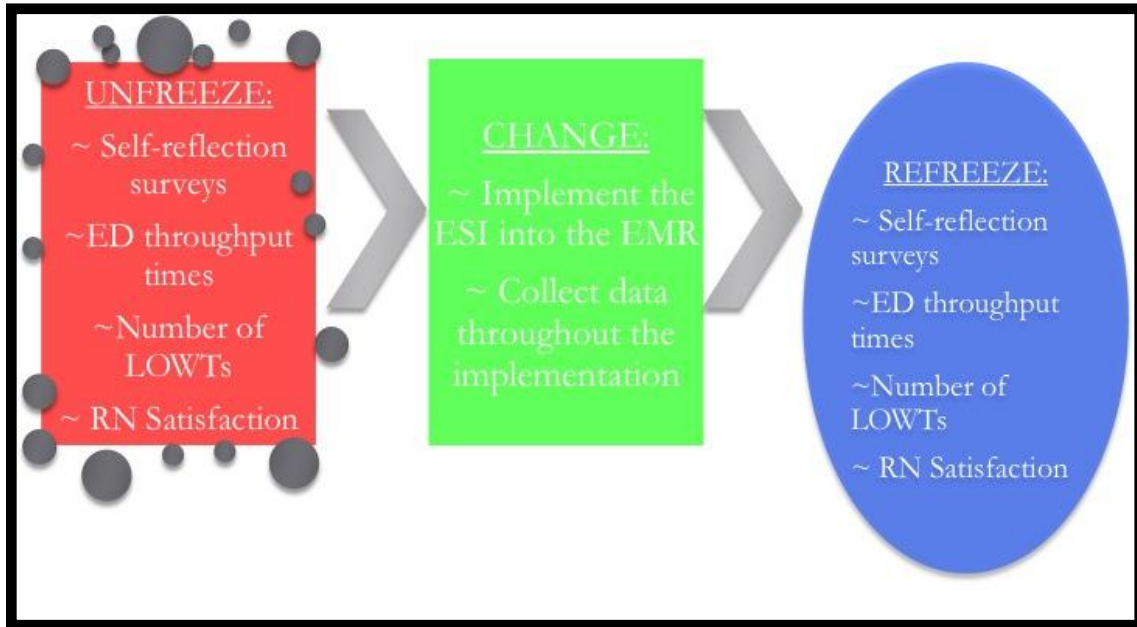
Figure 3.11   *Change Model in Relation to the QIP Project's Target Interventions*

Evaluation of the Implementation

The implementation of "Embedding ESI" was conducted throughout the months of June 2013 through August 2013. All of the previously mentioned interventional targets were monitored through the ED informational technology (IT) department. ED throughput times, the number of LWOT patients, and RN satisfaction self-reflection surveys were also reviewed. All data was aggregated, de-identified and entered into a Microsoft Excel spreadsheet by the ED IT department for further analysis.

Instruments Used to Measure Outcomes

ED throughput times were evaluated before and during of the QIP project implementation. The WellSoft software program time stamped each aspect of the triage process. The ED throughput times were collected through the ED IT department. The ED IT department entered these data into a Microsoft Excel worksheet for comparison. The findings of the ED throughput times are discussed in Chapter Four.

In addition to the ED throughput times, the number of LWOT patients were also evaluated before and during of the implementation of the QIP project. WellSoft also kept records of the number of patients who left the ED before treatment from a medical provider was given. The ED IT department staff also entered this information in a Microsoft Excel worksheet. The rationale behind the patients' decisions to leave the ED without treatment was not documented or reviewed. These findings are also discussed in Chapter Four

Anonymous RN self-reflection surveys completed before and after "Embedding ESI" were sorted into two categories: triage team RNs or non-triage team RNs. The self-reflection surveys were administered to all RNs because some patients arrive to the ED via EMS, bypass the triage area, and go directly to the corresponding patient care area. A non-triage team RN must complete a rapid triage assessment and determine an ESI acuity-level on these patients. All self-reflection surveys were administered to RNs through their work mailboxes located in the ED staff break room remained anonymous. On the self-reflection survey administered before "Embedding ESI", each RN reported his or her utilization and how often he or she visually referred to the ESI triage system

and its components while triaging patients. The self-reflection survey results reviewed

before the QIP project provided support that change was needed. The self-reflection

survey administered before "Embedding ESI" is available in Appendix P. On the self-

reflection survey administered after the implementation period the RN staff were asked

the same questions as posed on the self-reflection survey administered before

implementation. In addition the questions shown in Appendix Q were also included on

the self-reflection survey administered after the implementation of "Embedding ESI".

The information from the self-reflection surveys was entered into a Microsoft Excel

Spreadsheet.

Data Analysis

The data analysis methods for the QIP project included descriptive and simple cross

tabulation analysis. For the ED throughput times, descriptive analysis was completed as

the monthly averages for each focal point of the ED throughput times were compared

("Survey analysis guidelines," 2009). The three monthly averages before and during the

QIP project were compared. Also, the averages for these two timeframes were calculated

and compared. The number of LWOT patients' data was also analyzed by descriptive

analysis strategy. The percent frequency of LWOT patients the three months before and

the three months during the implementation of "Embedding ESI" were compared

("Survey analysis guidelines," 2009). Each separate month's percentage was used.

All surveys were analyzed by RN category (triage team RNs or non-triage team RNs).

From the spreadsheet all answers were reviewed for accuracy and completeness and the

data analyzed with descriptive and simple cross tabulation analysis. Descriptively, the

frequencies of questions one through six were calculated from the RNs' responses ("Survey analysis guidelines," 2009). The simple cross tabulation analysis strategy was completed on each question, one through six and percentages for each response reported. The responses from the members of the triage team RNs were compared to responses of the ED RNs who did not belong to the triage team ("Survey analysis guidelines," 2009). Charts, tables, or graphs were created for easier comparison. Results are discussed in Chapter Four.

Conclusion

Chapter Three described the details of "Embedding ESI" design and the implementation process. "Embedding ESI" was developed for the potential improvement of the efficiency of the triage process at a healthcare facility located in the southeastern USA. Lewin's *Change Theory* assisted with the implementation "Embedding ESI". The literature review previously described in Chapter Two, guided development of "Embedding ESI". After the development and completion of education intervention and of "Embedding ESI" to ED staff, the target interventions were measured. The results of these target interventions are discussed in Chapter Four.

The embedded ESI triage system in the EMR continued as part of every patient's

chart in the ED for the months of June through August 2013. The purpose of the QIP

project was to evaluate the efficiency of pre- and post-triage, number of LWOT patients,

and RN satisfaction of the triage process following the implementation of an

electronically embedded ESI triage system template in the EMR at a southeastern

healthcare facility. Self-reflection surveys are also part of the analysis in regards to the

RNs' satisfaction before and after implementation. Chapter 4 describes the results of the

QIP project's target interventions.

Description of Measures

ED Throughput Times

The ED IT department measures the time patients spend in the ED starting with

the arrival time of each patient. The ED throughput category, referred to as "LOS" by the

healthcare facility, measures from the time patients enter the ED until the time patients

leave the ED, regardless of discharge disposition. The discharge disposition options

include discharge home, admission to the hospital, or a transfer to another medical

facility. Times are also measured for different segments of ED care that occur such as the

"door to ED bed" (i.e., the time patients enter the ED until the time the patients arrive in

the corresponding acuity-level patient care area) and the "triage to ED bed"(i.e., the time

from completion of the triage process until the patients arrive in the corresponding

acuity-level patient care area). The difference between these two categories is the length

of time patients wait for the initiation of the triage process or the "door to triage"

segment. This is not calculated at the healthcare facility, but was calculated for this QIP

project. The ED throughput times, "door to triage" and "triage to ED patient care area"

are two proxy measures of efficiency in the QIP project.

The ED IT department extracts this information from WellSoft and places the

information into a Microsoft Excel spreadsheet. The ED IT department reports the ED

throughput times on a monthly and quarterly basis. For the QIP project the three months

prior to the implementation of "Embedding ESI" is compared with the three months

during "Embedding ESI". The results of the ED throughput times in relation to the QIP

project are in Figures 4.1, 4.2, 4.3.

Number of Left without Medical Treatment Patients

The number of patients who leave the ED without medical treatment may serve as

an indicator of patients' perception of the efficiency of the pre- and post-triage process.

The QIP project focuses on the number of LWOT patients who leave the ED after the

completion of the triage process, not before or during. The ED IT department also

extracts the number of LWOT patients from WellSoft and places the information into

Microsoft Excel. The ED IT department reports the number of LWOT patients on a

monthly and quarterly basis. The QIP project compares the percentage of LWOT patients

three months prior to the implementation of "Embedding ESI" to the three months during "Embedding ESI" implementation (See Figure 4.4).

ED RN Satisfaction (Self Reflection)

The RNs' perception, attitude, acceptance, and behavior relative to "Embedding ESI" are extremely important in relation to outcome on nursing practice. Because all of the ED RNs, not just those on the triage team, may complete the triage process, all were given self-reflection surveys regarding the triage process before and after "Embedding ESI". However, only some of the RNs voluntarily completed a self-reflection survey about their feelings in regards to the triage process before the QIP project. One month after "Embedding ESI" was completed, self-reflection surveys were distributed again to all ED RN staff. Again, only some of the ED RNs voluntarily completed a self-reflection survey about their feelings in regards to the triage process and the electronic, acuity assistance template embedded in the EMR. These results are included in Tables 4.1, 4.2, and 4.3. The percentages for questions one through six on the self-reflection surveys were calculated and compared before and after "Embedding ESI"; see Table 4.4.

<div align="center">

Analysis of Research Questions

</div>

The goal of the QIP project is to increase the efficiency of the ED triage process. The ED throughput times, number of LWOT patients, and RN satisfaction are the target interventions of the QIP project. The results are displayed below.

ED Throughput Times Results

The results of the ED throughput times are shown in Figures 4.1 and 4.2. The "door to triage" results reflect the time patients enter the ED until the time patients start the triage process. The time is measured in minutes. Figure 4.1 displays the monthly averages *before* "Embedding ESI", (March through May), and displays the monthly averages *during* "Embedding ESI" (June through August). On average patients waited approximately 8.6 minutes for the start of the triage process in months March through May 2013. On average patients waited approximately 10 minutes for the start of the triage process in the months June through August 2013.
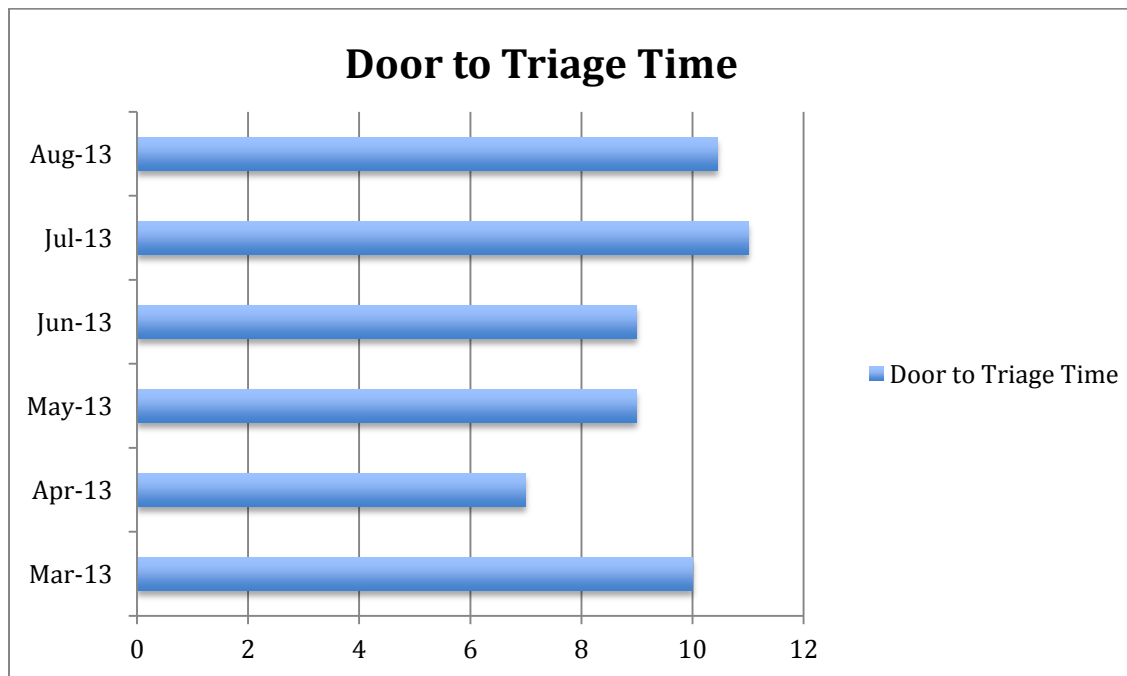
Figure 4.1   *Door to Triage Time*

"Triage to ED patient care area" time reflects the time patients complete the triage process until the time patients arrive in the corresponding acuity-level patient care area.

Figure 4.2 displays the monthly "triage to ED patient care area" averages before "Embedding ESI" (March through May), and during "Embedding ESI" (June through August). On average patients waited approximately 51 minutes until they arrive in the corresponding acuity-level patient care area March through May 2013. On average patients waited approximately 34.3 minutes until they arrived in the corresponding acuity-level patient care area the months June through August 2013. See Figure 4.3 for a visual representation of the average decrease of time patients waited in the waiting room before being placed in the patient care area.

