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Staff Education Project: The Emergency Severity Index

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
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Walden University
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Abstract

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MS, Frontier Nursing University, 2011

BS, University of Phoenix, 2008

Project Submitted in Partial Fulfillment

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Abstract

The triage process is an important precursor to ensuring expeditious and appropriate medical care in the Emergency Department (ED). There is a positive correlation between proper triage technique and improved patient outcomes, making triage an essential issue for nursing practice. The purpose of this project addressed the results of a staff education program directed at teaching the Emergency Severity Index (ESI) Triage System to 42 triage nurses working in an ED in a critical access facility in the rural Midwest. The practice-focused problem for this project was as follows: Will a staff educational program improve understanding of the ESI triage system? The theoretical frameworks for this project included analysis, design, development, implementation, and evaluation (ADDIE) and Knowles' theory of adult learning principles. The learning material was adapted from Emergency Severity Index (ESI), a triage tool for emergency department care published by the Agency for Healthcare Research and Quality (AHRQ). Pre- and post-test scores completed by the 42 triage nurses enrolled in the learning sessions were examined. Comparison of the pre- and posttest scores revealed a marked improvement of staff understanding of concepts of the ESI. Scores from the pre- and post-tests were evaluated using descriptive statistics and a paired-sample t-test, showing that participation in the education program resulted in increased knowledge in triage using ESL in all participants. After review of past peer reviewed studies and the results of this focused intervention, a recommendation was made to support the implementation of this teaching project to similar triage settings. Improved education will support the success of implementing and maintaining standardized triage systems.

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Dedication

I would like to dedicate this project to the incredible group of providers, nurses and other emergency room staff from our community hospital. Your dedication to patient care has never been more evident than during this time of pandemic.

Acknowledgments

I would like to thank my husband, David, for his unwavering support and patience throughout this educational undertaking. Bless you for never complaining about the time I spent working on schoolwork when we could have been doing something fun. I couldn't have done it without my best friend.

A special thanks goes to Dr. Corinne Wheeler for her advice and encouragement for my completion of this doctoral program. Thanks for not giving up on me.

Thanks to Dr Anna Valdez for sharing her ideas and providing guidance on the proposal and final project.

Thanks also to my children, grandchildren, and my friends who constantly reminded me that "age is just a number." Thanks for every time you told me you were proud of me.

Table of Contents

List of Tables

Section 1: Nature of the Project

Introduction

Recognition of symptom severity makes accurate triage skills an essential issue for nursing practice. Mis-triage is responsible for dangerous delays in patient care oftentimes leading to poor outcomes and death (Stone, 2019). Zamanpour et al. (2020) state that accurate, immediate patient triage is necessary to support critical thinking and decision making. This doctoral project focused on introducing nursing education to a group of triage nurses currently practicing in an acute access rural hospital. The educational content was related to utilization of a standardized triage process. This project served as a precursor to the implementation and maintenance of the ESI triage system at this facility. This five-level process has a direct effect on reduced length of stays, medical expense, need for inpatient admission, and decreased mortality rates (Kwak, 2018).

Problem Statement

The practice-focused question for this project was as follows: "Will a staff educational program improve understanding of the ESI Triage System?" The desired outcome was to obtain an improved staff understanding of an effective triage process. Currently, the practice site has no standardized method for triaging patients presenting to the ED. Triage decisions are greatly affected by nursing bias, which is in turn, affected by several modifiers such as the educational level of the triage nurse, years of practice and experience, cultural and religious beliefs (Worth et al. 2019). Inferences made by the triage staff may be based upon intuition, preconception, and emotion, ultimately causing

a negative effect on the assignment of illness or injury severity (Johannessen, 2017). Therefore, the opinions of the nurse may introduce bias regarding the true presentation of patient symptoms.

Triage staff bias and opinions contribute to the current triage problem at this practice site. When questioned by providers as to the reasoning for inappropriate placing of critically ill patients in a fast-track area, several triage nurses reported that they did not believe the symptoms on presentation warranted a higher acuity area. Subsequently, when nonemergent patients were placed in monitored beds, these same nurses responded that they chose these assignments simply because there was no available room in fast track.

The recent influx of patients presenting to the ED with complaints of COVID-19 symptoms has added additional stress to an already strained ability to control workload and flow within the department. Abrupt radical increases in ED patient census have caused increased confusion in the triage area as staff are experiencing difficulty with patient placement. Inadequate triage systems are not functional and cannot be adapted to increased patient volumes. This then contributes to increased ED staff workload and overcrowding (Fong, 2018).

Purpose Statement

Currently, a gap exists in the nursing triage procedures within this rural healthcare setting. No standardized triage protocols are in place, causing staff and patient confusion regarding appropriate treatment needs. Although the triage staff has been able to identify obvious emergencies causing threat to life and/or limb, most of the staff reported they are

unsure about lesser cases. One example given was that if a patient presents to triage with a complaint of abdominal pain, individual triage nurses tend to have various opinions pertaining to the acuity and placement of the patient. If a patient is stoic when describing location and intensity of pain, several of the nurses have stated that these patients can be returned to the waiting room until a room is available. Another staff member reported a reluctance to place a young adult in a monitored room despite the patient complaining of chest pain and shortness of breath. This patient was assigned a room in the fast-track area and later had to be transferred to a higher acuity area when it was discovered that he was suffering from a spontaneous pneumothorax.

The purpose of this project was to design, implement, and evaluate a staff education activity regarding the ESI. This teaching project was directed at instructing the triage nursing staff on the proper use of the ESI triage system. The overall aim of the project was to improve staff understanding of this standardized triage process. The practice-focused question is as follows: "Will a staff educational program improve understanding of the ESI triage system?" Introducing this training exercise was expected to ensure successful implementation of ESI triage process for the acute access facility.

Ghazali et al. (2020) report a significant improvement in ED triage staff knowledge following education. The learning activities in that study incorporated the use of the teaching plan and materials provided by ARHQ (Ghazali et al. 2020). Reassessment and educational refresher courses are recommended to maintain staff compliance with the triage process (Ghazali et al. 2020). The end result of this project lends support to and verification of these findings.

Nature of the Doctoral Project

The purpose of this project was to design, implement, and evaluate a staff educational program based on the ESI. Educational sessions were conducted face-to-face at the practice site. Three sessions were scheduled with 15 triage nurses attending sessions one and two, and 12 nurses attending session three. The chosen location was the staff break room situated within the ED. The desired outcome was improved understanding of a standardized triage process by a group of nurses currently practicing in a busy midwestern rural ED.

The sources of evidence collected for this project included national and expert agencies that contribute to evidence-based practice, emergency triage, and/or the Emergency Severity Index. These include the Emergency Nurse Association (ENA, n.d.), Journal of Emergency Medicine (American Academy of Emergency Medicine, n.d.), International Emergency Nursing (European Society of Emergency Nurses, n.d.), and the Advanced Emergency Nursing Journal (American Academy of Emergency Nurse Practitioners, n.d.). These sources were utilized in the development of the staff education program. Other professional organizations and journals utilized are summarized in the literature matrix located in Appendix F

Nursing staff from the emergency department participated in the education via a presentation and handouts. Evidence-based pre- and post-tests were administered before and after the education. These tests were adopted from the ESI triage manual (Gilboy, 2020). The test questions were identical for both examinations. Performing a comparison

of the number of correct answers from each test provided an accurate determination of the effect of the education on the students' understanding of the subject.

