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Effect of Emergency Severity Index (ESI) Annual Competency Assessment on Mistrriage Rates

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Effect of Emergency Severity Index (ESI)

Annual Competency Assessment on Mistrriage Rates

BY

Stefanie Hoffman

A paper submitted in partial fulfillment of the requirements for the degree

Doctor of Nursing Practice

South Dakota State University

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This Doctor of Nursing Practice (DNP) Project is approved as a credible and independent investigation by a candidate for the DNP degree and is acceptable for meeting the project requirements for this degree. Acceptance of this DNP Project does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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Contribution to Emergency Nursing Practice

- Current literature on the Emergency Severity Index (ESI) triage tool does not focus on specific criteria for developing an ESI annual competency assessment to ensure triage trained registered nurses (RNs) are competent in accurate application of the ESI algorithm subsequently ESI triage level assignment to emergency department (ED) patients.
- The main finding of this project is that mistrriage rates did not significantly change with the implementation of an annual ESI competency assessment.
- Recommendations for translating the findings of this project into emergency clinical practice include implementation of an annual ESI competency assessment and continued education of the ESI algorithm for triage trained RNs.

Abstract

Introduction: In order to accurately assign an Emergency Severity Index (ESI) acuity level to patients who present to the emergency department (ED) triage area, it is essential triage nurses remain competent in the ESI triage tool. In addition, effective use of the ESI triage tool is critical in preventing patients from being mistriaged.

Objective: The purpose of this quality improvement project was to determine the effect of an ESI annual competency assessment in an ED for triage trained registered nurses (RNs).

Methods: Triage trained RNs completed an ESI competency assessment composed of 25 patient scenarios in competency assessment A, and 10 patient scenarios (if competency assessment B was needed). The patient scenarios utilized were previously created by the Agency for Healthcare Research Quality (AHRQ). Pre- and post- implementation data was collected via retrospective chart reviews and interpreted with application of the ESI algorithm, comparing the assigned ESI level that was performed by the triage trained RN against the calculated one using the algorithm to determine if the initial assigned ESI level was accurate.

Results: A retrospective chart review (RCR) of 150 charts was conducted; 75 pre- and 75 post-intervention implementation data were analyzed to determine the ESI accuracy by triage trained RNs. Pre and post data were represented by categories of correct triage and mistriage (separated into undertriage and overtriage). A chi-square test was the statistical test used for the data analysis of the RCR and a p-value of 0.8535 was attained, concluding that between the pre and post data, there was no statistically significant difference in mistriage.

Discussion: The implementation of an ESI annual competency assessment aligns well with an emerging theme in the literature that ED nurses should be provided with ongoing education and frequent methods of reinforcing knowledge and implementation of ESI triaging.

Keywords: Emergency Severity Index (ESI), ESI algorithm, ESI annual competency assessment, Triage trained registered nurses (RNs)

Effects of Emergency Severity Index (ESI) Annual Competency Assessment on Mistrriage Rates

Introduction

According to the Institute of Medicine (IOM) report, 91% of emergency departments (EDs) in the United States (U.S.) experience overcrowding which not only threatens quality care delivery, patient safety, and timeliness of emergency care but leads to a buildup of patients in the triage area (Alexander et al., 2016; Hinson et al., 2018; Worth et al., 2019). Consequently, every triage trained registered nurse (RN) must determine which patient will be seen first, further elevating the importance of critical decision-making skills needed to be successful in this role. Thus, EDs must have a valid and reliable triage tool established, such as the Emergency Severity Index (ESI) triage tool (Wulp, et al., 2011).

The ESI is a five-level triage system that categorizes ED patients by evaluating their acuity and anticipated resource needs. If a patient does not meet a high acuity level criterion (ESI level 1 or 2), then the triage trained RN will consider the expected resources needed to assign a lower acuity level criterion (ESI level 3, 4, or 5). The result of an incorrect acuity level assignment can negatively impact patient safety and is known as mistrriage, which is further divided into two categories of under- or over-triage. Under-triaging poses the risk of patient deterioration in the triage lobby while waiting to be seen. Meanwhile, over-triaging a patient deters limited resources and bed availability to a patient not requiring immediate care. In addition, accurate ESI assignment is crucial to ensure efficient ED workflow. Triage trained RNs are expected to use the ESI algorithm correctly for every patient who enters the ED (Mistry et al., 2018); and furthermore, ESI is intended to be utilized by nurses who have triage experience or those who have attended a separate, comprehensive triage educational program (Gilboy et al.,

2011). Per the Emergency Nurses Association (ENA), the national percentage for mistrriage is 40%, as a result of nurse triage accuracy being reported at approximately 60% (Emergency Nurses Association, 2021). In addition, in terms of correct triage a threshold of 90% has been frequently reported as being selected for EDs. However, as each ED is unique, individualized goals and circumstances should be taken into consideration when determining the threshold for correct triage and mistrriage. For example, consideration of overtriage may be included subsequently resulting in a lower threshold of correct triage of 80%. Overtriage is preferable to risking an adverse event because the patient was triaged to a less urgent category. Even though, this results in a mistrriage, the triage trained RN did err on the side of caution, and ED leadership or management teams as result may consider increasing the mistrriage rate to 20% (Gilboy, 2020).

The ESI triage tool is a five-level triage system, and such systems are considered the gold standard of ED triage (Gilboy, 2013). Evidence supports this triage tool and the tool is considered a valid instrument that was designed for the ED setting (Buschhorn et al., 2013; Dateo, 2013; Fielden & Oleksiak, 2005; Gilboy, 2013; Jordi et al., 2015). The ESI triage tool has acceptable reliability and validity properties in the U.S. (Mirhagi et al., 2015). The reliability and validity of ESI have been evaluated and observed in numerous studies that have included several thousands of patients (Asaro & Lewis, 2008; Alexander et al., 2016; Gilboy et al., 2013; Mirhaghi et al., 2015;). Studies have shown reliability of ESI represented by statistical k scores that exemplify moderate to almost perfect reliability (Wulp et al., 2011). Cairos-Ventura et al. conducted a study that assessed reliability by the level of agreement on triage assignments among nurses using Cohen's kappa inter-rater agreement adapted for the bilateral k_{c2} index; to further interpret the data in the kappa index, the Landis and Koch scale was utilized (2019). The

analysis of reliability showed a k_{c2} of 0.94 index, indicating a remarkable reliability, according to Landis and Koch criteria (Cairós-Ventura et al., 2019). However, reliability of ESI relies heavily on the healthcare providers judgement, therefore reliability has also been found to range from a k equaling 0.46 to 0.91 (Hinson et al., 2018). In addition, the ESI triage tool has been reported by nursing to be a simpler and more convenient triage tool to use when prioritizing ED patients for medical treatment compared to previous triage systems (Gilboy et al., 2011).

To build upon the triage trained RN's ESI established foundation, an ESI annual competency assessment could validate RN competency in continued utilization of the ESI triage tool; and a knowledgeable triage trained RN is more likely to correctly assign the ESI level and recognize a high-risk patient, further aiding in the prevention of mistrriage (Gonzalez & Soltero, 2009). Educational resources designed to support effective and accurate assessment of the initial patient encounter, such as an ESI annual competency assessment could assist in building on the already established ESI foundation a triage RN possesses (Dateo, 2013; Recznik et al., 2019; Wolf et al., 2018; Worth et al., 2019). An ESI annual competency assessment consisting of patient scenarios in which the triage trained RN will assign an ESI level could potentially promote ongoing education using the triage tool.

Gaps

Through a literature review (see Appendix A), it was concluded that although numerous studies researched only the ESI triage tool and its effectiveness as a triage scale, there were limited publications focusing on specific criteria for developing an ESI annual competency assessment for the triage nurse (Dateo, 2013; Elias et al., 2015; Gonzalez & Soltero, 2009; Worth, 2019). An emerging theme in the literature was that ED nurses must be provided with ongoing education with frequent and diverse methods of reinforcing knowledge and

implementation of ESI triaging (Dateo, 2013; Fielden & Oleksiak, 2005; Gonzalez & Soltero, 2009; Mirhaghi et al., 2015). This further supports the need to determine the effectiveness of an annual competency assessment.