Figure 4.2 *Triage to ED Patient Care Area Time*

Triage to ED Patient Care Area Time Averages
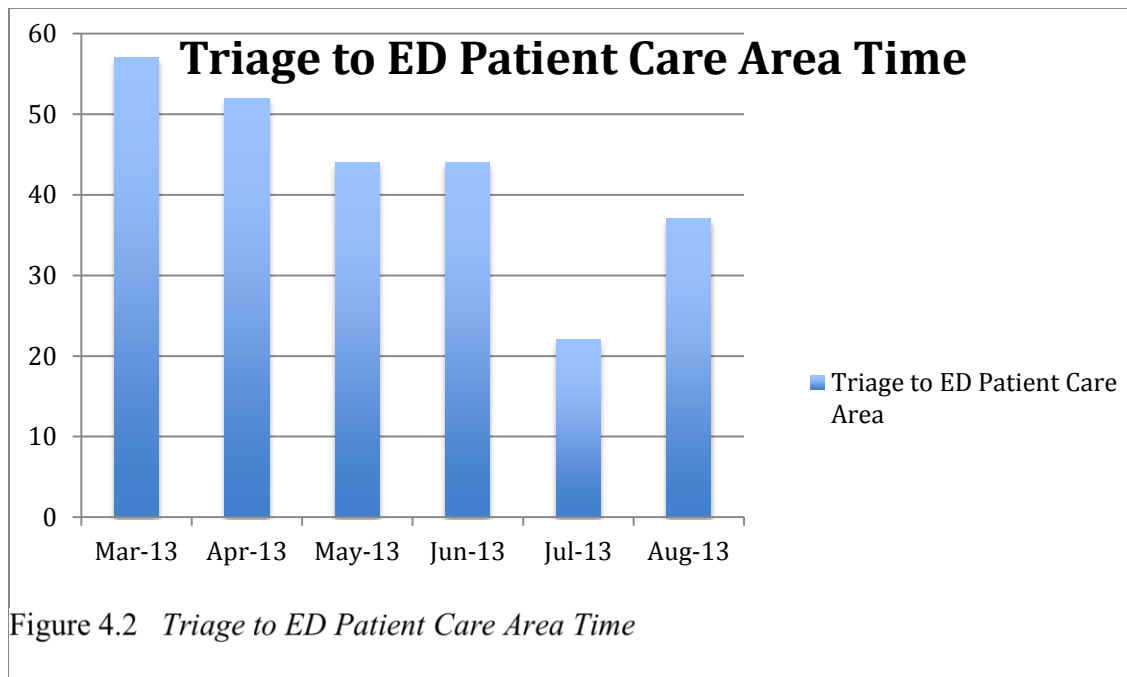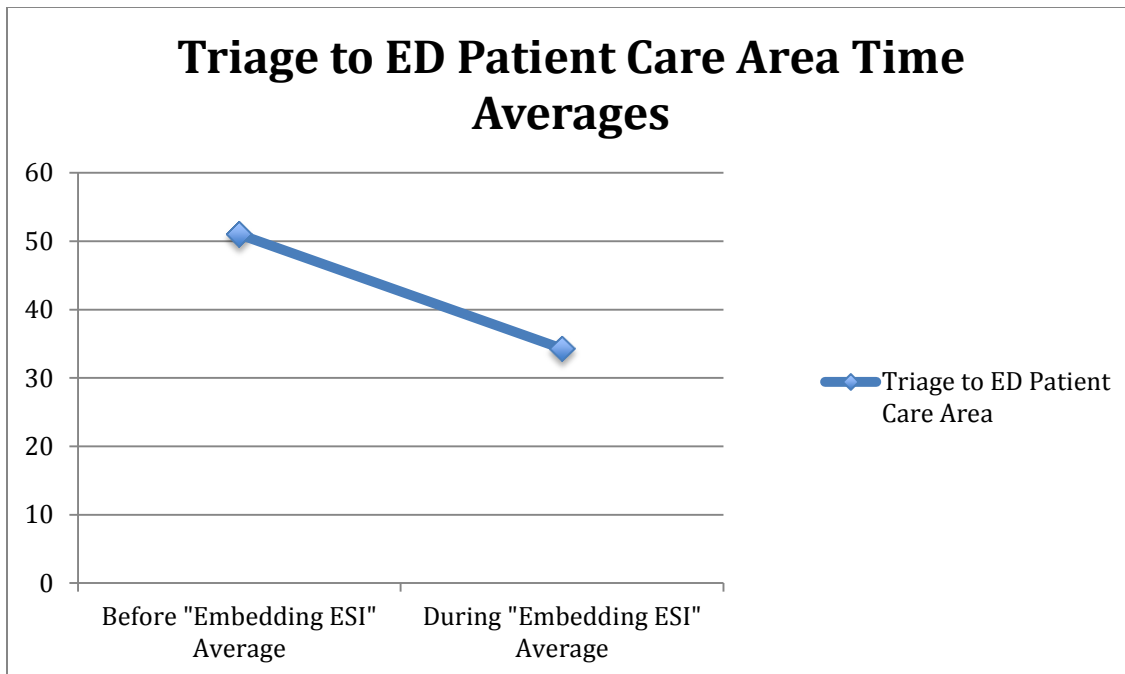
Figure 4.3 *Triage to ED Patient Care Area Time Averages*

Number of LWOT Patients Results

Figure 4.4 displays the results for the percentage of LWOT patients. It shows the gradual decrease in number of LWOT patients throughout the implementation of "Embedding ESI". In March, before the implementation of "Embedding ESI", the actual number of LWOT patients was 385 patients (7.2%). The number of LWOT patients in August 2013 was 264 patients (4.8%).
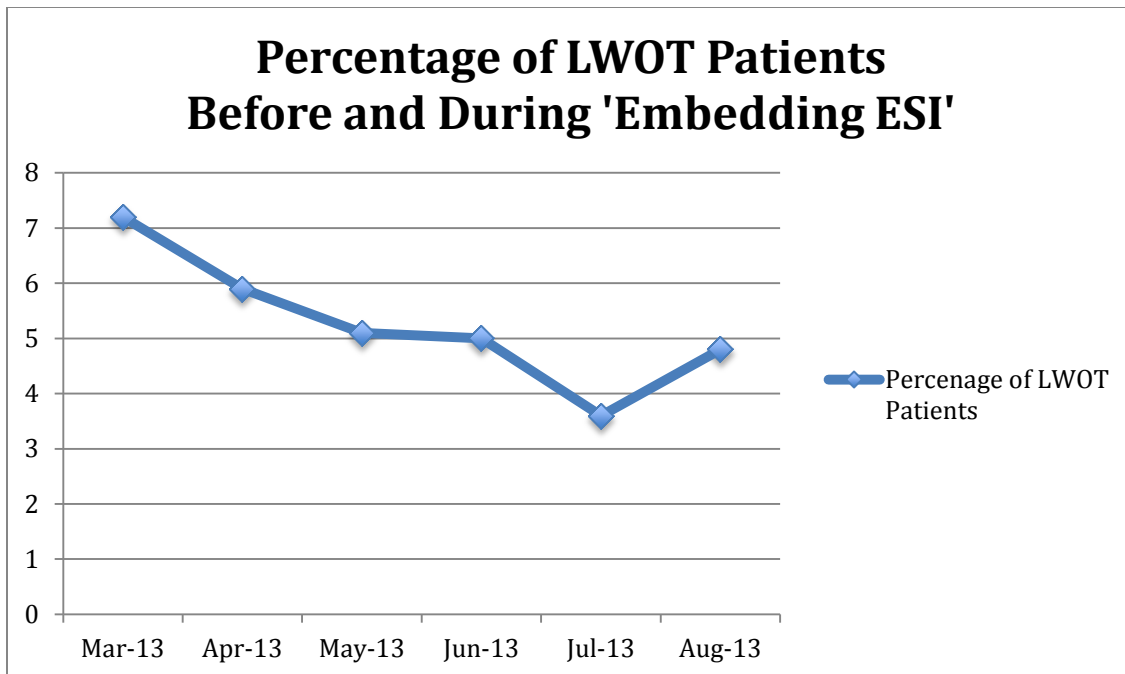
Figure 4.4 *The Percentages of LWOT Patients*

ED RN Satisfaction Results

The results of the healthcare facility's ED RNs' self-reflection questionnaire concerning "Embedding ESI" are in the tables 4.1-4.4. The feelings are from self-reflection surveys before "Embedding ESI" and self-reflection surveys after "Embedding ESI" implementation. The survey responses are divided into the individual questions and compare triage team RNs with non-triage team RNs for easier comparison. The RNs' feelings change throughout the implementation period related to the new documentation method of the ESI triage system's acuity-level decisions. Overall, approximately 78% of all ED RNS, triage team RNs and non-triage team RNs, who completed the self-reflection survey after "Embedding ESI" were satisfied with the electronic, acuity assistance template embedded in the EMR, Wellsoft. However, some RNs self-report they omitted this element in the triage note. There was a small increase in the number of

triage team RNs that felt they used the ESI triage system after "Embedding ESI". Before "Embedding ESI" the triage team RNs felt they used the ESI triage system when they triaged patients, 94% of the time, but after "Embedding ESI" felt they used the ESI triage system 96% of the time. Both groups of RNs, triage team RNs and non-triage team RNs, self-reported they used the ESI triage system 100% of the time after "Embedding ESI" when they triaged patients and assigned acuity-levels; the percent increased an average of 13% for both groups before and after "Embedding ESI". There was also an increase between both groups of RNs in regards to how often the RNs refer to the ESI triage system on the computer. However, it is under the assumption the RNs are referring to the previously mentioned modified ESI triage system table located on the hard drive of each computer in the ED, and the RNs are not referring to the electronically embedded ESI click-and-drop template because the survey question does not specifically make this distinction. There was an average 9% decrease in the number of RNs from both groups who felt they were not accurately using the ESI triage system after "Embedding ESI" because they realized after "Embedding ESI" they were not using the ESI triage system properly prior to the implementation. The number of RNs with education levels or additional national certification for ED did not change before and after "Embedding ESI". Table 4.4 compares the percentages of each self-reflection survey question's responses before and after "Embedding ESI".

In regards to the self-reflection survey after "Embedding ESI", 97% of RNs from both groups self-reported that the embedded ESI template assisted with the triaging of patients and the acuity-level decisions. These results are in Table 4.1.

Table 4.1

Self-Reflection Survey Results for TT and Non-TT RNs Before & After "Embedding ESI"

	Before "Embedding ESI" TTRN N=36		Before "Embedding ESI" Non-TTRN N=15		After "Embedding ESI" TTRN N= 23		After "Embedding ESI" Non-TTRN N=17	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
1. Do you feel that you use ESI when you triage? **Yes/ I try to/ Sometimes/Most of the time**	33	92	15	100	22	96	17	100
No/ intuition/MD assigned	2	6	0	0	1	4	0	0
No response *	1	2						
2. If yes, how often do you use ESI when you triage and assign acuity-levels? **100%**	19	53	7	47	14	61	11	65
75%	15	41	8	53	9	39	6	35
50%	0	0	0	0	0	0	0	0
25%	1	3	0	0	0	0	0	0
No response **	1	3						
3. How often do you refer to ESI on the computer when you complete the triage palate? **Always/Continuous/each**	3	8	2	13	8	35	11	64

	Count	%	Count	%	Count	%	Count	%
time **Mostly/most often/often/50%-75%**	4	11	2	13	7	30	4	24
Rarely/Twice/10%	1	3	2	13	3	13	2	12
Never/None/No/☐/0%	27	75	9	61	5	22	0	0
No response ***	1	3						
4. Do you think you are accurately following the ESI guidelines?								
Yes/Most of the time	26	72	11	73	20	87	13	76
Sometimes/try/hope	5	14	3	20	2	9	1	6
No/Prob not/ unknown	4	11	1	7	1	4	2	12
No response ****	1	3					1	6
5. What's your highest level of nursing education? *****								
MSN	1	3	0	0	1	4	0	0
BSN	13	38	8	53	9	39	10	59
ADN	18	53	7	47	13	57	7	41
Diploma	1	3	0	0	0	0	0	0
No response	1	3						
6. Are you CEN certified? **Yes**								
No/Not yet/Working on it	1 34	3 94	1 14	7 93	2 21	9 91	0 16	0 94
No response ******	1	3					1	6
7. How satisfied are you with the embedded ESI template in the triage palate?	n/a*		n/a*					
Very Satisfied					9	39	0	0
Satisfied					12	52	10	59
Dissatisfied					2	9	7	41
Very Dissatisfied					0	0	0	0
8. How often do you use the embedded ESI	n/a*		n/a*					

			TT RN		Non-TT RN	
template when you triage patients?						
100%			15	65	13	76
75%			4	17	4	24
50%			2	10	0	0
25%			1	4	0	0
0%			1	4	0	0
9. If you complete the embedded ESI template, how often did it assist you with your acuity-level decisions?	n/a*	n/a*				
Most of the time			6	26	12	71
Some of the time			13	57	5	29
Rarely			3	13	0	0
Never			0	0	0	0
No response			1	4		
10. Was there a problem identifying and categorizing the number of resources for the different levels of ESI acuity-levels?	n/a*	n/a*				
Most of the time			0	0	1	6
Some of the time			4	18	3	18
Rarely			12	52	10	58
Never			7	30	3	18
*******						

TT RN: Triage Team RNs

Non-TT RN: ED general RNs

n/a* There were no responses for these questions on the before "Embedding ESI" surveys due to the questions only being included on the after "Embedding ESI" surveys.

Note, the actual open-ended responses from RNs were grouped together in the above categories. The actual responses can be found in Appendix R.

Table 4.2

Self-Reflection Survey Comments Before "Embedding ESI" Additional Thoughts and Ideas

Thoughts and Ideas	
Triage Team RN Reponses	**Non-Triage Team RN Reponses**
"I have never triaged before. Came from NICU"	"Thank you for selecting me to participate in your survey! Have an excellent day and thank you for choosing' (the healthcare facility).
" I prefer the Emergent, Urgent, non-urgent triage process"	"It is confusing when pulling pts from waiting room who fall under 3,4, &5 acuity level. We have been told to pull back according to time, but 3s can be sicker and need care faster than 4&5's that have been waiting longer."
"You must use ESI guidelines in triage. This is how you measure Acuity/Interventions"	"I try but increase acuity due to severity of need to be seen sometimes"
"Need an extra protocol person/reassessment person during busy times"	"Sometimes until the pt is worked up it is hard to tell how sick they really are"
"Unable to always determine amt of resources needed"	
"Simplify the ESI system"	
" I like 3 RN's in triage"	
"Triage can "waiver" based on MD in area"	
"Paperwork doesn't make you a better nurse. Experience and nursing Judgment are most important !!"	
"Depends on how busy the department/area of ED that pt is going to (potentially) and who the doctor will be. on how well ESI works If CC is slammed, 2☐Int or WR /c protocols"	
"3ʳᵈ triage nurse is ok @ times. Doing protocols on pt will in triage is	

better than sending to waiting room & then doing protocols."	
"Protocol B4 waiting room"	
"Like RN at door b/c VS already done"	
"I triage based on pt c/o, pain scale, VS then interventions"	
"Interventions has nothing to do with patient care"	
"There's only 1 question I ask in triage – "can I take care of this pt in triage?"	
"Like 3 step-urgent/non-urgent based"	
"Protocols are effective in triage but should be done before pt is in waiting room."	
"You use more than ESI in triage"	
"?"	
"I try to follow Guidelines but I am sure I do not always follow correctly or forget certain Guidelines"	
"It really doesn't matter how many Interventions I feel that the patient needs-It is left up to the doctor (ESI 3-5)"	
"The pre-triage RN is an asset when triage is busy but not so much when it isn't."	

Table 4.3

Self-Reflection Survey Comments After "Embedding ESI" Question 11

11. What are your suggestions for improving the triage process?	
TT RN Responses	**Non-Triage Team RN Responses**
"There are no blood pressure guidelines"	"? Have not used it much; still learning; maybe easy questions and blunt"
"Keep the ESI template on the triage palate"	"no suggestions at this time"
"I think having the ESI pallette Helps – especially these not comfortable /c triage"	"train newer nurses to do triage (not brand new) but maybe let some train to get used to triaging & to PREVENT error from occurring!"
"I ♥ the new ESI template"	"could newer nurses go to "shadow" in triage after a year of ER experience"
"Need post TR RM assign. so when we are doing things on pt in TR the staff know where they are"	"include specifics for peds"
"None I can think of"	" I enjoy having it embedded in triage template!"
"utilize EBP to provide best triage possible"	"more options"
"mid level provider involved in actual triage of pts"	"none"
"none" or "none at this time"	"I really like having the embedded template. I think it helps when assigning acuity"
"Take some of the tasks away from triage RN, too much to do, concentrate on pt c/o"	"Continue to utilize the ESI triage system"
"over the past 13 years, the Triage process has improved for this Dept."	"Triage team would not work due to too many EMS patients"
"keep the 2 nurses and the pre-triage RN as is. Augmented triage helps so much too"	"n/a"

"can't change if wrong assigned by mistake" in relation to the number of resources	
"meds added later, too time consuming, or start them as general & pharmacy Final them"	
"N/A"	
TT RN No response = 8	Non-Triage Team RN No response = 6

Table 4.4

Self-Reflection Survey Percentages Before and After "Embedding ESI"

Variables	TT		ED	
	Before	*After*	*Before*	*After*
1. Do you feel that you use ESI when you triage patients, either in triage or in patient care area when patients arrive by EMS?				
Yes	92%	96%	100%	100%
No	6%	4%	0 %	0%
2. If yes, how often do you use ESI when you triage and assign?				
90-100%	53%	61%	47%	65%
75% (most of time)	41%	39%	53%	35%
50%	0%	0%	0%	0%
25%	3%	0%	0%	0%
3. How often do you refer to ESI on the computer when you complete the triage palate?				
Always	8%	35%	13%	64%
Mostly	11%	30%	13%	24%
Rarely	3%	13%	13%	12%
Never/None	75%	22%	61%	0%
4. Do you think you are accurately following the ESI guidelines?				
Yes/ Most of the time	72%	87%	73%	76%
Sometimes/try/hope	14%	9%	20%	6%
No/Prob Not/unknown	11%	4%	7%	12%
5. What's your highest level of nursing education?				