Prior studies and research obtained from peer reviewed journals and other sources were examined prior to the beginning of the teaching program. This information offered insight on the anticipated or desired outcome, as well as the effect on the practice gap. The identifiable practice gap pertained to the knowledge deficit regarding an effective triage process. In this instance, the students' participation in the learning sessions improved the knowledge base. The material and content structure I presented has decreased the nursing practice gap by improving individual understanding of how the ESI system works and how to apply it to practice.

Significance

The significance of this educational project was to the opportunity to standardize triage decision-making skills in the selected practice site. A standardized, competent triage process will improve patient outcomes by assuring that patients are placed appropriately and the level of care is addressed (Hinson, 2019). Patients, nurses, ED providers, and the community will be impacted by this project. Following participation in the educational sessions, the ED nursing staff involved in the triage process showed an improvement in understanding of the triage process and were able to effectively use the provided algorithm to assist with making determinations related to patient acuity and placement within the department. During the process, the triage nurse can make more appropriate determinations of the number and type of resources required for optimal

patient care. An accurate use of resources supported optimal patient care and reduced resource waste for the hospital and the ED (Hinson, 2019).

The implications for social change included improved and timely treatment of all patients presenting to the ED, regardless of the initial complaint. This also affects the optimal utilization of resources and decrease waste. Patient flow should improve by reduced wait times and throughput times. These hypotheses will need to be investigated in future studies following the implementation of the triage system. A potential exists to adapt and transfer this teaching project to other areas by Summer 2023. These areas might include local Urgent Care and private provider medical office settings. This timeline will allow the ED to assess the effect of the education and the usefulness of the triage system.

Summary

. The purpose of this project was to design, implement, and evaluate a staff educational program based on the ESI. Educational sessions were conducted to decrease the nursing practice gap as it relates to a knowledge deficit of the ESI triage system. Comparisons of pre- and post-test scores were utilized to determine the acquisition of knowledge by the nursing triage staff. The significance of the project included nursing staff ability to utilize the ESI algorithm appropriately in every patient triage encounter. According to Hinson (2019), this new knowledge will improve patient outcomes in the ED. Accurate patient placement will also support effective use of ED resources (Hinson, 2019).

Section 2: Background and Context

Introduction

The practice-focused question for this project was "Will a staff educational program have an improved understanding of the ESI Triage System?" This particular practice setting has not previously used a standardized process for triage in the ED. Therefore, it will be important to incorporate a proven program that can be developed, implemented, and evaluated for success. Previous education and work experience of staff were considered during the developmental stage and before implementation of the new process. Therefore, only RNs were included in the program.

This section includes the concepts, models, and theories used to develop the educational program. Two theoretical frameworks, analysis, design, development, implementation, and evaluation (ADDIE) and Knowles' theory of adult learning principles are discussed.

Concepts, Models, and Theories

One theoretical framework for this project is the ADDIE concept (Figure 1). This model allows for each of the five areas (Analysis, Design, Develop, Implement, Evaluate) to be examined and revised as needed in order to achieve the greatest possible success with improved staff learning. ADDIE is recommended by researchers for teaching projects because it offers a step approach toward a goal of acquired learning (Misesani et al., 2020). This method allows for the determination of the definite educational deficit, provides an intervention to the lack of knowledge, and evaluates the results of the effects of the new education. The ADDIE model will also support flexibility in the program

implementation and evaluation by the interjection of revised strategies, as needed (Lasky, 2018).

The analysis phase is the base and starting point for the ADDIE model as it constitutes the discovery and identification of the practice problem (Bouchrika, 2020). This phase also includes the identification of the learners and requirements to participate in the learning experience, potential barriers to the process, and intended end results of the program (Muruganantham, 2015). The current practice problem at this facility was identified by the care providers, nursing staff, and administrative team through observation and acknowledgement of repeated incidences displaying improper patient placement and acuity assignment within the department. The staff also reported witnessing delays in care when patients were initially assessed by another staff member, and it was determined that the patients' acuity levels were assigned incorrectly.

The design phase provides a systematic approach to the development of the actual educational systems (Bouchrika, 2020). The educational design is constructed by determining the delivery system for the learning material such as integration of educational materials. These materials included manuals, handouts, study guides, audiovisual tools, and other instructional guides deemed most appropriate for learner activity (Kurt, 2017). All teaching materials were assessed for content specific or relative to the subject prior to the completion of the design phase (Appendix A and B).

Project development includes completing the working design of the learning activity (Bouchrika, 2020). All materials such as lecture notes, educational handouts, audiovisual presentations, pre- and posttests, and evaluation forms were prepared.

Although there was a recommendation that students might benefit from the use of electronic forms, it was decided by the ED administrative team that face-to-face learning sessions would be most appropriate for the intended group at this facility (Nichols-Hess & Greer, 2016). Reasons given included limited access to individual home internet service, creation of program encouraging group interaction, student participation with scenario presentations, and concerns for staff noncompliance with learning activity completion. Signup sheets for multiple sessions were made available for staff to choose a date and time most convenient for them. This program required approximately four to five-hour time frames. Four dates were available with time slots that accommodated both day and night shift staff.

The implementation portion encompasses the actual teaching project. Bouchrika (2020) describes three concepts necessary for completing a successful learning session: educator training, procurement of teaching tools, and provision of an environment conducive to learning. Handbooks, pre- and post-tests, and evaluation forms (Appendix D) were developed and made available to each participant. Audiovisual equipment was set up in each classroom, and the educator was familiar with the operation of the unit. The teaching environment was large enough to accommodate all the students comfortably and had appropriate lighting, room temperature, and adequate seating. The ED staff lounge was utilized due to the area size and easy accessibility.

The effectiveness of the teaching project was measured during the evaluation step (Bouchrika, 2020). The evaluation was divided into two areas: actual end result knowledge of the subject matter and the perceived effectiveness of the instructor and the

teaching plan. The resulting knowledge was gauged using the differences between the pre- and post-test scores. A questionnaire was completed by each student to determine the personal perceived effect of the instructor and the teaching tools. Data obtained during the evaluation influenced changes in the project implementation and identification of problem areas affecting learner understanding of the material.

A second framework used for this project involved Knowles' theory of adult learning principles. This model states that adult learning of any subject can be achieved by applying six principles (Twaddell, 2019). These principles remain constant in all education involving adult learners and follow the andragogical theory developed by Knowles. They are as follows.

Principle 1 states that adults must understand the importance of why they need to learn new material (Knowles et al., 2005). In this project, the triage staff understood and acknowledged the importance of learning how to use the new triage system. They also realized that this knowledge would have a positive effect on patients and nursing practice.

Principle 2 notes that the learners need to have control over the results of the educational presentation. Once the new information is synthesized by the students, the decision of how to apply the knowledge rests with them. How the learner chooses to apply the principles of the ESI triage system will ultimately determine the success of the teaching project. The students are aware that because of their experience with triage and patient care, they were competent and capable of learning the material.

Principle 3 suggests that if learners can relate the provided information to previous experiences, there is a greater chance that they will accept the information as

true and reliable. In this instance, the triage staff was able to identify with the components of and problems with the current triage process. In effect, it is difficult for a nurse with no previous triage or patient care experience to grasp a true understanding of the educational material.

Principle 4 states that the staff must show a readiness to learn (Knowles, 2005). At the beginning of the teaching sessions, the learners were allowed to express any perceived concerns with the current triage process and bought in to the idea that change was necessary. This dialogue acknowledged that there was motivation to learn about the new triage process.

Principle 5 is based on the understanding that once the practice problem is identified, the nurses will understand the goal of the educational project is to improve knowledge. Once the goal was reached, the nurses had more confidence in their ability to apply the knowledge to practice. Understanding the concepts of the ESI triage system will provided the tools needed to resolve problems associated with the current process.