Methods

This quality improvement project was designed to assess accuracy of ESI assignment in the ED triage setting subsequently improving safety in the ED. ED workflow is also improved through accuracy of nurse-to-patient ratios based on accurate patient assignment of ESI acuity levels by the triage trained RN. The PICOT question utilized to drive this project was: In triage trained RNs in a Midwest medical center ED (P), how does implementation of the ESI annual competency assessment (I) compared to the current practice of no annual competency assessment (C) impact the ED patient mistrriage rate (O) within a two-month time period (T)?

Setting

The project took place in a 32-bed ED in an urban Midwest medical center. This ED manages approximately 43,200 patient visits annually. Although the ED nurses use the ESI triage tool, the facility had no ongoing continuing education or annual competency of the ESI triage tool. Before the project was initiated, nurses attended a four-hour class and one six-hour orientation shift with an experienced triage trained RN, but no further education or validation was offered to practice skills necessary for accurate ESI level and triage assignment.

Sample

The project sample was composed of 40 triage trained RNs from the ED. Of these RNs, 4 of the RNs were masters prepared and the remaining 36 were bachelor's prepared. The predominant gender of the sample population was female, 90%. Levels of experience varied from 1.5 years to 10 years. The lack of longevity of the levels of experience can be further

contributed to the high turnover rates on the unit. However, all participants had at least one year of ED nursing experience prior to becoming a triage trained RN.

Intervention

The ESI competency assessment consisted of two competencies, A and B, with the intention of Competency B only being utilized if the required score was not attained with Competency A. The ESI Annual Competencies A and B were selected by the Project Manager from competency cases by the Agency for Healthcare Research and Quality (AHRQ) (Gilboy et al., 2011). Permission to use these was obtained from the AHRQ website (see Appendix I). In 2019, the Emergency Nurses Association (ENA) acquired the ESI property rights and is now responsible for the maintenance and improvement of the implementation handbook's fourth edition. Therefore, the cases utilized in this competency assessment remain the same under ENA's ownership. Competency A (see Appendix J) was composed of 25 patient scenarios where the triage trained RNs assigned an ESI level of one through five. The project's key stakeholders determined the triage trained RNs were required to achieve an 80% score on Competency A, or remediation was required and performed by the department education coordinator (DEC). Remediation consisted of providing rationale and education for all incorrectly answered questions in Competency A; RNs who scored less than 80% were required to take Competency B (see Appendix K) after completion of remediation. Competency B was composed of 10 new patient scenarios where the triage trained RN assigned an ESI level of one through five. No set percentage was required on Competency B; and this was determined by the project's key stakeholders.

Protection of Human Subjects

The project's approval was obtained through the nursing research council (NRC) at the facility where this project was implemented, and the NRC further determined the facility's institutional review board (IRB) review was not warranted. In addition, the project was deemed to not involve human subjects and did not require IRB approval from the Project Manager's university (see Appendix F).

Procedure

Triage trained registered nurses (RNs) completed an ESI competency assessment. Due to the COVID-19 pandemic, the ESI Competency A and B assessments were transcribed into an online format for the participants to complete. Prior to the pandemic, the intervention was designed to be administered via paper format at a unit meeting on a set date and time. With the adjustment to the online format all triage trained RNs were given 10 days to complete Competency A and an additional 14 days to complete Competency B following their remediation with the DEC.

Mistrriage rates were determined before and after competency assessments were completed. Data was collected via a retrospective chart review of 150 charts. The ESI level that was assigned by the triage trained RN was compared to the configured ESI level using the algorithm to determine if the initial ESI level was accurate. Triage scores were determined by the Project Manager of all 150 charts. Thirty charts out of the 150 charts were further abstracted by two experienced triage registered nurses who were the unit champions of the project. The unit champions determined triage scores of these charts. The purpose of procedure was to determine interrater reliability, further verifying expertise of the project manager.

Data Collection

The number of triage trained RNs who completed Competency A and Competency B was determined, as well as the exam percentages for both competencies. In addition, a patient deidentified report of the retrospective chart review was created and reviewed by an additional stakeholder at the project's setting. From this report, 150 charts, 75 pre- and 75 post- competency assessment, were randomly selected. The Project Manager was blinded to whether the charts were pre- or post- intervention, as this additional stakeholder chose the 150 charts and was the only project stakeholder with knowledge as to which charts were pre- or post- intervention.

For two months pre-intervention, *September and October*, 75 charts were randomly selected to assess the triage trained RNs' ability to accurately assign an ESI level, followed by 75 charts two months post-intervention, *December and January*. Of the 75 charts chosen retrospectively pre- and post- intervention, a stratified randomization method was used to obtain 25 pediatric patients, ages less than 18 years of age; 25 adolescent/adult patients, ages 18 to 65; and 25 geriatric patients, ages 65 years and older.

With application of the ESI algorithm (see Appendix H) and use of the resources per ESI triage system (see Appendix I), ESI assignment of each of the 150 charts was determined by the Project Manager. Specific metrics to assist in the determination of accurate triage versus a mistrriage can be determined through the chief complaint, ESI acuity level, ED initial set of vital signs obtained; including systolic and diastolic blood pressure, heart rate, respiratory rate, oxygen saturation, and temperature. In addition, laboratory test such as blood work and urine, electrocardiogram (ECG), energetic high-frequency electromagnetic radiation (x ray), computed tomography (CT) scan, magnetic resonance imaging (MRI), and ultrasound angiography. Intravenous (IV) fluids, utilized specifically for hydration, or IV, intramuscular (IM), and

nebulized medications, specialty consultation, simple procedures; such as, laceration repair, foley catheter, and complex procedures; such as, conscious sedation, were all metrics that counted as resources which contribute to the ESI assignment. These metrics were discrete fields abstracted from the RCR. Alongside the metrics the ESI algorithm was utilized to determine the correct ESI level and whether the patient was mistriaged.

Interrater reliability was established by two-unit champions, who are trained triage experienced ED RNs. The unit champions configured the triage score in 20% of the total number of 150 charts that were randomly selected. The inter-rater reliability was calculated by a percentage agreement between the raters and analyzed with the chi-square test. There was a weighted kappa value of .9372 among the two-unit champions and the project manager.

Results

Out of the 40 triage trained RNs, 12 passed Competency A with a score of 80% or higher. The mean score of Competency A was 65.9% including an identified outlier. The outlier was an exam score of 8%; this score occurred because the participant did not complete the entire assessment. With the exclusion of the outlier, the mean score for Competency A was 67.30%. Out of the remaining 28 triage trained RNs, 26 completed competency B (2 were noted to not complete competency B by the allotted timeframe) with 20 out of the 26 achieving a score of 80% or better. The mean score of competency B was 86.1%. In addition, of the 12 triage trained RNs who achieved an 80% or greater on Competency A, the mean score was 87% and the scores ranged from 80 to 96%. Of the 20 triage trained RNs who achieved an 80% or greater on Competency B, the mean score was 91% and scores ranged from 80-100%. The remaining 6 who completed competency B scored 70%, which was the mean score. See Table 1.

Table 1

ESI Competency Assessment Measures

Measure	Competency	
	A	B
Competency score	M = 67.3%	M = 86.1%
RNs who completed competency	n=40	n=26
RNs who achieved $\geq 80\%$	n=12	n=20
Score of RNs who achieved $\geq 80\%$	M = 87%	M = 91%

The statistical analysis of this project was performed by the Project Manager under the guidance of a statistician. The chi-square test was used to analyze the data from the pre intervention chart review and post intervention chart review. The pre- and post-intervention in addition included correct triage and mistrriage. Mistrriage was further delineated into undertriage and overtriage. The parameters that were compared were the proportions of correct triage in the pre- and post- intervention. The corresponding estimates were pre-intervention of 56 out of 75 correct triage (74.6%) and post-intervention of 54 out of 75 correct triage (72%). In addition, undertriage was compared by the proportions and the corresponding estimates were pre-intervention as 3 undertriage and post-intervention as 5 undertriage. Overtriage was compared, and 16 overtriage were found in both the pre- and post-intervention. See Table 2. Based on chi-square test, a p-value of 0.8535 was obtained with a level of significance at 5%. Between the pre- and post-intervention, there was not a statistically significant difference in mistrriage.

