Improving Emergency Department Triage

Quality Improvement Project

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Abstract

**Background:** Healthcare presents challenges that require nursing professionals to continually evaluate their practice. Overcrowding in the emergency department (ED) has become a worldwide public health problem over the last decade (DiSomma et al., 2015). ED overcrowding occurs when the demand for emergency resources exceeds those available. ED triage decisions are based on resource utilization. ED overcrowding implies the need for accurate triage decisions to ensure that care is delivered in a time-sensitive manner for those who are ill.

In order to provide the best care in a timely manner, for our patients, improvements in current emergency triage practice are necessary. Variation in the use of the Emergency Severity Index (ESI) triage algorithm among emergency department nurses has been found to be a significant problem. If the triage nurse misinterprets a patient’s presentation, the result can be improper allocation of resources or mistriage. Mistriage occurs when ESI is not utilized properly. Mistriage has been associated with delay of care and treatment (Yurkova, 2011). Mistriage further contributes to the ED overcrowding crisis.

In order to improve care, improvements in triage practice must be made. Most emergency departments provide and require ESI education. Education programs vary among emergency departments. Programs vary with regard to who is educated, length of education, and methods utilized to deliver education. Improved ESI education is necessary to improve triage practice.

**Purpose:** The purpose of this Doctorate of Nursing Practice (DNP) quality improvement project was to improve current ED triage practice. The authors of the ESI triage algorithm recommended that the rate of ED mistriage should be kept at less than 10% (Gilboy, Tanabe, Travers, & Rosenau, 2011). The researcher measured improvements by a decrease in the rate of
mistriage. The researcher created this project in an attempt to remedy the burden of overcrowding in the ED. The researcher has identified a need for an ED triage practice improvement.

**Methods:** The researcher utilized a quasi-experimental design. Participants consisted of a convenience sample of ED registered nurses. The intervention was a nurse driven evidence-based quality improvement project in the form of a triage education program. The researcher developed an ED triage YouTube education program and provided laminated ESI resource cards for participants. Additional intervention included mentoring of participants and participation in an interactive Facebook page dedicated to emergency department triage over a 4-week period.

**Evaluation:** The researcher measured a decrease in the number of mistriages through the evaluation of 20 case-based triage scenarios in pre, post, and post posttest evaluations. The ED triage case-based scenarios were developed by the experts of the ESI research team. The researcher cleaned, coded, and checked the data for normality of distribution and outliers. The researcher handled missing data through the use of multiple imputation. The researcher utilized descriptive and inferential statistics (frequencies, means, and standard deviations) to describe differences.

**Clinical Implications:** The DNP quality improvement project will increase knowledge, which will improve current ED triage practice. Improvements in ED triage practice will be evident by improved accuracy of ESI triage level assignment. Improvements in ESI triage level assignment will ensure the delivery of timely care in the emergency department, ultimately having a positive impact on the ED overcrowding crisis.
Problem Identification and Significance

In the report, “The Future of Emergency Care in the United States,” the Institute of Medicine (2006) described the ongoing crisis of overcrowding in most emergency departments. The increasing demand for health care combined with a deficit in available hospital beds has further complicated the overcrowding crisis over the past several years (DiSomma et al., 2015). ED overcrowding occurs when demand for emergency resources exceeds those available. ED overcrowding requires accurate triage decisions to ensure that care is delivered in a time-sensitive manner. Early recognition of high-risk patient presentations and accurate anticipation of resource utilization in triage is essential for the best outcomes and for mitigating ED overcrowding (Gilboy et al., 2011). Improvements in triage practice will ensure the delivery of timely ED care.

ED triage is the complex process of sorting and prioritizing patients for care (Gilboy et al., 2011). The ESI triage algorithm was developed in an attempt to standardize ED triage. ESI is a five-level triage algorithm that provides clinically relevant stratification of patients into five groups from least to most urgent based on acuity and resource needs (Gilboy et al., 2011). Five-level ED triage systems are widely utilized in most hospitals in the UK, Canada, Australia, and the United States. Use of five-level triage systems were found to have a positive influence on emergency department care (Shelton, 2010). The American College of Emergency Physicians and the Emergency Nurses Association support the use of the ESI triage algorithm as a valid and reliable tool (Gilboy, Tanabe, Travers, Rosenau, & Eitel, 2005). Researchers have demonstrated the reliability and validity of the ESI triage algorithm across multiple studies of several thousand patients (Gilboy et al., 2011; Martin et al., 2014; Wuerz et al., 2001).
The ESI Triage Algorithm

According to the ESI triage algorithm, Level 1 acuity assignment requires immediate intervention to preserve life or limb. Level 2 acuity focuses on identifying high-risk patients who need time-sensitive treatment. Level 2 acuity requires the highest level of clinical decision-making by the triage nurse (Gilboy et al., 2011). A Level 2 acuity patient is one who is experiencing a serious condition such as new onset of confusion, lethargy, disorientation, or a patient who is experiencing severe pain or distress. If a patient does not fit Level 2 criteria, they are assigned Level 3, 4, or 5. Assignment to the lower acuity levels is based on estimation of resource utilization: Level 3 requires two or more resources, Level 4 requires one resource, and Level 5 requires no resources. Examples of resources include: Lab studies, radiologic studies, administration of intravenous fluids, specialty consultation, simple procedures, and conscious sedation.

Practice Gap

Mistriage occurs when the ESI is not utilized properly, the severity of a patient’s condition, illness or injury, is under or overestimated. Mistriage has been attributed to delay of care, which further contributes to the ED overcrowding crisis. Mistriage can lead to negative care processes and poor health outcomes. Multiple researchers have recognized the dangers associated with mistriage (Aacharya, Gastmans & Denier, 2011; Amsterdam et al., 2010; Atzema, Austin, Tu, & Schull, 2010; Liu, Hobgood, & Brice, 2003).

The practice of undertriage is a safety concern, as it may place the patient at risk for deterioration (Grossman et al., 2014). An example of undertriage may be in the case of an elderly woman who presents to triage complaining of non-traumatic left shoulder pain. The triage nurse may assign a Level 4 triage, anticipating the patient will require just one resource,
such as an X-ray. The triage nurse should recognize that some patients who are experiencing a cardiac event will present with left shoulder pain. If the triage nurse fails to consider the possibility of a cardiac event and assigns a low level triage such as a Level 4, undertriage has occurred. Patients who are having a cardiac event require many more resources and timely care. If the triage nurse feels the patient is potentially having a cardiac event, a higher-level triage level should be assigned, such as a Level 2 triage. Undertriage can lead to delay of care. Poor quality of care, excessive length of stay, and increased mortality have been related to delay of care in the ED (Schneider & Asplin, 2008). A report by the Joint Commission found that half of all sentinel events resulting in morbidity and mortality occurred as a result of delay in treatment in the emergency department (Richardson et al., 2008).

A review of literature yielded many possible explanations for mistriage. Schrader and Lewis (2011) recognized that five-point triage systems, such as the ESI triage algorithm, allow for significant subjectivity in triage. Variability in the triage process and outcomes has been associated with a nurse’s intuition and subjective decision making (Domagala & Vets, 2015). Advanced age, African American and Latino ethnicity, and female gender have been associated with higher rates of mistriage (Lehmann et al., 2009; Lopez et al., 2010; Zook et al., 2016). Scholars have attributed ED overcrowding to higher rates of mistriage (Andersson, Omberg, & Svedlund, 2006).

A random sample of ESI triage demonstrated that the current rate of mistriage exceeds that suggested by the authors of the ESI triage algorithm. The recommend rate of mistriage was suggested to be kept at less than 10% (Gilboy et al., 2011). Improvements in triage practice will have a positive effect on ED overcrowding. Thus, the current researcher recognized an opportunity for a nursing practice improvement.
The authors of the ESI algorithm suggested a learning experience from 2-4 hours of didactic, suggesting that supplemental materials such as visual aids may be useful. Most emergency departments have triage education programs in place. Not much is known about emergency department triage with relation to effectiveness of ESI triage education.

**Definitions**

*Overcrowding* defines a situation in which the need for resources exceeds those available.

*Emergency department triage nurse* is a specialized emergency department nurse who has the ability to recognize useful cues from information to rapidly identify and respond to potential life threatening events (Montejano, 2010).

*Triage* is derived from the French word *trier*, meaning “to sort” (Aachara et al., 2011). In the ED, triage is a rapid assessment of a patient’s general appearance including a brief history of the presenting problem using limited physiological data. Triage is considered to be a core competency of an effective emergency department registered nurse (Gerdtz, 2011).

*Mistriage* occurs when ESI is not utilized properly. Mistriage occurs when the severity of a patient’s condition, illness, or injury is under or overestimated (Gilboy et al., 2011).

*Undertriage* is a term referring to the underestimating the urgency of the condition of a person arriving and not prioritizing his or her management over that of a patient with less urgent needs (The Free Dictionary, 2012).

*Overtriage* is a term referring to the unintentionally overestimating the urgency of the condition of a person arriving and prioritizing that person’s management over a patient with more urgent needs (The Free Dictionary, 2012).
Resource, as defined by the ESI, includes lab and diagnostic tests, ECG, IV and IV fluid administration, IM medication (except for tetanus), specialty consultation, simple procedures, and conscious sedation (Gilboy et al., 2011).

Evidence Appraisal & Implications

The researcher conducted a literature search in the current body of research on this topic (Appendix A). This consisted of an online library search of research articles of evidenced-based and peer reviewed sources, academic journals, dissertations, and continuing education articles. The researcher reviewed abstracts of identified documents and full texts of relevant documents for compilation of evidence. The researcher searched reference lists of retrieved documents to identify additional relevant publications. For the purpose of this investigation, the researcher conducted searches utilizing MEDLINE, CINAHL, EMBASE, and within the Cochrane Library utilizing online search tools. The number of irrelevant retrievals was limited by using index terms through thesaurus and by linking search terms. To further limit the search, articles written in English between 1990 and 2016 were utilized. Key words included emergency, emergency department, emergency severity index, emergency education, emergency nursing, triage, triage education, nursing, nurses, nursing education, mistriage, and high-risk triage.

Implementation of the triage algorithm

Wuerz et al. (2001) implemented the ESI triage algorithm. Wuertz et al. conducted this study with the intent of validating the ESI instrument within a population-based cohort using hospitalization and ED length of stay as outcome measures. The administrative intervention was followed by a population-based retrospective cohort study. The sample consisted of 8,251 patients triaged by 62 triage nurses at two university hospital emergency departments. Triage education for the study incorporated educational sessions as a didactic presentation and group
discussion of triage case studies. Posters, pocket cards, and simple reinforcement tools were devised and utilized. Change strategies were implemented.

The methods utilized to assess triage reproducibility incorporated a twenty-case post-test and independent paired triages for a convenience sample. The paired triages, for a portion of the cohort, utilized an investigator who retrospectively assigned triage category according to information in the staff nurses written triage note, the staff nurses ESI level was blinded. The researchers described the successful introduction of the five-level ESI triage algorithm at two-university hospital EDs. The researchers offered useful suggestions with regard to training ED triage nurses. Wuertz et al. concluded that the triage nurses at both hospitals achieved levels of inter-rater agreement for triage level assignments and meaningful associations were made between ESI triage level assignation and hospitalization and ED length of stay. The study provided further evidence regarding the validity and reliability the ESI tool.

**Nurse characteristics with regard to triage**

In order to develop an effective triage education program and to provide insight into nurse characteristics with relation to triage, Martin et al. (2014) conducted a descriptive study to explore differences in nurse attitudes and experiences related to ESI triage scores. The descriptive, exploratory study utilized a sample of 64 nurses and 1,644 triage events from three different emergency departments. Martin et al. found no statistically significant evidence to support the notion that attitude or experience influenced ESI level assignation. The authors did not support the notion that nurses need experience before assignment to the triage area. The researchers examined associations between a triage nurses characteristics and triage capabilities, and found that an overall attitude of caring was demonstrated among triage nurses. Martin et al.
found that nurses without ED experience have the capability to perform accurate ESI triage. Reliability of the ESI tool was once again proven to be statistically significant.

Andersson et al. (2006) evaluated triage with regard to a nurse’s decision-making ability while prioritizing patients for care. These authors utilized a qualitative observational content analysis. Triage nurse participants had more than 6 months of ED triage experience. The nurses were observed during patient interactions utilizing a priority triage model within ten minutes of patient arrival to the ED. Following observation was a tape-recorded interview, wherein the researchers asked the nurses to reflect upon decision of priority. The researchers assessed the nurses’ skills, personal capacity, work environment, and assessment.

Similar to Martin et al. (2014), the qualitative investigation by Andersson et al. (2006) attempted to identify factors that affect a nurse’s triage decisions. Both studies support the belief that triage is a complex activity. Triage is influenced by multiple factors. Andersson et al. determined that further investigation is necessary to provide a better understanding of the influences of patient prioritization.