Principle 6 states that learners must have a motivation to learn the new material (Knowles, 2005). This motivation may be achieved by advising the learners that the educational program is mandatory, and that the introduction of the new triage process is imminent. They also understood that a portion of personal job performance is dependent upon the ability to use the ESI system appropriately. Emphasis was placed on the effects the ESI system has on patient care and outcomes.

Relevance to Nursing Practice

Patients, EDs, critical access facilities, and the nursing profession may benefit from the information obtained from this project. Bittencourt et al. (2020) stated that appropriate use of available resources and assignment to a qualified provider help with reducing the delay in patient care currently experienced in the ED. In this particular care setting, a 25 percent increase in patient census since the onset of the Coronavirus pandemic has contributed to patient flow problems.

Overcrowding has been a well-documented problem with EDs throughout the United States and other countries (Salway et al., 2017). A systemic review of literature conducted by Bittencourt et al. (2020) examined an array of interventions proposed to improve patient flow. One of the interventions examined the effect of a standardized triage process on the length of stay (LOS). The results of these studies indicated that an effective triage process decreases LOS and improves service delivery in the ED (Bittencourt, 2020). Other factors that affect LOS in this practice site included short staffing and delays in door-to-treatment times.

Previously, this practice site employed a three-level triage process, which was not used consistently. Patients were placed in categories of emergent, urgent, and nonurgent. There were no inclusion criteria for each category, and patient assignment to each category was based on nursing discretion. Hinson (2019) argued that the three-level approach to triage is the least effective model because it requires excellence with nursing observation and critical thinking skills and does not allow for nurses with less professional experience. The ESI system is based on assigning patients to one of five

categories: critical, emergent, urgent, less urgent, and nonurgent (Gilboy, 2011). Within ESI, inclusion criteria for each category are stated, and an algorithm is used to determine patient placement. This precludes personal bias and uncertainty by triage staff.

Local Background and Context

The context of this educational project was to introduce the ESI triage system to a rural healthcare facility in the Midwestern United States. This facility offers several medical specialties and includes a 28-bed ED, with a staff of 42 nurses and 16 paramedics, eight physicians and 15 midlevel providers. This project was introduced to the nursing staff only since their responsibilities include all areas of patient triage. Understaffing continues to be a current problem throughout the facility. This hospital provides medical services to five surrounding counties and is the closest acute care access within a 100-mile radius.

Since there has been no standardized policy related to triage, this project was implemented and measured within this setting. There was administrative support from the facility's leadership team for this project. Educational materials and handbooks were purchased from the Agency for Healthcare Research and Quality (AHRQ). A classroom was provided by the ED, and audiovisual equipment were obtained from the facility's education department.

Patient volumes have increased significantly over the last year. According to tracking reports obtained from the facility, ED census for 2021 was 38,472. The current average daily census is 150 patients. The projected census for 2022 is greater than 47,000 (Community Health Systems, 2022). Available nursing staff varies from forty to forty-

two and is divided into overlapping shifts. Physicians and midlevel providers work staggered shifts to supply 24-hour coverage.

The COVID-19 pandemic has had a profound effect on the current patient population presenting to the ED. Patient census has exploded in the wake of symptomatic patients, as well as those concerned by possible exposure to the virus. Based on observations by providers and nursing staff, triage of this patient subgroup has been more inconsistent when compared to other presenting complaints. Patients with moderate to severe COVID symptoms have been placed in inappropriate treatment areas. This causes a delay in care and flow when the patient must be redirected to a monitored, negative pressure room.

Closures of several local healthcare facilities providing both urgent and emergent care have almost certainly impacted the number of patients presenting to this ED. Three area community owned hospitals and urgent care centers closed over the last two years causing an increase in the numbers of patients arriving to the practice site. A problem exists with a lack of access to primary care, which has forced many patients to present to the ED seeking treatment for acute and chronic problems (Stone, 2019).

Role of the DNP Student

Currently, I am a care provider and Lead Nurse Practitioner working in the ED of the target facility. In my 12-year career, emergency medicine has been and continues to be my professional focus. I have witnessed first-hand the problems created by inappropriate triage within the ED. Patients with critical findings are often placed in

unmonitored rooms, while others with minor illnesses are assigned to areas equipped for emergently ill patients.

In the ED setting, midlevel providers are routinely assigned to various areas of patient acuity. There is a fast-track area designated for nonurgent patients. All other areas in the ED contain patients assessed as moderately urgent to critical. These room assignments provide for observations about the effectiveness and appropriateness of the need for a standardized triage process. Inappropriate triage situations have occurred frequently throughout each shift, which results in patients being misplaced into treatment areas. For example, a critical injury might be placed in the fast track area, while a patient presenting with a nonemergent complaint was assigned to a cardiac monitoring room. Occurrences of poor triage resulted in patient movement to a more appropriate treatment area after they are assessed by a provider, which caused a delay in patient care and wasted resources.

My role as the DNP student for this program included the tasks of staff educator. Necessary educational materials were obtained from AHRQ. A sufficient number of handbooks, pre- and post-tests were provided for the students. Session scheduling was coordinated with the ED Nurse Manager, and sign-up sheets offering several teaching dates and times were made available to the staff. Scheduling was flexible to allow for staff attendance.

The education was based upon materials derived from the handbooks and audiovisual disks supplied from AHRQ regarding the ESI system. Pre- and post-tests were graded by myself, and a comparison study of the results were analyzed. The

information was provided to the hospital education department and the ED Nurse Manager. I analyzed the results of the student evaluations regarding the educational program to determine if changes were necessary for improvement in the program delivery.

Role of the Project Team

The project team included the facility's education department, the ED Nurse Manager, and myself. Lateral communication between the team was achieved regarding scheduling of classes, a review of the teaching content, classroom and equipment provisions, and evaluation of the class results. The nurse manager attended the initial class session and gave her approval of the course content and delivery. She also reviewed the content, pre- and post-test results, and the student evaluations of the program. Verbal feedback was provided to me within a week of the course completion. The manager communicated instructions related to attendance sign-up sheets and flexible scheduling with the learners.

The education department provided audiovisual equipment, financial support to obtain the student handbooks, and a program evaluation tool. An educator provided me with instruction on the proper use of the equipment, as well as contact information in case I had any questions. Upon completion of the four learning sessions, the education department and nurse manager were responsible for record-keeping regarding ED staff compliance and successful completion of the learning program.

Summary

The theoretical frameworks for this project followed the ADDIE model and Knowles andragogical theory. These models were chosen to guide the analysis of the problem and the design, development, implementation, and evaluation of the teaching process. Educational materials consisted of a teaching program provided by AHRQ. This project was a precursor to introduce a standardized triage process which is scheduled to be implemented within thirty days of the completion of the educational program. The expectation was that the evidence-based triage system will improve patient outcomes and department throughput times by providing triage nurses with a process to more easily identify severity of symptoms and guide proper patient placement within the ED.

The context of the project was a rural acute care access facility that is geographically isolated from larger facilities in urban areas. The ED census is expected to steadily increase this year, according to projections provided by the organization. With the closure of several local healthcare facilities, the lack of primary care providers, and the onset of the COVID-19 pandemic, a standardized triage system was and continues to be a vital tool in appropriate patient care.

Section 3: Collection and Analysis of Evidence

Introduction

The purpose of this DNP project was to design, implement, and evaluate a staff education project on the ESI triage system. The goal of the project was to provide a working knowledge of the system. The practice-focused question for this project was, "Will a staff educational program improve understanding of the ESI triage system?" The desired outcome was to familiarize triage staff with the system, allowing for a smooth transition to the eventual implementation of the standardized triage process.