Table 2

Mistrriage Analysis

Measure	Numbers		Percentages	
	Pre-	Post-	Pre-	Post-
Correct Triage	56	54	74.6%	72%
Undertriage	3	5	4.0%	6.6%
Overtriage	16	16	21.3%	21.3%

In addition, the consideration of patient age was analyzed specific to mistrriage. Age was broken down further into the following categories: 0-17 years old, 18-64 years old, and 65 years and older. A logistic regression model was used with age and group as the independent variables for this portion of the data analysis. Table 3 below reveals the percentage of frequencies, correct triage, and mistrriage compiled from the 150 charts that were selected for the project and analyzed for this age variable. The chi square test revealed that age and group were not statistically significant related to mistrriage with respective p-values of 0.7175 and 0.5507.

Table 3

Patient Age Variable Analysis

Measure	Percentage		
	Frequency	Correct Traige	Mistrriage
0-17 years old	M = 5.33%	M = 4%	M = 1.33%
18-64 years old	M = 61.33%	M = 43.3%	M = 18%
65 years & older	M = 33.33%	M = 26%	M = 7.33%

Discussion

In comparison to the literature on specific criteria for development of an ESI annual competency the evolving theme prevailed that all ED nurses must be provided with ongoing and frequent education to strengthen ESI triaging knowledge. No statistical significance in this project can be perhaps attributed to a small sample size of the RCR, as the RCR amounted to approximately 1% of the project's population within the project's timeframe. Although, more than likely the rationale is due to the lack of education prior to administration of the ESI annual competency assessment.

In addition, specific to this project's setting overtriage occurred 32 times (or 21.33%) compared to the 8 occurrences of undertriage (or 5.33%) out of the data collection from the 150 RCRs. As previously mentioned, consideration of overtriage may result in EDs requiring an increased threshold for mistrriage. With overtriage, the triage trained RN assigns the patient to a higher acuity versus a lower level of acuity, erring on the side of caution. Ultimately, this is preferable to an adverse patient outcome in the triage setting. As overtriage took up more of the mistrriage percentage when compared to undertriage, correct triage is still preferable and an ESI annual competency assessment promotes accurate triage by the triage trained RN.

Preventing mistrriage promotes patient safety in the healthcare system and even perhaps an increase in patient satisfaction scores. As patients are appropriately triaged based off the ESI triage tool, safe and timely patient care delivery can be determined by the triage trained RNs. In addition, less patient adverse events can occur and the healthcare system within the community will be known for their safe, effective, and efficiently delivered care in their ED.

Limitations

A limitation of this project was identified as the retrospective review included only a review of 150 charts. This amounted to approximately 1% of the project's population within the project's time frame. An additional limitation was identified to be that the competency cases utilized in the project's intervention were easily accessible to participants, as the AHRQ competency cases are available online for any of the participants to access.

Recommendations for Practice

Establishing an ESI annual competency assessment for accurate use of the ESI triage tool by triage trained RNs prevents mistrriage in the ED, subsequently promoting patient safety. Educational strategies that incorporate ESI reinforcement and retention of knowledge, such as an ESI annual competency assessment decrease the possibility of mistriaging patients. Future projects should incorporate ESI algorithm education prior to administering an ESI annual competency assessment, as well as developing specific criteria, such as education of ESI delivered on monthly, biannual, or quarterly basis to ensure successfulness in maintaining ESI competency for the triage staff. Although measuring competency in clinical decision making is challenging, implementing an ESI annual competency assessment may improve accuracy of ESI level assignment from triage trained RNs (Dateo, 2013; Gilboy, 2013; Wulp et al., 2018). Therefore, future research in this area should promote criteria to develop a competency assessment for triage trained RNs in EDs and/or education specific to promoting successful completion of such competency assessments based off of promotion of accurate use of the ESI triage tool.

Conclusions

In conclusion, best practice for triage includes continuing education in the ESI; such as an annual competency assessment, quality-assurance feedback, and a minimum of one year of ED experience as necessary components to maintain consistency, standardized and enhanced triage competence (Gilboy et al., 2013). In addition to this, nurses should have standardized training in resource utilization to formulate more accurate resource predictions (Dateo, 2013). Since the triage nurse's clinical judgement and assessment skills facilitate assignment of ESI acuity by making decisions related to urgency, bed allocation, resources, and staff utilization. An ESI annual competency assessment would not only encompass post-triage trained RN components for best practice but would promote the formulation of more accurate resource predictions from the triage trained RN staff of EDs (Dateo, 2013; Gilboy et al., 2011).

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Appendix A

Evidence Table

Author (s) & Date	Study Design	Participants, Sample Size & Setting	Intervention	Results	Comments (Strengths/Weaknesses)	Gaps	Recommendations for Practice	Evidence Level, Quality
Gonzalez, J. & Soltero, R., (2009)	Retrospective chart review	Sample size 100 medical charts; which is 10% of the patients seen during the week in the month of May 2009 at an ED hospital in Puerto Rico.	Emergency Severity Index (ESI) tool	Of the 100 charts, 5 were excluded due to incomplete data. Results revealed: 36.1% of patients were assigned a correct ESI; 41.1% were under-triaged; 27.4% were over-triaged.	Sample size limited study to be statistically significant. Vital sign discrepancies in the project. No ESI level 1's were included in the sample.	Study's findings warrant further study exploration to identify rationale behind mistrriage to improve patient's evaluation in the ED.	Highly experienced nurses should be assigned the triage RN role. ED staff should be provided frequent, diverse methods of reinforcing ESI triage knowledge. Early involvement of physician at triage if the triage nurse is uncertain of the presenting patients acuity	III-C

Wolf et al., (2018)	Qualitative exploratory study with a focus group	26 nurses were recruited to attend the Emergency Nurses Association (ENA) 2015 conference in Florida.	Online survey and a focus group discussion with 3 guided questions: What is the experience of emergency nurses with regard to triage practice? What facilitates appropriate and effective triage practices? What are the barriers to appropriate triage practice?	Five themes were identified: sick or not sick; competency/qualifications; triaging the ED, not the patient; the unexpected; barriers and facilitators	Sample size was a small self-selected group and findings may not be generalizable to the emergency nursing population as a whole.	Future research should focus on intervention and comparison studies examining the effect of staffing, nurse experience, hospital policies, and length of shift on the accuracy of triage decision making.	Careful consideration of the triage process in EDs should be taken by educators, managers, and bedside staff. In addition, administrators should be acquainted with situational workload and staffing numbers incorporating staffing skills into that mix, so appropriate staffing and educational resources can be provided to support effective and accurate assessment at the initial patient encounter.	III-C
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<p>Worth et al., (2019)</p>	<p>Descriptive, correlational study</p>	<p>148 RN leaders in EDs from all regions in the U.S.</p>	<p>ED Triage Structure and Process Survey</p>	<p>EDs did not meet minimum recommendations of the ESI triage system</p>	<p>Not all participants used ESI system. The intervention used was specifically developed for this study. Thus, limiting the comparison of results with previous studies. Population generalizability is limited as participants were from the ENA ED managers list. Response rate may lack full representation of EDs in the</p>	<p>Structure and process for triage nurses' qualifications, triage education, and quality monitoring of triage decisions did not reflect that ESI guidelines are consistently used in practice.</p>	<p>Prioritize a review or establish the policy that support triage accuracy and reliability of the triage system. Interdisciplinary collaboration when reviewing the triage system is also recommended.</p>	<p>IV-B</p>
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					U.S. Strength of study was based on sample size of 148; which exceeded the number of subjects needed based on the power analysis (122).			
Dateo, J. (2013)	Literature review	N/A	Lit. Review	Triage nurses require the correct training, tools, and continuing education to provide high-quality care.	Characteristics of a good triage nurse and ESI tool was thoroughly reviewed to be valid and reliable	Most hospitals not all have policies containing criteria for skills and knowledge of a triage nurse. Consistency of ESI was	Nursing mentor to facilitate the triage nurse learning process. Quality-assurance feedback to evaluate performance and continuing education is crucial for the triage nurse to advance their practice.	V-B

						related to consistent training and departmental philosophy of on patient assessment.		
Recznik, C. et al (2019)	Randomized crossover study	25 RN participants in a single hospital 249 bed in the continental U.S.	ESI pre-test was completed prior to the study's intervention of a 2-hour individual educational session and a post-test followed.	Statistically significant improvement from pre- to post-test for all participants.	Pediatric patient population-based study. Center sees 4 pediatric patients a day therefore, study cannot be generalizable. Single researcher conducted all educational sessions, the	Pediatric triage education in the ED does not indicate conclusively which method of education is most effective for general emergency nurses.	Stimulation and paper-based cases were both effective at improving pediatric triage accuracy with the ESI when measured using a set of previously validated pediatric triage cases.	II-B