Göransson, Ehrenberg, Marklund, and Ehnfors (2006) explored factors associated with a nurse’s triage decision making. The study explored personal characteristics of registered nurses related to the accuracy of their acuity ratings of patient scenarios. The study utilized the Canadian Triage and Acuity Scale (CTAS), which is a five-level emergency department triage scale similar to the ESI algorithm. The study utilized a sample of 423 registered nurses from 48 (62%) of Swedish emergency departments. The study indicated that personal characteristics of the RNs did not correlated with the ability to triage the scenarios, except for nursing experience. Clinical experience was slightly correlated with the ability to triage scenarios correctly. Based on the low correlation, it is unlikely that such a difference can be accounted for by clinical
experience alone. Additional research is necessary to further evaluate the RN decision-making process during triage.

The literature search provided insight on nurse characteristics with regard to triage. In order to develop an effective educational experience it was necessary to investigate whether or not a correlational existed between nurse characteristics and the ability to make accurate triage decisions.

**Triage teaching strategies**

Grossman et al. (2014) investigated the long-term effects of a teaching intervention designed to reduce undertriage rates in older ED patients. The purpose of the study was to evaluate patient-related risk factors and reasons for non-adherence to ESI triage algorithm, associated with undertriage. These researchers utilized data from a previous evaluation for pre-test evaluation, and collected post-test data 1 year after the teaching intervention. The teaching intervention was a 1-hour lecture designed to facilitate correct triage level assignation in older adults. In the final analysis, the researchers included 394 patients from an urban tertiary care center in Switzerland. All nurses were either certified in emergency nursing or had long standing experience in emergency nursing. All of the nurses were trained according to the recommendations of the ESI implementation handbook, which is a basic formal 4-hour training program. The instruments were pre and posttest evaluations. Participants took a test before and immediately after teaching session and again 1 year after. The test consisted of six case scenarios and a multiple-choice portion focused on life saving interventions. Two experts were utilized for inter-rater reliability.

The teaching intervention did not result in a substantial decrease in rate of undertriage of older adults 1 year after teaching intervention. Factual knowledge was high before and after
teaching intervention, suggesting that factual knowledge is not merely a matter of undertriage. Independent risk factors for undertriage were not identified. A trend towards undertriage in older adults was observed. The study demonstrated that the misapplication of ESI triage was related to undertriage of older adults. The reasons for undertriage may be more complex than anticipated by the researchers.

This study provided valuable information with regard to triage education. The current recommendation is a four-hour triage-training program. Additional educational measures may be necessary to support learning. Improvements in triage education are necessary to decrease variation of ESI triage level assignation. The study indicates that triage teaching interventions may be more effective if more than factual knowledge was provided.

Dateo (2013) evaluated the importance of triage nurses’ assessment, and identified factors to increase the accuracy of the ESI. The literature review identified factors that increase accuracy and inter-rater reliability of ESI among ED nurses with regard to ED triage of adult patients. The review found that a triage nurses competency should be reviewed through subjective and objective assessment and documentation in addition to ESI designations.

Dateo (2013) suggested that standardization of nurse training and of resource utilization is necessary in order to facilitate prediction of patient resource needs. The review suggested that only nurses with expert triage characteristics should triage. Nurses should be provided with standardized training of ESI in order to improve consistency. Training in the form of continuing education, quality-assurance feedback, and a minimum of one year of ED experience, was suggested. Continuing education is essential to allow for continued growth in practice. Quality-assurance feedback was suggested to be useful to evaluate performance. The study provided
evidence that mentorship is advantageous to maintain consistency and to enhance triage competency. Nurse mentors were found to facilitate the learning process.

Rutschman et al. (2006) evaluated ED triage, specifically variability of the triage process, and examined the reliability of a four level triage scale via triage simulator interactive software. The design was a prospective two-phase evaluation of clinical scenarios using computerized simulation. The study found variability in triage with use of the simulator. Triage acuity was overestimated 11% of the time, underestimated 31% of the time. Test re-test reliability of the instrument was noted to be adequate by researchers, inter-rater reliability was moderate. The study provided an effective example of alternative options for triage education.

Dong et al. (2007) evaluated the use of a computerized CTAS-based triage decision support tool (eTriage). The tool was implemented after utilizing various educational strategies. The study utilized a prospective design conducted in real time. The design utilized a real ED environment. The researchers felt a real ED environment was far superior and more generalizable, as compared to case-based scenarios typically utilized to evaluate triage. Real-time studies are more complicated to perform and may produce different kappa scores compared to simulations. The study evaluated the implementation of a Web-based triage decision support tool using complaint-based templates derived from CTAS. Agreement between study nurses and duty triage nurses, both using eTRIAGE, was moderate to good. Triage overrides occurred in approximately 10% of cases. Study nurses tended to down triage or under triage patients more often than duty nurses. The study demonstrates the need to improve the triage process, and the need to identify improvements in training and skill retention.

Garbez et al. (2011) identified factors affecting triage nurses in their assignment of patients to triage level two or three in the five-level ESI triage system. A secondary aim was to
validate the ESI criteria presently used by triage nurses to assign patients to levels two and three triage. The nurse predictions of patient final diagnosis were documented 66% of the time. The triage nurses performed one-time triage interactions with patients who presented to the ED setting during the nurses’ work shift. Garbez et al. demonstrated that less experienced nurses can be taught how to appropriately triage patients in the ED setting, and concluded that education should incorporate patient symptoms, and other factors, rather than just algorithms. The authors suggested that nurses should learn how to cluster patient information according to relevance, into a framework for assigning patients to acuity levels. The authors also suggested that nurses should be mentored in the development of differential diagnosis to help them make an accurate judgments regarding triage level assignation. Less experienced triage nurses should be encouraged to assign a higher-level triage, such as a level 2 for high-risk patients to ensure the delivery of timely care. Lastly, Garbez et al. suggested that larger studies are necessary to validate findings.

Evans and Kohl (2014) developed a hands-on competency-based learning program to improve the current process of educating emergency department nurses. They suggested that emergency department nurses require a diverse knowledge base. These authors demonstrated that effective nursing education is facilitated through the creation of a simulation environment. The simulation environment incorporated a practice area for high-risk skills. The study supported utilization of a nurse mentor. The nurses reported high satisfaction related to the simulation environment.

Rankin, Then, and Atack (2013) sought to improve the accuracy of ED triage through the implementation of a web-based triage educational experience. In a randomized control trial, the researchers measured the impact of web-based learning on clinical practice. The researchers
evaluated the effect of a 6-week Web-based workshop. A mandatory tutorial, online discussion, and triage workplace project were required in addition to the Web-based course. The results indicated successful implementation of the triage educational experience. The post study comparisons demonstrated improved triage accuracy. Triage level agreement between RNs and expert raters was 99.7% within one triage level after the experience.

**Link between Current Literature and Project Idea**

The literature review provided evidence that the five-level ESI triage algorithm is an effective tool for ED triage. The ESI tool has been widely accepted in most hospital emergency departments in the United States. The validity of the ESI tool has been proven in multiple studies through expert comparison (Martin et al. 2014; Wuerz et al., 2001). The literature review incorporated evidence from other 5-level triage algorithms such as CTAS.

The review of literature provided examples of effective strategies for the development of a triage education program. Examples of effective strategies included educational sessions, which incorporated didactic presentations; group discussions; and scenario-based triage case studies. Posters, pocket cards, and reinforcement tools are effective in triage education (Wuerz et al., 2001). The review of literature suggested that multiple strategies or training modalities may be most effective with regard to triage education. The incorporation of patient symptoms, rather than just algorithms for use in professional development was suggested in the literature (Garbez et al., 2011). Other effective training modalities were through quality-assurance feedback, and through mentorship (Dateo, 2013). Multiple researchers have suggested that nurse mentors effectively facilitate the learning process (Dateo, 2013; Garbez et al., 2011).

The literature review explored characteristics of ED triage nurses. Multiple factors were found to affect triage decisions such as: Nursing skills, personal capacity, and work environment
Göransson et al., 2006). Personal characteristics, such as attitude of the RN, did not correlate with the ability to effectively triage scenarios (Andersson et al., 2006; Göransson et al., 2006). A nurse’s attitude, therefore, need not be considered in the development of an educational program.

The effect of a nurse’s clinical experience with regard to triage ability was found to be contradictory in the literature. Two of the cited authors found no difference in triage capability for nurses without experience (Garbez et al., 2011; Martin et al., 2014), whereas several other researchers found a positive correlation between experience and ability to triage accurately (Dateo, 2013; Evans & Kohl, 2014; Göransson et al., 2006). In the current research, the researcher will include nurses with minimal ED experience.

Grossman et al. (2014) investigated the long-term effects of a teaching intervention designed to reduce undertriage rates in older ED patients. The one-time learning experience did not prove to be effective to establish new learning. A mixed methods program with an interactive forum and mentoring may prove to be effective to establish triage learning. Current challenges in nursing education related to time limitations and continued efforts to provide an effective and innovative educational experience have lead to the creation of this program. The DNP quality improvement project educational program will be delivered and supported by means of social media. A literature review found that social media learning provided a favorable platform to promote knowledge sharing, and stimulate diverse and enriching conversations (Fitzgerald, Radmanesh, & Hawkins, 2015). Facebook and YouTube were chosen to deliver project interventions.
**PICOT**

*(P)* Will emergency department triage nurses *(I)* who participate in the ESI triage training program *(C)* compared to current ESI nurse training program *(O)* see improved accuracy of ESI level assignation, decreased mistriage *(T)* Pre, post, and post post-test comparisons.

**Purpose**

The purpose of this project was to implement and evaluate the effects of an online multi-methods nurse-driven evidence-based triage education program. The purpose was to improve current triage practice, ultimately improving ED process and positively impacting the crisis of ED overcrowding.

**Methods/Implementation**

The intent of this section is to provide an overview of the theoretical framework, project design, sample, sample size, setting, measures, procedures, and evaluation methods. In this section, the researcher will also discuss human subject protection, IRB approval, and the process of maintaining confidentiality.

**Theoretical Framework**

The researcher utilized Ausubel’s Theory of Meaningful Learning to guide the emergency department triage education experience. Ausubel’s perspective is one of the well-known theories of cognition. The theory emphasizes presentation of the new, the current, and the different, for the re-elaboration of concepts, from prior knowledge and retention of what makes sense, and what is meaningful for the transformation of professional practice (De Sousa, Formiga, Oliveira, Costa, & Soares, 2015). The learning theory recognizes that learning is an inductive process, which starts from a primary understanding of general concepts (Aliakbari, Parvin, Heidari, & Haghani, 2015). In meaningful learning, the student must be willing to learn
and the presented content must be logical and psychologically meaningful (De Sousa et al., 2015). It is important that the mentor understands where the student is in relation to current knowledge in order to build on and further develop the student’s knowledge (Shaw & Fulton, 2014).

Ausubel’s perspective can be effectively applied to adult education, specifically in nursing education (Aliakbari et al., 2015). In the DNP quality improvement project, the utilization of Ausubel perspective can be exemplified through the process of building on previous ESI triage education and experience. The nurses who have agreed to participate in the study all have had previous varied ESI training. The quality improvement educational experience was designed to build on previously learned concepts related to emergency department triage.

**Project Design**

The researcher utilized a quasi-experimental design to implement and evaluate the effects of an online multi-methods nurse-driven evidence-based triage education program to improve current triage practice.

**Sample**

The sample \((N=51)\) consisted of a convenience sample of emergency department triage registered nurses. The researcher included willing nurse participants currently working in the emergency department with various levels of experience. The researcher excluded nurses not willing to participate and those not currently working in the ED.

**Sample Size**

The researcher performed power analysis to determine sample size for before-after study paired \(t\)-test. The researcher determined that 31 was an adequate sample size for the study.
Setting

The project took place online. The timeline for the project was September 9, 2016 to October 26, 2016 (Appendix F). The pre and posttest portions took place at different times from September 9 to September 22, 2016. All initial posttests were completed before September 22, prior to participation in the Facebook program. The participants completed the post posttest after participating for 4 weeks in an emergency department triage dedicated Facebook site. The program was entirely online, and the participants could access materials at their convenience.

Measurement Tools

The researcher measured the participants’ improvement through pre, post, and post posttest evaluations. The pre, post, and post posttest evaluations contained 20 case-based scenarios. The pretest, posttest, and post posttests utilized the same 20 emergency department triage case-based scenarios. The experts of the ESI research team developed these emergency department triage case-based scenarios. The scenarios were created and evaluated, and determined to be valid by expert raters for inter-rater reliability. The ESI expert panel included researchers, senior physicians, and expert nurses who have previously established content validity of the questionnaire. The questions cover common chief complaints in different populations related to all five triage categories. The ESI research team granted approval to utilize questions prior to the implementation of the study.

Procedures

The researcher first obtained IRB approval from Drexel University. The researcher asked the nurse participants to complete a participant agreement form prior to participation in the program. The nurses completed the pretest (Appendix C) after completing the participation
agreement form. The researcher utilized the pretest to assess the participants’ baseline knowledge.

Following the pretest, participants viewed a 22-minute YouTube triage education program. The researcher administered a posttest immediately following the YouTube education program. Following the posttest, the researcher asked the participants to participate in an interactive Facebook page dedicated to emergency department triage. The researcher administered the post posttest following 4 weeks of participation in the ED triage Facebook page. The researcher administered a post posttest to compare the YouTube education to the interactive Facebook page and mentoring of participants and effectiveness of improving ED triage practice. The pre, post and post posttest evaluations contained 20 case-based scenarios.