The practice setting for the project was a 250-bed acute care facility in a rural area of the Midwestern United States. Patient census has dramatically increased due to the COVID-19 pandemic and recent closures of multiple local healthcare facilities in the area. The need for a standardized triage system was identified to improve patient outcomes and flow.

The program was developed using the ADDIE model and Knowles' andragogical theory. The hospital education department and ED management team cooperated and assisted in setting up the program. Financial backing, classroom, and hospital equipment were provided.

The current triage process was deemed dysfunctional by the ED providers and nursing staff. It was not supported by an evidence-based practice and basically relied on the perceptions and attitudes of the triage nurse. Commonplace triage errors included under or over triage with misidentified acuity levels, incorrect room assignments leading to poor resource utilization and increased length of stays. With the recent influx of

patients, the process was graded as an inadequate system for determining severity of symptoms and patient placement.

Practice-Focused Question

As previously stated, this practice setting did not have a standardized system of triage in place. This presented a practice gap related to timely and appropriate patient care. ED administration has determined that the ESI five level triage system will be implemented as soon as staff education is completed. The practice-focused question was "Will a staff educational program improve understanding of the ESI triage system?"

The purpose of the project was to measure improvement of staff understanding of the ESI triage process. Measurements were obtained by comparing the difference in responses to pre- and post-tests following a staff educational program. These measurements provided the data necessary to decide if the teaching sessions achieved the goal of improved understanding.

Sources of Evidence

Primary articles published over the five-year span of 2015-2021 related to ED triage systems and sentinel resources on adult education were examined. Scientific databases including Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medline, Cochrane, PubMed, and EBSCO Host were utilized for peer reviewed scholarly articles. Additional information was obtained from activity reports generated by the target facility's ED activity data and the ESI handbook provided by AHRQ.

Search terms for the literature review included triage, ESI triage system, ADDIE, Knowles adult learning theory, nursing education techniques, triage performance, and staff education. All articles were evaluated for relevance to this project. Findings from the research offered insight as to the implementation and evaluation of other facilities and organizations that have instituted the ESI process. Comparisons of multiple triage processes provided information regarding the pros and cons of various symptoms.

The literature was analyzed for objective reliability of information using the currency, relevance, authority, accuracy, and purpose (CRAAP) evaluation criteria below and placed in a matrix table for reference (Central Michigan University Library, 2021).

- Currency (the timeliness of the information)
- Relevance (does the information relate to the project purpose)
- Authority (level of evidence determined by Melnyk and Fineout-Overholt, 2011)
- Accuracy (the reliability and correctness of the content)
- Purpose (reason and objectivity of the information)

The purpose of the project was to measure improvement of staff understanding of the ESI triage process. Measurements were obtained by comparing the difference in responses to pre- and post-tests following a staff educational program. These measurements provided the data necessary to decide if the teaching sessions achieved the goal of improved understanding. An independent *t* test was performed to compare the two sets of data. The *t* test allowed for the evaluation of two separate samples; the scores of the pretest versus the scores of the posttest.

Inclusion criteria for staff participation in this project was set for RN nursing staff responsible for triaging patients presenting to the ED. In this target setting, 42 staff members met the criteria. Participants were asked to sign up for one of four sessions based on personal preference. Class times lasted approximately four to five hours. At the beginning of each session, participants were asked if they had any prior knowledge of the ESI triage system. It was noted that none of the participants had any present knowledge of the system.

Analysis and Synthesis

The teaching module incorporated the handbook and the DVD supplied by AHRQ. Subjects covered included an overview of the triage process, the variations of levels 1-5, expected resource needs, use of vital signs, pediatric triage using ESI, and the implementation and evaluation of the ESI system (Gilboy, 2012). Practice and competency cases were reviewed following the lectures and DVD presentation.

The ESI is recommended by the Emergency Nurses Association (ENA) and the American College of Emergency Physicians (ACEP) as the standard for triage in the emergency setting (Gilboy et al. 2020). Reliability of the system is established by both inter-rater and intra-rater measures (Gilboy et al. 2020). Following training, all triage nurses should perform triage in the same manner with the same results. The intra-rater measure noted that an individual nurse will be able to consistently apply the correct triage rating to patients with similar complaints. The validity of the system can be verified by investigating patient outcomes (Gilboy et al., 2020). An example of this could be comparing the ESI triage level assigned by the nursing staff to the outcome of the patient.

If multiple patients designated as nonurgent in the ED are subsequently admitted to the hospital, or if multiple patients determined to be high acuity are discharged, then the system is invalid and not reliable. Multiple studies involving hundreds of triage nurses and thousands of patients confirm that the ESI system is reliable and valid (Gilboy, 2020). Therefore, a proper educational program is essential to encourage nursing and patient response.

Pre- and post-test content was taken directly from the practice and competency cases presented in the ESI handbook. Forty-two questions including multiple choice, true/false, and case studies were obtained from the ESI handbook. Pre-test questions were identical to post-test questions, and all test questions were assigned a value of one point with 42 possible points in total. In order to maintain anonymity with the test results, each nurse was assigned a number to be used for identification purpose. This number was known to myself and the nurse only. The pre-test was administered and collected by me. Both pre- and post-test scores were recorded. Individual scores were provided to each student using the assigned identification number given to them at the beginning of the course. All tests were placed in the nurses' educational folders and given to the facility's educational director.

Students completed a separate evaluation questionnaire to identify strengths and weaknesses of the program. Based on the findings of the tool, future educational programs can be amended if necessary. Changes to the educational program may include the use of information retrieved from newer versions of the training materials.

The data were analyzed using descriptive statistics and a paired *t* test. The descriptive statistics were used to describe the basic features of the data. The *t* test also allowed for the evaluation of two separate samples: the scores of the pre-test versus the scores of the post-test. The independent variable was identified as the educational program presentation. The dependent variables were the test scores of the pre- and post-test and the resulting knowledge attained by the students.

The stated hypothesis maintained that there would be a significant improvement in the scores of the post-tests versus the scores of the pre-tests. The null hypothesis stated that there was no change in the test scores. The resulting data analysis confirms a significant improvement in the staff's knowledge of the ESI system.

Summary

The purpose of this DNP project was to design, implement, and evaluate a staff education project on the ESI triage system. The goal of the project was to provide a working knowledge of the system. The practice-focused question for this project was, "Will a staff educational program improve understanding of the ESI triage system?"

Research prior to the program included peer reviewed journal articles that were relevant to the ESI system and effective teaching methods. Inclusion criteria also consisted of publication within the last five years, along with evidence-based theories acceptable to the professional nursing community. All the evidence was evaluated for objective reliability. The educational program was completed, and the scores from both pre- and post-tests were collected. Data was then applied to an independent *t* test to

determine if there was a significant change in the student's knowledge base of the ESI system.

Section 4: Findings and Recommendations

Introduction

The current problem for this practice setting is that there is no evidence-based standardized triage process in place with the ED. There is also a nursing knowledge deficit related to the chosen process, which is the ESI five level system. The practice-focused question for this project is "Will a staff educational program improve understanding of the ESI triage system?" The purpose of this DNP project was to design, implement, and evaluate a staff education project on the ESI system.

The content of the ESI handbook and educational DVD were identical. Following an introduction and overview of the ESI system, the various ESI levels were presented. Also included in the text and DVD were sections containing an explanation of expected resource needs. The effect of the resources on the determination of levels 3-5 were presented; the role of vital signs; use of the ESI for pediatric triage; ESI algorithm; implementation of the process; and evaluation and quality improvement of the program. The final sections contained practice and competency cases, which were used for the pre- and post-tests.