					study's intervention.			
Mistry, B. et al (2018)	Cross-sectional multicenter study	87 nurses from 3 EDs located in 3 countries	25 written standardized triage scenarios taken from the ESI implementation handbook	Larger portion of scenarios were under-triaged rather than over-triaged. No relationship was drawn from accuracy of score assignment and years of nursing experience each participant had with using ESI	Small number of project sites (3). Strength: findings of all 3 countries clinical sites had consistent findings. Study had an increased number of pediatric patient scenarios.	Study findings identified nurses who had been trained in ESI at least 1 year prior and routinely used ESI in clinical practice had high variability of ESI score assignment in clinical practice. Pediatric scenarios	Study recommends a need for a more reliable ED triage tool	II-A

						scored less accurate than adult scenarios.		
Jordi, K. et al., (2015)	Cross sectional multi-center study	69 RNs from 4 EDs in Switzerland	30 standard ESI teaching case scenarios were used and in addition nurses' subjective confidence applying the ESI algorithm was obtained from a Likert scale	59.6% of case scenarios were scored correctly out of the 69 nurses. 78% felt confident in their ability to utilize the ESI intervention.	Nurses were tested in a single room and this may have influenced the nurses' performance. Strength of the study is the involvement of a heterogenous sample of 69 experienced triage nurses from four hospital EDs reflecting various practice	Reasons for frequent inaccurate determination of triage acuity cannot be determined with certainty.	Test questions from ESI lead to patient acuity ratings that differ from the rating intended by the author. Thus, test questions should be assessed for performance criteria.	II-B

					<p>backgrounds and experiences in different settings.</p> <p>Lengthily time frame from initial ESI training and ESI testing. Potential of different training provided at 4 project sites.</p>			
<p>Buschhorn, H. M. et al., (2013)</p>	<p>Observational study</p>	<p>60 paramedics and EMT; 43 triage nurses at an academic referral center with an emergency medicine residency ED</p>	<p>ESI triage tool</p>	<p>75 triages/transports were completed and overall concordance between EMS and RNs was 0.409</p>	<p>EMS personnel is not familiar with ESI triage tool. Nurse triage scores were not validated in this study only pre-hospital</p>	<p>Additional research is warranted for potential causes of poor ESI acuity assignment?</p>	<p>The ESI triage tool is not recommended for pre-hospital use.</p>	<p>III-B</p>

					personnel scores were.	Pre-hospital to ED care transitions need further exploration.		
Alexander, D. et al, (2016)	Prospective study	52 nurses at a Tertiary academic hospital ED in the northeast	A specific data collection tool	Triage nurse predicted admissions with a sensitivity of 71.5% and discharge with a specificity of 88.0%. In addition, results concluded that 30 out of 100 times, RN prediction of patient disposition incorporating	Single-site study therefore may not be generalizable to other EDs. 15% of potential patients were missing in data.	ESI accuracy is significantly missed for older patients and for patients at the ESI level 3.	Future triage education should focus on further patient streamlining by creating multiple levels within ESI level 3.	III-B

				the ESI tool was incorrect.				
Wulp, I. et al., (2011)	Prospective observational study	All nurses at a Level I ED in the Netherlands	Worthing Physiological Scoring System (WPSS)	WPSS score, main complaint, and age were significant predictors for ESI triage category out of the 929 patient charts that were abstracted for data analysis.	Study was conducted solely on day and evening shifts. 37.1% of the study's patients were excluded from the data due to no consent was obtained.	No association between pain scores and ESI triage scores.	Vital signs are associated with ESI triage categories and should be incorporated into ESI assignment. However, pain scores and ESI triage scores did not correlate which revealed a practice recommendation to revise the ESI guidelines.	III-B
Hinson, J. et al., (2018)	Single-center retrospective cohort study	All patient visits who presented at a large tertiary care academic hospital ED in Brazil from January 1, 2013-	ESI triage tool	Initial ESI triage score was determined to be inaccurate for 16,426 out of 96,071 patient charts. In summary, 1 in 5 patients were	Large sample size was a strength within this project. ED nurses at this project's location undergo structured and ongoing	Despite ongoing training of ESI, under- or over-triage was still present.	Development of future triage tools.	II-A

		September 13, 2015.		over- or under-triaged by ESI on ED arrival	training in ESI; which is both a strength and a weakness as most EDs do not have this structure in place. Therefore, study's findings may be an overestimate of ESI performance in general.			
Elias et al., (2015)	A blinded trial	73 vignette cases; project setting was n/a	Clinical GPS (cGPS) generated triage scores of 73 sample case vignettes from the ESI, version 4 implementation handbook were	eGPS severity score perfectly matched the ESI handbook severity score 69 out of 73 vignettes.	Only one researcher was used for data entry in the cGPS computer system; therefore, systematic error associated	Additional clinical studies and database improvements were identified to be required to	Use of future cGPS requires establishment of safety and reliability. Please note: The cGPS in this study is an automated tool providing computerized	III-B

			<p>compared to the “gold standard” ESI-created scores found in the handbook</p>		<p>with data entry is possible. Generalizability of these results is not possible given the vignettes versus a real clinical patient presentation. Assumption of the cGPS and ESI use of the 5-point scales are equal was made.</p>	<p>determine the triage accuracy with regard to real patient cases and various score algorithms</p>	<p>clinical decision support as a potential independent triage tool for use by providers in urgent care and emergency room settings.</p>	
<p>Mirhaghi, A. et al., (2015)</p>	<p>Single-center study</p>	<p>ED in north east of Iran. Sample was composed of 20 nurses and 8 physicians.</p>	<p>A paper-based scenario questionnaire developed from the ESI, version 4:</p>	<p>High risk patients were recognized after ESI implementation.</p>	<p>Weighted kappa was used in the data analysis and un-weighted kappa could have</p>	<p>ESI may not reveal optimal outcomes in developing countries</p>	<p>ESI enhances recognition of high-risk patients, and shows a significant impact on enhancing triage accuracy in the ED.</p>	<p>II-B</p>

		866 patients, sample size	Implementation handbook		potentially provided a more realistic estimation of reliability. Study limited to a single-center study affecting the generalizability.	compared to what triage tools are already in place, further research is needed as this remains a gap.		
McGhee et al., (2016)	Clinical practice guideline	N/A	Suggested guidance for vital sign assessment and documentation	Failure to reassess vital signs throughout the patient's stay may result in delayed discharge, as well as adverse outcomes.	N/A	ED managers need to review policy or guidelines regarding how often vital signs should be reassessed.	Vital sign reassessment policy guidance for ED managers based off of a patient's ESI acuity level assignment.	IV-C
Asaro, P.V. & Lewis,	Retrospective analysis	Academic tertiary care hospital adult	Canadian Triage and Acuity Scale	96,918 patient encounters	Single center study, adult only ED.	With ESI the focus is resource	Modification of the triage process (such as converting to a	II-A

<p>L.M., (2008)</p>		<p>ED in the U.S. Ambulatory triage nurses was the project's sample population.</p>	<p>(CTAS) and ESI</p>	<p>triaged with CTAS; first observation period. 98, 279 patient encounters with ESI; second observation period. Results displayed a shift in triage acuity distribution 1 month in advance of the formal transition; reflective of the new system, the ESI. Triage to a nonemergent level under ESI was greater than that under</p>	<p>Transition period (approximately 1 month out of 15 months) for nursing between CTAS and ESI; which included nurses receiving training on ESI.</p>	<p>utilization highlighting a potential decrease in recognizing high-risk situation patients. Further research is needed to compare ESI to CTAS.</p>	<p>different triage system as in this study CTAS to ESI) include detection of patients that potentially have time sensitive conditions.</p>	
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				CTAS; overall general trend to down- triage patients was seen with ESI.				
Fielden, N. M. & Oleksiak, R. (2005)	Clinical project	Tertiary care hospital ED	Setting's ED ESI algorithm revision; additional 2- hour class that incorporate didactic education on triage and the ESI system and practices cases from the ESI handbook	Post triage ESI education a greater number of patients were categorized in more appropriate triage levels; as evidence by an increase in ESI level 2 & 3 patients and a decrease in ESI level 4 & 5 patients.	Prior to intervention implantation it was identified that triage guidelines were not being followed.	Incorporat ing anticipate d resource utilization into the triage process enhanced the triage nurses' decision in categorizi ng patients in the ED.	Annual competency assessment using triage case studies.	IV-C