MSN	3%	4%	0%	0%
BSN	38%	39%	53%	59%
ADN	53%	57%	47%	41%
Diploma	3%	0%	0%	0%
6. Are you CEN certified?				
Yes	3%	9%	7%	0%
No	94%	91%	93%	94%

Conclusion

A healthcare facility in the southeastern USA implemented "Embedding ESI" with the goal to improve efficiency of the triage process. The target interventions were ED throughput times, the number of LWOT patients, and RN satisfaction. The successful implementation of "Embedding ESI" improved these target interventions. Overall, 'triage to ED patient care area' times improved with the implementation of "Embedding ESI". The number of LWOT patients decreased with "Embedding ESI" implementation, and the ED RNs are satisfied with the triage process and the electronic, acuity assistance template embedded in the EMR. "Embedding ESI" potentially leads to improvement in the efficiency of the triage process at the QIP project site. Accurate triage scores and utilization of Embedding ESI improves the quality, safety, and efficiency of health care for all patients. The QIP project also meets one of Agency for Healthcare Research and Quality's areas of emphasis, related to the improvement of educational training for the health care workforce (Gilboy et al., 2012). The change made a positive impact on the way patients were triaged in the ED department. The results show the important role that each of these interventions play and how they impact the triage process.

DISCUSSION

In relation to Lewin's *Change Theory*, recommendations for practice in relation to the QIP project falls into the refreeze stage. In the refreeze stage, the new behavior becomes institutionalized as the new pattern of triage (*"Change Theory Kurt Lewin"*, 2011). As Chapter Four describes, "Embedding ESI" improved the efficiency of the triage process, reduced LWOTs and was favorably accepted by the RNs. The information collected for this project provides the evidence-base for the development of new triage standard operating procedures (*"Change Theory Kurt Lewin"*, 2011). During the refreeze stage, it is important for the management team to monitor RN behaviors and actions regarding "Embedding ESI" implementation to assure compliance with the new protocol so that the change will become the new pattern.

Recommendations for Practice

A general recommendation for practice is the continual use of the electronic, acuity assistance template that is embedded in the EMR, Wellsoft. The efficiency of the triage process through the improvement of "triage to patient care area" times and RNs' satisfaction with the new process provides the evidence to support this recommendation. The number of LWOT patients decreased after the placement of the electronic, acuity

assistance template. The RNs at the healthcare facility also indicated that the electronic, acuity assistance template improved their ESI acuity-level decisions.

Another recommendation is that the continuous use of the electronic, acuity assistance template that is embedded in the EMR, Wellsoft, become a mandatory documentation site. By making the electronic, acuity assistance template a mandatory documentation site, this this can potentially prevent some RNs from neglecting to fill out the electronic, acuity assistance template. The RNs have the option of assigning an ESI acuity-level without completing the embedded assistance template. Currently, RNs also have the option of completing the four components of the electronic, acuity assistance template, without changing the default ESI acuity-level one decision in the template. This recommendation will enforce the complete use of the electronic acuity assistance template before an acuity-level decision is decided. Accuracy can be enhanced with consistent use of the ESI template.

Another general recommendation for practice is that the electronic, acuity assistance template that is embedded in the EMR, also be part of the 'Nurse's Note' area of WellSoft. In addition to the initial area in the triage note where the RNs complete the acuity assistance template, it can be an additional option in the RNs' assessment area for patients who experience a change of status while in the ED waiting room. This will allow the initial triage-acuity level documentation in the triage note section of the EMR and the revised change in acuity-level documentation when the actual change of status occurs. By documenting these two acuity-level decision assessments separately, the documentation is thorough and includes the rationale for the change of status in the EMR, Wellsoft.

And lastly, another recommendation for practice includes adding the pediatric population to the electronic, acuity assistance template that is embedded in the EMR, Wellsoft. "Embedding ESI" only focused on the adult population due the previously described inclusion and exclusion criteria of the QIP project. However, a thorough triage process includes the pediatric patient population. The ESI triage system has specific guidelines for the pediatric population that are different from the adult population. Special considerations include age and body temperature range. By including the pediatric population and their special considerations in the electronic, acuity assistance template that is embedded in the EMR a safer, more efficient, and accurate triage process is available for both adult and pediatric patient populations.

Recommendations for Research

A recommendation for research is the impact of the electronic, acuity-level assistant template on accurate triage category patient outcomes. If this new system improves the accuracy of acuity-level decisions, then patients should receive timely care in an acuity-level appropriate manner because patients are not under-triaged or over-triaged. With accurate acuity-level decisions ESI acuity-level two patients will receive medical attention and treatment faster than ESI acuity-level three, four, and five patients, which will improve the outcomes for the ESI acuity-level two patients. Since the ESI acuity-level three, four, and five patients do not need care as urgently as the ESI acuity-level two patients, then it is safe for these patients to wait an extended length of time in the waiting room, with appropriate triage reassessments and protocol implementations, before they are placed in a patient care area.

Recommendations For Education

"Embedding ESI" has several educational opportunities that can improve the efficiency of the triage process. One recommendation for education is to annually educate RNs on the ESI triage system. Through repetitive education on the ESI triage system, RNs should be less likely to forget and modify the ESI triage system due to the lapse of time from the initial ESI triage system education. Annual education on "Embedding ESI" is also necessary to encourage its accurate and timely use that leads to an efficient triage process. As new RNs begin working in the ED, orientation to the ED should include training on the electronic, acuity assistance template that is embedded in Wellsoft. All RNs in the ED triage patients on a daily basis. It is important that all RNs understand and efficiently utilize the ESI triage system and the electronic, acuity assistance template that is embedded in the EMR for a more efficient triage process.

Another recommendation for education is the manifestation of the importance of EMR documented triage acuity-level decisions with rationale. Documentation in the EMR explains the RNs' triage decisions. It also allows others to view the triage acuity-level decision rationales. RNs should know why they choose certain triage acuity-level decisions for the benefit of patient safety. Triage decisions with rationales provide support for the chosen triage acuity-levels and provide patients a safer environment. It is also an important need for continued monitoring with appropriate data collection and analysis to ensure the triage system is continually utilized appropriately. Patient safety can improve because of the appropriate waiting timeframes and reassessments in accordance with the triage acuity-level decisions.

Limitations

One limitation of the QIP project was the development and response of staff to the self-reflection surveys. After re-examination of the self-reflection surveys, several questions were not fully developed with appropriate response options and replicated on both the pre and post surveys for the analysis. This resulted in a broad range of responses that made analysis difficult and open to interpretation, and assumptions. Other limitations the small number RNs that responded to the surveys, and the number of surveys returned incomplete.

Another limitation is the focus of the QIP project only on the triage process. From the results, if an efficient amount of time on the initial triage process is spent at the beginning of the triage process, then there will be a decrease in overall ED throughput times. Focus categories excluded from this project included the measurement of time from patients' arrival to the ED until the time patients see a medical provider, as well as the measurement of time from the point at which patients reach the patient care area until the time patients see a medical care provider. These times were not included in this project because the data was neither collected nor available through the ED IT department. The medical providers have the ability and control over the length of time patients wait to see a provider. By decreasing the wait times associated with these focus categories the overall ED length of stay for patients can potentially decrease, which can potentially improve the efficiency of the ED throughput times. Another limitation was being unable to include patient satisfaction with the ED experience in the data. Unfortunately, this data was not available for analysis. The ability to collect and analyze

this data would provide greater insights into the efficiency and outcomes of the entire triage process.

Conclusion

The QIP project provided evidence to support the use of an embedded ESI template to improve the efficiency of the triage process through the decrease in the number of LWOT patients, and RN satisfaction at a southeastern USA healthcare facility. Lewin's *Change Theory* guided this QIP project for its successful implementation. The ED throughput times, number of LWOT patients, and RN satisfaction scores were the target interventions. Improvement in these areas is crucial for a more efficient triage process. The reception and acknowledgement of the RNs' responses towards the QIP project also provided evidence for its successful implementation. This quality improvement project provides evidence for continued use of an electronic, acuity assistance template that is embedded in the EMR, Wellsoft.

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The various types of triage systems, the countries in which they are utilized, and the number of categories included in each triage system.

Table A.1

Types of Triage Systems

Triage System	Country in which system is utilized	Approach to triage	Number of categories included in system
Australian Triage Scale (ATS)	Australia	Urgency descriptor, which sets a time frame on how urgent the patient needs to wait prior to seeing a provider	5
Canadian Triage and Acuity Scale (CTAS)	Canada	Presenting complaint	5
Manchester Triage Scale (MTS)	United Kingdom	Algorithm	5
Emergency Severity Index (ESI)	United States	3-tier assessment acuity, resource management, and acuity	5

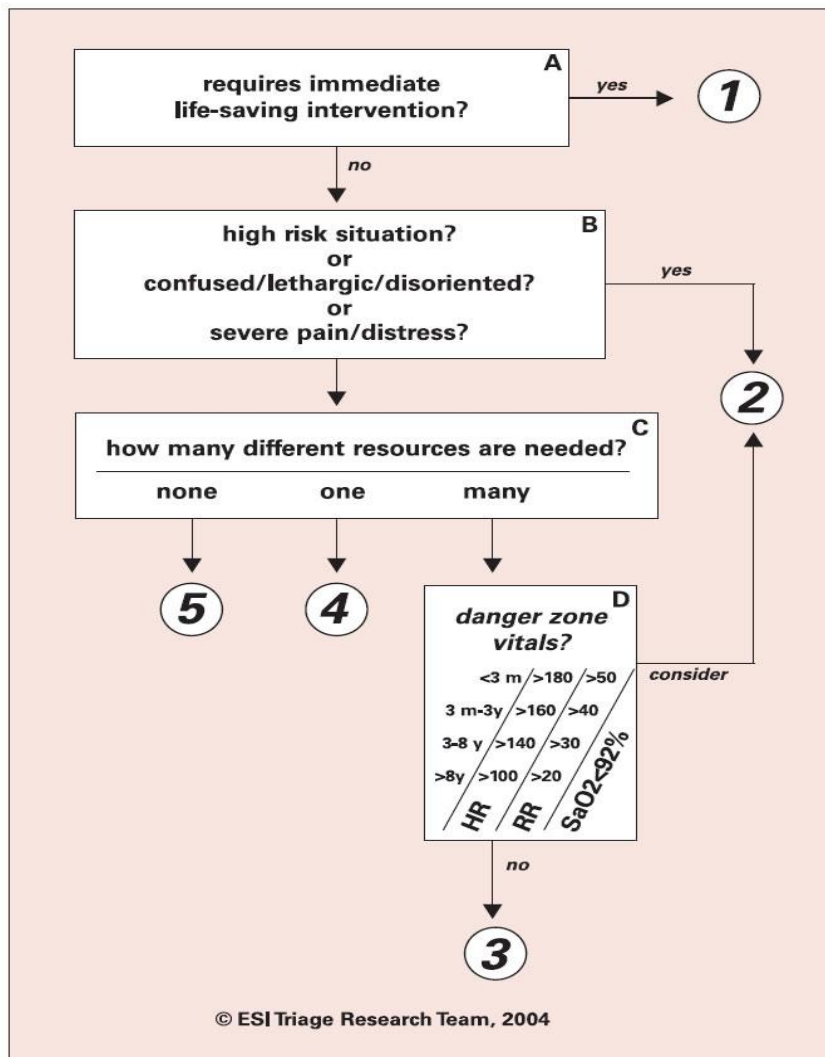(Fitzgerald et. al., 2010)

An algorithm of the ESI Triage System.

Figure B.1.   *ESI Triage System*

(Gilboy et al., 2012)

The triage policy and procedure that is utilized at the project site.

Table C.1

Triage Policy and Procedure at Southeastern Healthcare Facility

Health Emergency Department Policy & Procedure	
Policy Number: 700-126	Approved by: J. Wallace Davies, MD C. Phillips, RN S. Walters, RN C. Hooper, RN
Title:	Triage
Policy:	The Emergency Severity Index (ESI) instrument will be used to identify a triage classification for all patients entering the Emergency Department at AnMed Health Medical Center.
Purpose:	To establish a process by which a registered nurse will assign a numerical classification to every patient who presents to the Emergency Department seeking medical treatment. This process will utilize a standardized model, which reflects an evaluation of both the urgency, and estimated resource needs necessary to provide adequate care for the patient.
Responsibility:	RN Staff
Procedure:	**1. Patients arriving at the ED through the public entrance requesting health care services will be logged into the EmSTAT system by the Guest Ambassador or the triage nurse. Entered data by Guest Ambassador: Patient name, statement of complaint in the patient's own words and date of birth. Entered data by the triage nurse: Clarification of the statement of complaint, vital signs, triage classification, PMH,**

	allergies, medications, suicide risk assessment, and room assignment. Patients arriving via EMS will have the above information logged by the triage nurse, primary nurse (nurse assigned to the room) or nurse designee (a nurse in the clinical area). **The triage nurse will complete a brief assessment as defined in the ESI implementation plan, assign a triage classification based on the assessment and document this in EmSTAT. Patients will be placed in the appropriate clinical area based on this assessment. Specific room placement will be coordinated between the triage nurse and the charge nurse. Triage nurse will obtain PMH, allergies, medications, vital signs, pain assessment, and suicide risk assessment on all patients except those that require immediate medical attention. Triage nurse will also perform inspection, auscultation, and initiate protocols on patients when appropriate.** **2. The staff member who escorts the patient from triage to the clinical area will assure that the primary nurse or charge nurse is informed of the patient's location and any patient information relevant to their needs.** **3. Upon placement in the room, the primary nurse or designee will prepare the patient for examination (undressed and in a gown), ready for physical evaluation, perform and document a primary and secondary focused assessment and monitor patient according to their presenting symptoms.** **4. The primary nurse, designee, or charge nurse will assure that Emergency Department physician is immediately notified of any patient who is received in the clinical area and classified as a Level 1 or 2.**
Procedure:	Secondary Triage 1. Implement nursing guidelines as appropriate 2. Perform reassessment of patient condition to include:

	a. Vital signs b. Pain scale c. Patient response to treatment/medications d. Physical assessment of pain e. Reassessments will be performed every hour