The sources of evidence were obtained by a comparison of scores of pre- and post-tests completed by the learners. Pretests were administered prior to educational sessions, and post-tests were completed following the sessions. Test results were plugged into an SPSS system to analyze the data applied to an independent samples *t* test. Improvement of scores on the post-tests indicated improved knowledge and understanding of the new triage system.

Findings and Implications

Scores from the pre- and post-tests were evaluated using descriptive statistics and a paired-sample t-test. All students scored higher in the post-test following participation in the education program. A table reporting the pre-test and post-test scores for each participant are in Table 1. The results from the pre-test (M = 35.37, SD = 1.76) and post-test (M = 41.84, SD = 0.37) resulted in an improvement in knowledge of ESI, t (42) =26.11, p <.001. Table 1 below summarizes the mean, variability, and shape of the pre-test and post-test distribution of total test scores.

Table 1

Descriptive Statistics Summarizing the Mean, Standard Deviation and Standard Error

Variable	N	Mean	Std. Deviation	Std. Error Mean
Pre-test Scores	42	35.37	1.76	0.27
Post-test Scores	42	41.84	0.72	0.11

A paired-samples t-test was conducted to compare the scores of the pre and post-tests. These results in Table 2 suggest that participation in the staff education program resulted in increased knowledge in triage using ESI.

Table 2

Paired Differences of t-test Comparing Pre- and Post-Test Knowledge Triage Using ESI

	Mean	Std. Deviation	Std. Error Mean	t	t-crit	df	p	Sig. (2-tailed)
Pair Pre - Post Test Scores	6.47	1.62	0.022	0.856	2.02	41	0.021	.005

There was a total of 42 questions with one point assigned for each correct answer, for a possible total of 42 points. Pre- and post-tests were graded by me, and the results

were shared with the students individually and confidentially. A conclusion was made that all students test scores did improve as much as twenty-five percent following the teaching sessions. Students verbalized a better understanding of the ESI triage system and a self-confidence in the ability to utilize the system.

Recommendations

Recommendations for this project include ensuring that each new staff member be required to complete the training course before assignment to the triage area. Nurses should be required to complete a refresher course and testing each year to evaluate continued knowledge of the system. Remediation should be offered when necessary. These recommendations will support the new practice and contribute to the continued success of the triage system.

Strengths and Limitations of the Project

The strengths of this project included the identification of a true practice gap and the positive outcome of the educational program. The number of students was appropriate to prove the hypothesis that learning would be improved. Using the materials provided by AHRQ also ensured that the information provided was evidence based and true. Weaknesses of the project are indicated by the fact that the study was conducted in one healthcare facility in a distinct rural area. There was, however, significant research to support the hypothesis of the study by prior investigators. The project did not address test anxiety or other variables that could affect pre- and post-testing.

Section 5: Dissemination Plan

Test results were provided to each individual student. Scores were not posted in common areas. Copies of the scored pre- and post-tests were distributed to the ED nurse manager for review and are kept on file with the hospital education department. Students were also given copies of the tests upon request.

Analysis of Self

The program evaluations completed by the students revealed extreme satisfaction with the course, classroom, and the delivery of the material. As a nurse practitioner currently working in the ED, this project has given me great satisfaction. I believe that the elimination of this practice gap will help to ensure improved patient care and flow within the department. Further, the new triage process will improve our community health and wellness goals. My long-term professional goals are to complete my doctorate degree and perhaps teach new nurse practitioners. I would also like to be involved in performing future teaching in-services to address nursing knowledge deficits. Challenges for this project included coordinating course times to ensure that all nursing staff could attend the sessions. Acquisition and development of the actual educational materials took more time than I originally expected, which was partly due to wait times for administrative approval and support.

Summary

The practice problem for this project was "Will a staff educational program improve understanding of the ESI triage system?" The initial gap in practice was identified as a lack of nursing knowledge related to the ESI triage system. The hypothesis

for this study was that ED nurses would have a better understanding of the process. The educational offering was necessary as a precursor to implementation of the new triage process. Before and after the learning sessions, nursing knowledge was evaluated using the scores of pre- and post-tests. The results were compared, and an improvement was noted between the test scores. The nursing staff also reported a greater understanding of the process and felt confident in utilization.

Prior research suggests that the use of the ESI system will improve patient outcomes within the ED. By eliminating this gap in practice, the nursing staff can provide more appropriate patient care. This is an important contributor to the health of our rural community.

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Appendix A: Pre- and Post-Tests

(Taken from ESI Implementation Handbook, Version 4)

Student ID Number_____Date:_____

Read the following statements and provide the correct answer:

1. A magnetic resonance imaging (MRI) procedure is considered a resource in the ESI triage system. (T/F)
2. A psychiatry consult is considered a resource in the ESI triage system. (T/F)
3. Cardiac monitoring is considered a resource in the ESI triage system. (T/F)
4. How many ESI resources will this patient need? A healthy 25-year-old construction worker presents with back pain. The triage nurse predicts he will need a lumbar spine x-ray, oral pain medication administered in the ED, and a prescription to take home. (1, 2, or more)
5. It is necessary to take vital signs to determine the number of ESI resources in an adult ED patient will need. (T/F)
6. The triage nurse must have enough experience to be certain about the resources needed for each patient in order to accurately assign an ESI triage level. (T/F)
7. A 30-year-old sexually active female patient with vaginal bleeding and cramping, doesn't use birth control, and is dizzy and pale. In determining this patient's ESI triage level, does it matter if the local ED does urine pregnancy tests at the point of care versus sending a specimen to the laboratory? (Y/N)

   How many resources will this patient require? (0, 1, 2, or more)

8. How many resources will this patient need? A healthy 40-year-old man presents to triage at 0200 with a complaint of toothache for two days, no fever, and no history of chronic medical conditions. (0, 1, 2, or more)
9. How many ESI resources will this patient need? A 22-year-old female involved in a high-speed rollover motor vehicle collision and thrown from the vehicle; presents intubated, no response to pain, and hypotensive. (0, 1, 2, or more)
10. How many ESI resources will this patient need? A 60-year-old healthy male who everted his ankle on the golf course presents with moderate swelling and pain upon palpation of the lateral malleolus. (0, 1, 2, or more)
11. Is it considered an ESI resource if a patient requires a constant observation to prevent a fall? (Y/N)

Assign the correct ESI level for each case.

12. 3- week- old male, VS T110.8, HR 160, RR 48, SpO2 96%, poor feeding, less active than usual, sleeping most of the day.
13. 22-month-old, fever, pulling ears, immunizations up to date, history of frequent ear infections
14. 6-year-old with cough. VS: T 104.4, HR 140, RR 30, SpO2 91%. Cough with fever for two days, chills, short of breath with exertion, green phlegm, sleeping a lot.
15. 94-year-old male, abdominal pain. VS: T 98.9, HR 100, BP 130/80, SpO2 93%.,Vomiting, epigastric pain. Looks sick.

16. 61-year-old female, referred with asthma. VS: T 99.1, HR 112, RR 28, BP 157/94, SpO2 91%, Peak expiratory flow rate= 200. Asthma exacerbation with dry cough, steroid dependent, multiple hospitalizations, never intubated.
17. 9-year-old male, head trauma. No VS available. Collided with another player at a Lacrosse game, loss of consciousness for "about 5 minutes", witnessed by coach. Now awake with headache and nausea.
18. 62-year-old with CPR in progress.
19. 53-year-old with 30% body surface burns.
20. 22-year-old who needs a work note.
21. 12-year-old with an earache.
22. 45-year-old involved in a high-speed motor vehicle collision. BP 120/60, HR 72, RR 18.
23. An unresponsive 14-year-old. EMS tells you he and his friends had been "doing shots".
24. 14-year-old with rash on his feet, was exposed to poison ivy three days ago. Ambulatory with stable vital signs.
25. 3-month-old with petechial and purpuric lesions all over. VS: RR 60, HR 196, SpO2 90%, T 39 degrees C rectal.