Appendix B

JHNEBP Model

Evidence Levels	Quality Guides
Level I Experimental study, randomized controlled trial (RCT) Systematic review of RCTs, with or without meta-analysis	A High quality: Consistent, generalizable results; sufficient sample size for the study design; adequate control; definitive conclusions; consistent recommendations based on comprehensive literature review that includes thorough reference to scientific evidence
Level II Quasi-experimental study Systematic review of a combination of RCTs and quasi-experimental, or quasi-experimental studies only, with or without meta-analysis	B Good quality: Reasonably consistent results; sufficient sample size for the study design; some control, fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence
Level III Non-experimental study Systematic review of a combination of RCTs, quasi-experimental and non-experimental studies, or non-experimental studies only, with or without meta-analysis Qualitative study or systematic review with or without a meta-synthesis	C Low quality or major flaws: Little evidence with inconsistent results; insufficient sample size for the study design; conclusions cannot be drawn

Evidence Levels	Quality Guides
Level IV Opinion of respected authorities and/or nationally recognized expert committees/consensus panels based on scientific evidence Includes: <ul style="list-style-type: none"> Clinical practice guidelines Consensus panels 	A High quality: Material officially sponsored by a professional, public, private organization, or government agency; documentation of a systematic literature search strategy; consistent results with sufficient numbers of well-designed studies; criteria-based evaluation of overall scientific strength and quality of included studies and definitive conclusions; national expertise is clearly evident; developed or revised within the last 5 years B Good quality: Material officially sponsored by a professional, public, private organization, or government agency; reasonably thorough and appropriate systematic literature search strategy; reasonably consistent results, sufficient numbers of well-designed studies; evaluation of strengths and limitations of included studies with fairly definitive conclusions; national expertise is clearly evident; developed or revised within the last 5 years C Low quality or major flaws: Material not sponsored by an official organization or agency; undefined, poorly defined, or limited literature search strategy; no evaluation of strengths and limitations of included studies, insufficient evidence with inconsistent results, conclusions cannot be drawn; not revised within the last 5 years

Level V Based on experiential and non-research evidence Includes: <ul style="list-style-type: none"> Literature reviews Quality improvement, program or financial evaluation Case reports Opinion of nationally recognized experts(s) based on experiential evidence 	Organizational Experience: A High quality: Clear aims and objectives; consistent results across multiple settings; formal quality improvement, financial or program evaluation methods used; definitive conclusions; consistent recommendations with thorough reference to scientific evidence B Good quality: Clear aims and objectives; consistent results in a single setting; formal quality improvement or financial or program evaluation methods used; reasonably consistent recommendations with some reference to scientific evidence C Low quality or major flaws: Unclear or missing aims and objectives; inconsistent results; poorly defined quality improvement, financial or program evaluation methods; recommendations cannot be made Literature Review, Expert Opinion, Case Report, Community Standard, Clinician Experience, Consumer Preference: A High quality: Expertise is clearly evident; draws definitive conclusions; provides scientific rationale; thought leader(s) in the field B Good quality: Expertise appears to be credible; draws fairly definitive conclusions; provides logical argument for opinions C Low quality or major flaws: Expertise is not discernable or is dubious; conclusions cannot be drawn
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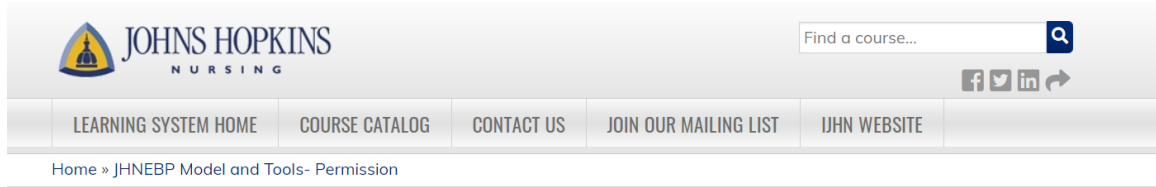
Appendix C

Level of Evidence

Level of Evidence		Grade	
II	6	A	3
III	6	B	9
IV	3	C	4
V	1		
=16			

Appendix D

Permission to use JHNEBP



The screenshot shows the top portion of the Johns Hopkins Nursing website. On the left is the logo for Johns Hopkins Nursing. To the right is a search bar with the text "Find a course..." and a magnifying glass icon. Below the search bar are social media icons for Facebook, Twitter, LinkedIn, and a share icon. A navigation menu contains the following items: LEARNING SYSTEM HOME, COURSE CATALOG, CONTACT US, JOIN OUR MAILING LIST, and IJHN WEBSITE. Below the navigation menu is a breadcrumb trail: Home » JHNEBP Model and Tools- Permission.

JHNEBP MODEL AND TOOLS- PERMISSION



Thank you for your submission. We are happy to give you permission to use the JHNEBP model and tools in adherence of our legal terms noted below:

- You may not modify the model or the tools without written approval from Johns Hopkins.
- All reference to source forms should include "©The Johns Hopkins Hospital/The Johns Hopkins University."
- The tools may not be used for commercial purposes without special permission.

If interested in commercial use or discussing changes to the tool, please email jjhn@jhmi.edu.

Downloads:

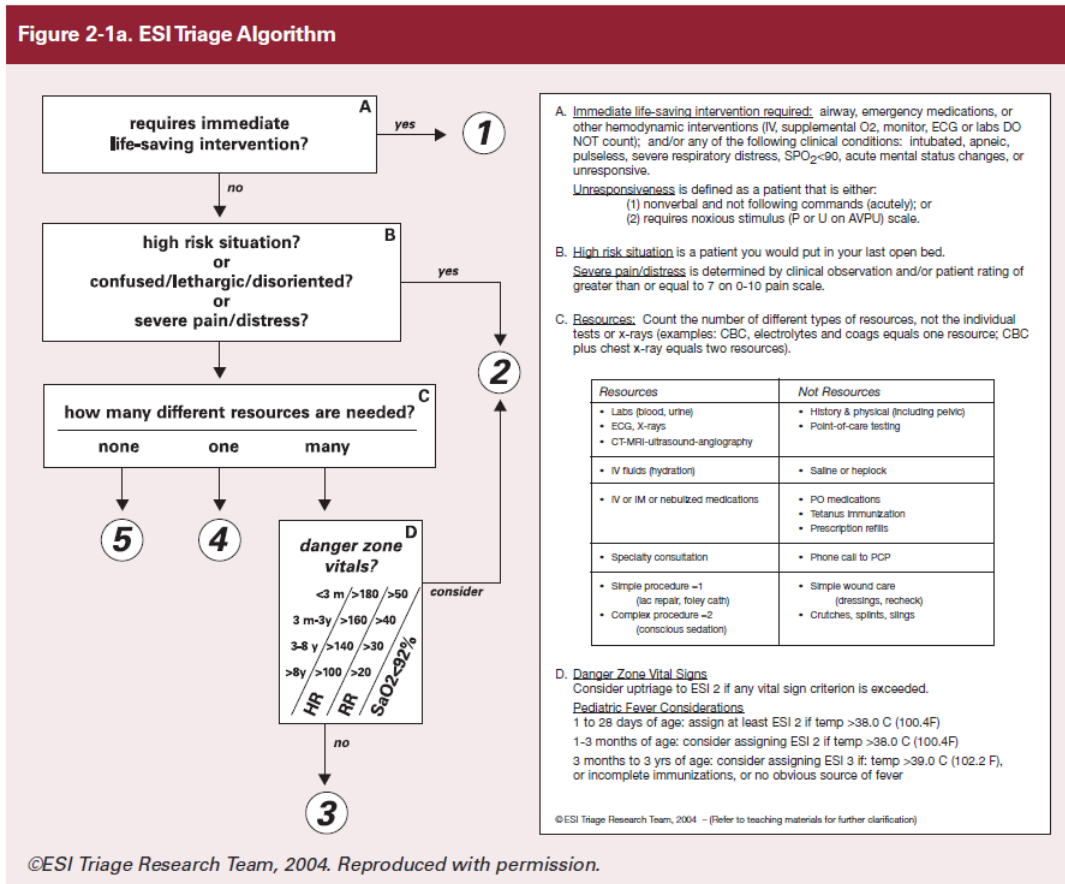
[JHNEBP Tools-Printable Version](#)

[JHNEBP Tools-Electronic Version](#)

Appendix E

ESI Algorithm

Figure 2-1a. ESI Triage Algorithm



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Appendix F

University IRB Approval



Appendix G Facility Approval



August 12, 2020

Re: Letter of Agreement for Onsite Nursing Research/EBP/PI projects and studies - Sanford Sioux Falls

This is to confirm that we agree to collaborate with **South Dakota State University** on **EBP project** entitled **Effects of Emergency Severity Index (ESI) Annual Competency Tool on Mistrriage Rates**, conducted by **SDSU** graduate student/faculty **Stefanie Hoffman/Dr. Jo Voss & Dr. Nicole Gibson**.