The interventions were a nurse driven evidence-based triage education YouTube program supplemented by participation in an interactive Facebook page. Laminated ESI resource pocket cards were provided to participants (Appendix B).

The researcher created a 22-minute triage evidenced-based education slide presentation utilizing the ESI Handbook (Gilboy et al., 2011), and various other evidenced-based sources. The triage education program was available to learners via YouTube (Appendix E). The program reviews the ESI algorithm and defines resources. The program provides a systems review of high-risk triage presentations. The researcher chose YouTube as a platform for the educational experience as it is easy to use and easy to access. YouTube provides an opportunity for students to actively engage in the presented content increasing the likelihood the content will be understood and retained (May, Wedgeworth, & Bigham, 2013). The YouTube education program provides review of the ESI triage algorithm. The program includes an evidenced-based
systems review focusing on high-risk triage presentations in the ED. Additionally, the presentation provides examples of resources according to the ESI triage algorithm.

Further intervention for the project includes a Facebook page which was created for mentoring, for sharing of journal articles and other triage related topics, and for participants to review triage case scenarios (Appendix D). Participants were encouraged to share their triage experiences over a 4-week period. Facebook offers participants an opportunity to post comments, allowing the learner to restructure their thoughts and actively engage to improve learning (Wankel, 2009). The project utilizes social media and mentoring to meet objectives.

The researcher provided additional mentoring to participants through feedback via e-mail correspondence. The researcher emailed the participants with the results of their pre and post-test assessments with correct rationale for ESI triage level assignation of case scenarios.

The researcher provided laminated ESI algorithm pocket cards (Appendix B) to participants upon agreement of participation. One side of the laminated pocket-sized card illustrates the ESI triage algorithm. The other side of the card provides examples of ESI resources.

The researcher administered the posttest immediately following the ESI YouTube education program. Participants were then asked to take part in the interactive Facebook page for the following 4 weeks. Finally, the researcher administered the post posttest. The program was completed over a 7-week period.

**Evaluation**

**Data collection**

The pretest, posttest and post posttests consisted of 20 case-based emergency department triage scenarios developed by the expert ESI research team. Expert raters have evaluated the
scenarios for inter-rater reliability. Additionally, participants were asked number of years of
nursing experience (pretest), degree status (post test), and satisfaction related to the triage
education program (post posttest). The researcher emailed the tests to the participants. The
researcher scored the tests and saved the results in a secure electronic database.

**Data analysis**

The researcher cleaned, coded, and checked the data for normality of distribution and
outliers. The researcher handled missing data through the use of multiple imputation. The
researcher utilized descriptive and inferential statistics (frequencies, means, and standard
deviations) to describe differences.

**Outcomes**

The results of this project will (a) increase knowledge of the ESI triage algorithm; (b)
provide ED nurses with a better understanding of high-risk triage presentations through a
systems approach; (c) remedy current challenges of nursing education through a mixed methods
interactive teaching approach; (d) improve current ED triage practice by improving ESI triage
level assignation; and (e) ensure the delivery of safe, timely, and quality emergency care through
improved triage practice.

**Strengths and Limitations**

Increased structure related to participants of a single selected group under observation.
Strengths of this project include evidence of effective triage education to: 1) advance clinical
nursing practice, and 2) improve outcomes for patients. This design has minimal internal
validity, controlling for convenience selection. Threats to validity related to events that occur
inbetween testing intervals, pre, post, and post posttest and time inbetween testing. Limitation
related threats to external validity may be related to follow up period and potential loss of
participants during that period. External validity can be threatened by effects from experiment and influence of exposure.

**Human Rights Protection**

Human Subject Research Protection application was submitted prior to conducting the project, and the researcher obtained IRB approval from Drexel University. The researcher made every effort to safeguard and maintain the confidentiality of the participants’ information. Confidentiality procedures for this project included the electronic storage of all data, which will be secured. The researcher stored and secured all data on password-protected computers. The researcher will not share pre, post, and post posttest participant information; all data will be stored in a secured file.

**Summary**

Through the current study, the researcher identified an opportunity for a clinical practice improvement. Through the mixed-media interactive triage education program, the researcher provided an effective means to provide ED nurses with a better understanding of the emergency severity index triage algorithm and high-risk triage presentations through a systems approach. Through this project, the researcher sought to improve current ED triage practice by improving accuracy of ESI triage level assignation. The researcher aims to ensure the delivery of safe, timely, quality emergency care through improvements in triage practice, ultimately having a positive impact on the crisis of ED overcrowding. Additionally, this DNP quality improvement project will help to facilitate the further development of future practice improvements.
Results

Introduction

The purpose of this project was to implement and evaluate the effects of an online multi-methods nurse-driven evidence-based triage education program. The purpose was to improve current triage practice, ultimately improving ED process, which will have a positive impact on the crisis of ED overcrowding. Nurses completed a pretest, posttest, and post posttest, which utilized 20 emergency department triage case-based scenarios. The questions covered common chief complaints in different populations related to all five triage categories. The researcher compared the correct responses to the 20 emergency department triage case-based scenarios between the pretest, posttest, and post posttest. For statistical analysis, the dependent variable was percent correct (total number correct divided by total number of questions), and the independent variable was time (pre, post, and post-post). Through statistical analysis, the researcher determined if the percent correct significantly changed over time. Specifically, the researcher assessed if there was a decrease in the number of mistriages (incorrect responses) when evaluating the pre, post, and post posttest evaluations.

In this section, the researcher will present the results of the data analysis methods following the collection and organization of the data, including details on the research question and hypothesis, a description of the sample used for statistical analysis, and an exploration of the statistical test used to observe the research question and hypothesis. The researcher will conclude this section with a summary.

Demographics

In total, 51 nurses participated in the pretest, 46 participated in the post test, and 43 participated in the post posttest. There were no missing responses, as each nurse answered each
question/scenario. To determine if there was a decrease in the number of mistriages when evaluating the pre, post, and post posttest evaluations, the researcher used the data from only the participants who completed all three evaluations. This left a sample of 42 nurses who were represented in the statistical analysis.

Table 1 shows a summary of the nurses’ years of experience, degree type, and satisfaction with the triage learning experience. Most nurses had either 0 – 5 years, 6 – 10 years, or 20 or more years of experience (26.2%, \( n = 11 \) for each group). Next was 11 – 15 years of experience (16.7%, \( n = 7 \)), and 16 – 20 years (4.8%, \( n = 2 \)). When asked about their degrees, most had a BSN/Bachelor’s Degree (61.9%, \( n = 26 \)), followed by Associate’s Degree (23.8%, \( n = 10 \)), MSN/Master’s Degree (9.5%, \( n = 4 \)), and Diploma (4.8%, \( n = 2 \)). And finally, regarding how satisfied they were with the triage learning experience, 2.4% \( (n = 1) \) stated they were moderately satisfied, 21.4% \( (n = 9) \) stated that they were very satisfied, and most (76.2%, \( n = 32 \)) stated they were extremely satisfied.
Table 1

**Summary of Demographics**

<table>
<thead>
<tr>
<th>Years of Experience</th>
<th>n</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 5 Years</td>
<td>11</td>
<td>26.19</td>
</tr>
<tr>
<td>6 – 10 Years</td>
<td>11</td>
<td>26.19</td>
</tr>
<tr>
<td>11 – 15 Years</td>
<td>7</td>
<td>16.67</td>
</tr>
<tr>
<td>16 – 20 Years</td>
<td>2</td>
<td>4.76</td>
</tr>
<tr>
<td>20+ Years</td>
<td>11</td>
<td>26.19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree</th>
<th>n</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diploma</td>
<td>2</td>
<td>4.76</td>
</tr>
<tr>
<td>Associate Degree</td>
<td>10</td>
<td>23.81</td>
</tr>
<tr>
<td>BSN/Bachelor’s Degree</td>
<td>26</td>
<td>61.90</td>
</tr>
<tr>
<td>MSN/Master’s Degree</td>
<td>4</td>
<td>9.52</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rating of Triage Learning Experience</th>
<th>n</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderately Satisfied</td>
<td>1</td>
<td>2.38</td>
</tr>
<tr>
<td>Very Satisfied</td>
<td>9</td>
<td>21.43</td>
</tr>
<tr>
<td>Extremely Satisfied</td>
<td>32</td>
<td>76.19</td>
</tr>
</tbody>
</table>

**Study Variables**

The dependent variable that the researcher used for analysis was percent correct, which the researcher calculated by dividing the total number correct by each nurse, by the total number of questions (20). The independent variable used for analysis was time (pre, post, and post post). Table 2 shows a summary of the number of mistriages (number incorrect), and percent correct, at each time point. The researcher noted that the average number of mistriages decreases from pre \((Mean = 6.07, SD = 2.64)\) to post \((Mean = 4.07, SD = 2.18)\) to post-post \((Mean = 2.40, SD = 2.12)\). This implies that average percent correct scores increases from pre \((Mean = 69.64, SD = 13.22)\) to post \((Mean = 79.64, SD = 10.90)\) to post-post \((Mean = 87.98, SD = 10.60)\).
Table 2

Summary of Mistriages and Percent Correct Over Time

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mistriages</td>
<td>6.07</td>
<td>2.64</td>
</tr>
<tr>
<td>Percent Correct</td>
<td>69.64</td>
<td>13.22</td>
</tr>
<tr>
<td>Post</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mistriages</td>
<td>4.07</td>
<td>2.18</td>
</tr>
<tr>
<td>Percent Correct</td>
<td>79.64</td>
<td>10.90</td>
</tr>
<tr>
<td>Post-Post</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mistriages</td>
<td>2.40</td>
<td>2.12</td>
</tr>
<tr>
<td>Percent Correct</td>
<td>87.98</td>
<td>10.60</td>
</tr>
</tbody>
</table>

**Statistical Analysis**

To determine if the percent correct significantly increased from pre to post to post-post, the researcher performed a repeated measures ANOVA. Results of the analysis showed that there was an overall significant difference in percent correct over time ($F (1.64, 4312.3) = 28.72$, $p < 0.0001$). Specifically, the results of a Bonferroni post hoc test showed that post 1 scores were significantly higher than pre scores ($p = 0.002$), post-post scores were significantly higher than pre scores ($p < 0.0001$), and post-post scores were significantly higher than post scores ($p < 0.0001$). Figure 1 shows a profile plot of the estimated marginal means of scores, over time, where a steady increase can be seen. Overall, the researcher concluded that the percent correct significantly increases over time, which implies that the number of mistriages significantly decreases over time.
Summary

The main purpose of this project was to implement and evaluate the effects of an online multi-methods nurse-driven evidence-based triage education program. The purpose was to improve current triage practice, ultimately improving ED process, which would likely have a positive impact on the crisis of ED overcrowding. Results of the analysis showed that there was an overall significant difference in percent correct from pre to post to post-post, which implies that there was also a decrease in the number of mistriages.
Discussion and Conclusions

**Introduction**

The purpose of this project was to implement and evaluate the effects of an online multi-methods nurse-driven evidence-based triage education program. The purpose was to improve current triage practice, ultimately improving ED process which will have a positive impact on the crisis of ED overcrowding. A total of 42 nurses completed a pretest, posttest, and post posttest, which utilized 20 emergency department triage case-based scenarios. The questions covered common chief complaints in different populations related to all five triage categories. The researcher compared the percentage of correct responses to the 20 emergency department triage case-based scenarios between the pretest, posttest, and post posttest.

For statistical analysis, the dependent variable was percent correct (total number correct divided by total number of questions), and the independent variable was time (pre, post, and post-post). To determine if the percent correct significantly increased from pre to post to post-post, the researcher performed a repeated measures ANOVA. Through the statistical analysis, the researcher determined if the percent correct significantly changed over time. Specifically, the researcher assessed whether there was a decrease in the number of mistriages (incorrect responses) when evaluating the pre, post, and post posttest evaluations.

**Interpretation of the Findings**

Results of the analysis showed that there was an overall significant difference in percent correct from pre to post to post-post test, implying a decrease in the number of mistriages. The current findings of the current study show that the utilization of the triage education program may lead to positive results. This finding is aligned with the findings of Dateo (2013). Dateo found that the standardized nurse training related to resource utilization is essential to facilitate
the prediction of patient resource needs in the emergency department. Moreover, Dateo recommended that nurses should be provided with standardized training for ESI for consistency of care. Furthermore, Dateo recommended that continuing education and quality-assurance feedback are necessary to maintain consistency, standardize, and enhance triage competence among nurses, a finding supported in the current study. Likewise, the current study supports the notion of multiple researchers having suggested that nurse mentors effectively facilitate the learning process (Dateo, 2013; Garbez et al., 2011).

The current studies findings correlated with Wuerz et al., 2001. Similar to Wuerz, the current study provided positive results through the utilization of a didactic presentation, such as the presentation offered through YouTube, through scenario-based triage cases, such as those utilized on the Facebook site, and through the use of visual aides similar to the laminated ESI cards provided to study participants. Learning was enhanced in the current study through the incorporation of patient symptoms in learning, rather than just through the use of algorithms, similar to findings presented in the literature by Garbez et al., 2011.