(AnMed Health Medical Center, 2011)

A visual aid of the patient flow at the project site.
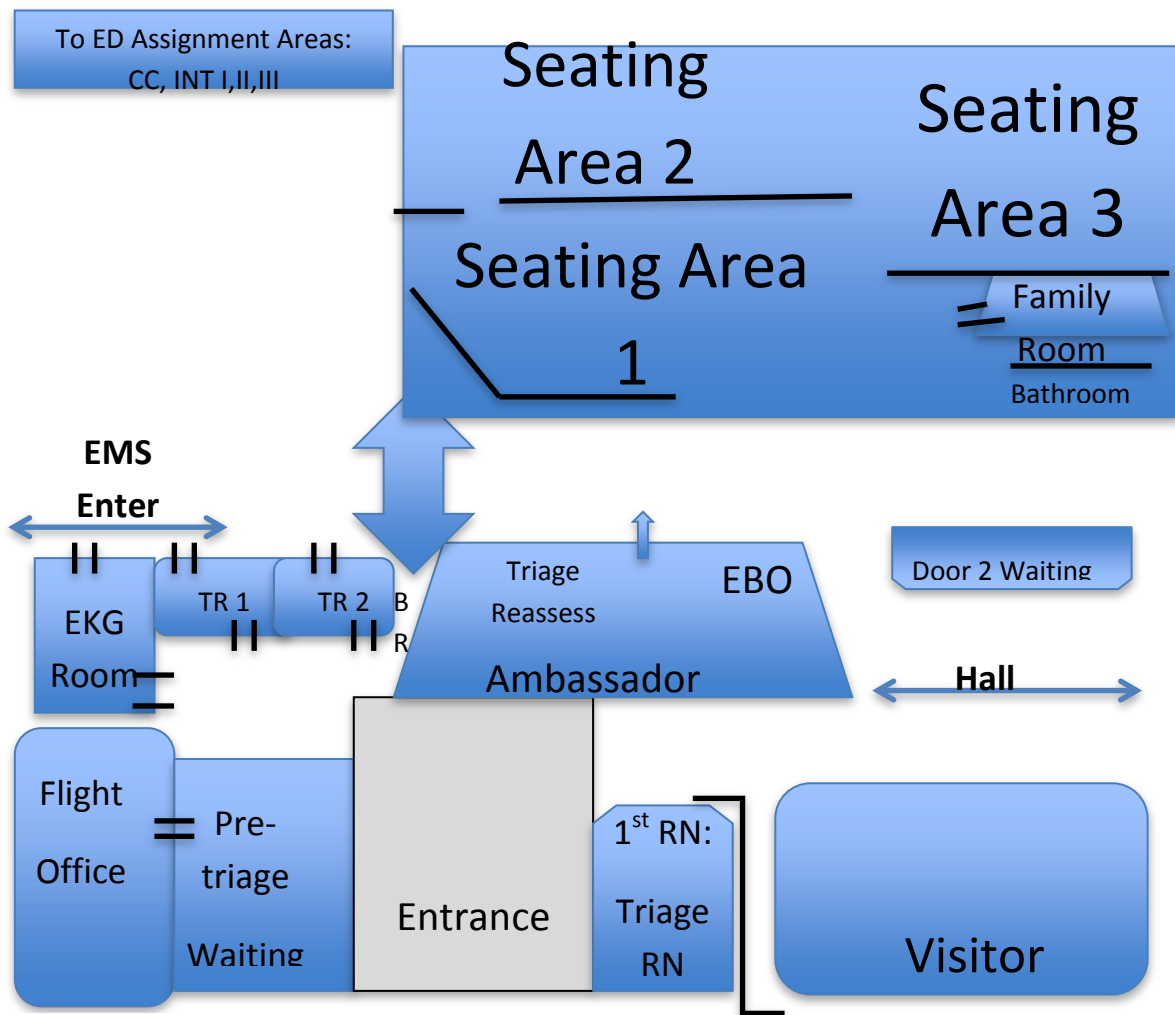
Figure D.1.   ED Diagram of Patient Flow

Reassessment Triage RN Note in WellSoft

Nurse_Note:

REASSESSMENT TRIAGE

PHYSICAL_EXAM:

GENERAL_APPEARANCE: (adult) - alert, oriented_X_3, no_obvious_discomfort.

Condition now: unchanged *or* now much worse *or* now worse *or* now improve *or* now gone

NURSING_INTERVENTION: none *or choose one from the following available options*

Triage disposition options:

Pt aware of potential waiting time * Pt escorted to ed bed and list number

Pt transported to x-ray/CT/etc. via wheelchair, etc. * Charge nurse notified * ED MD notified

Triage interventions options:

Dressing (pressure)* Dressing (sterile) * Extremity elevation *

Ice pack applied to affected area – *fill in* * Motrin dose given PO * None *

Pt refused pain medication * Splint applied to affected area * Tylenol dose given PO *

Wheelchair provided

The common protocols utilized for patient complaints at the project site.

Table F.1.

ED Protocols for Specific Complaints

Complaint	Protocol
Abdominal Pain/ Nausea and Vomiting	· IV line with normal saline (NS) fluid at 1,000mL over one hour · Collect rainbow of blood tubes, complete blood count (CBC), comprehensive metabolic panel (CMP), urinalysis (U/A), (urine-HCG in females of childbearing age), Lipase if age >18 · Zofran 4mg IV push (IVP) · If mild nausea may offer Zofran 4-8mg tablet by mouth (PO) or orally disintegrating tablet (ODT) · For pediatric patients, the dosing of Zofran is: (<8kg: Dosing not established/contraindicated) 8-15 kg: 2mg PO once 15-30 kg: 4mg PO once >30 kg: 8 mg PO once
Shortness of Breath/Dyspnea	-IV line with NS at keep vein open (KVO) -Oxygen at 2 liters/minute -Echocardiogram (EKG), chest x-ray (CXR) (portable if non-ambulatory) -Collect rainbow, CBC, basic metabolic panel (BMP), (add Cardiac Enzyme Series and b-type natriuretic peptide (BNP) if associated chest pain/discomfort or history of congestive

	heart failure (CHF); blood cultures times two if temp. > 101/5) -Nebulizer therapy with albuterol 2.5 mg/atrovent 0.5 mg

Back Pain	-**Acetaminophen 650 mg and/or ibuprofen 400 mg PO X one** -**If pain > 6 on pain scale, may offer Toradol 60 mg intramuscular (IM) injection X 1** -**Urine-HCG in females of childbearing age, U/A (if pain is acute and/or traumatic)** -**If history/findings correlating with real colic, may place peripheral IV and hang 1 liter of NS to be run in over one hour and administer Toradol 30 mg IV**
Dysuria:	-U/A; urine-HCG in females of childbearing age -In Males, deliver male deoxyribonucleic acid (DNA) probe to bedside -If temperature > 101.5, give Tylenol 650 mg PO or per rectum (PR) and place IV with NS at KVO
Headache:	-Acetaminophen 650 mg and/or ibuprofen 400mg PO X one -If pain > 6 on pain scale, may offer Toradol 60 mg IM X 1 -If temperature > 101.5 or is described as "worst headache of life", place IV with NS at KVO, collect rainbow, CBC
Sore throat/earache	-If age > 12, acetaminophen 650 mg and/or ibuprofen 400 mg PO X 1; if age less than 12, Tylenol and/or Motrin protocols -If suspected strep exposure and/or temp. > 101.5, obtain Strep ID Group A swab
Allergic Reactions	-For patients with mild to moderate symptoms (i.e. NO complaints of dyspnea, shortness of breath, airway involvement or chest pain): Benadryl 50 mg and Zantac 150 mg by PO -For patients with severe symptoms (possible airway involvement/chest pain): IV line with NS at 1,000 mL over one hour, Solumedrol 125 mg IV, Benadryl 50 mg IV and Zantac 50 mg IV
Chest Pain:	-(Pertains only to patients > age 35 unless prior history of acute severe

	cardiovascular disease (ASCVD) -Oxygen at 2 liters/minute -Cardiac Monitor -IV line with NS at KVO -Collect rainbow, CBC, BMP, Cardiac Enzyme Series, portable CXR -Two baby ASA po, nitroglycerin (NTG) 0.4 mg sublingual (subL) X 1, may repeat every 5 minutes times two
Weakness/Syncope, Near-syncope:	· (Pertains only to patients >35 unless prior history of ASCVD, transient ischemic attack (TIA), or cerebral vascular accident (CVA) · EKG · IV line with NS at KVO · Collect rainbow, Cardiac Enzyme Series, CBC, BMP · Bedside Blood Glucose check · Urine-HCG in females of childbearing age
Seizure	· Dextrostick · IV line with NS at KVO · Collect rainbow, CBC, BMP, serum level of any identified anticonvulsant agent if routinely available (e.g. Dilantin (phenytoin), Tegretol (carbamazepine), Depakote (valproic acid), phenobarbital – if uncertain as to availability of test, check with physician · Urine-HCG in females of childbearing age
Depression / Mental Health / Substance Abuse / Intoxication	· If known or suspected intoxication or history of substance abuse: urine drug screen (UDS), serum alcohol level · Collect rainbow · Urine-HCG in females of childbearing age
Epistaxis	· Nasal clamp applied to nares for 15 minutes · Ear nose throat (ENT) tray to bedside · Neo-synephrine spray, 4% topical cocaine, headlamp to bedside
Eye injury/pain	· Visual acuity recorded on chart · Tetracaine, fluorescein strip, Wood's lamp to bedside

Extremity Injuries (excluding pelvis/spine)	· Acetaminophen 650mg and/or Ibuprofen 400mg PO X one; if patient >12 years old, may offer Toradol 60mg IM once. If child <12 years old, Tylenol and/or Motrin protocol · X-Rays of affected joint / extremity · If open soft tissue injury (abrasions, lacerations): clean with saline and apply sterile gauze loosely to wound(s). If >10 years since last tetanus immunization, administer TD 0.5mL IM once.
Pelvic Pain / Female GU	· U/A; if childbearing age and no confirmed history of hysterectomy, urine-hCG · Vaginal/gynecological setup; DNA probe and wet prep to bedside · If history is positive for menorrhagia (prolonged, >7 days, or heavy, >80mL of blood loss, AND has abnormal VS, then establish peripheral IV and collect rainbow.
Hyperglycemia/Diabetes Mellitus with documented blood glucose level of >400	· IV with NS x 1 Liter over one hour · CBC, BMP, U/A, (with urine-HCG if appropriate), serum ketones · If nauseous, may give Zofran 4mg IV
Pain (any site/cause)	· Adults: May give Ibuprofen 400mg and/or acetaminophen 650 mg PO · Pediatric Patients (age 2 and older): May give Tylenol/acetaminophen 15mg/kg PO or Motrin/ibuprofen 10 mg/kg PO
Influenza (suspected exposure)	· Provide patient with surgical mask · Obtain flu swab
Antipyretics for Fever	For adults (age >12): · If temp is between 100.4 degrees F and 102.5 degrees F, may give acetaminophen 650mg PO/PR and/or ibuprofen 400mg PO/PR For pediatric patients (age <12) · If temp is between 100.4 degrees F and 102.5 degrees F, may give acetaminophen 10-15mg/kg po/pt or 15-20mg/kg PR and/or ibuprofen 5mg/kg PO/PR · Pediatric patients should never receive

	a dose of medication that exceeds the recommended adult dose
Sickle Cell Crisis Pain	· Oxygen at 2 liters/min; continuos pulse oximetry · Establish peripheral IV (may access port if present); administer IVF as: NS 500mL bolus then at KVO rate · Collect rainbow of blood for labs: CBC, BMP, Absolute Reticulocyte Count · If patient complains of chest pain and/or has O2 sat <95% on room air, obtain EKG, Chest X-Ray, Cardiac Enzyme Series, and BNP · For pain, unrelieved by acetaminophen or ibuprofen, may administer Toradol 30mg IV and/or morphine sulfate 2-4mg IVP (Confirm all allergies prior to administering Toradol or morphine; check with MD before administering morphine)
Elderly patient (age >65) with Fever (>100.5 o F)	· IV line with NS @ KVO · Collect rainbow of blood for labs: CBC, BMP, Blood cultures x2, UA with culture if indicated · Chest X-Ray · Administer antipyretics per guideline stated previously
Laceration	· If possible foreign body, X-Ray of involved part to r/o foreign body · Suture tray set-up · Tetanus IM if last immunization > 5 years (dirty wounds) or >10 years (clean wounds)
Red Swollen Extremity (Atraumatic to rule out Deep Vein Thrombosis (DVT)	· Collect rainbow of blood for labs: CBC, international normalized ratio (INR)/partial thromboplastic time (PTT), D-Dimer · Analgesics as needed as stated in previous guideline
Pediatric Wheezing /shortness of breath (age <2 years)	· Nebulizer therapy with albuterol 2.5mg · Chest X-Ray posterior-anterior (PA)/Lateral (If not obtained in previous 2 weeks) · Respiratory syncytial virus (RSV) (If

not obtained in previous 2 weeks)

Inclusion and Exclusion Criteria of Articles Searched

Inclusion Criteria	Rationale	Exclusion Criteria	Rationale
ED setting for triage assessments	The PICO question focused on the ED setting for all triage assessments,	Patients triaged by ED doctors or paramedics	The focus of this literature search was the accuracy of the initial triage assessment completed by the nurse.
Adult population	The PICO question did not focus on pediatric or elderly patients because specialty populations are considered differently during triage	Articles that were not pertinent to the accuracy of the initial triage assessment	Specific triage scales, the accuracy of specific triage scales, ways to improve wait times in the ED, or how to implement protocols were not the focus of the PICO question.
English language	The author had proficiency in the English language and did not have multilingual abilities.		
Studies published within the last ten year period	To ensure the most recent knowledge was used in relevance to answering the PICO question		

Search Engines Utilized with Number of Results for Each Site

<u>**CINAHL and Medline (EBSCO):**</u>

Keyword combinations	Results
Emergency department (title) and triage (title) and accuracy (abstract)	10
Emergency department and triage (all in title)	10
Emergency department and triage (all text)	10
Triage (title) and emergency department (title) and accuracy (field)	10
Accuracy and triage and emergency department (all in title)	6
Standing orders and triage (title) and emergency department (title)	1
Triage protocols and emergency department (title)	10
Triage protocols and emergency department (all text)	10
Wait times and emergency department (all text)	10
Protocol and triage and emergency department	5
Interventions and triage and emergency department (all text)	1793
Emergency department and Emergency Severity Index	22

Cochrane library:

Keyword Combinations	Results
Emergency department and triage (title, abstract, keyword)	1 (other reviews)
Emergency department (title, abstract, keyword) and triage (title, abstract, keyword) and accuracy (abstract)	5 (controlled trials)
Emergency department and triage (title, abstract, keyword)	63 (controlled trials)
Emergency department (title, abstract, keyword) and triage (title, abstract, keyword) and accuracy (abstract)	2 (controlled trials)
Emergency department and triage (title, abstract, keyword)	1 (methods studies)
Emergency department (title, abstract, keyword) and triage (title, abstract, keyword) and reliability (abstract)	4 (controlled trials)

Joanna Briggs institute:

Keyword combinations	Results
Accuracy of emergency department triage assessment	6
Emergency department triage assessment – accurate	16
Emergency department and triage acuity	35

ISI Web of Knowledge:

Keyword Combinations	Results
Emergency department (title) and triage (title) and accuracy of patient acuity (topic)	1
Emergency department and triage (all in title)	196
Emergency department (title) and triage (title) and accuracy and reliability of triage (topic)	5

OVID:

Keyword Combinations	Results
Emergency department and triage and accuracy (keyword)	6
Emergency department and triage and accuracy (all in title)	0
Emergency department and triage assessment and accuracy (keyword)	22,533
Emergency department triage	151
Accuracy of emergency department triage	1
Emergency department and triage all text	12673 results, but when were limited to past ten years – 9860 and when limited to title – 0 results

ProQuest Dissertations and Theses:

Keyword Combinations	Results
Emergency department (title) and triage (title) and accuracy or reliability of triage assessment (abstract)	0
Emergency department (title) and triage (title) and accuracy or reliability (keyword)	2
Emergency department (title) and triage (title) and accuracy or reliability (document text)	2
Emergency department (title) and triage (title) and accuracy or reliability (abstract)	0
Triage (title) and accuracy or reliability (title)	0

PubMed-Medline:

Keyword Combinations	Results
Emergency department and triage (all in title)	265

Keyword Combinations	Results
Emergency department and triage and accuracy (all in title)	2
triage acuity software	8

Agency for Healthcare and Research Quality (AHRQ):

Keyword Combinations	Results
Emergency department triage accuracy (keyword)	15
Emergency department accurate triage assessments and acuity level (all in title)	1
Emergency department accurate triage assessments	127
Triage assessment accuracy (keyword) and adult to middle age (age of target population) and emergency medicine (clinical specialty)	18

American College of Emergency Physicians (ACEP):

Keyword Combinations	Results
Accuracy of emergency department triage assessments	19

Centers for Disease Control and Prevention (CDC):

Keyword Combinations	Results
Emergency department accuracy of triage assessments	261
Emergency department accuracy of triage assessments completed in hospital setting	218
Emergency department triage assessment and acuity accuracy	66
Triage assessment accuracy in emergency department (keyword)	386

Google Scholar:

Keyword Combinations	Results
Emergency department accuracy or acuity level (title searches) or triage assessment (exact phrase)	3
Emergency department and accuracy or acuity level or triage assessment (exact phrase)	267

The Federal Emergency Management Agency (FEMA):

Keyword Combinations	Results
Emergency department triage assessment	9
Accuracy of emergency department triage assessment (all in title)	0

SIGN 50 Levels of Evidence

Level	Description of Evidence
1+	Well-conducted meta-analyses, systematic reviews or RCTs with a low risk of bias
1-	Meta-analyses, systematic reviews, or Random Control Trails with a high risk of bias
2++	High quality systematic reviews of case control or cohort studies
2+	Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
2-	Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not casual
3	Non-analytic studies, e.g. case reports, case series
4	Expert opinion

(*SIGN 50: A guideline developer's handbook,* 2011)

Abbreviations and Acronyms

ADAPT – Adaptive Process Triage scale

ADN – Associate Degree in Nursing

ATS – Australian Triage Scale

BSN- Bachelor of Science in Nursing

CAEP – Canadian Association of Emergency Physicians

CC – Chief Complaint

CTAS – Canadian Triage and Acuity Scale

DMP – decision making process

ED – Emergency Department

EKG – Electrocardiogram

EMS – Emergency Medical Services

EMTALA – Emergency Medical Treatment and Active Labor Act

ENA – Emergency Nurses Association

ESI – Emergency Severity Index

HTS – Hospital Triaging Systems

ITS – Ipswich Triage Scale

MSN – Master of Science in Nursing

MPL – medical priority level

MTS – Manchester Triage Scale

NENA – National Emergency Nurses Affiliation

NR – Trained Nurse Reviewer

NTS – National Triage Scale

N/V – Nausea and Vomiting

NYC – New York City

PASW

PMH – Past Medical History

PO – by mouth

pt – patient

RCT – Random Control Trial

RM – Master's Prepared Emergency Department Nurse

RN – Registered Nurse

RTS – Revised Trauma Score

S1 – Section One

S2 – Section Two

SPSS – Statistical Package for the Social Sciences

TT – Triage Team

USA – United States of America

VS - Vital Signs

The Unfreeze Stage Evidence Table of Selected Articles Related to Lewin's Change Theory

Table K.1. Unfreeze Stage Evidence Table

REFERENCE:	TYPE OF STUDY QUALITY SIGN RATING	METHODS	THREATS TO VALIDITY & RELIABILITY	FINDINGS	CONCLUSION
Aacharya, et al., 2011	Ethical Analysis / 3	- Ethical analysis of ED triage system - Respect for autonomy, beneficence, nonmaleficence, justice were the four biomedical ethical principles reviewed - A care ethics perspective review was also completed	- Do not offer a comprehensive ethical review	- Due to ED triage, medical care may potentially lead to adverse effects like a delay in care, privacy and confidentiality compromise, poor physician - pt communication, failure to provide necessary	Propose a clinically and ethically based framework of ED triage planning, from a comprehensive ethics perspective that includes both an care-oriented and principles based approach - ED staff work in a high stress,

Reference:	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
				care, having to decide whose life to save, when saving everyone is not an option - Extended wait times in the ED can lead to an unintentional suffering - ED triage scales are developed to avoid harm	traumatic at times, and ethically sensitive environment – ED staff need educational, psychological, and ethical support to have a clinical-ethical based triage system and planning.
Andersson, et al., 2006	Qualitative / 3	-Completed at a rural ED in Sweden - TT consisted of nurses from 0700-2200 - TT followed a priority model and pts should have been prioritized within	- Triage was not utilized between 2201-0659 - Lengths of	- Observations revealed an understand-ing of the	- Triage is a complex activity - The TT prioritizes pts

Reference:	Type of Study Quality Sign Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		ten minutes of arrival - Study divided into two sections, S1=pts priority 2, S2=pts priority 1 and 3 - Study involved an observation and an interview process	experience and training as a nurse varied among the TT - Exclusion of priority 1 pts - Small sample size of 19 RNs - Observational study and the TT could have acted differently than normal because they were being observed	various aspects involved in the DMP during triage - Interviews revealed debating points on the DMP and pts MPL by the TT - Several factors are important and considered when the TT assigns the MPL to pts	based on various, nonhierarchical factors that can be divided into two categories, internal and external factors - These two factors serve as a basis for the triage assessment -Internal factors include the TT''s skills and personal capacity

Reference:	Type of Study Quality Sign Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
					-External factor includes the work environment -The pt's MPL is assigned by the nurse taking into consideration the pt's clinical condition, pertinent PMH, and potential examinations and tests
Castner, et al., 2011	Cross-sectional	- Descriptive, cross-section survey design	- A convenience	- Triage is completed in	- RNs feel they collect

Reference:	Type of Study Quality Sign Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
	analysis / 3	- N=430 - Questionnaire was developed by ED RNs and managers from their experience the data collected during triage and placed it into categories and presented in a 5 point Likert-type response survey - Survey asked RNs to rank how often they collected certain types of data -Survey asked RNs how important they felt each data point was to triage -Survey asked open ended questions - PASW 17.0 software analyzed the data	sample selected the nurses for the survey from an ENA mailing list - 27% response rate -Only included RNs in NYC and may not pertain to other locations - No reliability or criterion-validity of the survey tool - Subjects' perceptions and not their actions were measured	a designated area (76%) - RNs initiate protocols (54%) - Most important data to collect was VS, allergies, pain score, PMH - Least important data to collect was existing vascular access, last PO intake, height, skin and wound	and record a lot of data in triage that is not pertinent to the pt's acuity level - RNs also feel all of the data collected and recorded in triage is important - More investigation is needed to provide a pt centered triage and healthcare system delivery

REFERENCE:	TYPE OF STUDY QUALITY SIGN RATING	METHODS	THREATS TO VALIDITY & RELIABILITY	FINDINGS	CONCLUSION
			- Positive skewed results indicates potential bias towards positively worded questions - Unsure if RNs understood the term triage due to extended triage times reported	assessment - Mean triage time is 9.03 minutes	
Dallaire, et al., 2012	Cohort study / 2-	- Prospective study design - Sample included 100 pts with mode of arrival as EMS from December 2006-March 2007 - From the voluntary participation of ED RNs, each EMS pt was triaged	- Only five RNs were studied - Data was from the same hospital	- Each of 5 RNs took less than three hours to assign CTAS acuity levels	- Inter-rater agreement was moderately low and could mean

REFERENCE:	TYPE OF STUDY QUALITY SIGN RATING	METHODS	THREATS TO VALIDITY & RELIABILITY	FINDINGS	CONCLUSION

		using the CTAS and data was compiled using the ED hospital software (SIURGE Logibec Groupe Informatique Ltee, Montreal, QC, Canada
		- 100 written scenarios were yielded from the pt sample population
		- Scenarios included:
		  a. Gender
		  b. Age
		  c. CC
		  d. VS
		  e. PMH
		  f. Allergies
		  g. Medications
		  h. RTS
		- Five Experienced ED RNs from the same hospital were selected to review the scenarios and blindly assigned an triage acuity level using CTAS without knowing what acuity level their peer previously had assigned
			setting
			- Only pts arriving by EMS were included
			- The 5 RNs assigned triage acuity ratings to written scenarios instead of live cases, and may not accurately reveal an emergency situation
			- The written cases were derived from pts' charts and RNs do not always chart
				to the 100 scenarios, which is less time than the CTAS guidelines recommends, with CTAS recommending five minutes per pt
				- Overall inter-rater agreement was moderate with kappa value of 0.44
				- Paired RN agreement values ranged from fair to
					the CTAS triage method is not reliable
					- Further research needs to be completed on the reliability of the CTAS when used over and over by the same individual
					- Further research is also warranted in other situational results of experienced RNs

REFERENCE:	TYPE OF STUDY QUALITY SIGN RATING	METHODS	THREATS TO VALIDITY & RELIABILITY	FINDINGS	CONCLUSION

		- RN agreement values were measured using the kappa statistic calculated with quadratic weights
		- Kappa values were drawn for the ten pair of RNs and a global Kappa coefficient was calculated to measure overall inter-rater agreement
		- Kappa agreement defined as:
		  a. Very good (0.81-1.00)
		  b. Good (0.61-0.80)
		  c. Moderate (0.41-0.60)
		  d. Fair (0.21-40)
		  e. Poor (<0.20)
		- Statistical analysis were completed using SAS version 9 software
		-See Results below:
		
		| RN
			1	2 |
				|---|---|---|
				| 1 | - | 0.30 (0. 0.40) |
				| 2 | - | - |
					all information collected	good with kappa values of 0.3–0.61 – The p-value for the chi-square test of homogeneity was p=0.0013, indicating the observed variation was statistically significant	

Reference:	Type of Study Quality Sign Rating	Methods			Threats to Validity & Reliability	Findings	Conclusion
		3	-	-	-	0.49 (0.35–0.64)	0.44 (0.26–0.60
		4	-	-	-	-	0.42 (0.28–0.56)
Göransson, et al., 2006	Case control / 2-	- 78 directors of different Sweden EDs were asked to participate in study - 62%, 48 ED directors, agreed to participate - 423 RNs from 48 different EDs in Sweden independently triaged 18 pt case scenarios - Two RNs & one physician, experienced with ED triage & developing educational pt scenarios, wrote the 40 case scenarios - Scenarios included Pt age, gender, and appearance; Pt chief complaint and their perception of their illness upon meeting the ED triage RN; VS; RN assessment area to be completed and filled in by the participant using			- Convenient sampling for participation of the RNs - 29% of RNs agreed to participate - RN participants did not use the CTAS on a daily basis prior to the study - 56% of the case scenarios were either	- 58% of the triage ratings among the RNs were accurate overall - 22% to 89% of the triage ratings were accurate amongst each RN - In 50%-69% of the cases, 60.9% were accurately	- Intrapersonal characteristics, such as decision making processes, may play a role in triage accuracy - A small correlation was seen amongst triage accuracy and those RNs with more

Reference:	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		CTAS - After completion of the scenarios, each participant answered an 11 question survey concerning their personal characteristics - Data collectors, participated in a survey concerning each the sampling process and each ED organization - CTAS was the chosen triage assessment tool used for the study - Another group of experienced ED triage RNs and one physician independently triaged each case scenario for reliability and validity	high or low acuity - Study was scenario based - Perception through readings may have affected the participants' decision	triaged - No relationship was found between a RN's personality and their ability to triage	general nursing -Further research with an emphasis on the decision making process should be utilized to identify and describe a RN's characteristics
Göransson, et al., 2008	Descriptive and comparative study /3	- "Think aloud method" for data collection - Descriptive and comparative design used from data collection in 2004-2005 previous study - Content analysis of data was	- Patient scenario based, not real life situations when triage accuracy	- RNs used numerous different thinking strategies while	- Triage decision making is a complex because of the various

REFERENCE:	TYPE OF STUDY QUALITY SIGN RATING	METHODS	THREATS TO VALIDITY & RELIABILITY	FINDINGS	CONCLUSION
		completed - Purposive sampling was used to select 16 RNs participants from a previous sample of 423 RNs. From previous study, those RNs with the highest and lowest triage accuracy scores were selected, eight RNs from each group were selected to participant in this study - Five pt scenarios were developed and used in the study	decisions occurred - Lack of contextual information, ex. Staffing of RNs and pts waiting to be triaged - Imaginary pts; RNs could not ask more in depth questions or could not recheck VS.	triaging, searching for information, generating hypothesis, stating their assumption - RNs structured their triage process differently; some assigned acuity level first, while others collected data or made a hypothesis first - There was	thinking strategies used by RNs while in triage - RN managers need to be contentious about what RNs they place in triage because of the complex thinking strategies and the indefinite skills needed for an accurate assessment

Reference:	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
				little difference in the acuity levels in this study (thinking strategies and triage structure) when compared to the older study	- Further research is needed to determine which thinking skills used in triage is most important - Further research is also needed to see how education and contextual information plays a role in triage
Göransson, et al., 2011	Case analysis / 3	- 19 pt scenarios were triaged in 2006 by 45 RNs using one triage scale - The same pt scenarios were triaged in 2008 by 30 RNs using ADAPT	- Small RN rater participation - Small	- RN agreement (k value = 0.529 vs. 0.472)	Numerous pts were triaged as both stable and unstable

REFERENCE:	TYPE OF STUDY QUALITY SIGN RATING	METHODS	THREATS TO VALIDITY & RELIABILITY	FINDINGS	CONCLUSION
			number of pt scenarios was used - RNs were not familiar with ADAPT - Newly employed RNs - Scenario based study	between the two scales were not significantly different (P=0.65) - 74% of pt scenarios were not allocated a triage level with ADAPT - RNs need to feel the triage scale is accurate	using - Revision of ADAPT algorithm is needed - Both triage scales showed a moderate RN agreement between triage levels
Grouse, et al., 2008	Case analysis / 3	- 50 pt case scenarios were derived from 50 ed pt charts - MTS was the triage scale used in the study - 20 RNs, trained in MTS, were	- Small study at a single institution - Study was scenario based	- The range of kappas was 0.4007 to 0.8018 - The median	- MTS is a reliable triage system to be used in the ED