Pre and Post Test Case Studies

Review the following cases and discuss the number of resources used and the ESI triage level for each.

26. "Without the helmet, I would have been really hurt" reports a 19-year-old healthy male who was involved in a bicycle accident. He lost control of his bike when he hit a pothole. He has a 2 cm laceration on his arm and pain over his left clavicle. VS: T 97.4, RR 18, HR 62, BP 122/70, SpO2 100%, Pain 6/10.
27. When asked why she came to the ED, the 18-year-old college student begins to cry. She tells the triage nurse that she was sexually assaulted last night at an off-campus party.
28. " I have this skin rash in my crotch. It looks like jock rot. Probably got it from not washing my gym clothes" reports an 18-year healthy male. No abnormal vital signs.
29. "The doctor told me to come back this morning and have my boil checked. He lanced it yesterday and packed some stuff in it. He said he just wants to make sure it is healing OK," reports a 54-year-old diabetic male. The patient goes on to tell you that he feels so much better. T 98, RR 16, HR 64, BP 142/78, SpO2 98%, Pain 2/10.
30. A 16-year-old high school hockey player collapsed on the ice after being hit in the anterior chest by the puck. The coaching staff began CPR almost immediately,

and he was defibrillated three times with a return of spontaneous circulation. He arrives in the ED intubated.

31. “I have been wheezing for a few days, and today I woke up with a fever. My rescue inhaler doesn’t seem to be helping” reports a 43-year-old female with a past history of asthma. VS: T 101.4, RR 26, HR 90, BP 138/70, SpO2 95%.
32. “This sounds really strange. A bug flew into my right ear while I was gardening. I tried to get it out by using a Q-tip. I just don’t know what else to do, but this buzzing noise is driving me crazy” a 55-year-old female tells you. No previous medical history and vital signs are within normal limits.
33. “This morning, I stepped on a rusty nail, and it went right through my shoe into my foot. I washed it really well. I read on the internet that I need a tetanus shot.” No previous medical history and vital signs are within normal limits.
34. “I was having breakfast with my wife, and all of a sudden I couldn’t see out of my right eye. It lasted about five minutes. I’m just scared because I’ve never had anything like this happen before” reports a 56-year-old male with a history of HTN and high cholesterol.
35. “I was walking down the street and twisted my ankle as I stepped off the curb. I don’t think it’s broken, but it hurts so much” reports a 43-year-old female with a history of colitis. VS: T 98, HR 72, RR 18, BP 134/80, SpO2 100%, Pain 8/10.
36. A 16-year-old female is brought to the ED by her mother who reports that her daughter took more than 30 acetaminophen tablets about 30 minutes before admission. The tearful girl tells you that her boyfriend broke up with her this

morning. No previous medical history and no allergies or medications. Vital signs are within normal limits.

37. "My colitis is acting up" reports a 26-year-old female. "It started with an increased number of stools and now I'm cramping a lot. My gastroenterologist told me to come to the ED to be evaluated". No other past medical history. T 97, RR 18, HR 68, BP 112/76, SpO2 100%, Pain 6/10.

38. "I was so disappointed about not making the varsity soccer team that I punched a wall" reports a 15-year-old healthy male. His hand is swollen and tender to touch. VS T 97, RR 16, HR 58, BP 106/80, SpO2 100%, Pain 5/10.

39. A 46-year-old female with a history of sickle cell disease presents to the ED because of a crisis. She has pain in her lower legs that began eight hours ago and the pain medication she is taking is not working. Currently she rates her pain as 8/10. She has no other medical problems, and her current medications include Folate and Vicodin. VS are all within normal limits.

40. "I take a blood thinner because I have had clots in my legs" reports a 54 year old black male. "They told me that the medicine would prevent them, but today I have pain and swelling in my lower leg. It started out just being sore, but now I can hardly walk on it." Denies any other complaints. Vitals signs are within normal limits.

41. A 10-year-old presents with facial swelling after eating a cookie at school. Fine red rash all over. Has a history of peanut allergy. Wheezing heard upon auscultation. VS: RR 16, HR 76, SpO2 97%, T 36.7 C.

42. An 8-year-old healthy child with a fevr of 38.7 C at home arrives at triage with complaints of a sore throat and a fine red sandpaper rash across chest. Sibling at home had a positive strep culture at the pediatrician a few days ago. Respirations are nonlabored. Vital signs are stable.

Appendix B: Evaluation of Educational Session

Please take a few moments to provide feedback for the class. Your responses will remain anonymous. Please circle your response based on the following:

Strongly disagree 2- Disagree 3-Neutral 4-Agree 5- Strongly Agree

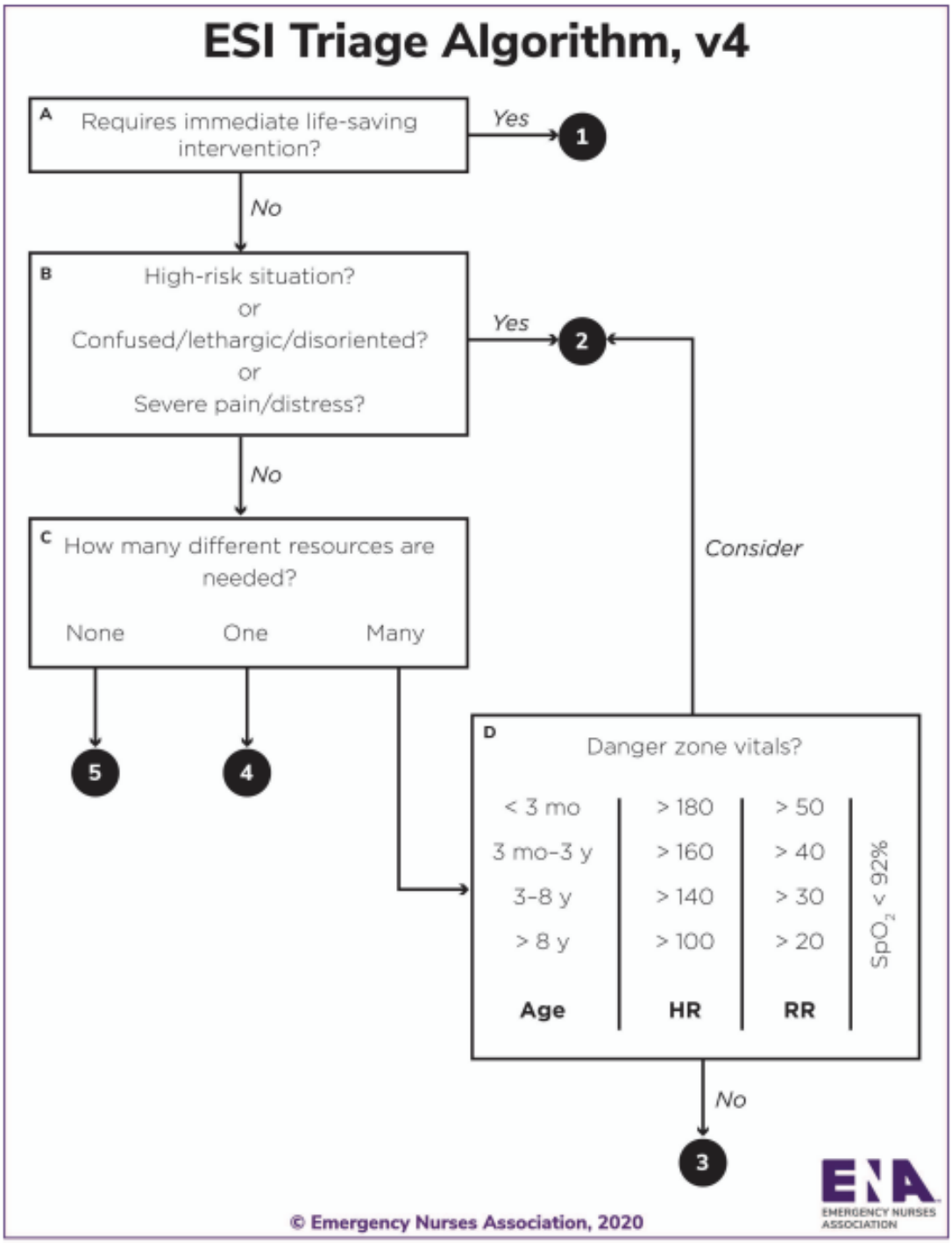
1. I would recommend this class to other professionals in my field. 1 2 3 4 5
2. I am satisfied with the knowledge I have gained from this class. 1 2 3 4 5
3. I will be able to apply the knowledge I have gained from this class.1 2 3 4 5
4. The instructor was knowledgeable of the subject matter. 1 2 3 4 5
5. The instructor presented the information clearly. 1 2 3 4 5
6. The class environment was comfortable and conducive to learning.1 2 3 4 5
7. The information presented was relevant and easy to understand. 1 2 3 4 5
8. Please comment on the strengths and weaknesses of the instructor/class.
9. Please list any recommendations for future classes.
10. Do you have any concerns or questions that were not addressed during the course time?