Grossman et al. (2014) investigated the long-term effects of a teaching intervention designed to reduce undertriage rates in older ED patients. The one-time learning experience did not prove to be effective to establish new learning. A mixed methods program with an interactive forum, which included mentoring, was proven to be effective to establish triage learning in the current study, supporting the notion that multiple methods program may be more effective to enhance triage learning.

The current researcher, similar to Rankin, Then, and Atack (2013), sought to improve the accuracy of ED triage through the implementation of a web-based triage educational experience.
Similar to Rankin, Then, and Atack, the current study posited through pre- and post-test analysis confirming a transfer of knowledge occurred.

The current study supports the notion that social media learning provided a favorable platform to promote knowledge sharing, and stimulate diverse and enriching conversations similar to findings of Fitzgerald, Radmanesh, and Hawkins (2015). The YouTube and Facebook sites were utilized to deliver interventions. Similarly, Evans and Kohl (2014) posited that the positive effects of triage education program evaluated in the current study could result in high satisfaction among the participants.

**Limitations of the Study**

The current study had several limitations. Initially, the research design has minimal internal validity, controlling for convenience selection. Specifically, the threats to validity related to events that occur in between testing intervals, pre, post, and post posttest and time in between testing limits the current study. Moreover, limitation related threats to external validity may be related to the loss of participants during the follow-up period. Furthermore, external validity may have been threatened by the effects from the experiment and the influence of exposure.

**Recommendations**

To address the limitation of the current study, the researcher has several suggestions for future research. Initially, the researcher recommended that future researchers should consider using random sampling method to increase internal validity. The current researcher utilized a convenience sampling method, which may have increased the threats to internal validity; due to this, the sample participants may not be representative of the whole population. Moreover, the researcher also noted that the time interval during the pre, post, and post posttests may have an
effect on validity of the findings. Thus, the researcher recommends that researchers should carefully consider the amount of time in between testing sessions.

**Implications**

The findings of the current study show positive effects of the triage educational program among nurses. Initially, the study can promote positive social change in terms of nursing practice. The positive effects of triage educational program may lead educators to realize that it helps in addressing the crisis of ED overcrowding. This may encourage the utilization of this and similar triage educational programs. Improvements in ED triage practice will be evidenced by improved accuracy of ESI triage level assignation. Improvements in ESI triage level assignation will ensure the delivery of timely care in the emergency department, ultimately having a positive impact on the ED overcrowding crisis. The American College of Emergency Physicians and the Emergency Nurses Association support the use of the ESI triage algorithm as a valid and reliable tool (Gilboy et al., 2005). Moreover, researchers have demonstrated the reliability and validity of the ESI triage algorithm across multiple studies of several thousand patients (Gilboy et al., 2011; Martin et al., 2014; Wuerz et al., 2001).

**Conclusion**

Mistriage occurs when the ESI is not utilized properly, and when the severity of a patient’s condition, illness or injury is under or overestimated. Researchers have attributed mistriage to delay of care, which further contributes to the ED overcrowding crisis. Also, mistriage can lead to negative care processes and poor health outcomes. The aim of the current study was to address this crisis on ED overcrowding through improvements of ED triage practice. The main purpose of this project was to implement and evaluate the effects of an online multi-methods nurse-driven evidence-based triage education program. The purpose was to
improve current triage practice, ultimately improving ED process and having a positive impact on the crisis of ED overcrowding. Results of the analysis showed that there was an overall significant difference in percent correct from pre to post to post-post tests, which implied that there is a corresponding decrease in the number of mistriages. While some researchers (Grossman et al., 2014; Martin et al., 2014) have demonstrated opposite results, others (Dateo, 2013; Evans & Kohl, 2014; Rankin et al., 2013) have also found the positive effects of triage educational programs. With the current findings, the researcher concluded that educators should encourage the use of multi-methods triage education programs in order to address the problem of mistriage in order to have a positive impact on ED overcrowding.
References


## Appendix A

### Evidence Table

<table>
<thead>
<tr>
<th>Article #</th>
<th>Author &amp; Date</th>
<th>Purpose</th>
<th>Methodology</th>
<th>Results/Study Findings</th>
<th>Limitations/Conclusions</th>
<th>Evidence Rating Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Smith, A. (2013).</td>
<td>The purpose of this literature was to review present triage decision-making research within the Revised Cognitive Continuum Theory.</td>
<td>Design: Review of triage literature. Inclusion/exclusion: not specified Sample characteristics: Research review of triage literature Definition of study variables: not specified Measure/instrument: not specified Interventions being evaluated: Educational strategies with regard to triage nurses decision-making.</td>
<td>Review of literature of triage decision-making with intent to influence the development and implementatiom of training programs that foster triage decision making. Educational strategies that foster successful triage skills among emergency nurses should be identified, developed and implemented utilizing the four models of judgment outlined in the Cognitive Continuum Theory.</td>
<td>Limitation: Literature was only reviewed in PubMed. In the theoretical discussions of decision making no one model was advocated. It was felt that a combination of cognitive and judgment making strategies are to be utilized in triage decision making.</td>
<td>VII</td>
</tr>
<tr>
<td>2.</td>
<td>Martin, A., Davidson, C., Panik, A., Buckenmeyer, C., Delpais, P., Ortiz, M. (2014).</td>
<td>The purpose of this research was to explore the differences in nurse attitudes and</td>
<td>Methodology design: A descriptive, exploratory study Inclusion/exclusion: Included were all patients who entered the emergency</td>
<td>Findings: No statistically significant evidence was found to support the notion that attitude or a</td>
<td>Limitations: Convenience sample self-selected for participation, lacking equal representation in experience and number of patients triaged.</td>
<td>VI</td>
</tr>
</tbody>
</table>
Experience with regard to ESI triage scores.

Department via designated triage area and assigned an ESI triage level by enrolled nurse participants during the 8-hour shift. Excluded: Patients who arrived by ambulance bypassing the triage area.

Sample characteristics:
N=64 nurses triaging 1,644 triage events

Setting: multi-center 3 emergency departments

Study variables:
Independent and dependent
Accuracy of ESI scoring by nurses validated by clinical nurse expert raters and triage experience and attitude toward patients in triage

Measures/interventions:
Participants completed demographic data, attitude (Caring Nurse Patient Interaction, CNPI-23) survey and triage data collection tools during continuous 8-hour triage shift. Clinical nurse expert raters retrospectively reviewed charts and assigned ESI score to be compared with the nurse score.

Descriptive statistics were utilized to describe the nurse, Pearson’s correlation was specified amount of experience contributes to accurate ESI level assignment. The findings did not support the current practice of requiring at least one year experience before a nurse is assigned to triage area.

Furthermore, Reliability of the ESI tool was once again proven to be statistically significant.

One of the clinical experts rated a large number of participants, allowing for possible bias. Retrospective chart study may have not represented the patient population accurately.

Conclusion: Nurses with minimal ED experience and a working understanding of ESI 5-level triage possess the knowledge and capacity to safely and appropriately triage patients in the emergency department.
used to examine the relationship between experience and attitude.

Interventions: Determine whether a difference exists in nurse attitudes and experience for those triage nurses who assign ESI triage scores accurately and those who do not.


#### Purpose:
Implement Emergency Severity Index into nursing practice and validate the instrument with a population-based cohort using hospitalization and ED length of stay as outcome measures.

#### Methodology:
- **Design:** Administrative intervention followed by a population-based retrospective cohort study.
- **Sessions:** 1.5 hour educational sessions were completed. The sessions included a didactic presentation and a group discussion of triage case studies. Posters and pocket cards and simple reinforcement tools were devised. Change strategies were implemented.

#### Inclusion/Exclusion:
- Adult patients who presented to the emergency department during a four week period.
- Excluded (604 patients) were patients less than 14 years old, patients with incomplete ED evaluations and patients with missing triage acuity assignments.

#### Findings:
This study describes the successful introduction of the 5-level ESI triage algorithm to triage nurses at two university hospital emergency departments.

#### Limitations:
- Only a portion of the cohort for paired triages was sampled.
- Large sample size drawn from 2 sites.
- Time to complete triage was not measured.

#### Conclusion:
Nurses at the hospitals achieved levels of interrater agreement for triage level assignments.

Meaningful associations between ESI triage category and hospitalization and ED length of stay were established.
Sample/Variables: N=62 triage nurses triaged 8,251 adult patients registered in the ED over a four week study period.

Setting: Two university hospital emergency departments.

Measures: Triage reproducibility was assessed with a 20-case posttest and by independent paired triages for a convenience sample of patients. For the paired triages an investigator retrospectively assigned triage category according to information in the staff nurses written triage note, with staff nurse ESI level assignment masked. A voluntary, anonymous staff survey was distributed approximately 16 months after implementation.

Interventions: Correct ESI triage assignation, utilizing the 5-level triage tool.

| 4. | Andersson, A., Omberg, M., & Svedlund, M. (2006). | Purpose: Describe how nurses implement triage when patients arrive in the | Methodology: Design: Qualitative observational content analysis. Inclusion/exclusion: Included were | Findings: Both internal and external factors affect triage level assignation. Internal | Limitations: Study limited to those triaged to an ESI level >1. Small sample size. | VI |
| ED. Highlight factors considered when prioritizing patients with an exploration into nurses’ decision making. | selected triage nurses N=19 (3 males and 16 females) with more than 6 months of triage experience in emergency triage, with a willingness to participate in the study, while working in the ED. Excluded were patients assigned priority 1 ESI. Sample characteristics: 19 selected triage nurses in a county hospital in rural Sweden. The nurses were observed during patient interaction utilizing a priority triage model within 10 minutes of patient arrival to the ED. Following observation was a taped recorded interview where nurses were asked to reflect upon decision of priority. Variables: Nurses and factors considered while making triage decisions. Instruments: Qualitative content analysis of data from observations and interview transcripts. Text was divided into units based on similarities. The units are coded with meaning consistency. Skills, personal capacity, work environment, and assessment were factors such as a nurses skills and personal capacity. External factors such as work environment were found to impact triage decision making. | Observational study may distort usual behavior pattern. Conclusions: It was determined that triage is a complex activity. Multiple factors influence patient prioritization upon arrival to the emergency department. The factors can not be ranked in order of importance. |
| 5. | Grossman, F., Zumbrunn, C., Ciprian, S., Stephan, F., Woy, N. et al. (2014). | Purpose: Investigate the long-term effect of a teaching intervention designed to reduce undertriage rates in older ED patients. Hypothesize non-adherence to ESI triage algorithm is associated with undertriage. Explore patient related risk factors and reasons for undertriage in older ED patients. | Methodology Design: Pre-post test quasi experimental design Data from previous evaluation was utilized for pre-test evaluation, post-test data was collected one year after teaching intervention. Teaching intervention included a one-hour lecture designed to facilitate correct triage level assignment in older adults. Inclusion/exclusion: Pre-test group N=519 patients were included. 511 aged 65+ were treated in the ED, of those 117 had to be excluded, 3 referred from another hospital, 6 records were not available and 108 patients had no ESI level assigned (65 were direct to bed, 43 for unknown reason). In the final analysis N=394 patients were included. Sample characteristics: 16 triage nurses in the pretest and 17 in the post test were utilized. Setting: Urban tertiary care center in Switzerland. | Findings: The rate of undertriage was stable over time. The teaching intervention did not result in a substantial decrease in rate of undertriage of older adults one year after teaching intervention. Factual knowledge was high before and after teaching intervention suggesting factual knowledge is not merely a matter of undertriage. Independent risk factors for undertriage were not identified. A trend towards undertriage in older adults was observed. | Limitations: Single center study. Retrospective triage level assignment by experts. Consecutive sampling, a group of patients was assigned no triage level leading to possible selection bias. Changes in ED population and acuity over time, higher in post test environment may have influenced undertriage rates. List of risk factors for undertriage may be incomplete such as dementia, nursing home resident, or do not resuscitate status. Conclusion: Misapplication of existing triage criteria is cited as being an important factor associated with undertriage of older adults with application of ESI algorithm. Rationale for undertriage appears more complex than anticipated. | VI |
nurses either certified in emergency nursing or had long standing experience in emergency nursing. All of the nurses were trained according to the recommendations of the ESI implementation handbook, which is a basic formal four-hour training program. Study Variables: Triage nurses and increased knowledge of triage of older adults in the emergency department. Instruments: Pre and post test evaluations Participants took a test before and immediately after teaching session and again one year after. The test consisted of 6 case scenarios and a multiple choice portion on life saving interventions. Two experts were utilized for interrater reliability. Paired Wilcoxon signed ranks test was utilized to evaluate factual knowledge before and immediately after teaching session. Pearson’s $\chi^2$ test with Yate’s continuity correction was utilized to compare undertriage rate of ESI level pre and
|   | Dateo, J. (2013) | Purpose: Clarify the importance of the triage nurse’s assessment and identify factors to increase the accuracy of ESI scale. | Methodology Design: Literature review Inclusion/exclusion: not specified Sample characteristics: ED triage nurses Study Variables: ED nurses and ESI triage algorithm. Instruments: Not applicable Interventions: Identify factors that increase accuracy and inter-relater reliability of ESI among ED nurses related to triage of adult patients | Findings: A triage nurses’ competency should be reviewed through subjective and objective assessment and documentatio n in addition ESI designations. Standardized nurse training related to resource utilization, to facilitate the prediction of patient resource needs in the emergency department. Findings support the use of expert nurses in triage. Nursing should be | Limitations: Limited Review Conclusions: Emergency departments are challenged to provide efficient, safe, and quality patient care. Emergency department triage nurses must possess clinical judgment skills to utilize the ESI triage algorithm. A triage nurse should be selected based on expert nurse characteristics and must be offered essential ESI training. Nurse mentors can facilitate the learning process. Quality-assurance feedback should be provided to evaluate performance. Continuing education is | VII |
provided standardized training for ESI for consistency of care.