After review and approval by the Sanford Nursing Research Council, nursing projects and studies are referred to Sanford Research and the Sanford Institutional Review Board (IRB) to determine Human Subjects research status, level of risk, or exemption from Board review.

Procedures for this project/study include: **An annual ESI competency tool will be implemented to enhance and sustain the triage trained RNs' knowledge and accuracy when assigning an ESI level. The annual competency tool will consist of 25 patient scenarios that were created by the Agency for Healthcare Research Quality (AHRQ) and use is permitted through their website.** If a minimum of information is necessary to the project or study, and is to be collected from patient medical records, data access will be approved by the Sanford Privacy Office. Precautions are in place so that information will not be identifiable.

We understand that any protected health information, such as names, addresses, social security numbers, medical record numbers, account numbers, birthdates, admission and discharge dates, that is abstracted from medical records for research purposes will be **no protected or identifiable health information will be abstracted**. De-identified data will be kept on a separate computer in a locked area, accessible only to the principal investigator. There will be no data transfer. Analysis will be conducted on inaccessible, password protected computers. Aggregate Sanford Health clinical data will remain confidential and will not be shared outside of the organization without specific authorization.

This letter confirms that we are aware of the conduct of this project in **Sanford USDMC emergency department** and agree to collaborate with the investigator.

Sincerely,

Robin Huether, ED Director

Robin Huether, Director
Typed and Signed Authorized Department Signature
Title

Kelly Hefti, MSN, RN, CNP, COHN-S
Vice President Nursing and Clinical Services

8/7/2020

Date

Date

Appendix H

Permission to Use EBP Model

You have permission, as requested today, to review and/or reproduce *The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care*. Click the link below to open.

[The Iowa Model Revised \(2015\)](#)

Copyright is retained by University of Iowa Hospitals and Clinics. **Permission is not granted for placing on the internet.**

Citation: Iowa Model Collaborative. (2017). Iowa model of evidence-based practice: Revisions and validation. *Worldviews on Evidence-Based Nursing, 14*(3), 175-182. doi:10.1111/wvn.12223

In written material, please add the following statement:

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Please contact UJHCNursingResearchandEBP@uiowa.edu or 319-384-9098 with questions.

Appendix I

Permission to use AHRQ

Copyright notice

The Emergency Severity Index Version 4 Triage Algorithm (the "Algorithm") is the intellectual property of The ESI Triage Research Team, LLC (the "Author"). The Author has applied for copyright with the United States Copyright Office. The Algorithm is the sole and exclusive property of the Author, and the Agency for Healthcare Research and Quality has a license to use and disseminate the two works derived from this algorithm: the training two-DVD set ("Emergency Severity Index Version 4: Everything You Need to Know") and the implementation handbook ("Emergency Severity Index Version 4: Implementation Handbook"). The Author hereby assures physicians and nurses that use of the Algorithm as explained in these two works by health care professionals or physicians and nurses in their practices is permitted. Each professional user of these two works is granted a royalty-free, non-exclusive, non-transferable license to use the Algorithm in accordance with the guidance in these two works.

The Algorithm may not be changed in any way by any user. The algorithm and the contents of the DVD set and implementation handbook may be incorporated into additional training materials developed by a user, on the condition that no fee is charged by the user for the Algorithm, the contents of these two works, or the additional training materials.

The Algorithm has been rigorously tested and found to be both reliable and valid, as described in the research references included in these two works. However, the Author and the Agency for Healthcare Research and Quality require that the implementation and use of the Algorithm be conducted and completed in accordance with the contents of these two works using the professional judgement of authorized physicians or nurses and staff directed and supervised by them. Each health care professional who decides to use this algorithm for emergency triage purposes does so on the basis of that health care provider's professional judgment with respect to the particular patient that the provider is caring for. The Author and the Agency for Healthcare Research and Quality disclaim any and all liability for adverse consequences or for damages that may arise out of or be related to the professional use of the Algorithm by others, including, but not limited to, indirect, special, incidental, exemplary, or consequential damages, as further set forth below.

Note

The Author and the Agency for Healthcare Research and Quality have made a good faith effort to take all reasonable measures to make these two works accurate, up-to-date, and free of material errors in accord with clinical standards accepted at the time of publication. Users of these two works are encouraged to use the contents for improvement of the delivery of emergency health care. Any practice described in these two works should be applied by health care practitioners in accordance with professional judgment and standards of care used in regard to the unique circumstances that may apply in each situation they encounter. The Author and the Agency for Healthcare Research and Quality cannot be responsible for any adverse consequences arising from the independent application by individual professionals of the materials in these two works to particular circumstances encountered in their practices.

Appendix J

ESI Annual Competency Assessment A and Answer Key with Rationale

This competency assessment will be composed of 25 questions in which you will need to assign the correct ESI level after the patient case. A score of 80% is required.

1. "I think I picked up a bug overseas," reports a 34-year-old male who presented in the emergency department complaining of frequent watery stools and abdominal cramping. "I think I am getting dehydrated." T 98°F, RR 22, HR 112, BP 120/80, SpO2 100%. Pain 6/10. **ESI level**_____
2. When asked why she came to the emergency department, 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. **ESI level**_____
3. "I don't know what's wrong with my baby girl," cries a young mother. She reports that her 2-week-old baby is not acting right and is not interested in eating. As you begin to undress the baby, you notice that she is listless and her skin is mottled. **ESI level**_____
4. "My pain medications are not working anymore. Last night I couldn't sleep because the pain was so bad," reports a 47-year-old female with metastatic ovarian cancer. "My husband called my oncologist, and he told me to come to the emergency department." The patient rates her pain as 9/10. Vital signs are within normal limits. **ESI level**_____
5. A 48-year-old male tells you that he has a history of kidney stones and thinks he has another one. He has right costovertebral angle pain that radiates around to the front and into his groin. He is nauseous but tells you he took a pain pill, and right now he has minimal pain. He denies vomiting. T 98°F, RR 16, HR 80, BP 136/74, SpO2 100%. Pain 3/10. **ESI level**_____
6. "After my pediatrician saw my son's rash, he said I had to bring him to the emergency department immediately. He has this rash on his face and chest that started today. He has little pinpoint purplish spots he called petechiae. My son is a healthy kid who has had a cold for a couple of days and a cough. My pediatrician said he had to be sure nothing bad is going on. What do you think?" **ESI level**_____
7. "Her grandfather pulled her by the wrist up and over a big puddle. Next thing you know, she is crying and refusing to move her left arm," the mother of a healthy 3-year-old tells you. Vital signs are within normal limits. **ESI level**_____
8. A 46-year-old asthmatic in significant respiratory distress presents via ambulance. The paramedics report that the patient began wheezing earlier in the day and had been using her inhaler with no relief. On her last admission for asthma, she was intubated. Vital signs: RR 44, SpO2 93% on room air, HR 98, BP 154/60. The patient is able to answer your questions about allergies and medications. **ESI level**_____
9. A 56-year-old male with a recent diagnosis of late-stage non-Hodgkin's lymphoma was brought to the ED from the oncology clinic. He told his oncologist that he had