Appendix C: Staff Education Outline

STAFF EDUCATION: THE EMERGENCY SEVERITY INDEX CONTENT OUTLINE

A. Introduction to the Emergency Severity Index
    a. Research-Based Triage Tool
    b. Standardization of Triage Acuity in the U.S.
    c. History of the Emergency Severity Index
    d. Research on the Emergency Severity Index
    e. Benefits of the Emergency Severity Index
B. Overview of the Emergency Severity Index
    a. Decision Point A: Does the Patient Require Immediate Lifesaving Intervention?
    b. Decision Point B: Should the Patient Wait?
    c. Decision Point C: Resource Needs
    d. Decision Point D: The Patient's Vital Signs
C. ESI Level 2
    a. Is This a High-Risk Situation?
    b. Is the Patient Experiencing New Onset Confusion, Lethargy, or Disorientation?
    c. Is the Patient Experiencing Severe Pain or Distress?
    d. Special Situations
D. ESI Levels 3–5 and Expected Resource Needs
    a. Resource Predictions
    b. What Constitutes a Resource?
    c. Resources in Context
    d. The Role of Vital Signs in ESI Triage
    e. Are Vital Signs Necessary at Triage?
    f. Using Vital Signs with ESI Triage
    g. Vital Signs and Pediatric Fever
E. Use of the ESI for Pediatric Triage
    a. Background and Research
    b. Pediatric Triage Assessment: What Is Different for Pediatric Patients?
    c. A Standardized Approach to Pediatric Triage Assessment
    d. Assigning ESI Levels for Pediatric Patients
F. Implementation of ESI Triage
    a. Decision-Making and Planning
    b. Policies and Procedures
    c. Implementation Day
    d. Post-Implementation
G. Evaluation and Quality Improvement
    a. ESI Triage Quality Indicators and Thresholds
    b. ESI Triage Data Collection
    c. Practice ESI Case Studies
    d. ESI Triage Algorithm, v4

Appendix D: Triage Algorithm



A. Immediate life-saving intervention required: Airway, emergency medications, or other hemodynamic interventions (intravenous access, supplemental oxygen, monitor, electrocardiogram, or labs DO NOT COUNT); and/or any of the following clinical conditions: intubated, apneic, pulseless, severe respiratory distress, pulse oximetry (SpO_2) < 90%, acute mental status changes, or unresponsive.

Unresponsiveness is defined as a patient who is either:

1. Nonverbal and not following commands (acuteley); or
2. Requires noxious stimulus (P or U on AVPU)

B. A high-risk situation is a patient you would put in your last open bed.

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

C. Resources: Count the number of different types of resources, not the individual items (e.g., complete blood count, electrolytes, and coagulants equals one resource; complete blood count plus chest radiograph equals two resources.)

Resources

- Labs (blood, urine)
- Imaging
- Intravenous fluids (hydration)
- Intravenous, intramuscular, or nebulized medications
- Specialty consultation
- Simple procedure = 1 (laceration repair, foley catheter)
- Complex procedure = 2 (procedural sedation)

Not resources

- History and physical exam (including pelvic)
- Point-of-care testing
- Saline or heparin lock
- Oral medications
- Tetanus immunizations
- Prescription refills
- Contact with primary care physician
- Simple wound care (dressings, recheck)
- Crutches, splints, slings

D. Danger zone vitals: Consider uptriage to ESI 2 if any vital sign criterion is exceeded.

Pediatric fever considerations:
1–28 days of age: Assign at least ESI 2 if temperature > 38°C (100.4°F)
1–3 months: Consider assigning ESI 2 if temperature > 38°C (100.4°F)
3 months–3 years: Consider assigning ESI 3 if:

1. Temperature > 39°C (101.2°F); or
2. Incomplete immunizations; or
3. No obvious source of fever

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Appendix E: Comparison of Individual Pre- and Posttest Scores

Student ID	Pretest Score	Posttest Score	Percent Change
01	35	40	+14.7
02	32	40	+13.1
03	34	38	+14.3
04	35	39	+15.1
05	34	40	+14.3
06	32	37	+13.8
07	33	37	+13.9
08	35	38	+14.7
09	38	40	+16.3
10	35	39	+14.7
11	37	38	+15.9
12	33	39	+13.5
13	36	40	+15.1
14	35	40	+15.1
15	34	37	+13.9
16	35	38	+15.1
17	36	40	+15.1
18	35	40	+15.1
19	33	37	+13.9
20	38	40	+16.3
21	39	40	+16.8
22	35	39	+14.7
23	37	40	+15.5
24	35	40	+15.1
25	35	40	+14.7
26	38	40	+16.3
27	34	39	+14.3
28	34	38	+13.9
29	38	40	+16.3
30	36	40	+15.1
31	36	40	+15.5
32	35	39	+14.7
33	37	39	+15.9
34	34	39	+14.3
35	33	37	+13.5
36	35	38	+14.7
37	38	40	+16.3
38	34	40	+13.9
39	35	41	+14.4
40	37	42	+15.5
41	37	42	+14.9
42	38	42	+15.3