Continuing education, quality-assurance feedback and a minimum of 1 year of ED experience and mentorship are necessary to maintain consistency and standardize and enhance triage competence.

### Methodology:
Prospective two-phase evaluation of clinical scenarios using computerized simulation.

### Inclusion/exclusion:
Not identified

### Sample:
22 interactive computerized vignettes describing patients presenting to the emergency department, abstracted from actual ED situations. The vignettes were rated twice by N=45 nurses and N=8 physicians.

### Variables:
Nurses and physicians and described emergency department triage scenarios

### Findings:
Variability among triage was noted. Triage acuity was overestimate 11% of the time, underestimated 31% of the time. Test re-test reliability of the instrument was good, interrater reliability was moderate.

### Limitations:
Real patients would be evaluated in the same way as vignettes are not certain. The interactive simulator had some limitations. The nurses and physicians agreed that the simulator was very close to reality while gathering useful information, most complained about the lack of visual clues. Evaluation was limited to one ED, which may limit the generalizability of our conclusions.

### Conclusions:
Overall the computerized triage simulator was found to be an innovative tool to evaluate the
Measures:
Triage performance evaluation, rates of under and over-estimated triage were calculated. Comparison among study participants and expert panel was evaluated. Triage process evaluation was measured using a number of questions along with clinical information gathered by each evaluator. Test re-test interrater reliability rates between observers and between phases was measured utilizing kappa statistics.

Interventions:
ESI triage level assignment to evaluate the reliability of the triage instrument.

Methods:
Experimental design.

Inclusion/Exclusion:
Not specified

Sample:
The sample was a convenience sample drawn from nurses (N = 203) who enrolled in the online for the Canadian Triage and Acuity Scale CTAS course.

Multi-stage sampling N=203 RN’s were randomly selected. 132 participated N=65 in the intervention group, N=67 were included in the control group.

Findings:
1. Learner Demographic Survey Pre and post test analysis confirmed transfer of knowledge
2. Online Learner Support Instrument 78% (N=94) of participants reported their knowledge of triage had improved.
3. Triage Accuracy 46.8% (N=52) of charts were under-triaged

Limitations:
No statistically significant difference in triage accuracy between RNs, in either group, as compared to the ED expert.

The results demonstrated that the web-based course provided a standardized and effective educational experience that improved emergency department triage accuracy. The workplace project was found to enhance transfer of learning to the workplace. Technology was found to be a useful
<table>
<thead>
<tr>
<th>Measure/instrument(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Learner Demographic Survey</td>
</tr>
<tr>
<td>2. Online Learner Support Instrument</td>
</tr>
<tr>
<td>3. Triage Accuracy</td>
</tr>
<tr>
<td>4. Online Discussion</td>
</tr>
</tbody>
</table>

Interventions:
All RNs received exactly the same content and learning activities. The experimental group differed from the control group in 3 ways: a mandatory tutorial, awarding of marks for online discussion, and completion of a workplace project.

Data were collected using standard instruments, chart audit, and interviews.

triaged, 53% (N=59) were over-triaged. The C group had significantly (P<.01) increased number of under-triaged patients (N=43) in comparison to the E group (N=9). The E group had significantly (P<.01) increased numbers of over-triaged patients (N=42) in comparison to the C group (N=17).

4. Online Discussion
The results of the t test indicated that there was no significant difference in the number of messages posted to the forum (t=0.622, df=9, P=.55)


The researchers identified a knowledge practice gap related to clinical decision making during ED triage. Nurses were found to

The researchers utilized a prospective correlational design and a retrospective chart data collection to correlate accuracy of ESI level assignation. Multi-center staging was utilized. Data was collected over a two-month period

Acuity level assigned based on chief complaint accounted for 67% of the patients. Clinical presentation accounted for 32.9% of patients.

Limitations: Small sample size with voluntary participation may have contributed to selection bias.

Retrospective chart data collection was another study limitation.

Conclusions:
have difficulties determining between triage level 2 and 3. High-risk patients can suffer from adverse outcomes if they are not identified quickly. The purpose was to identify factors that affect a triage nurses assignment of patients to triage level 2 or 3 within the 5-level ESI triage system. A secondary purpose was to validate the ESI criteria presently used by triage nurses determine acuity of patients.

Inclusion and exclusion: RNs who completed the ESI triage training program in the previous 12 months were included. The nurses were required to be certified by the institution to perform triage were included.

Sampling: A convenience sample of N=18 ED triage nurses were utilized from 2 different emergency departments.

Measurement: The Triage Questionnaire was developed by the researcher to assess the nurses’ clinical decision making related to determining the severity of illness of the patient and subsequent assignment to ESI acuity level 2 or 3. The questionnaire was developed after a thorough review of the literature related to ED nurse triage by the researchers who were determined to possess expert knowledge of ESI, and the ENA Triage Curriculum.

The Triage Questionnaire was reviewed by three from two hospital emergency departments.

Differences for level assignment for pain among groups (level 2 or 3) was not found to be statistically significant ($P = .627$). Long wait time was chosen once as a factor that influenced triage level assignment. Time of day was never chosen as a factor that influenced triage level assignment.

Other factors that were measured were mechanism of injury, multiple visits, multiple visits for the same chief complaint, present presentation, psychiatric symptoms, status change, alteration in baseline and medical history.

Statistical significance was noted among the experienced nurses.

The ESI triage algorithm was found to be reliable and valid.

Findings suggest that less experienced triage nurses should be taught how to cluster patient information according to its relevance to provide a framework to assist with triage level assignment.

Nurses should be mentored to help identify differential diagnosis associated with high risk.

Less experienced nurses may benefit from understanding factors that are considered important by experienced triage nurses, in order to help identify high-risk situations.

The decision-making process involved in triage requires further evaluation.

Larger studies are suggested in order to validate findings.
| 10. | Göransson, K., Ehrenberg, A., Marklund, B., & Ehnfors, M. (2006). | The purpose of this study was to investigate whether a relationship exists between a nurses personal characteristics and accuracy of triage decisions. The study utilizes the Canadian Triage and Acuity Scale. | Methodology: Cross sectional design | Findings: RN triage case scenario agreement was 58% of the expected agreement. No significant relationship was found between the personal characteristic of RNs and the ability to triage accurately except for years of experience. | Limitations: The nurse participants did not use CTAS triage in daily practice. The nurse participants commonly triaged acuity levels 1 and 5. Of the scenarios utilized, 56% were a level 1 or level 5. The large number of case scenarios fitting into one of the extremes may have positively influenced the study. | V1 |
(CTAS), which is a five-level triage scale similar to the ESI that is utilized in the US. Differences with regard to educational standards, and prerequisites of clinical competence in triage, were noted among the literature.

Variation in triage accuracy was noted among triage nurses in the literature. Lack of available information related to a nurses personal characteristics and impact on accuracy of triage decision-making.

Descriptive and inference statistical analysis was performed via SPSS software.

Correlations between personal characteristics and acuity ratings were analyzed using Pearson’s correlation coefficient. ANOVA and 95% confidence intervals were used to compare differences between groups. Statistical significance was measured if p < 0.05.

Interventions: Two RN’s and one physician developed 40 patient scenarios, which were further evaluated by an independent group of four RNs and one physician for face validity and content. 18 of the 40 scenarios met inter-rater agreement.

Triage nurses completed questionnaires. The questionnaires included the 18 scenarios that met inter-rater reliability, followed by 11 questions related to personal characteristics of the nurse.

Data was collected over two days by a local data collector. Opposite clinical nursing experience.

Clinical experience was only slightly correlated with the ability to triage scenarios. Triage is a complex nursing task.

The design of this study was scenario based. Case scenarios are felt to lack pertinent real-life assessment information and the pressure of time constraints.

A larger study may have shown greater statistical significance between personal characteristics of RNs and the ability to triage accurately.

Conclusions:
Based on the findings in the study the researchers suggest that a nurses intrapersonal characteristics may have an effect on triage decision-making.

Low agreement of triage scores may suggest improvements are needed in the ED triage education process to better prepare nurses for triage.

Further investigation is necessary to fully evaluate this topic.
| 11. | Dong, S., Bullard, M., Meurer, D., Blitz, S., ... Holroyd, B. (2007). | **Purpose:** The study was to evaluate the use of a computerized CTAS-based triage decision support tool. The tool was implemented after utilizing various educational strategies. | **Methodology:** The study utilized a prospective design conducted in real time. The study took place in a tertiary care ED. **Inclusion/exclusion:** All adult patients (≥ 17 years of age) presenting to the ED during a scheduled study-nurse shift were eligible for inclusion. **Sample:** In phase I of the study, N=569 patients were triaged by both a standard trained nurse (STN) and a study nurse. In phase II of the study, N=577 patients were triaged by a targeted triage nurses (TTN) and a study nurse. **Measurement/intervention:** This study evaluated two sets of triage nurses using eTRIAGE, a computer based triage tool. Each set of triage nurses received two different training regimens. The training regimen in phase I was inconsistent, two-thirds of the nurses received no formal training on the | **Findings:** In phase I, agreement between STNs and study nurses was moderate (quadratic weighted κ = 0.55, 95% confidence interval [CI] 0.49-0.62). In phase II, agreement between TTNs and study nurses was good (quadratic weighted κ = 0.65; 95% CI 0.60-0.70). The researchers identify the point estimate difference in agreement between the two phases improved, the CIs for these estimates overlapped. | **Limitations:** The study took place in 1 center. Differences between phase I and phase II, may be due to the users experience with the software and the selection of motivated nurses. Triage assessments were completed by 2 independent triage nurse evaluators separately which may have contributed to a lower level of agreement allowing the patient an opportunity to change answers, this process may have also allowed for bias. | **Conclusions:** Agreement between study nurses and duty triage nurses, both using eTRIAGE, was moderate to good. Triage overrides occurred in approximately 10% of cases. Study nurses tended to downtriage or undertriage patients more often than duty nurses. The study demonstrates the need to improve the triage process, and the need to identify improvements in |
application and were forced to learn on the job. All the nurses in phase II were trained and comfortable with the application before study data was collected. This study evaluated the implementation of a Web-based triage decision support tool using complaint-based templates derived from CTAS.

| 12. | Evans, L., & Kohl, D. 2014 | Purpose: Improve current process of educating nurses and developing hands on competency-based learning | Methodology: Education council identified 13 ED specific nursing skills requiring proficiency. Objectives were identified in accordance with hospital policy and best practices. Stations at staff education day were created which required staff to demonstrate skills under supervision and guidance of an education council member. Variables: Emergency department nurses and education/skills Interventions: Emergency department specific skills education. | Findings: High satisfaction ratings by staff members participating in skills learning. | Conclusions: Emergency nurses need a diverse knowledge base. Creation of a simulation environment where high-risk skills can be practiced and knowledge shared facilitates nurse competence in the emergency department. Areas of improvement were identified. | VII |
Appendix B

Laminated ESI Resource Cards

A. Immediate life-saving intervention required: airway, breathing, circulation, or other interventions (eg, supplemental O₂, intubation, ECG or fetal). NOT including vital signs (BP, RR, HR, Temp) and/or any of the following clinical conditions: intubated, aspirated, pulseless, severe respiratory distress, 

SPO₂ < 90, acute mental status changes, unresponsive.

Unresponsive is defined as a patient that is either

1. Nonverbal and not following commands (seizure) or

2. Requires forced body stimulus (P or V on AED scale).

B. High risk situation: 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 tasks of a care scenario. CBC, electrolytes, and x-ray equals one resource. CBC plus chest x-ray equals two resources.

<table>
<thead>
<tr>
<th>Resources</th>
<th>Abt Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab testing (blood, urine)</td>
<td>History &amp; physical (including pelvic)</td>
</tr>
<tr>
<td>ECG, X-rays</td>
<td>Point-of-care testing</td>
</tr>
<tr>
<td>IV fluids (intravenous)</td>
<td>Suction equipment</td>
</tr>
<tr>
<td>Vf or IM or rectal medications</td>
<td>Phlebotomy</td>
</tr>
<tr>
<td>IV fluids (intravenous)</td>
<td>PO medications</td>
</tr>
<tr>
<td>IV fluid total (inpatient)</td>
<td>Tetanus immunization</td>
</tr>
<tr>
<td>IV fluids (intravenous)</td>
<td>Prescription refills</td>
</tr>
<tr>
<td>Intravenous line (less than 24 hours)</td>
<td>Specialty consultation</td>
</tr>
<tr>
<td>Intravenous line (more than 24 hours)</td>
<td>Phone call to PCP</td>
</tr>
<tr>
<td>Intravenous line (more than 7 days)</td>
<td>Simple wound care</td>
</tr>
<tr>
<td>Intravenous line (more than 7 days)</td>
<td>Intravenous devices</td>
</tr>
</tbody>
</table>

D. Danger Zone Vital Signs

Consider upgrading to ESI 2 if any vital sign is exceeded.