REFERENCE:	TYPE OF STUDY QUALITY SIGN RATING	METHODS	THREATS TO VALIDITY & RELIABILITY	FINDINGS	CONCLUSION
		invited to participate - Weighted kappas was calculated for each pair of raters - The original triage acuity was removed and each RN independently assigned a MTS acuity	not face to face encounters with pts	kappa was 0.6304	
Ineke & Stel, 2009	Comparative study / 2-	-Systematic literature search -Three online databases - Search engine An alternative kappa weighting scheme was developed -Kappas of previous conducted reliability studies were recalculated		-Kappa is the most frequently used statistic in triage-reliability studies (n 5 33) -Linear and quadratically weighted kappa do not reflect mistriage -Kappa was lower than	-No existing studies on reliability of triage systems account for mistriage. -Using triage-weighted kappa, which reflects severity of mistriage shows that the reliability of triage

Reference:	Type of Study Quality Sign Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
				reported with a mean difference of 0.17 (range: 0.04e0.32)	systems is lower than reported.
Swailes, et al., 2009 doi: 10.1016/j.jen.2009.05 .010	Descriptive compara-tive design / 2+	- Assessed for significant differences between the 4-level and 5-level triage systems - Focused on treatment order & administration for patients complaining of severe (>8/10) abdominal pain - Participants completed a computer-based Human Subjects Protection training module - EMR extracted data -The following data were collected: account number, Date of visit, sex, age, ethnicity, time of triage, pain scale rating at triage, triage category, and time of order and	- Not all patients who presented for abdominal pain were used in the study	- There were 684 medical records: 210 in pre-ESI, 178 in ESI stage 1, and 296 in ESI stage 2 - Demographic data was assessed for significant differences between the 3 stages	- The implementation of the ESI triage system had no effect on the overall time from triage to treatment order or from triage to treatment administration in this sample - Despite

REFERENCE:	TYPE OF STUDY QUALITY SIGN RATING	METHODS	THREATS TO VALIDITY & RELIABILITY	FINDINGS	CONCLUSION
		administration of treatment - Criteria for selection included: patients >18 years of age & complaining of abdominal pain with intensity >8/10 - Patients had to be ambulatory, awake, A&Ox3, and able to communicate upon arrival - Psychiatric patients were excluded from the sample because these conditions could affect self-report of pain level - Language line phones were used with non-English speaking patients - After initial ESI implementation period, charts were reviewed for compliance & found that triage RNs were not including the patients' self-report of pain when determining acuity levels. - A second stage of ESI implementation was started with		- Normally distributed data were tested for significance using one-way analysis of variance - Categorical variables were tested using x2 - Time to treatment order, time to treatment administration, & time between order and administration for ESI	fluctuations in daily volume over the 3 study stages, when the model was adjusted for volume, time from triage to treatment order and time from triage to treatment administration were no different - Prior to the 5-level ESI triage system implementati

REFERENCE:	TYPE OF STUDY QUALITY SIGN RATING	METHODS	THREATS TO VALIDITY & RELIABILITY	FINDINGS	CONCLUSION
		changes made to the ED EMR that addressed the discrepancy - The pain assessment box was moved to a more prominent space in the objective assessment, and further data entry was blocked until a pain level was recorded. - A self-reported pain score of 8/10 triggered a red flag icon that alerted the charge RN of a patient c/o severe pain. The red flag icon remained until a provider made an entry in the EMR. - Then data therefore was collected in 3 intervals: pre-ESI, ESI stage 1, & ESI stage 2.		stages were compared using the general analysis of covariance (AOCV) - Time from triage to treatment order and from triage to treatment administration for ESI levels were compared using both a 2 sample t test and analysis of covariance	on, times from triage to treatment order and from triage to treatment administration were no different between patients triaged as "urgent" and "urgent stable." -Stage 1 ESI and stage 2 ESI, patients who were classified as ESI level 2 had

Reference:	Type of Study Quality Sign Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
				- Linear regression was run to determine which factors (sex, age, ethnicity, pain scale rating, or triage category), if any, had a relationship with the time from triage to treatment order or from triage to treatment administration - A log	significantly shorter times to treatment order and administration than did those triaged as ESI level 3 (see Table 3) - The 5-level ESI triage system was a successful method for getting level 2 patients to treatment more quickly compared with the previously used 4-level

REFERENCE:	TYPE OF STUDY QUALITY SIGN RATING	METHODS	THREATS TO VALIDITY & RELIABILITY	FINDINGS	CONCLUSION
				transformation was completed on the data because not all assumptions of linear regression were met. - P values less than .05 were considered statistically significant - Sex was similar across the 3 data collection stages - ESI stage 2	system - pre-ESI period, 68% of patients complaining of severe abdominal pain were classified using the 4-level triage scale as "urgent." - During stages 1 and 2, 10% of patients complaining of severe abdominal pain were triaged to ESI

REFERENCE:	TYPE OF STUDY QUALITY SIGN RATING	METHODS	THREATS TO VALIDITY & RELIABILITY	FINDINGS	CONCLUSION
				patients were younger than patients within the ESI stage 1 group (P = .0467). - Significant differences also existed in the distribution of race between all of the stages (P = .0367) - Regression model showed that different factors had a relationship	level 2, with 90% assigned to ESI level 3. - Triage nurses assessed patients using both a 3-stage system and 5-level ESI - Informal comments indicated a trend for the emergency nurses to "triage the room," which is described as an

REFERENCE:	TYPE OF STUDY QUALITY SIGN RATING	METHODS	THREATS TO VALIDITY & RELIABILITY	FINDINGS	CONCLUSION
				with time to treatment order in ESI stage 2 compared with factors affecting the pre-ESI stage - In the pre-ESI stage, with every 10 years added to a patient's age, patients can expect their average time from triage to treatment order to decrease by 7.5%,	awareness by the triage nurse of volume within all areas of the emergency department, which could affect triage decisions - Further research is needed to investigate the reason for a decrease in acuity assignment after implementing the ESI triage

Reference:	Type of Study Quality Sign Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
				assuming that all else was equal (P < .0005). - In stage 2 ESI, with every 10 years added to a patient's age, patients can expect their average time from triage to treatment order to decrease by 3.9%, assuming that all else was equal (P = .0018).	system - Front-line emergency nurses must demonstrate accurate and consistent triage abilities, focusing foremost on patient presentation - Achieving staff engagement requires great care and a significant amount of time in the pre-

Reference:	Type of Study Quality Sign Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
				- Patients who had an acuity level of 2 can expect their treatment order to be placed 39.7% faster relative to patients who had an acuity level of 3 (P < .0005). - Male patients can expect their treatment order to be placed 8.4% faster relative to female	implementation phase - The ESI triage system is a viable tool for improvement of patient care in the emergency department - Users must fully embrace ESI for it to be most beneficial.

REFERENCE:	TYPE OF STUDY QUALITY SIGN RATING	METHODS	THREATS TO VALIDITY & RELIABILITY	FINDINGS	CONCLUSION
				patients (P = .0471). - For stage 2 ESI, acuity and sex had a significant relationship with time from triage to treatment administration - Male patients could expect their time from triage to treatment administration to be 6.4% faster relative to female	

Reference:	Type of Study Quality Sign Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
				patients (P = .0484). - Before ESI was implemented, times from triage to treatment order and from triage to treatment administration were no different between the acuity levels ("urgent" and "urgent stable")	
Wuerz et al., 1998	Experimental / 2-	- 2-phase experimental study of triage nurses' and EMTs' ratings for 5		Eighty-seven participants	Triage assessments

Reference:	Type of Study Quality Sign Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		scripted patient scenarios - Used in-person interviews and follow-up written surveys		(>90% of those eligible) with 55 (63%) completed both phases of the study - Inter-rater agreement on triage category was poor (κ=.347 overall) - 13 of 55 (24%) participants rated the 5 cases the same severity in both phases -Kendall	(both inter-rater and intra-rater) by experienced personnel are inconsistent using these 5 standardized patient scenarios. These results challenge the reliability of current ED triage practice.

REFERENCE:	TYPE OF STUDY QUALITY SIGN RATING	METHODS	THREATS TO VALIDITY & RELIABILITY	FINDINGS	CONCLUSION
				correlation (τ-B) comparing phases 1 and 2 varied from .145 to .554. -Estimates of admission probability varied -Estimates of the appropriate time to physician evaluation (from immediate to 24 hours) were not reflective with severity	

Reference:	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
				ratings. There was good agreement on estimated need for an ED monitored bed or diagnostic studies.	

The Change Stage Evidence Table of Selected Articles Related to Lewin's Change Theory

Table L.1. Change Stage Evidence Table

Reference	Type of Study Quality SIGN Rating	Methods	Threats To Validity/ Reliability	Findings	Conclusions
Cooper, 2004	Case scenarios / 3	- Hypothetical scenarios presented either on paper or on a computer with a photograph, the visual cues provided by the addition of a photograph	- The cases presented on paper were not the same as those presented on the computer	- When visual aid was presented with the scenario the inter-rater agreement increased	- Mode of delivery of information is important
Farrohknia et al., 2011	Systematic review / 1-	- Systematic search of the international literature published from 1966 through March 31, 2009 explored the British Nursing Index, Business Source Premier, CINAHL, Cochrane Library, EMBASE, and PubMed.	- Limited to adult patient population - Only looked at EDs and not other facilities of continuum of care	- Most of the studies that investigated associations between different vital signs or chief complaints and mortality after ED arrival were observational cohort studies based on selected, diagnosis-specific, patient groups. - All 11 articles	- Triage systems are supported with limited evidence - Validity of scales was not reviewed - No gold standard of process was found

Reference	Type of Study Quality SIGN Rating	Methods	Threats To Validity/ Reliability	Findings	Conclusions
				that were found to answer the question concerning reliability of triage scales and met the defined inclusion criteria were observational studies. - None of the studies reported on hospital admission rates adjusted for age and gender or mortality	
Garbez, et al., 2011 (2)	Case Analysis / 3/	- 18 RNs participated through convenience sampling recruitment - Two ED sites - ESI triage scale was utilized - If the RN assigned a Level 2 or Level 3,	- Convenience sampling of 13 experienced RNs, with four or more years of triage experience recruitment process was heavily weighed towards experienced	- 18 RN participation - 334 RN- pt interaction -Level 2 indicators based on RN influence were Pt age, VS, and pt urgency to be seen in a timely manner - Level 3	- Objective factors, from an experienced triage RN perspective, combined with factors already delineated in ESI Version 4, can lead to triage improvement in less experienced RNs - These identified

Reference	Type of Study Quality SIGN Rating	Methods	Threats To Validity/ Reliability	Findings	Conclusions
		then they completed a questionnaire as to what pt factors influenced their acuity level decision	RNs vs. the five RNs who had less than four years of experience - Participation in study was voluntary - No inter-rater reliability was assessed - Pt information was collected from the pt charts - RNs were aware they were being studied	assignment was decided based on potential number of resources	objectives also provide a foundation for data gathering and decision making processes used in ED triage - Larger studies need to be implemented to support this
Goransson, et al., 2005	Case Study / 3	- Swedish hospitals with somatically injured pts were identified (n=78) -A letter was sent to medical directors of all hospitals for permission to conduct the study	-Convenience sampling method - Only 29% of ED RN population participated - Triage scale, CTS, utilized in study was not well known by RNs in the	- 4 geographical types of hospitals participated in study, university, county, regional, and local/ general - 57.7% of the acuity ratings were in concordance with the expected outcome	- Out of 7,550 pt acuity ratings, there was a large amount of variability between the RNs - Patient safety is questioned based on the results - Follow up is needed to develop a better understanding of the complex

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Reference	Type of Study Quality SIGN Rating	Methods	Threats To Validity/ Reliability	Findings	Conclusions
		- 30 hospitals declined to participate - Final hospital sample n=48 - Convenience sampling for RN participation (n=423) - 18 pt case scenarios were accessed - ED RN team wrote case scenarios	study - Study design was scenario based and RNs could not gain additional information when needed -Scenario information may be read differently than when experienced in real life	- 28.4% of acuity ratings were over triaged - 13.9% of acuity ratings were under triaged - Inter-rater agreement the triage decisions, (n=7550) was 0.46 and 0.71 - Not one triage scenario was assigned the same acuity level by all RNs	process of triage and to develop a better, uniformed and standardized system.
Eitel et al., 2008 doi: 10.1016/j.jen.2008.04.027	Case Review / 3	-Rationale for why the case was mis-triaged as a level 3 (non-urgent) case using a 3-level system and that should have been assigned to a level 2 acuity rating if the 5-level ESI triage system was used.		- With more and more patients are seeking care in the ED, it is imperative that the triage nurse listen closely to the patient's concerns and obtain objective data including vital signs and assessment of	The ESI is a valid and reliable triage tool that has been tested and evaluated in many different EDs -ESI is also used in other countries. - To maintain reliability and validity of the ESI across ED settings, it is important that

Reference	Type of Study Quality SIGN Rating	Methods	Threats To Validity/ Reliability	Findings	Conclusions
		Although the goal of the original scenario may have been to describe a patient in early sepsis who may have qualified as ESI level 2, the clinical information provided in the Journal of Emergency Nursing column did not support such a rating. - When comparing level 3 patients within a 3-level system, this would essentially equate to assigning a level 4 or 5 within ESI but definitely not to a level 3 patients in a 5-		findings to evaluate whether the patient is truly a high risk. - With limited space and limited beds, the triage nurse has to ask "would I give my last open bed to this patient?" - With the information provided in this case scenario, the answer is no.	emergency nurses follow the algorithm as developed. - Written and DVD training materials are available at no cost from the following Web site: www. ahrq.gov/research/esi

Reference	Type of Study Quality SIGN Rating	Methods	Threats To Validity/ Reliability	Findings	Conclusions
		level system. - By assigning ESI level 2 and require that we give our last monitored bed. - Treatment should begin within 2- 6 hours, but no standard currently exists.			
Howlett, et al., 2012	Case control / 2+	- EN was trained in CAEP and NENA materials and then triaged two separate months of ED pt charts, one year apart. - EN was blinded to the original triage score or the physician data - NR independently reviewed 128 random cases	- Retrospective study - No second independent observer for the pts - Did not consider accuracy from an outcomes perspective - The NR's ability to serve as the trainer and the gold standard was not tested	- Trial 1: 2838 pts - Trial 2: 3091 pts - CTAS 1: 0.14% (Trial 1) 0.23% (Trial 2) - CTAS 2: 5.3% (Trial 1) 4.4% (Trial 2) - CTAS 3: 36% (Trial 1) 39% (Trial 2) - CTAS 4:	- A quality review method for triage accuracy is achievable in a simple manner in most hospitals - The accuracy and reliability of the triage process overtime has been measured through this study - Five clinical indicators have been identified as to over 60% of ED visits - Training efforts of