- facial and bilateral arm swelling and increasing shortness of breath. The patient also reports that his symptoms are worse if he lies down. Vital signs: BP 146/92, HR 122, RR 38, SpO2 98% on room air, temperature normal. **ESI level**_____
10. EMS arrives with a 28-year-old male who was stabbed in the left side of his neck during an altercation. You notice a large hematoma around the wound, and the patient is moaning he can't breathe. HR 110, RR 36, SpO2 89%. **ESI level**_____
 11. An 11-year-old presents to triage with his mother, who reports that her son has had a cough and runny nose for a week. The child is running around the waiting room and asking his mother for a snack. Vital signs are within normal limits. **ESI level**_____
 12. "I don't know what is wrong with my son," reports the worried mother of a normally healthy eight-year-old male. "He's losing weight and acting so cranky. Last night he was up to the bathroom every hour, and he can't seem to get enough to drink." The child is alert and appropriately. Vital signs: T 98.6°F, RR 30, HR 98, BP 92/78, SpO2 98%. **ESI level**_____
 13. "He has had diarrhea for 2 days, and he just started throwing up this morning. This has been going around the family, and he seems to have it the worst. He has been drinking before today, but now he doesn't want anything to drink," reports the mother of a 19-month-old. The toddler is awake and alert but quiet in the mother's arms, and you notice his lips are dry and cracked. Vital signs: T 99°F, RR 30, HR 130, SpO2 100%. **ESI level**_____
 14. EMS arrives with an 87-year-old male who slipped on the ice and injured his right hip. His right leg is shortened and externally rotated. The patient's only complaint is hip pain. He rates his pain as 5/10, and his vital signs are within normal limits. **ESI level**_____
 15. "My baby is having a hard time drinking his bottle," reports the young mother of a 3-month-old. The baby is alert and looking around. You notice a large amount of dried mucus around both nares. T 98°F, RR 40, HR 132, SpO2 99%. **ESI level**_____
 16. A 72-year-old female is brought in by ambulance from the nearby nursing home. They report that she has become increasingly confused over the last 24 hours. She is usually awake, alert, and oriented and takes care of her own activities of daily living. At triage she has a temperature of 99.6°F, HR 86, RR 28, BP 136/72, SpO2 94% on room air. **ESI level**_____
 17. Melissa, a 4-year-old with a ventriculoperitoneal shunt (drains excess cerebrospinal fluid), is brought to the ED by her parents. The mother tells you that she is concerned that the shunt may be blocked because Melissa is not acting right. The child is sleepy but responds to verbal stimuli. When asked what was wrong, she tells you that her head hurts and she is going to throw up. T 98.6°F, RR 22, HR 120, SpO2 99% on room air, BP 94/76. **ESI level**_____
 18. The overhead page announces the arrival of the Code STEMI. Paramedics arrive with a 62-year-old male with a history of a myocardial infarction 4 years ago who is complaining of chest pressure that started an hour ago. The field EKG shows anterior lateral ischemic changes. Currently, the patient's heart rate is 106, RR 28, BP 72/53, SpO2 is 95% on a nonrebreather mask. His skin is cool and clammy. **ESI level**_____

19. "I had a knee replacement 3 months ago. Now look at it!" states a 64-year-old male. The knee is red, swollen and tender to touch. Vital signs: T 99°F, RR 20, HR 74, BP 164/74, SpO2 97%. Pain 6/10. **ESI level**_____
20. "This is so embarrassing," reports a 29-year-old male. "For the last 12 hours, I have had this thing stuck in my rectum. I have tried and tried to get it out with no success. Can someone help me?" The patient denies abdominal pain or tenderness. Vital signs are within normal limits. Pain 4/10. **ESI level**_____
21. EMS arrives with a 67-year-old female who lives alone. The patient called 911 because she was too sick to get herself to the doctor. The patient has had a fever and cough for 3 days. She reports coughing up thick green phlegm and is concerned that she has pneumonia. She denies shortness of breath. Past medical history HTN, T 102°F, RR 28, HR 86, BP 140/72, SpO2 94%. **ESI level**_____
22. EMS arrives with a 14-year-old male who was snowboarding at a nearby ski area, lost control, and ran into a tree. The patient was wearing a ski helmet, is currently aware, alert, and oriented and is complaining of left upper-quadrant pain and left thigh pain. His left femur appears to be broken. BP 112/80, HR 86, RR 14, SpO2 98%, and temperature is normal. **ESI level**_____
23. "I woke up this morning, and there was a bat flying around our bedroom. Scared me half to death, and now I am so worried about rabies," an anxious 48-year-old female tells you. "My husband opened the window, and the bat flew out." Past medical history of ovarian cysts, no med or allergies, vital signs are within normal limits. **ESI level**_____
24. The family of a 74-year-old male called 911 when he developed severe mid-abdominal pain. "My husband is not a complainer," reports his wife. "The only medication he takes is for high blood pressure." On arrival in the ED, the patient's HR is 140, RR 28, SpO2 94%, BP 72/56. **ESI level**_____
25. "I woke up this morning, and my eyes are all red and crusty," reports a 29-year-old kindergarten teacher. "I think I got it from the kids at school," she tells you. She denies pain or other visual disturbances. Her vital signs are within normal limits. **ESI level**_____

Answer Key with Rationale

1. **ESI level 3: Two or more resources.** From the patient's history, he will require labs and IV fluid replacement—two resources.
2. **ESI level 3: Two or more resources.** This patient needs to be taken to a safe, quiet room within the emergency department. Her medical, emotional, and legal needs must be addressed in a timely manner.
3. **ESI level 1: Requires immediate lifesaving intervention; possible aggressive fluid resuscitation.**
4. **ESI level 2: Severe pain or distress.** This patient needs aggressive pain management with IV medications. There is nothing the triage nurse can do to decrease the patient's pain level. The answer to "Would you give your last open bed to this patient?" should be yes.
5. **ESI level 3: Two or more resources.** The patient is presenting with signs and symptoms of another kidney stone. At a minimum, he will need a urinalysis and

CT scan. If his pain increases, he may need IV pain medication. At a minimum, two resources are required. If the pain level was 7/10 or greater and the triage nurse could not manage the pain at triage, the patient could meet level-2 criteria.

6. **ESI level 2: High risk.** Rashes are difficult to triage, but the presence of petechiae is always a high-risk situation. Even if the patient looks good, it is important to recognize that petechia can be a symptom of a life-threatening infection, meningococemia.
7. **ESI level 4 or 5: This case is an example of variations in practice around the country.** Many emergency departments would examine the child and then attempt to reduce the dislocation of the radial head without an x-ray. Others may x-ray the child's arm, which is considered one ESI resource. Relocation is not considered a resource.
8. **ESI level 2: High-risk.** An asthmatic with a prior history of intubation is a high-risk situation. This patient is in respiratory distress as evidenced, by her respiratory rate, oxygen saturation, and work of breathing. She does not meet the criteria for ESI level 1, requires immediate lifesaving intervention.
9. **ESI level 2: High risk.** This patient is demonstrating respiratory distress with his increased respiratory rate and decreased oxygen saturation. Symptoms are caused by compression of the superior vena cava from the tumor. It is difficult for blood to return to the heart, causing edema of the face and arms.
10. **ESI level 1: Requires immediate lifesaving intervention.** Depending on the exact location penetrating neck trauma can cause significant injury to underlying structures. Based on the presenting vital signs, immediate actions to address airway, breathing, and circulation are required. Intubation might be necessary due to the large neck hematoma, which may expand.
11. **ESI level 5: No resources.** This healthy-sounding 11-year-old will be examined by a physician and then discharged home with appropriate instructions and a prescription if indicated.
12. **ESI level 2: High risk.** This patient has an elevated respiratory rate and heart rate. The symptoms of polydipsia and polyuria are two classic signs of diabetic ketoacidosis.
13. **ESI level 3: Two or more resources.** This 19-month-old is dehydrated and will require a minimum of two resources: labs and IV fluids. In addition the physician may order an IV antiemetic.
14. **ESI level 3: Two or more resources.** This patient probably has a fractured hip and will need an x-ray, IV pain medication, and an orthopedic consult. If the reason for a fall in the elderly is unclear, the patient should be assigned ESI level 2 to rule out a cardiac or neurological event.
15. **ESI level 5: No resources.** Following a physical exam, this baby will be discharged to home. Prior to leaving, the mother needs to be taught techniques to keep the baby's nares clear of mucus.
16. **ESI level 2: High risk.** An elderly patient with increasing confusion and a fever needs to be evaluated for an infection. UTIs and pneumonia need to be ruled out. This patient may be septic and requires rapid evaluation and treatment.
17. **ESI level 2: New-onset confusion, lethargy, or disorientation.** The mother of this 4-year-old knows her child and has probably been through this situation

before. A child with a ventriculo-peritoneal shunt with a change in level of consciousness and a headache is thought to have a blocked shunt until proven otherwise and may be experiencing increased intracranial pressure.