Pediatric Triage Considerations

1-2 years of age: assign ESI 2 if temp > 38.0°C (100.4°F)

3 months to 2 years of age: consider assigning ESI 2 if temp > 38.0°C (100.4°F)

0-2 months of age: consider assigning ESI 2 if temp > 38.0°C (100.2°F), or incomplete immunizations, or no obvious source of fever.

Appendix C

ESI Pretest, Posttest, Post Posttest

1. A 23 year old female present to triage complaining of generalized abdominal cramping with moderate vaginal bleeding, one pad every four hours since she woke up this am. She is 6 weeks pregnant. She denies any localized pain or other complaints. 

   Select the correct ESI acuity level below:

   - ESI level 1
   - ESI level 2
   - ESI level 3
   - ESI level 4
   - ESI level 5

   **Vital Signs:**
   - Temperature 98.6
   - Heart rate 86
   - Respiratory rate 16
   - Blood pressure 120/80

2. "I have been sick for 4 days with the GI bug that is going around. Today, I am really dizzy." Reports multiple episodes of vomiting and diarrhea for 4 days, denies fever or chills, lips are dry and cracked and his skin is cool and moist. This 29-year-old male is healthy, takes no medications and has no allergies.

   Select the correct ESI acuity level below:

   - ESI level 1
   - ESI level 2
   - ESI level 3
   - ESI level 4
   - ESI level 5

   **Vital Signs:**
   - Temperature 37.3 C (99.2 F)
   - Heart rate 132
   - Respiratory rate 24
   - Blood pressure 78/palpable

3. A 45 year old male is brought to triage by the police. He was found in the park and appears intoxicated. There is a small laceration to his forehead; he cannot remember how he got this, but denies trauma.

   Select the correct ESI acuity level below:

   - ESI level 1
   - ESI level 2
   - ESI level 3
   - ESI level 4
   - ESI level 5

   **Vital Signs:**
   - GCS is 14
   - Temperature 98.2
   - Heart rate 96
   - Respiratory rate 18
   - Blood pressure 150/90
4. "I can't seem to get the bleeding stopped and I have been pinching my nose for the past hour" reports a 63 year old patient on warfarin (Coumadin) for atrial fibrillation. "About an hour ago it just started pouring blood. I can feel it running down the back of my throat and I think I am going to vomit." The patient's skin is cool and diaphoretic.

Select the correct ESI acuity level below:

- [ ] ESI level 1
- [ ] ESI level 2
- [ ] ESI level 3
- [ ] ESI level 4
- [ ] ESI level 5

<table>
<thead>
<tr>
<th>Vital Signs:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within normal limits</td>
</tr>
</tbody>
</table>

5. EMS brings in an elderly patient from the nursing home. They were called to the scene for a "possible stroke." The patient is unresponsive with an obvious facial droop. She has a long medical history and no other information was sent with the patient from the nursing home.

Select the correct ESI acuity level below:

- [ ] ESI level 1
- [ ] ESI level 2
- [ ] ESI level 3
- [ ] ESI level 4
- [ ] ESI level 5

<table>
<thead>
<tr>
<th>Vital Signs:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart rate is 96</td>
</tr>
<tr>
<td>Respiratory rate 10</td>
</tr>
<tr>
<td>Oxygen saturation is 89%</td>
</tr>
</tbody>
</table>

6. A 39 year old obese male presents to triage with a chief complaint of chest heaviness, "like someone is sitting on his chest" but denies chest pain. His wife made him come. Associated symptoms include mild nausea, shortness of breath. Symptoms woke him from sleep. Skin is warm and moist.

Select the correct ESI acuity level below:

- [ ] ESI level 1
- [ ] ESI level 2
- [ ] ESI level 3
- [ ] ESI level 4
- [ ] ESI level 5

<table>
<thead>
<tr>
<th>Vital Signs:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature 98.4</td>
</tr>
<tr>
<td>Heart rate 30</td>
</tr>
<tr>
<td>Respiratory rate 16</td>
</tr>
<tr>
<td>Blood pressure 75/50</td>
</tr>
</tbody>
</table>
7. "Mom thinks I broke my finger. I was playing baseball and caught a fly ball without a mitt." A healthy 11 year old male points to his right 3rd finger with a deformity. His mother tells you that he takes no medications and has no allergies. 

Select the correct ESI acuity level below:

- [ ] ESI level 1
- [ ] ESI level 2
- [ ] ESI level 3
- [ ] ESI level 4
- [ ] ESI level 5

Vital Signs:
- Temperature 36.9 C (98.4F)
- Heart rate 82
- Respiratory rate 18
- Blood pressure 102/78

8. "My heart is pounding in my chest" reports a 26 year old female with a history of supraventricular tachycardia. Note Vital Signs at triage. "I feel like I am going to pass out" she tells you. 

Select the correct ESI acuity level below:

- [ ] ESI level 1
- [ ] ESI level 2
- [ ] ESI level 3
- [ ] ESI level 4
- [ ] ESI level 5

Vital Signs:
- Heart rate 188
- Blood pressure 70/palpable

9. A 59 year old female presents to triage complaining of nausea and epigastric distress. She feels like this is a GI problem. She denies SOB but complains of "feeling so tired". 

Select the correct ESI acuity level below:

- [ ] ESI level 1
- [ ] ESI level 2
- [ ] ESI level 3
- [ ] ESI level 4
- [ ] ESI level 5

Vital Signs:
- PMH: high cholesterol, DM
- Temperature 97.8
- Heart rate 84
- Respiratory rate 18
- Blood pressure 150/90
10. A 55 year old female presents to triage with a sudden onset of acute loss of vision in left eye. She has normal visual acuity in her right eye. She denies any medical history or medication use. 
Select the correct ESI acuity level below:

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

<table>
<thead>
<tr>
<th>Vital Signs:</th>
<th>Temperature 37C (98.6 F)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heart rate 88</td>
</tr>
<tr>
<td></td>
<td>Respiratory rate 18</td>
</tr>
<tr>
<td></td>
<td>Blood pressure 140/85</td>
</tr>
</tbody>
</table>

11. The police arrive in the triage area with a disheveled young man in handcuffs who is talking rapidly to himself. The police report that they were called to his home because he was standing on the front lawn naked screaming obscenities to the neighbors and threatening to kill them all. 
Select the correct ESI acuity level below:

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

| Vital Signs: | Within normal limits |

12. A 19 year old requests to see a doctor for treatment of an ingrown toenail. The nail area is red, tender and draining pus. He denies any medical problems, is on no medications and has no allergies. 
Select the correct ESI acuity level below:

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

<table>
<thead>
<tr>
<th>Vital Signs:</th>
<th>Temperature 37C (98.6 F)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heart rate 82</td>
</tr>
<tr>
<td></td>
<td>Respiratory rate 16</td>
</tr>
<tr>
<td></td>
<td>Blood pressure 118/72</td>
</tr>
<tr>
<td>Case</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| 13.  | EMS arrives with a 76 year old female who tripped over her dog and injured her right hip. On exam her right leg is shortened, externally rotated with good circulation, motor and sensation. The patient rates her pain as 5 on a scale from 0 to 10. She denies any complaints prior to tripping over her dog. She has a history of hypertension and medications include a diuretic. She has no allergies. | **Vital Signs:**
Temperature 35.7 C (96.2 F)
Heart rate 78
Respiratory rate 18
Blood pressure 148/90 | ESI level 3 |

14. | A 40 year old female presents to triage complaining of a sudden onset of a severe frontal headache after moving her bowels. States the headache is associated with nausea. She denies other symptoms. Holding her head, appears very uncomfortable. Denies medical history. | **Vital Signs:**
Temperature 98.6
Heart rate 110
Respiratory rate 24
Blood pressure 140/95 | ESI level 2 |

15. | A 70 year old male presents to triage with difficulty emptying his bladder, voiding in very small amounts. He states he is "dribbling". Complains of 4/10 pain. | **Vital Signs:**
Temperature 97.7
Heart rate 72
Respiratory rate 20
Blood pressure 110/80 | ESI level 4 |
16. A 17 year old male walks into triage stating: My boss won't let me come back to work until I get a note from a doctor. I work in a grocery store stocking shelves. Yesterday I was moving stock and several boxes fell and hit my foot. I'm fine, it doesn't hurt but my boss made me come. There are no obvious signs of trauma to the foot. Vital signs are within normal limits. 
Select the correct ESI acuity level below:

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

**Vital Signs:**
Within normal limits

17. "I shouldn't have eaten those fried clams" the patient tells you as you begin her triage assessment. Her chief complaint is abdominal pain that started two hours ago, which she rates as 6 on a scale of 0 to 10. She has vomited once and continues to be nauseous. She is 48 years old with no past medical history, takes no medications and has no known allergies. 
Select the correct ESI acuity level below:

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

**Vital Signs:**
- Blood pressure 142/84
- Heart rate 98
- Respiratory rate 20
- Temperature 37.2 C. (99 F)

18. Medflight arrives with a 32-year-old female who was the restrained driver in a high-speed motor vehicle crash. The patient is 7 months pregnant and complaining of pain in her right lower leg and abrasions on her face from the airbag. She appears in no acute distress. Her skin is warm and dry. She asks you if her baby is going to be ok.
Select the correct ESI acuity level below:

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

**Vital Signs:**
- Heart rate 100
- Respiratory rate 26
- Blood pressure 140/82
19. An 62 year old male is brought in by his daughter with a complaint of generalized weakness. The patient was due for dialysis today, but missed the appointment because he feels weak. Denies other problems.

Select the correct ESI acuity level below:

- [ ] ESI level 1
- [ ] ESI level 2
- [ ] ESI level 3
- [ ] ESI level 4
- [ ] ESI level 5

Vital Signs:
- Temperature 99.0
- Heart rate 92
- Respiratory rate 22
- Blood pressure 100/68

20. "My daughter forgot to pack her inhaler", states the mom of a 13 year old girl. PMH of asthma. The daughter denies any shortness of breath or wheezing. They are on vacation and the mom just wants to be prepared.

Select the correct ESI acuity level below:

- [ ] ESI level 1
- [ ] ESI level 2
- [ ] ESI level 3
- [ ] ESI level 4
- [ ] ESI level 5

Vital Signs:
- Temperature 98.6
- Heart rate 74
- Respiratory rate 16
- SPO2 100% on RA.
Appendix D

Pretest, Posttest, Post Posttest Answers with Rationale

1. A 23-year-old female present to triage complaining of generalized abdominal cramping with moderate vaginal bleeding, one pad every four hours since she woke up this am. She is 6 weeks pregnant. She denies any localized pain or other complaints.

Select the correct ESI acuity level below:

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

Reason is... This patient will consume a number of resources including labs, intravenous fluids, an ultrasound and perhaps intravenous analgesics. Her generalized abdominal cramping and stable vital signs do not place her at high risk for an ectopic pregnancy.

<table>
<thead>
<tr>
<th>Vital Signs:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature 98.6</td>
</tr>
<tr>
<td>Heart rate 86</td>
</tr>
<tr>
<td>Respiratory rate 16</td>
</tr>
<tr>
<td>Blood pressure 120/80</td>
</tr>
</tbody>
</table>

2. “I have been sick for 4 days with the GI bug that is going around. Today, I am really dizzy.” Reports multiple episodes of vomiting and diarrhea for 4 days, denies fever or chills, lips are dry and cracked and his skin is cool and moist. This 29-year-old male is healthy, takes no medications and has no allergies.

Select the correct ESI acuity level below:

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

Reason is... A high risk situation. This 29-year-old patient has been sick for 4 days with vomiting and diarrhea. He is now dizzy, has cracked lips, a heart rate of 132 and a blood pressure of 78/palpable. It would be unsafe for this patient to wait for more than a few minutes for care.

<table>
<thead>
<tr>
<th>Vital Signs:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature 37.3 C (99.2 F)</td>
</tr>
<tr>
<td>Heart rate 132</td>
</tr>
<tr>
<td>Respiratory rate 24</td>
</tr>
<tr>
<td>Blood pressure 78/palpable</td>
</tr>
</tbody>
</table>
3. A 45-year-old male is brought to triage by the police. He was found in the park and appears intoxicated. There is a small laceration to his forehead; he cannot remember how he got this, but denies trauma. Select the correct ESI acuity level below:

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

**Reason is...** This patient has visible signs of trauma, has no recollection of what happened and smells of alcohol. This is a high risk presentation. The triage nurse cannot attribute his lack of memory and disorientation to alcohol given the fact he has obvious head trauma.

---

4. "I can't seem to get the bleeding stopped and I have been pinching my nose for the past hour" reports a 63-year-old patient on warfarin (Coumadin) for atrial fibrillation. "About an hour ago it just started pouring blood. I can feel it running down the back of my throat and I think I am going to vomit." The patient's skin is cool and diaphoretic. Select the correct ESI acuity level below:

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

**Reason is...** This is a high risk situation. The patient will continue to bleed unless interventions are initiated. She is high risk for hypovolemic shock and her skin is already cool and diaphoretic.