Reference	Type of Study Quality SIGN Rating	Methods	Threats To Validity/ Reliability	Findings	Conclusions
		and using CTAS assigned a triage acuity level; this served as a proxy for accuracy of CTAS guidelines and was completed for inter-observer reliability - The results were compared using the weighted quadratic kappa	externally - The study was limited to one ED setting, not multiple hospitals	50% (Trial 1) 49% (Trial 2) - CTAS 5: 8% (Trial 1) 5.5% (Trial 2) - Insufficient data: 44.5% (Trial 1) 50.44% (Trial 2) - Inconsistent Triage (with sufficient data) 14% (trial 1) 16% (trial 2) - Weighted kappa was viewed as "good" strength of agreement in both trials 0.596 (trial 1) 0.604 (trial 2) - Weighted kappa for NR vs. inter-rater agreement was viewed "very good" strength, (0.94) - Absolute kappa	triage staff need to focus on the data collection and performance consistency of clinical indicators - A trained NR to review the triage cases and providing feedback to those RNs who triage, may be just as important as the CTAS education itself. - Further studies need to be implemented with standardized trainers and the audit/feedback loop, and correlation with outcomes in multiple hospital settings

Reference	Type of Study Quality SIGN Rating	Methods	Threats To Validity/ Reliability	Findings	Conclusions
				0.48 (trial 1) 0.49 (trial 2) Triage score higher than guidelines: 17% (trial 1) 24% (trial 2) Triage score lower than guidelines: 32% (trial 1) 33% (trial 2) - Five clinical indicators were documented in over 60% of all visits and are as follows: a. Pain scale b. Chest pain c. Musculoskeletal injury d. Respiratory illness e. Headache	
Worster et al., 2004	Randomized controlled trial /1+	- Ten triage nurses, were randomly assigned either to	- It was conducted with paper scenarios, not with real	- Number of years of nursing practice was the only significant	After 3 hours of training, experienced triage nurses were able to perform

Reference	Type of Study Quality SIGN Rating	Methods	Threats To Validity/ Reliability	Findings	Conclusions
		training in ESI version 3 or to refresher training in CTAS. - They independently assigned triage scores to 200 emergency cases, unaware of the rating by the other nurses. - The participants were selected by their respective nurse managers according to their availability to participate in this 2- day project. - All were trained and experienced in the use of CTAS prior to the study, but none were familiar with ESI.	patients. - The 200 cases used in this study were prospectively and randomly collected specifically for the purpose of the study. - There was only a single CTAS and ESI level 1 case scenario out of the 200 - The previous CTAS training and experience of the participants provided those in the CTAS group with an advantage.	demographic difference found between the 2 groups (p = 0.014). - There were no significant differences found between the 2 groups with respect to: age (p = 0.053); years in the ED (p = 0.13); hours of prior CTAS training (p = 0.57); or years of experience in triage (p = 0.61).	triage assessments using ESI v.3 with the same inter-observer reliability as those with experience and refresher training in using the CTAS

Reference	Type of Study Quality SIGN Rating	Methods	Threats To Validity/ Reliability	Findings	Conclusions
		ED cases - To prevent communication between participants, the groups were observed by a proctor - A staff member who was blind to the study objective entered the data onto a spreadsheet. - Two-sample t tests were conducted on continuous variables from the nurses' personal information to compare the 2 groups. Inter-observer reliability for each of the 2 groups was measured using a quadratic			

Reference	Type of Study Quality SIGN Rating	Methods	Threats To Validity/ Reliability	Findings	Conclusions
		weighted kappa interval			

The Refreeze Stage Evidence Table of Selected Articles Related to Lewin's Change Theory

Table M.1. The Refreeze Stage Evidence Table

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
Bitterman, 2009	Expert Opinion/ 4	- Expert Opinion		-Each HTS needs to address a dozen issues to improve their current triage process.	- Only the most clinical experienced nurses with the best interpersonal skills should be triaging pts. - Triaging nurses need to be trained in recognizing abnormal VS, identifying life threatening situations, communication skills for conversing with pts, families, and physicians, as well as following documentation

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
					and EMTALA guidelines
Fitzgerald, et al., 2010	Systematic Review / 1-	- 69 pieces of literature were selected for the review - Various countries and their methods of triage was reviewed - ATS, CTAS, ESI ITS, MTS, and the NTS were the triage assessment scales reviewed - The conceptual frameworks for triage were reviewed - Five various triage RN decision making processes were also reviewed - The validity and		- Most ED triage is completed by experienced RNs - Some physicians also triage, there is no evidence to support physicians complete a more accurate triage assessment or a more cost effective triage assessment than RNs - Effectiveness of triage is associated with experience - Despite the various triage	- No gold standard to measure triage accuracy - Around the world, triage is an important aspect of the ED, showing clinical and organizational value - The emergency medicine community has the opportunity to commit to an international triage scale and to then use that scale for further research and evaluation - The future of triage needs to

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		repeatability of triage scales were reviewed - Those who complete triage were reviewed - The funding and performance of triage systems were reviewed - The future direction of triage was recommended		scales, all urgent pts are assigned accurately and made a top priority - Several improvements to the triage decision-making process are the recipe, dictionary, algorithm, red flags, and global assessment approaches. - The variety of triage scales demonstrates the difficulties in having a consistent approach to every healthcare situation in every hospital	focus on a consistent, 5 level triage scale that can be applied to each health situation and does not allow funding or reimbursement have a determining factor.

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
				while taking into consideration the funding and social circumstances - Adverse factors of triage are lack of training, time limitations, and interruptions - If the hospital is private, then pts tend to get over triaged in order to receive more reimbursement - If EDs follow the acuity triage system, then those with a lower acuity would never be seen due to	

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
				the higher acuities always taking priority	
Garbez, et al., 2011	Cross-sectional analysis / 3	- Prospective, cross-sectional design - RNs were recruited through convenience sampling - 2 ED settings - 18 RNs participated - 334 RN-Pt interactions - ESI was triage scale utilized - Data was collected over 4 months, during all hours of every day - 13 female and 5 male RNs participated - Majority of	- Convenience sample to recruit RNs - Use of only two data collection sites - Small RN sample size, 18 nurses - Data collection from charts - RNs were aware they were being studied	- Pts with a CC of N/V, PMH of renal insufficiency or failure were assigned to Level 2 instead of Level 3 (p=0.036 and p=0.013 respectively) - Pts assigned to Level 2 were more likely to utilize cardiac monitoring, EKGs, medications, and specialty consultations than Level 3 pts	- It is critical ED triage RNs be aware of pt factors and potential resources that potentially influence triage level assignments - There is a significant difference of resource utilization between a Level 2 and a Level 3 triaged pt

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Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		RNs were BSN prepared (n=7.39%) or in a graduate school program (n=5, 28%) - A few had a MSN (n=4,22%) degree or an ADN (n=2, 11%) - Seven RNs were certified in emergency nursing			
McHugh et al., 2011 doi: 10.1111/j.1553-2712.2011.01240.x	Cross-sectional analysis of secondary data / 3	- Data were obtained from the 2009 American Hospital Association (AHA) Annual Survey —Intensive questionnaire mailed to all U.S. general medical and		- Of the 4,897 hospitals surveyed, 82% responded - 62% (3,024 hospitals) provided information on their ED triage system. - The most commonly	- More than 3,000 hospitals used ESI and more patients were triaged using the ESI than any other triage acuity system - There is an opportunity to further

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		surgical hospitals - The survey is mailed to all hospital chief executive officers (CEOs) in the United States - Descriptive statistics were used to explore various triage acuity systems used by different types of hospitals - the following question was added: ''Which of the following best describes the type of triage system your ED uses on a daily basis to determine which patients can wait to be seen and which		used triage system types were the five-level ESI (56.9% of responding hospitals) and three-level triage systems (25.2%) - More than 70% of large hospitals and teaching hospitals use the ESI - The majority (72.1%) of all ED patient visits were assessed using ESI - Invalidated three-level systems were more common in small hospitals, public hospitals, nonteaching	promote the adoption of validated, reliable triage systems. - The opportunity for increased adoption of the Emergency Severity Index or other validated, reliable triage systems, as recommended by the American College of Emergency Physicians and the Emergency Nurses Association is clear

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		need to be seen immediately.' - Reponses options included: three-level system; four-level system; five-level ESI; five-level system, other, and do not know - The number of ED visits from the AHA annual survey were used to calculate the percentage of ED patients served by various triage systems - Analyses were performed using Stata version 10.0		hospitals, and hospitals in the Midwest. - 13.1% of visits were assessed using a three-level system.	
Selman et al., 2006 doi: 10.1016/j.jen.2005.12.019	Cohort / 2+	- Level III trauma center ED that triages		- Preliminary data indicate that	-ESI can increase appropriate

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		an average of 200 to 220 patients a day - The number of patients leaving be-fore treatment can be as high as 800/ month. The previous triage system included three levels. - Implementation of the ESI Five-Level Triage System - Teams of nurses and physicians in the ED provided training to staff on all shifts for one month prior to implementation. - The professional		appropriate triage designation by nurses is conducted 85% of the time. - The number of patients leaving prior to treatment decreased from 15% to 11%	triage designation, decrease length of stay, and reduce the number of patients who leave the emergency department before receiving care. - The ESI system assists the provider in identifying the priorities of care and has the potential for significantly improving both patient outcomes and satisfaction.

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		projects coordinator and the clinical educator developed a process for reviewing charts to evaluate appropriate triage designation by nursing staff.			
Singer, et al., 2012	- Descriptive statistics - Qualitative content analysis for the data analysis/ 3	- Self-administered questionnaire was sent to 935 people that had requested the ESI training materials from AHRQ via telephone, mail, E-mail, and in person at conferences - All volunteered to participate - Semi-structured	- Volunteer participation	-Three hundred twenty-two survey respondents (82%) reported use of ESI in their ED. - 77% (n = 144) were emergency nurses, 26% (n = 96) were ED nurse managers, and 18% (n = 65) were clinical	- The majority of ED professionals who reported using the ESI were very satisfied with the tool. - Users found that it was more accurate than other triage algorithms and reduced the subjectivity of the triage

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		telephone interview protocols were also used - 6 experts met to provide guidance, review the study instruments, and recommend potential key informants for interviews - The survey elicited responses about their use of and satisfaction with the ESI algorithm and training materials - Response rate was 42% (n = 392). - Data was cleaned,		nurse educators or trainers. - Satisfaction with the ESI triage algorithm was high - ESI users indicated that the ESI is more accurate than other triage algorithms - ESI strengths are simplicity of use and the ability to reduce the subjectivity of triage - The major strengths of the ESI are its simplicity in use and strength in reducing the subjectivity of	process. - Both survey and interview findings indicated that few emergency departments have formally assessed the impact of the ESI on ED operations. - ESI is a promising, relatively easy to use, and credible tool for further adoption. - ESI users are very satisfied with the AHRQ-funded & ESI training materials. - ESI is more accurate than other triage algorithms. - The major

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		edited, and keyed into a statistical analysis program, SPSS 12.0		the triage process. - The key theme from open ended surgery was that the ESI is really helpful for less experienced emergency nurses, because they can assign patients according to the ESI's guide- lines - 88% (n = 257) indicated that the ESI is better at sorting patients clinically than other triage algorithms - 77% (n = 224) responded that the ESI	strengths of the ESI are its simplicity in use & reducing the subjectivity of the triage process - Future studies that explore the impact of the ESI on ED operations and outcomes is needed - Additional research is needed to identify the extent that ESI is the choice for US hospitals

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
				was better or much better for facilitating patient flow in the ED - 85% (n = 247) of users reported that ESI is more effective overall than the previously used triage system	
Storm-Versloot et al., 2011 **doi: 10.1111/j.1553-2712.2011.01122.x**	- Prospective, single-center, observational comparative study combined with a retrospective chart review / 3	Goal: to determine the validity of the ISS, the ESI, and the MTS triage systems. - Study was at an urban tertiary care academic teaching hospital with a Level I trauma center - The ED sees almost 31,000 patients		- The percentage of under triage using the ESI (86 of 421; 20%) was significantly higher than in the MTS (48 of 421; 11%) - When combining urgency levels 4 and 5, the percentage of under triage was 8% for	- All three triage systems appear to be equally valid - ESI showed the highest percentage of under triage and the ISS the lowest, it seems preferable to use a verifiable, formally structured triage system.

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		annually - When the study began, no formally structured triage system was in use - An ISS was in place, which was based on clinical expertise - When patients were registered, the patients' appearance and presenting complaints were judged, and the nurse or receptionist implicitly answered the question: ''Could this patient wait safely before being seen?'' Options were: patient could		the informally structured system (ISS), 14% for the ESI, and 11% for the MTS. - Sensitivity and specificity were significantly different between ESI and MTS only in urgency level 4. - In all 900 patients triaged, urgency levels across all systems were associated with significantly increased resource use, hospitalization rate, and LOS. - Complete	- Based on these results, not one of these systems appears superior. However, we do recommend the use of a formally structured triage system in order to obtain verifiable systematic judgments, transparency, and uniformity in triage.

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		not wait at all, patient should be seen as soon as possible, or patient could wait. - six ED nurses received a 6-hour combination of didactic and practical training in each triage system (ESI and MTS), - random and on different days of the week between 12 noon and 10 PM, the nurses triaged all patients entering the ED consecutively - Trauma patients and those who left without		triage notes were available for 875 patients (97%) triaged using the ISS, 876 (97%) using the ESI, and 872 (97%) using the MTS - When the three-triage systems were compared as four-level systems, the distribution of urgency levels was shown to be significantly different (Friedman test, $p < 0.006$). - The same was true when the ESI and the MTS were compared as	

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		treatment were excluded - Triage ratings of 421 (48%) patients treated only by emergency department (ED) physicians were compared with a reference standard determined by an expert panel - The percentage of undertriage, the sensitivity, and the specificity for each urgency level were calculated - Differences in distribution of urgency levels were tested by means of the		five-level systems (Friedman test, $p < 0.001$). - In the ISS, more patients were scored ''very urgent'' than in the ESI and the MTS. - In 890 patients available for analysis, the number of resources was strongly associated with the urgency level in all triage systems - The highest agreement (64.8%) with the reference standard was found for the ISS, while the	

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		Friedman's test. - To evaluate the relationship between triage classification and these aspects, the Spearman's correlation coefficient was calculated - To determine the validity of all three systems in patients treated by an emergency physician, we compared the ESI and the MTS triage classifications - The percentage of patients who were under or over-triaged was calculated. - The		highest overtriage (29%) was found for the MTS - When comparing ESI and MTS as five-level systems with the reference standard, agreement decreased and over-triage increased, while significant differences remained.	