Appendix F: Literature Matrix

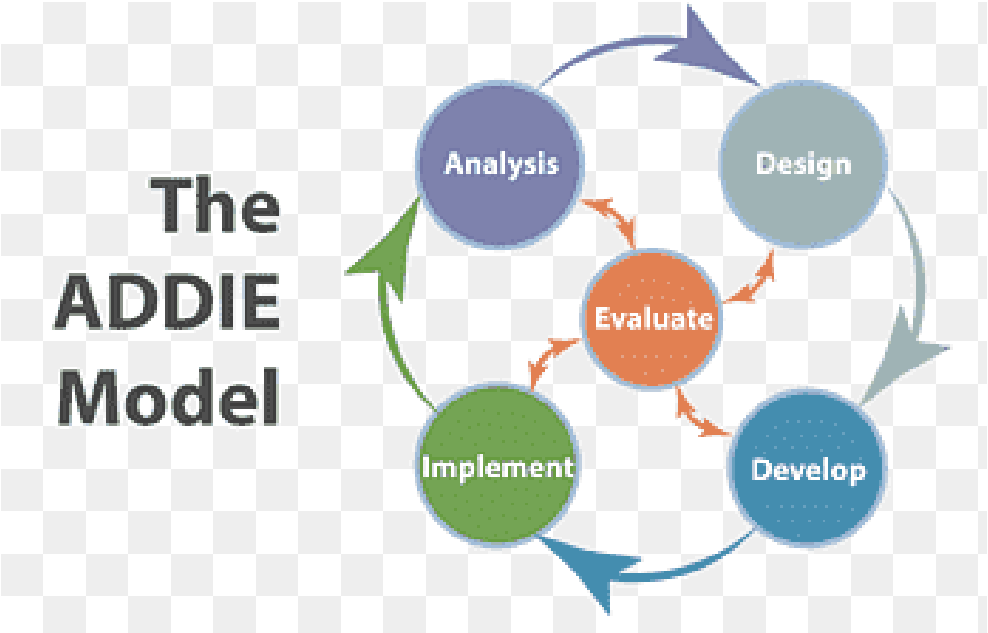
Date:06-25-2023			EBP Question: "Will a staff educational program improve understanding of the ESI triage system?"				
Article	Author and Date	Evidence Type	Sample, Sample Size, Setting	Findings That Help Answer the EBP Question	Observable Measures	Limitations	Evidence Level, Quality
1	Bittencourt 2020	Narrative literature review	15 peer reviewed journals/articles	Need to strengthen knowledge base of triage service using changes in ED processes	Qualitative use of cases and context	Only 15 cases reviewed	III High
2	Bouchrika 2020	Narrative literature review	32 peer reviewed articles	Instructional design aimed at increasing the effectiveness of delivered education	Qualitative use of cases and context	Does not address criticisms of new process	III High
3	Community Health Systems 2020	Quantitative	Rural acute care facility ED	Number of patients presenting to ED	Quantitative data	Measured for one year only	III High
4	Fong 2019	Random Control	300 ED patients presenting to triage	ESI is best choice for triage process	Quantitative	Examined 300 patients in one ED	II High
5	Ganjali 2020	Mixed Methods	400 patients presenting to triage	High accuracy of ESI compared to other triage processes	Qualitative use of questionnaires and quantitative of number of patients triaged appropriately	400 patients in one ED setting	I High
6	Ghazali 2020	Random Control	Control group: 143 ED nurses in 10 public hospitals	Effect of training significantly improved triage decisions	Skill and accuracy measured at 2 and 4 weeks following nursing	Measured at 2 and 4 weeks only- small control group from each hospital	I High
7	Gilboy 2020	Clinical Practice Guidelines	None	Effective resource for educational program for ESI training	Experiential evidence	None	IV High

8	Hinson 2019	Systematic Review	50 peer reviewed articles R/T process and comparison to other triage processes	ESI has high interrater reliability and improves triage decision making skills	Percentages of correct identification of serious illnesses with need for emergent care	Identifies but does not offer solutions to presented criticisms	III High
9	Johannessen 2017	Qualitative Review	16 ED triage nurses performing 349 triage assessments in one urban ED	Nursing triage processes were biased after an explanation of ESI process	Face to face assessments and triage decisions	Small control group	II High
10	Knowles 2005	Clinical Practice Guidelines	None	Design for educational program	Experiential evidence	Relies on assumption that all adults are capable of self-learning	IV High
11	Kurt 2017	Clinical Practice Guidelines	None	Design for educational program- comparison to Knowles theory	Experiential evidence	Overly detailed - excessive time required to complete material preparation	V High
12	Kwak 2018	Quasi-experimental	43,748 patients presenting to ED in 3 Korean hospitals	ESI has high reliability following staff education	Number of positive vs negative outcomes R/T correct triage practices	Study conducted in Korea- unknown ED resources	II High
13	Lasky 2018	Clinical Practice Guidelines	None	Design for educational program	Experiential evidence	None	IV High
14	Lentz 2017	Systematic Review	54 peer reviewed articles	Need for standardized triage tool	Metrics R/T validity of triage decision making	Possible research bias based on definition of over and under triage	III High

15	Malecki 2015	Quasi-experimental	770 ED patients in one Iranian hospital setting	Improved patient outcomes using ESI vs "spot check" triage	Increased LOS, Door to treatment and diagnostic wait times when utilizing "spot check" system	Limited study location	II High
16	Martin 2014	Quasi-experimental	64 ED triage nurses	Need for focused education and nursing assignment to triage based on knowledge of triage system	Kappa statistic based on nursing education	Limited number of clinical settings	II High
17	Misesani 2020	Qualitative descriptive	68 college students; 6 lecturers	Need to develop and present academic speaking materials in conjunction with printed materials	Questionnaires	Limited number of lecturers in control group- results based on student opinions	IV High
18	Mistry 2018	Quasi-experimental	87 ED triage nurses in Brazil, UAE and USA hospitals	Article highlights need for nursing education to improve triage accuracy	Interrater reliability- triage accuracy based on acuity level	Broad based study in one ED from 3 different countries	II High
19	Murugan anthan 2015	Case Study	72 college students	ADDIE method offers significant impact on learning new material	Students scored 93%-100% on achievement tests	One case study only- No pretest performed to compare with posttest score	IV High
20	Nakao 2017	Literature review	23 peer reviewed articles	Definition of triage	Mortality rates reported by observers	No observable measures- examines triage processes from 1727-1830	V High

21	Nicholas-Hess 2017	Literature review	45 peer reviewed articles	Validity of ADDIE method	Measures improvement in knowledge	Review conducted but no new studies implemented	VI High
22	Oermann 2015	Narrative literature review	42 peer reviewed articles	Validity of ADDIE method and Knowles theory	Improved knowledge after education measured by testing scores	2015 edition-generalized student populations (not specific to nursing)	III High
23	Salway 2017	Meta-analysis	14 large EDs in New York City	Identifies proper triage as one solution to overcrowding in EDs	NEDOCS (National ED Overcrowding Scale)	Study performed in larger hospitals in NYC	I High
24	Stone 2019	Quasi-experimental	9 metropolitan Eds; 232 triage encounters	Triage decisions have a direct effect on patient outcomes	Positive and negative patient outcomes R/T triage decisions	No comparison of triage systems	II High
25	Twaddle 2019	Narrative literature review	9 peer reviewed articles	Validity of Knowles' theory	Knowledge improvement measured after educational program	Small number of articles reviewed	II High
26	Walden University 2019	Systematic review	None	Mission Statement	None	None	IV High
27	Yarmohammadian 2017	Systematic review	30 peer reviewed articles	Triage decisions have a direct effect on patient flow in the ED	LOS and Door to treatment times were improved with a standardized triage system	Although multiple triage systems were discussed, there was no exact data comparing triage systems	III High
28	Yazdannik 2020	Case Study	35 triage nurses in a rural ED	Electronic vs face-to-face education has higher learning outcomes	Results and comparison and pre- and post-tests	One location-small sample	I High

29	Zamanpour 2020	Case Study	155 Medical students; 103 Triage cases; 52 Control cases	ESI education prior to process implementation will improve nursing decision making skills	Comparison of pre- and post-test students questionnaires	No comparison of pre- and post-test scores	I High



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