---

5. EMS brings in an elderly patient from the nursing home. They were called to the scene for a "possible stroke." The patient is unresponsive with an obvious facial droop. She has a long medical history and no other information was sent with the patient from the nursing home. Select the correct ESI acuity level below:

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

**Reason is...** This patient is unresponsive, with a respiratory rate of 10 and an oxygen saturation of 89%. This patient will require immediate life saving interventions, including possible intubation.
6. A 39-year-old obese male presents to triage with a chief complaint of chest heaviness, "like someone is sitting on his chest" but denies chest pain. His wife made him come. Associated symptoms include mild nausea, shortness of breath. Symptoms woke him from sleep. Skin is warm and moist.

Select the correct ESI acuity level below:

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

Reason is... This patient requires immediate life saving interventions including possible initiation of fluids, vasoactive medications to increase his blood pressure, and transcutaneous pacing.

Vital Signs:
- Temperature 98.4
- Heart rate 30
- Respiratory rate 16
- Blood pressure 75/50

7. "Mom thinks I broke my finger. I was playing baseball and caught a fly ball without a mitt." A healthy 11-year-old male points to his right 3rd finger with a deformity. His mother tells you that he takes no medications and has no allergies.

Select the correct ESI acuity level below:

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

Reason is... This child's finger will probably be x-rayed to determine if there is a fracture. X-ray is one resource.

Vital Signs:
- Temperature 36.9 C (98.4F)
- Heart rate 82
- Respiratory rate 18
- Blood pressure 102/78

8. "My heart is pounding in my chest" reports a 26-year-old female with a history of supraventricular tachycardia. Note Vital Signs at triage. "I feel like I am going to pass out" she tells you.

Select the correct ESI acuity level below:

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

Reason is... This patient requires immediate life saving interventions. She needs to be seen immediately by a physician and a nurse. The patient is currently unstable and requires intravenous access, intravenous medications and perhaps cardioversion.

Vital Signs:
- Heart rate 188
- Blood pressure 70/palpable
9. A 59-year-old female presents to triage complaining of nausea and epigastric distress. She feels like this is a GI problem. She denies SOB but complains of "feeling so tired".  
**Select the correct ESI acuity level below:**
- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

**Reason is...** This is a high risk situation. Her symptoms are classic for presentation of acute coronary syndrome in females. She needs an electrocardiogram and rapid evaluation.

| Vital Signs: |
| PMH: high cholesterol, DM |
| Temperature 97.8 |
| Heart rate 84 |
| Respiratory rate 18 |
| Blood pressure 150/90 |

10. A 55-year-old female presents to triage with a sudden onset of acute loss of vision in left eye. She has normal visual acuity in her right eye. She denies any medical history or medication use.  
**Select the correct ESI acuity level below:**
- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

**Reason is...** High risk. Any sudden loss of vision is a high risk situation.

| Vital Signs: |
| Temperature 37°C (98.6°F) |
| Heart rate 88 |
| Respiratory rate 18 |
| Blood pressure 140/85 |

11. The police arrive in the triage area with a disheveled young man in handcuffs who is talking rapidly to himself. The police report that they were called to his home because he was standing on the front lawn naked screaming obscenities to the neighbors and threatening to kill them all.  
**Select the correct ESI acuity level below:**
- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

**Reason is...** This patient is high risk. He is a danger to himself and others and needs to be placed in a safe environment. Departmental protocols will determine where and when the patient should be placed in the treatment area.

| Vital Signs: |
| Within normal limits |
12. A 19 year old requests to see a doctor for treatment of an ingrown toenail. The nail area is red, tender and draining pus. He denies any medical problems, is on no medications and has no allergies. **Select the correct ESI acuity level below:**

<table>
<thead>
<tr>
<th></th>
<th>ESI level 1</th>
<th>ESI level 2</th>
<th>ESI level 3</th>
<th>ESI level 4</th>
<th>ESI level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reason is...</td>
<td>This patient does not meet the criteria for ESI level 1 or 2. He will need an incision and drainage of his toe - one resource. Therefore he meets ESI level 4 criteria.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Vital Signs:
- Temperature 37 C (98.6 F)
- Heart rate 82
- Respiratory rate 16
- Blood pressure 118/72

13. EMS arrives with a 76-year-old female who tripped over her dog and injured her right hip. On exam her right leg is shortened, externally rotated with good circulation, motor and sensation. The patient rates her pain as 5 on a scale from 0 to 10. She denies any complaints prior to tripping over her dog. She has a history of hypertension and medications include a diuretic. She has no allergies. **Select the correct ESI acuity level below:**

<table>
<thead>
<tr>
<th></th>
<th>ESI level 1</th>
<th>ESI level 2</th>
<th>ESI level 3</th>
<th>ESI level 4</th>
<th>ESI level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reason is...</td>
<td>This elderly patient probably sustained a fractured hip. On arrival in the emergency department her pain is 5 out of 10. She does not meet ESI level 2 criteria. If there was no clear history as to why she fell and concern about possible mental changes, or if her pain was more intense she might be assigned to ESI level 2. This patient will consume 2 or more resources; x-ray, lab tests, intravenous pain medication and an orthopedic consult.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Vital Signs:
- Temperature 35.7 C (96.2 F)
- Heart rate 78
- Respiratory rate 18
- Blood pressure 148/90

14. A 40-year-old female presents to triage complaining of a sudden onset of a severe frontal headache after moving her bowels. States the headache is associated with nausea. She denies other symptoms. Holding her head, appears very uncomfortable. Denies medical history. **Select the correct ESI acuity level below:**

<table>
<thead>
<tr>
<th></th>
<th>ESI level 1</th>
<th>ESI level 2</th>
<th>ESI level 3</th>
</tr>
</thead>
</table>

Vital Signs:
- Temperature 98.6
- Heart rate 110
- Respiratory rate 24
- Blood pressure 140/95
15. A 70-year-old male presents to triage with difficulty emptying his bladder, voiding in very small amounts. He states he is "dribbling". Complains of 4/10 pain.

Select the correct ESI acuity level below:

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

Reason is... He will require urethral catheterization and a urinalysis, 2 resources. He is not in severe pain or distress and therefore does not meet ESI Level 2 criteria.

Vital Signs:
- Temperature 97.7
- Heart rate 72
- Respiratory rate 20
- Blood pressure 110/80

16. A 17-year-old male walks into triage stating: My boss won't let me come back to work until I get a note from a doctor. I work in a grocery store stocking shelves. Yesterday I was moving stock and several boxes fell and hit my foot. I'm fine, it doesn't hurt but my boss made me come. There are no obvious signs of trauma to the foot. Vital signs are within normal limits.

Select the correct ESI acuity level below:

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

Reason is... This patient has no complaints and has no obvious signs of trauma. The patient needs to be seen by a physician or mid level provider, examined and discharged. No resources are needed so the patient meets ESI level 5 criteria.

Vital Signs:
- Within normal limits
17. "I shouldn't have eaten those fried clams" the patient tells you as you begin her triage assessment. Her chief complaint is abdominal pain that started two hours ago, which she rates as 6 on a scale of 0 to 10. She has vomited once and continues to be nauseous. She is 48 years old with no past medical history, takes no medications and has no known allergies.

**Select the correct ESI acuity level below:**

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

**Reason is...** This 48 year old healthy female has abdominal pain that started two hours prior to admission. She vomited once but continues to be nauseous. Her vital signs are within normal limits. This patient does not meet the criteria for ESI level 1 or Level 2. She will need two or more resources; lab tests, intravenous fluids and medications for nausea and pain as well as other diagnostic studies.

Vital Signs:
- Blood pressure 142/84
- Heart rate 98
- Respiratory rate 20
- Temperature 37.2 C. (99 F)

18. Medflight arrives with a 32-year-old female who was the restrained driver in a high-speed motor vehicle crash. The patient is 7 months pregnant and complaining of pain in her right lower leg and abrasions on her face from the airbag. She appears in no acute distress. Her skin is warm and dry. She asks you if her baby is going to be ok.

**Select the correct ESI acuity level below:**

- ESI level 1
- ESI level 2
- ESI level 3
- ESI level 4
- ESI level 5

**Reason is...** This is a high-risk situation based on the mechanism of injury and the patient needs to be closely monitored for subtle changes. She will meet the criteria for a high level trauma alert, based on your protocols. However, her ESI triage level remains a Level 2. She does not meet ESI Level 1 criteria. Trauma and ESI triage levels are two distinct categorization systems.

Vital Signs:
- Heart rate 100
- Respiratory rate 26
- Blood pressure 140/82
19. An 62-year-old male is brought in by his daughter with a complaint of generalized weakness. The patient was due for dialysis today, but missed the appointment because he feels weak. Denies other problems. 

Select the correct ESI acuity level below:

☐ ESI level 1
☐ ESI level 2
☐ ESI level 3
☐ ESI level 4
☐ ESI level 5

Reason is... This is a high risk patient. He has a significant medical history, is a dialysis patient and feeling weak. The triage nurse does not know what his potassium is nor does she know what his electrocardiogram looks like. Therefore he meets the criteria for ESI level 2.

Vital Signs:
Temperature 99.0
Heart rate 92
Respiratory rate 22
Blood pressure 100/68

20. "My daughter forgot to pack her inhaler", states the mom of a 13-year-old girl. PMH of asthma. The daughter denies any shortness of breath or wheezing. They are on vacation and the mom just wants to be prepared.

Select the correct ESI acuity level below:

☐ ESI level 1
☐ ESI level 2
☐ ESI level 3
☐ ESI level 4
☐ ESI level 5

Reason is... This patient requires a prescription refill, which does not meet the definition of a resource. She has no physical complaints. She will be examined by a physician or physician extender and then discharged with the needed prescription.

Vital Signs:
Temperature 98.6
Heart rate 74
Respiratory rate 16
SPO2 100% on RA.
Appendix E

Evidenced-Based Educational Material

Available on YouTube: https://youtu.be/KMfPwkyXUTU

Emergency Department Triage Quality Improvement Project

Improving the utilization of the Emergency Severity Index triage algorithm

Kelley Toffoli MSN, APN, C.

Emergency Department Triage Quality Improvement Project

- **Purpose**
  - Review the ESI Algorithm
  - Utilize a systems approach to recognize potential high-risk triage presentations
  - Continue to provide quality, timely care in the emergency department through accurate ESI triage level assignment
Emergency Severity Index Review

Level 1 acuity requires immediate intervention to preserve life or limb.

Level 2 focuses on identifying high-risk patients who need time-sensitive treatment or meet predetermined criteria.

Level 2 requires the highest level of clinical decision making by the nurse.

Is this a high-risk situation?

Is the patient experiencing new onset confusion, lethargy, or disorientation?

Is the patient experiencing severe pain or distress?

(Carbez et al., 2011)

Emergency Severity Index Review

Patients who do not fit level 1 or 2 criteria are assigned to level 3, 4, or 5.

Assignment to the lower acuity levels is based on estimated resource utilization

Level 3 requires 2 or more resources

Level 4 requires one resource

Level 5 requires no resources

(Carbez et al., 2011)
Emergency Department Triage

Critical thinking is essential in emergency department triage.

ASK:
Is this a high-risk situation?

REMEMBER:
Atypical presentations require a high index of suspicion!!

Vital signs

- **Temperature**: Fever or Hypothermia
  - Consider sepsis, especially if immunocompromised, receiving chemotherapy, or has had a transplant
- **Heart Rate**: Tachycardia, bradycardia
- **Blood pressure**: Hypertension, hypotension
- **Respiratory Rate**
- **Pulse Ox**
- **Pain**
Vital Signs

- Expect compensatory tachycardia with a fever
- Beware of tachycardia with hypotension
  - Hypotension would require at least a level 2 assignment
  - Chest pain with hypotension = level 1 requires immediate attention
- Low pulse ox (even if 99%) = level 1
- Bradypnea (low respiratory rate) = level 1
- Differentiate from a dental pain of “10” and an abdominal pain of “10”. Severe pain = level 2

Cardiovascular

- Consider the possibility of a cardiovascular event when a patient presents with chest pain, epigastric pain, back pain, jaw pain, arm pain, and/or shoulder pain
- Symptoms of a cardiovascular event can be subtle such as fatigue, nausea, and/or dyspnea
- Women or those with comorbidities may have atypical presentations. Symptoms such as dyspnea, back pain, shoulder pain or even elbow pain may be present.
  - A woman presenting with nausea, epigastric discomfort and fatigue may present a high risk situation such as acute coronary syndrome = level 2
- Patients who are at high risk for cardiovascular events are those with diabetes, renal disease, the elderly, and those with COPD. Patients with atypical presentations have worse outcomes and greater mortality [El-Menyar et al., 2011]
Cardiovascular
(cont’d)

- A young person with chest pain, who has a history of cocaine use, may be having a **cardiac event**.
- High risk presentations include:
  - Those with **hypertensive crisis, acute vascular arterial occlusions**, and patients with fever following recent valve replacement or recent cardiothoracic intervention

[Gilboy et al., 2011]

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Cardiovascular
Thoracic Aortic Aneurysm Dissection

**Consider thoracic aortic dissection**

Symptoms of a thoracic aneurysm dissection may include, but are not limited to, the following:
- Pain in the jaw, neck, and/or upper back
- Pain in the chest and/or mid back
- Wheezing, coughing, or shortness of breath as a result of pressure on the trachea
- Hoarseness as a result of pressure on the vocal cords
- Difficulty swallowing (dysphagia) due to pressure on the esophagus

(University of Rochester Medical Center, 2016)
Respiratory

- Even if the patient is currently ventilating and oxygenating adequately, if they are in respiratory distress they have the potential to rapidly deteriorate—ESI level 2.
- Potential high-risk presentations can be related to asthma, pulmonary embolus, pleural effusion, pneumothorax, foreign body aspiration, smoke inhalation, or dyspnea.