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		sensitivity, specificity, predictive values, and likelihood ratios and their 95% confidence intervals (CIs) for each of the five urgency levels were calculated.			
Sun, 2010 doi.org/10.1016/j.annemergmed.2010.06.391	Retrospective, convenience study / 4	-Reviewed patients evaluated in the ED within a 2-month period. Patients from 3 different time shifts were sampled - Trained nurse and physician reviewers were given ESI criteria and a standardized data sheet for		-A total of 335 of 1032 eligible patients were selected. -Pearson correlations between nurse triage levels and physician triage levels for each shift were: 0.76 (days), 0.70 (evenings) and 0.56 (nights).	The study demonstrated a high correlation between nurse- and physician-assigned triage levels. This correlation was particularly high during peak volume hours on day and evening

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		data collection. -Pearson correlation coefficient and frequencies were used to compare the triage levels for physician and nurse reviewers.		- The frequency of same triaged patients was 56% (days), 58.9% (evenings) and 54.4% (nights). - The weighted Kappa for physician reviews inter-rater reliability (n=16 per shift) was 0.68 (days), 0.59 (evenings) and 0.06 (nights).	shifts, which is pertinent to managing a crowded ED in regards to patient safety.
Vance, et al., 2005	Cohort / 2- N= 289	- Prospective, single blinded RN estimate of triage accuracy of highly complex pts - Highly complex pt is	- Convenienc e sample of pts presented to the same ED over a one week	- These findings could potentially be beneficial for a guide to ED workload flow and case mix systems	- Triage RNs make valid and reliable triage assessments and assign the appropriate complexity

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		one who would need two or more procedures, investigations or consultations - Validity of the RNs triage complexity rating was manually compared with the number of actual procedures, investigations, or consultations completed on each pt 3 - Reliability of the RN triage assessment complexity was compared with the primary RN's pt assessment - Inclusion into study was	period - Small RN sample - Potential that RNs chose not to include pts who were difficulty to classify as low vs. high complexities - Limited compliance for data sheet completion between triage RN and primary RN - Only one factor for the required effort of pt care in the ED was examined	that are independent of disposition	level

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		decided based on the RNs filling out the data sheet - Exclusion criteria was not included in this study - Analysis software was SPSS for Windows version ten			
Wuerz et al., 2008	Cohort study / 2+	The five-level ESI algorithm was introduced to triage nurses at 2 university hospital EDs, and implemented into practice with reinforcement and change management strategies. - Inter-rater reliability was		Eight thousand two hundred fifty-one ED patients were studied. Weighted kappa for reproducibility of triage assignments was 0.80 for the posttest (n = 62 nurses), and 0.73 for patient triages (n = 219).	- Triage nurses at these two hospitals successfully implemented the ESI algorithm and provided useful feedback for further refinement of the instrument. - ESI triage reproducibly stratifies

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
		assessed by a posttest and by a series of independent paired patient triage assignments -A staff survey was performed. A cohort validation study of all adult patients registered during a one-month period immediately following implementation was performed. - The sites have an annual census of 50,000–60,000 patients		Hospitalization was 28% overall and was strongly associated with triage level, decreasing from 58/63 (92%) of patients in triage category 1, to 12/739 (2%) in triage category 5. - Median lengths of stay were two hours shorter at either triage extreme (high and low acuity) than in intermediate categories. - Staff nurses rated the new program easier to use, and more	patients into five groups with distinct clinical outcomes. - ESI five-level triage was implemented into nursing practice in a reasonably short period of time in these EDs Triage with the ESI reproducibly stratifies patients into five groups with distinct hospitalization rates and lengths of stay.

Reference	Type of Study Quality SIGN Rating	Methods	Threats to Validity & Reliability	Findings	Conclusion
				useful as a triage instrument than previous three-level triage.	

APPENDIX N

Educational Patient Case Scenarios

Patient Case Scenario	Triage Acuity Rating
1. "I think I picked up a bug overseas," reports a 34-year-old male who presented in the emergency department complaining of frequent watery stools and abdominal cramping. "I think I am getting dehydrated." T 98°F, RR 22, HR 112, BP 120/80, SpO2 100%. Pain 6/10.	
2. "My pain medications are not working anymore. Last night I couldn't sleep because the pain was so bad," reports a 47-year-old female with metastatic ovarian cancer. "My husband called my oncologist, and he told me to come to the emergency department." The patient rates her pain as 9/10. Vital signs are within normal limits.	
3. A 48-year-old male tells you that he has a history of kidney stones and thinks he has another one. He has right costovertebral angle pain that radiates around to the front and into his groin. He is nauseous but tells you he took a pain pill, and right now he has minimal pain. He denies vomiting. T 98°F, RR 16, HR 80, BP 136/74, SpO2 100%. Pain 3/10.	
4. A 46-year-old asthmatic in significant respiratory distress presents via ambulance. The paramedics report that the patient began wheezing earlier in the day and had been using her inhaler with no relief. On her last admission for asthma, she was intubated. Vital signs: RR 44, SpO2 93% on room air, HR 98, BP 154/60. The patient is able to answer your questions about allergies and medications.	
5. **A 56-year-old male with a recent diagnosis of late-stage non-Hodgkin's lymphoma was brought to the ED from the oncology clinic. He told his oncologist that he had facial and bilateral arm swelling and increasing shortness of breath. The patient also reports that his symptoms are worse if he lies down. Vital signs: BP 146/92, HR 122, RR 38, SpO2 98% on room air, temperature normal.**	
6. EMS arrives with a 28-year-old male who was stabbed in the left side of his neck during an altercation. You notice a large hematoma around the wound, and the patient is moaning he can't breathe. HR 110, RR 36, SpO2	

	89%.
7.	**"Without the helmet, I would have been really hurt," reports a 19-year-old healthy male who was involved in a bicycle accident. He lost control of his bike when he hit a pothole. He has a 2-centimeter laceration on his arm and pain over his left clavicle. Vital signs: T 97.4°F, RR 18, HR 62, BP 122/70, SpO2 100%. Pain 6/10.**
8.	"I have this skin rash in my crotch. It looks like jock rot. Probably got it from not washing my gym clothes," reports a 19-year-old healthy male. No abnormal vital signs.
9.	The overhead page announces the arrival of the Code STEMI. Paramedics arrive with a 62-year-old male with a history of a myocardial infarction 4 years ago who is complaining of chest pressure that started an hour ago. The field EKG shows anterior lateral ischemic changes. Currently, the patient's heart rate is 106, RR 28, BP 72/53, SpO2 is 95% on a non-rebreather mask. His skin is cool and clammy.
10.	"I had a knee replacement 3 months ago. Now look at it!" states a 64-year-old male. The knee is red, swollen and tender to touch. Vital signs: T 99°F, RR 20, HR 74, BP 164/74, SpO2 97%. Pain 6/10.
11.	"This is so embarrassing," reports a 29-year-old male. "For the last 12 hours, I have had this thing stuck in my rectum. I have tried and tried to get it out with no success. Can someone help me?" The patient denies abdominal pain or tenderness. Vital signs are within normal limits. Pain 4/10.
12.	EMS arrives with a 22-year-old woman with asthma who began wheezing earlier this morning. She is sitting upright on the ambulance stretcher leaning forward with an albuterol nebulizer underway. The patient is diaphoretic, working hard at breathing and unable to answer your questions. EMS tells you that they think she is tiring out. Her respiratory rate is 48, SpO2 is 94%, and she has a prior history of intubations.
13.	"I woke up this morning, and there was a bat flying around our bedroom. Scared me half to death, and now I am so worried about rabies," an anxious 48-year-old female tells you. "My husband opened the window, and the bat flew out." Past medical history of ovarian cysts, no med or allergies, vital signs are within normal

limits.

14. EMS radios in that they are in route with a 21-year-old with a single gunshot wound to the left chest. Vital signs are BP 78/palp, HR 148, RR 36, SpO2 96% on a non-rebreather.

15. "I woke up this morning, and my eyes are all red and crusty," reports a 29-year-old kindergarten teacher. "I think I got it from the kids at school," she tells you. She denies pain or other visual disturbances. Her vital signs are within normal limits.

(Gilboy et al., 2011)

<center>**APPENDIX O**</center>

Educational Patient Case Scenarios with Answers and Rationale

	Triage Acuity Rating	Rationale and Discussion
1.	ESI level 3	Two or more resources. From the patient's history, he will require labs and IV fluid replacement—two resources
2.	ESI level 2	Severe pain or distress. This patient needs aggressive pain management with IV medications. There is nothing the triage nurse can do to decrease the patient's pain level. The answer to "Would you give your last open bed to this patient?" should be yes
3.	ESI level 3	Two or more resources. The patient is presenting with signs and symptoms of another kidney stone. At a minimum, he will need a urinalysis and CT scan. If his pain increases, he may need IV pain medication. At a minimum, two resources are required. If the pain level was 7/10 or greater and the triage nurse could not manage the pain at triage, the patient could meet level-2 criteria
4.	ESI level 2	High-risk. An asthmatic with a prior history of intubation is a high-risk situation. This patient is in respiratory distress as evidenced, by her respiratory rate, oxygen saturation, and work of breathing. She does not meet the criteria for ESI level 1, requires immediate lifesaving intervention.
5.	ESI level 2	High risk. This patient is demonstrating respiratory distress with his increased respiratory rate and decreased oxygen saturation. Symptoms are caused by compression of the superior vena cava from the tumor. It is difficult for blood to return to the heart, causing edema of the face and arms.

6.	ESI level 1	Requires immediate lifesaving intervention. Depending on the exact location penetrating neck trauma can cause significant injury to underlying structures. Based on the presenting vital signs, immediate actions to address airway, breathing, and circulation are required. Intubation might be necessary due to the large neck hematoma, which may expand.
7.	ESI level 3	Two or more resources. Based on the mechanism of injury, this patient will require an x-ray of his clavicle and suturing of his arm laceration. In addition, he may need a tetanus booster, but that does not count as a resource. If the mechanism of injury was higher, the patient could meet ESI level-2 criteria, high risk. The patient's pain rating is 8/10, but the triage nurse can intervene by applying a sling and providing ice to decrease the pain and swelling.
8.	ESI level 5	No resources. Following a physical exam, this young man will be discharged to home with a prescription and appropriate discharge instructions.
9.	ESI level 1	Requires immediate lifesaving intervention. This patient is experiencing another cardiac event that requires immediate treatment. His vital signs and skin perfusion are suggestive of cardiogenic shock, and the patient may require fluid resuscitation or vasopressors to treat hypotension.
10.	ESI level 3	Two or more resources. The patient is presenting with signs and symptoms of an infection. At a minimum, he will require labs, an x-ray, an orthopedic consult, and IV antibiotics.
11.	ESI level 3	Two or more resources. An x-ray is needed to confirm placement in rectum. Then IV sedation and analgesia may be used to enable the physician to remove the foreign body in the ED, or he may be admitted for surgery. In this situation, two or more resources are required.
12.	ESI level 1	Requires immediate lifesaving intervention. This young asthmatic is tiring out and will need immediate lifesaving intervention that will require at a minimum a nurse and physician at the bedside immediately. The decision may be to continue the respiratory treatments and try IV steroids, IV magnesium, and heliox immediately. She may also require rapid sequence intubation.
13.	ESI level 4	One resource. It is unknown whether the bat bit the patient because they were sleeping, so post-exposure prophylaxis will be initiated. One resource—an intramuscular medication.
14.	ESI level 1	Requires immediate lifesaving intervention. The trauma team needs to be in the trauma room and ready to aggressively manage this 21-year-old with a single gunshot wound to the left chest. He will require airway

		management, fluid resuscitation and, depending on the injury, a chest tube or rapid transport to the operating room.
15.	ESI level 5	Following a physical exam, this patient will be discharged to home with a prescription and appropriate discharge instructions. No resources are required.

(Gilboy et al., 2011)

Self-Reflection Survey Before "Embedding ESI"

Triage Survey

1. Do you feel that you use ESI when you triage patients, either in triage or in patient care area when patients arrive by EMS?
2. If yes, how often do you use ESI when you triage and assign acuity-levels?
     100% 75% 50% 25% of the time
3. How often do you refer to ESI on the computer when you complete the triage palate?
4. Do you think you are accurately following the ESI guidelines?
5. What's your highest level of nursing education?
6. Are you CEN certified?
7. Thoughts and ideas...

Additional Questions Added to the Self-Reflection Survey After "Embedding ESI"

Additional Questions on the Post-Survey
How satisfied are you with the embedded ESI template in the triage palate?   **Very satisfied   satisfied   dissatisfied   very dissatisfied**
How often do you use the embedded ESI template when you triage patients?   **100%   75%   50%   25%   0%**
If you completed the embedded ESI template, how often did it assist you with your acuity-level decisions?   **Most of the time   some of the time   rarely   never**
What are your suggestions for improving the triage process?

Actual Responses from the Self-Reflection Surveys

Question One

* An additional comment on the after "Embedding ESI" survey included in the "Yes/ I try to/ Sometimes/Most of the time" category was a non-TT RN response of "In patient care area". An additional comment on the after "Embedding ESI" survey included in the "No/ "intuition/MD assigned" category was a TT RN response of "not really, basing off EMS Assessment and "normal vitals" per EMS. Do not assign acuity on EMS pt in TR".

Question Two

** An additional comment on the before "Embedding ESI" survey included in the "100%" category was a TT RN response of "90". Additional comments on the before "Embedding ESI" surveys included in the "75%" category were TT RN responses of "sometimes" and a non-TT RN response of "most of the time".

Question Three

***Additional comments on the before "Embedding ESI" surveys included in the "rarely" category were non-TTRN response of "only when I have questions about what acuity to assign, maybe 10% of triages" and "not often". Additional comments on the before "Embedding ESI" survey included in the "Never/None/No/□" category were TT RN responses of "why would I need to. I took the class.", "I do not refer to ESI on computer.", non-TTRN responses of "Didn't know there was a place to Look at and use – I go by my book", and "I use my sheet I got from training class.". Additional comments on the after "Embedding ESI" surveys included in the "Always/Continuous/each time" category were TT RN responses of "99%", and "frequently – Helps me to double check that the pt is correctly triaged", and non-TT RN responses of "100%", "daily", and "90". Additional comments on the after "Embedding ESI" surveys included in the

"Mostly/most often/often/50%-75%" category were TT RN responses of "sometimes", "when I have any doubt", and "sometimes when I can't decide what Acuity I think the pt should be". An additional comment on the after "Embedding ESI" survey included in the "rarely" category was TT RN response of "10%" and a non-TT RN response of "not often". An additional comment on the after "Embedding ESI" survey included in the "Never/None/No/☐" category was a TT RN response of "where is it?".

Question Four

**** Additional comments on the before "Embedding ESI" survey included in the "Yes/Most of the time" category was a TT RN response of "95%" and non-TT RN responses of "yes, to the best of my ability", and "best of my ability". Additional comments on the before "Embedding ESI" survey included in the "Sometimes/try/unknown/hope" category was non-TT RN responses of "I try my best.", "I try but increase acuity due to severity of need to be seen sometimes", and "sometimes until the pt is worked up it is hard to tell how sick they really are". An additional comment on the before "Embedding ESI" survey included in the "No/Prob not/ unknown" category was a non-TT RN response of "? I think so". Additional comments on the after "Embedding ESI" survey included in the "Yes/Most of the time" category was a non-TT RN response of "75%". Additional comments on the after "Embedding ESI" surveys included in the "Sometimes/try/hope" category was a TT RN response of "trying varies /c MD in area" and "to the best of my ability". Additional comments on the "No/Prob not/ unknown" category is non-TT RN responses of "As far as I know haven't been told otherwise" and "maybe :/" .

Question Five

***** There were two invalid responses on the before "Embedding ESI" TTRN surveys. One invalid response was "what does that matter?". The second invalid response was "RN". These two survey responses were not included in the analysis. An additional comment on the before "Embedding ESI" survey included in the "ADN" category was a non-TT RN response of "currently working on BSN".

Question Six

****** *Additional comments on the before "Embedding ESI" survey included in the* *"*No/Not yet/Working on it" category were non-TT RN responses of "no ma'am" and "to class taking test in May". An additional comment on the after "Embedding ESI" survey included in the "No/Not yet/Working on it" category was a TT RN response of "I wish".