18. **ESI level 1: Requires immediate lifesaving intervention.** This patient is experiencing another cardiac event that requires immediate treatment. His vital signs and skin perfusion are suggestive of cardiogenic shock, and the patient may require fluid resuscitation or vasopressors to treat hypotension.
19. **ESI level 3: Two or more resources.** The patient is presenting with signs and symptoms of an infection. At a minimum, he will require labs, an x-ray, an orthopedic consult, and IV antibiotics.
20. **ESI level 3: Two or more resources.** An x-ray is needed to confirm placement in rectum. Then IV sedation and analgesia may be used to enable the physician to remove the foreign body in the ED, or he may be admitted for surgery. In this situation, two or more resources are required.
21. **ESI level 3: Two or more resources.** This elderly patient may have pneumonia. Labs and a chest x-ray are required, in addition to IV antibiotics. If vital signs are outside the accepted parameters, they may be considered high risk and meet ESI level-2 criteria.
22. **ESI level 2: High risk.** The mechanism of injury represents a high-risk situation. His left upper-quadrant pain could be due to a splenic rupture or injury. He may also have a fractured femur, another source of volume loss. This patient's vital signs are stable, so there is no need for immediate lifesaving intervention, but he is at risk for hemorrhagic shock due to volume loss.
23. **ESI level 4: One resource.** It is unknown whether the patient was bitten by the bat because they were sleeping, so postexposure prophylaxis will be initiated. One resource—an intramuscular medication.
24. **ESI level 1:** The patient is presenting with signs of shock, hypotension tachycardia, and tachypnea. He has a history of HTN and is presenting with signs and symptoms that could be suggestive of a dissecting aortic abdominal aneurysm. On arrival in the emergency department, he will require immediate lifesaving interventions such as immediate IV access, aggressive fluid resuscitation, and perhaps blood prior to surgery.
25. **ESI level 5: No resources.** Following a physical exam, this patient will be discharged to home with a prescription and appropriate discharge instructions. No resources are required

Retrieved from: <https://www.ahrq.gov/professionals/systems/hospital/esi/esi10.html>

Appendix K

ESI Annual Competency Assessment B and Answer Key with Rationale

This competency assessment is to follow review of Part A of the ESI Annual Competency Assessment and will be composed of 10 questions in which you will need to assign the correct ESI level after the patient case.

Practice Cases

1. "I was taking my contacts out last night, and I think I scratched my cornea," reports a 27-year-old female. "I'm wearing these sunglasses because the light really bothers my eyes." Her right eye is red and tearing. She rates her pain as 6/10. Vital signs are within normal limits. **ESI Level** _____
2. EMS presents to the ED with an 18-year-old female with a suspected medication overdose. Her college roommates found her lethargic and "not acting right," so they called 911. The patient has a history of depression. On exam, you notice multiple superficial lacerations to both wrists. Her respiratory rate is 10, and her SpO₂ on room air is 86 percent. **ESI Level** _____
3. EMS arrived with an unresponsive 19-year-old male with a single self-inflicted gunshot wound to the head. Prior to intubation, his Glasgow Coma Scale score was 3.
4. "I ran out of my blood pressure medicine, and my doctor is on vacation. Can someone here write me a prescription?" requests a 56-year-old male with a history of HTN. Vital signs: BP 128/84, HR 76, RR 16, T 97°F. **ESI Level** _____
5. A 41-year-old male involved in a bicycle accident walks into the emergency department with his right arm in a sling. He tells you that he fell off his bike and landed on his right arm. He is complaining of pain in the wrist area and has a 2-centimeter laceration on his left elbow. "My helmet saved me," he tells you. **ESI Level** _____
6. A 32-year-old female presents to the emergency department complaining of shortness of breath for several hours. No past medical history, +smoker. Vital signs: RR 32, HR 96, BP 126/80, SpO₂ 93% on room air, T 98.6°F. No allergies, current medications include vitamins and birth control pills. **ESI Level** _____
7. "I just turned my back for a minute," cried the mother of a 4-year-old. The child was pulled out of the family pool by a neighbor who immediately administered mouth-to-mouth resuscitation. The child is now breathing spontaneously but continues to be unresponsive. On arrival in the ED, vital signs were: HR 126, RR 28, BP 80/64, SpO₂ 96% on a non-rebreather. **ESI Level** _____
8. A normal healthy 7-year-old walks into the emergency department accompanied by his father, who reports that his son woke up complaining of a stomach ache. "He refused to walk downstairs and is not interested in eating or playing." The child vomits at triage. Vital signs: T 100.4°F, RR 22, HR 88, BP 84/60, SpO₂ 100%. Pain 6/10. **ESI Level** _____

9. A 6-year-old male tells you that he was running across the playground and fell. He presents with a 3-centimeter laceration over his right knee. Healthy, no medications and no allergies, immunizations are up to date. **ESI Level**_____
10. "I slipped on the ice, and I hurt my wrist," reports a 58-year-old female with a history of migraines. There is no obvious deformity. Vital signs are within normal limits, and she rates her pain as 5/10. **ESI Level**_____

Practice Cases Answers and Discussion

1. **ESI level 5: No resources.** This patient will need an eye exam and will be discharged to home with prescriptions and an appointment to follow up with an ophthalmologist.
2. **ESI level 1: Requires immediate lifesaving intervention.** The patient's respiratory rate, oxygen saturation, and inability to protect her own airway indicate the need for immediate endotracheal intubation.
3. **ESI level 1: Requires immediate lifesaving intervention.** The patient is unresponsive and will require immediate lifesaving interventions to maintain airway, breathing, circulation, and neuro status; specifically, the patient will require immediate confirmation of endotracheal tube placement.
4. **ESI level 5: No resources.** The patient needs a prescription refill and has no other medical complaints. His blood pressure is controlled with his current medication. If at triage his blood pressure was 188/124 and he complained of a headache, then he would meet the criteria for a high-risk situation and be assigned to ESI level 2. If this patient's BP was elevated and the patient had no complaints, he or she would remain an ESI level 5. The blood pressure would be repeated and would most likely not be treated in the ED or treated with PO medications.
5. **ESI level 3: Two or more resources.** At a minimum, this patient will require an x-ray of his right arm and suturing of his left elbow laceration.
6. **ESI level 2: High risk.** This 32-year-old female with new-onset shortness of breath is on birth control pills. She is a smoker and is exhibiting signs and symptoms of respiratory distress (SpO₂ and respiratory rate.) Based on history and signs and symptoms, a pulmonary embolus, as well as other potential causes for her respiratory distress, must be ruled out.
7. **ESI level 1: Unresponsive.** This 4-year-old continues to be unresponsive. The patient will require immediate lifesaving interventions to address airway, breathing, and circulation.
8. **ESI level 3: Two or more resources.** At a minimum, this child will need a workup for his abdominal pain, which will include labs and a CT or ultrasound—two resources.
9. **ESI level 4: One resource.** The laceration will need to be sutured—one resource.
10. **ESI level 4: One resource.** This patient needs an x-ray to rule out a fracture. A splint is not a resource.

Appendix L

Key Stakeholder Approval

Date: June 15, 2020

This letter is in support of Stefanie Hoffman's DNP project, Emergency Severity Index (ESI) annual competency tool implementation at Sanford USDMC Emergency Department. This project will be focused on the ED triage RNs, and help to improve accuracy in ESI assignment thus decreasing our under-triage rate of our ED patient population volume.

We look forward to the results of the project.

Amy Mertz, ED Manager



Robin Huether, ED Director



Appendix M

DNP Project Timeline

Timeline item	Date
Committee Formation	June 2, 2020
Establish stakeholders at project's setting	June 15, 2020
Touchbase with project's setting nursing research council (NRC)	June 4, 2020
PICOT Paper Submissions	July 20, 2020 & August 4 th , 2020
PICOT Paper Approval	August 12, 2020
Methodology paper draft (including DNP project timeline)	August 7, 2020
Review of literature (ROL) paper draft	August 7, 2020
NRC	September 18, 2020
Pre-proposal meeting	September 23, 2020
Manuscripts for proposal development	October 12, 2020
SDSU IRB application & approval	October 2020
Proposal	October 26, 2020
DNP project implementation	November 2020
Beginning of Data Collection	November 2020
End of Data Collection	January 2021
Data Analysis	February 2021
Manuscript	April 12, 2021

Project Defense	April 26, 2021
DNP Project paper final	May 2021
Binding	May 2021