(Gilboy et al., 2011)

Respiratory

- Inhalation injuries from closed space smoke inhalation or chemical exposure can lead to rapid airway compromise—ESI level 2
Ear, Nose, Throat (ENT)

Consider the possibility of impending airway compromise

High risk presentations:
- A patient with neck swelling
- Obstruction from foreign body or from allergic reaction
- Drooling and/or stridorous presentations
- A patient who has difficulty handling oral secretions
- Epistaxis
  - caused by uncontrolled HTN
  - brisk bleeding secondary to posterior nose bleed
  - brisk bleeding related to anticoagulant use (Level 2 ED)

ENT (cont’d)

Consider:
- Peritonsilar abscess can place a patient at high risk for airway compromise
- Ludwig’s angina is an infection of the floor of the mouth or under the tongue often causing airway obstruction
- Epiglottitis often presents with fever and drooling
Abdomen

- Abdominal pain is the most frequent chief complaint evaluated in the ED (Ragsdale & Southerland, 2011).
- Severe abdominal pain with tachycardia, respiratory distress, pallor, bloating, bleeding, overall poor general appearance or hypotension can represent shock and would place the patient at high risk=ESI level 2.
- Remember, those 65 years and older often present with intra-abdominal disorders which are more complex, requiring more time, and more resources to diagnose and treat (Ragsdale & Southerland, 2011).

Abdomen

- Patients with severe nausea and vomiting, and/or diarrhea are at risk for hypovolemia and shock.
- If a patient complains of severe "ripping" abdominal pain radiating to the back they are at high risk for an abdominal aortic aneurysm (AAA) rupture. Patients often have a history of HTN.
- GI bleed includes those who present with hematemesis or a chief complaint of blood per rectum. Assess for signs of excessive blood loss and shock such as tachycardia and hypotension.
- Consider obstruction from inflammation or foreign body ingestion.  
  (Gilboy et al., 2011)
Genitourinary/Renal

- **Testicular torsion** often presents with sudden onset of testicular pain, with nausea and vomiting (Yang et al., 2011).
  
  Testicular Torsion = level 2, due to great risk of necrosis which can lead to infertility.

- Patients who receive **renal dialysis** can present a high risk situation. Patients may present with generalized weakness, consider an ESI level 2 assignment.

Gynecologic/Obstetric

- A postpartum patient with a chief complaint of heavy vaginal bleeding can present a high risk situation

- Excessive vaginal bleeding can lead to shock. Assess vital signs for tachycardia and/or hypotension

- **ALWAYS** obtain LMP, always consider a possibility of pregnancy

  (Gilboy et al., 2011)
**Gynecologic/Obstetric**

- **Ectopic pregnancy**: All pregnant patients with localized abdominal pain, vaginal bleeding or discharge in early pregnancy, should be assigned an ESI level 2. Pregnant patients with generalized abdominal pain and stable vital signs can be assigned an ESI level 3.

- **Spontaneous abortion** with heavy bleeding can be a problem if the patient is presenting with tachycardia and hypotension.

- Consider **abruptio placentae** and **placenta previa** with complaints of bleeding in late pregnancy.

  [Gilboy et al., 2011]

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**Ocular**

- **Chemical ocular injury** requires prompt attention for maximum functional outcome - ESI level 2.

- **Globe injury**
  - Globe rupture is an ophthalmologic emergency and requires emergent care by a specialist. Early recognition and intervention is essential (Seckington, 2014).
  - Signs of globe disruption can be subtle, such as an irregular pupil, or obvious, such as proptosis (extrusion of the intraocular contents), or disruption of the vitreous humor (which is the jelly-like, transparent substance that fills a majority of the eye). Globe injury is usually a result of a penetrating injury (Seckington, 2014).

- **Hyphema** (blood within the anterior chamber) can result in permanent vision impairment (Gharabeh et al., 2013).
**Ocular**

- **Central retinal artery occlusion** may present as a sudden, painless, unilateral vision loss or visual field defect usually a result of an embolism (Garg, 2016).

- **Acute closure-angle glaucoma** can present as an sudden onset of eye pain, associated with blurred vision related to an increase in intraocular pressure (Quigley, 2011).

- **Retainal detachment** symptoms can range from floaters and flashes in the visual field, to a curtain-like visual deficit (Polkinghorne & Craig, 2004).

- Sudden vision change, especially unilateral can be a symptom of an acute stroke.

- Any sudden loss of vision is a high risk situation=ESI level 2

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**Neurologic**

- **Unilateral weakness** is a high risk situation=ESI level 2

  Quick assessment should include:

  - Time of onset, heart rate, blood pressure, oxygen saturation, and blood glucose.

- Consider the differential diagnosis of neurologic presentations such those presenting with syncope, seizure, or change of mental status.

  *Think about the possibility of a cardiac arrhythmia or event, hypotension, hypoglycemia, stroke, hypoxia, and sepsis.*
**Neurologic**

**Head injury assessment** should include anticoagulant use, mechanism, and the potential for additional distracting orthopedic injury.

- The anticoagulated patient who is over 65 years of age has a greater probability of mortality related to cerebral bleeding (Grandhi et al., 2008)

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**Neurologic**

A patient presenting with severe or sudden onset of "**worst headache of my life,**" is a high risk presentation=ESI level 2.

The triage nurse should be suspicious for a **subarachnoid bleed** especially after exertion, such as lifting, having a bowel movement, or having sexual intercourse.
Neurologic

**Headache** considerations:
- Headache associated with neurologic changes = ESI level 2
- Headache with high blood pressure
- Headache with fever and meningeal symptoms such as nuchal rigidity

Orthopedics

- **Potential for loss of limb** = ESI level 1

High-Risk Orthopedic Presentations:
- Compartment syndrome
- Compromised neurovascular integrity
- Partial or complete amputations
- Patients with possible fractures of the pelvis, femur, and hip and with extremity dislocations should be carefully evaluated for hemodynamic compromise related to significant blood loss

(Giboy et al., 2011)
Orthopedic

Differential diagnosis considerations for orthopedic presentations:

- Neck pain
  - Dissection
  - Subclavian DVT
  - MI
- Posterior knee pain
  - DVT
- Non traumatic, painful, swollen, erythematous joint(s)
  - Joint infection or other systemic process

Orthopedic

Back pain

Don’t make the assumption that all patients presenting with back pain are benign.

- Consider:
  - Cauda equina syndrome (nerves are entrapped and require immediate surgical release)
  - Renal colic
  - Dissection of the thoracic aorta or renal artery

Did the pain begin gradually or suddenly?
Does the pain radiate down the leg or across the groin?
Ask specifically about any loss of bowel or bladder control.
Pediatric high-risk situations:
- Inconsolable child
- Lethargic child
- Fever causing seizure or related to sepsis
- Dehydration related to fever, vomiting, diarrhea
- Suspected child abuse
- Diabetic ketoacidosis may present with vomiting and/or abdominal pain

Pediatric high-risk situations (cont’d):
- Burns
- Head trauma
- Ingestions and overdoses including vitamins
- Infant less than 30 days of age with a fever of 100.4°F or 38°C, or greater
- Sickle cell crisis

[Gilbey et al., 2011]
Toxicology

- **Overdose** if apneic or requires other lifesaving measures=ESI level 1, if stable assign=ESI level 2, still a high-risk situation
- **Ingestion** is a high-risk situation
- **Intoxicated patients** with head injury=ESI level 2
  - Visible signs of trauma, especially with head injury, with suspected intoxication, presents a high risk situation

Integument

**High Risk Presentations:**

- Excessive bleeding, uncontrolled bleeding, arterial bleeding, and partial or full amputations
- If suspect self-inflicted injury, such as wrist laceration, consider the possibility of a suicidal ideation
- Third-degree burns or full thickness burns may require prompt evaluation and transfer to a burn center for definitive care

All of the above presentations warrant ESI level 2 assignment
Psychiatric

**High risk presentations:**
- A patient who presents with severe anxiety
- Patients who are suicidal, homicidal, psychotic, or violent
- Does the patient present an elopement risk?
  - The patient who requires immediate placement into a safe environment = ESI level 2

(Gilboy et al., 2011)

Trauma

**Important assessments related to trauma:**
- Head injury with vomiting (may be a sign of increased intracranial pressure)
- Distance the patient fell or jumped
- High velocity injuries such as MVC
  - *How fast the vehicle was moving?* If high speed = ESI level 2
- Assess the location of the injury
- Was it a penetrating injury? (C5W ask how many of the shots were heard)
- What type of weapon?

(Gilboy et al., 2011)
Trauma
Head Injury

**Consider ESI Level 2**

**Red flag signs that should raise suspicion for basal skull fracture, requiring prompt CT scanning of the brain:**

- Leakage of cerebrospinal fluid (CSF) from the ears (otorrhea) or nose (rhinorrhea).
- Raccoon eyes or panda eyes (bilateral periorbital bruising).
- Battle sign (bruising in the mastoid area behind the auricle of the ear, usually unilateral).
- Hemotympanum (presence of blood behind the eardrum).

(Bethel, 2012)

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Trauma
Adult Head Injury

**Criteria for CT scanning** (National Institute for Health and Clinical Excellence [NICE] 2007):

- GCS below 13 when first assessed, or below 15 two hours after injury.
- Suspected open or depressed skull fracture or signs of basal skull fracture.
- Post-injury seizure or focal neurological deficit.
- More than one episode of vomiting.

(Bethel, 2012)

**Consider ESI Level 2**
Trauma
Adult Head Injury

- Pre-injury amnesia of more than 30 minutes duration.
- Age 65 or older with amnesia or loss of consciousness.
- Anticoagulated patient with amnesia or loss of consciousness.
- Loss of consciousness or amnesia in association with a dangerous mechanism of injury, such as a fall from a great height.

[Bethel, 2012]

Consider ESI Level 2

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Trauma
Pediatric Head Injury (NICE, 2007)

Symptoms of intracranial bleeding necessitating CT scanning in infants and young children may include [NICE, 2007]:

- Witnessed loss of consciousness of more than five minutes duration.
- Anterograde or retrograde amnesia of more than five minutes duration.
- Abnormal drowsiness or lethargy.
- Post-injury seizure with no history of epilepsy.
- Evidence of basilar skull fracture (as previously discussed).
- Suspicion of an abuse injury.

[Bethel, 2012]

Consider ESI Level 2
Trauma
Pediatric Head Injury (NICE, 2007)

- Three or more separate episodes of vomiting within four hours of injury.
- Infant younger than 12 months with GCS below 15 on assessment.
- Child 12 months to 16 years with GCS below 14 on assessment.
- Tense fontanelle or suspicion of open or depressed fracture.
- Infants with bruising, swelling, or laceration that is greater than 5cm on the scalp.
- Dangerous mechanism of injury.

(Bothel, 2012)

Consider ESI Level 2

Hematology

Potential high-risk hematologic presentations include:

- Patients who are vomiting blood or a chief complaint of blood per rectum
- Patients with a history of anticoagulant use
- Patients with petechial eruption with or without fever
Endocrine

- Diabetic ketoacidosis (DKA)
  - Consider DKA in a diabetic patient who has had a recent illness, complains of nausea, vomiting and/or abdominal pain

- Hyperglycemia (excessive thirst, excessive urination...)

- Hypoglycemia (sweating, decreased LOC, headache...)

- A patient with thyroid crisis may present with tachycardia, edema

  (Gilboy et al., 2011)

Examples of Resources

- Lab tests (such as blood and/or urine tests)
- ECG
- X-ray
- CT, MRI, ultrasound, angiography
- IV fluids

  (Gilboy et al., 2011)
Examples of Resources

- IV and IM medications except for tetanus and/or nebulized medications medications
- Specialty consultation
- Simple procedures: Laceration repairs, or urinary catheter insertion
- Conscious sedation

(Gilboy et al., 2011)

NOT Resources

- History & physical examination (including pelvic exam)
- Point-of-care testing
- Saline or heparin
- Phone call to the patient's primary care provider
- Prescription refills
- Simple wound care (including dressings and abscess or wound rechecks)
- Crutches, splints and/or slings
- Tetanus and nebulized medications

(Gilboy et al., 2011)
References


References


References


Appendix F

Timeline

September
- Complete Pretest open 9/29/16
- Laminated ESI cards provided
- Complete Triage Education via YouTube after Pretest
- Complete Posttest after YouTube Education
- Participants Share via Facebook forum after Posttest
- Mentor/Reinforce learning

October
- Participants Share via Facebook forum
- Mentor/Reinforce learning
- Complete Post Posttest by 10/26/16

November
- Results

ESI QUALITY IMPROVEMENT PROJECT