



Overview of the efficiency of using the triage Emergency Severity Index (ESI) in emergency installations: A systematic review

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ABSTRACT

Introduction The Emergency Room (IGD) is unique in operation compared to units or installations from all parts of the hospital, because the Emergency Room operates around the clock with the presence of patients in an emergency and unscheduled state as well as a high flow of patients in and out. The patient is in a critical condition requiring immediate life-saving intervention until the patient is in a relatively stable condition. The Emergency Severity Index (ESI) is a triage system that categorizes 5 levels of severity, levels 1-2 require immediate treatment while levels 3-5 determine how many resources the patient needs. Inclusion of resource requirements in determining triage levels is a unique feature of the ESI triage system. **Method** The author uses the method used to conduct a systematic review is to search through the internet. Literature search used PubMed, google scholar, and Science Direct with keywords in English: Emergency Severity Index (ESI), Emergency Department. **Inclusion criteria** in this study were articles discussing the Efficiency of Using the Emergency Severity index, articles in English and Indonesian, limitations of articles published in the last 5 years (2018-2023) discussing the efficiency of using ESI, and full text articles, **Exclusion criteria** and criteria abstract only exclusions, articles with the type of review . The results of the literature search results obtained as many as 16 journal articles that are relevant to the research objectives. **Conclusion** emergency severity index (ESI) can be applied in emergency departments with a high level of sensitivity, specificity, accuracy and triage decisions. ESI can be modified with other methods and works well. ESI can also be used in vulnerable groups such as the elderly, children - post partum children and mothers. **Suggestion** Emergency severity index can be a reference to be applied in emergency departments in Indonesia because it has high efficiency.

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Kata kunci:

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ABSTRAK

Introduction Instalasi Gawat Darurat (IGD) unik dalam pengoperasian dibandingkan dengan unit atau instalasi dari seluruh bagian rumah sakit, karena IGD beroperasi sepanjang waktu dengan kehadiran pasien dalam keadaan gawat darurat dan tidak terjadwal juga alur masuk keluar pasien yang tinggi. Pasien dalam kondisi kritis yang membutuhkan intervensi penyelamatan hidup segera sampai pasien pada kondisi relatif stabil. Emergency Severity Index (ESI) adalah sistem triase yang mengkategorikan 5 level keparahan, level 1 – 2 membutuhkan penanganan segera sedangkan level 3-5 menentukannya dengan berapa banyak sumber daya yang dibutuhkan pasien. **Pencantuman** kebutuhan sumber daya dalam penentuan tingkat triase adalah fitur unik dari sistem triase ESI. **Method** Penulis menggunakan metode yang digunakan untuk melakukan sebuah

systematic review adalah dengan mencari melalui internet. Pencarian literatur menggunakan PubMed, google scholar, dan Science Direct dengan kata kunci dalam bahasa Inggris: Emergency Severity Index (ESI), Emergency Department. Kriteria inklusi dalam penelitian ini adalah artikel yang membahas Efisiensi Penggunaan Emergency Severity index, artikel di Bahasa Inggris dan Indonesia, batasan artikel yang diterbitkan di 5 tahun terakhir (2018-2023) membahas tentang efisiensi penggunaan ESI, dan artikel teks lengkap, kriteria Eksklusi dan kriteria eksklusi hanya abstrak, artikel dengan jenis review . Result hasil pencarian literature didapatkan jurnal sebanyak 16 artikel yang relevan dengan tujuan penelitian. Conclusion emergency severity index (ESI) bisa diterapkan di instalasi gawat darurat dengan tingkat sensitifitas, spesifikasi, akurasi dan keputusan triase yang tinggi, ESI bisa dimodifikasi dengan metode lainnya dan dapat berjalan dengan baik, ESI juga bisa digunakan pada kelompok rentan seperti lansia, anak -anak dan ibu post partum. Suggestion Emergency severity index bisa menjadi salah satu referensi untuk diterapkan di instalasi gawat darurat di Indonesia karena memiliki efisiensi yang tinggi.

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INTRODUCTION

The Emergency Room (IGD) is unique in operation compared to units or installations from all parts of the hospital, because the IGD operates around the clock with the presence of patients in an emergency and unscheduled state as well as a high patient flow in and out. Patients in critical condition requiring immediate life-saving intervention until the patient is in a relatively stable condition (Alserkal et al., 2020). There are several reasons why someone is escorted or comes to the ER. Apart from being caused by illness, a person can be brought or come to the emergency room because they have experienced trauma or violence. More than 5 million people in the world die every year due to trauma caused by traffic accidents, violence by themselves or others, fires, drowning, falls, poisoning and so on (Ardiyani et al., 2021). Triage has a very important role in the emergency service unit, especially when many patients arrive at the same time (Trifianingsih et al., 2022). Effective triage is needed when the need for medical action exceeds capacity, this factor becomes a major threat to patient safety and quality health services worldwide (Hinson et al., 2018). There are several case scenarios that occur in emergency departments where it is written that the average accuracy of nurses performing triage includes 56.2% in Taiwan, 59.2% in Brazil, 59.6% in Switzerland and also in a retrospective review study. In several emergency departments, the average triage accuracy was 58.7% in Pennsylvania and 68.3% in South Africa. This shows that the accuracy of triage carried out by nurses is still lacking (Ivanov et al., 2021).

The Emergency Severity Index (ESI) is a triage system that categorizes 5 levels of severity, levels 1-2 require immediate treatment while levels 3-5 determine how many resources the patient needs. Inclusion of resource requirements in determining triage levels is a unique feature of the ESI triage system. Severity is determined by the stability of vital functions and the potential threat to life, limb or organs. The triage nurse estimates resource

requirements based on previous experience with patients who have experienced similar injuries or complaints. Resource requirements are defined as the number of resources that are expected to be used by the patient sequentially for the decision level to be reached. Once oriented to the algorithm, the triage nurse will be able to triage patients quickly and accurately into one of the five defined levels (Emergency Nurse Association, 2020).

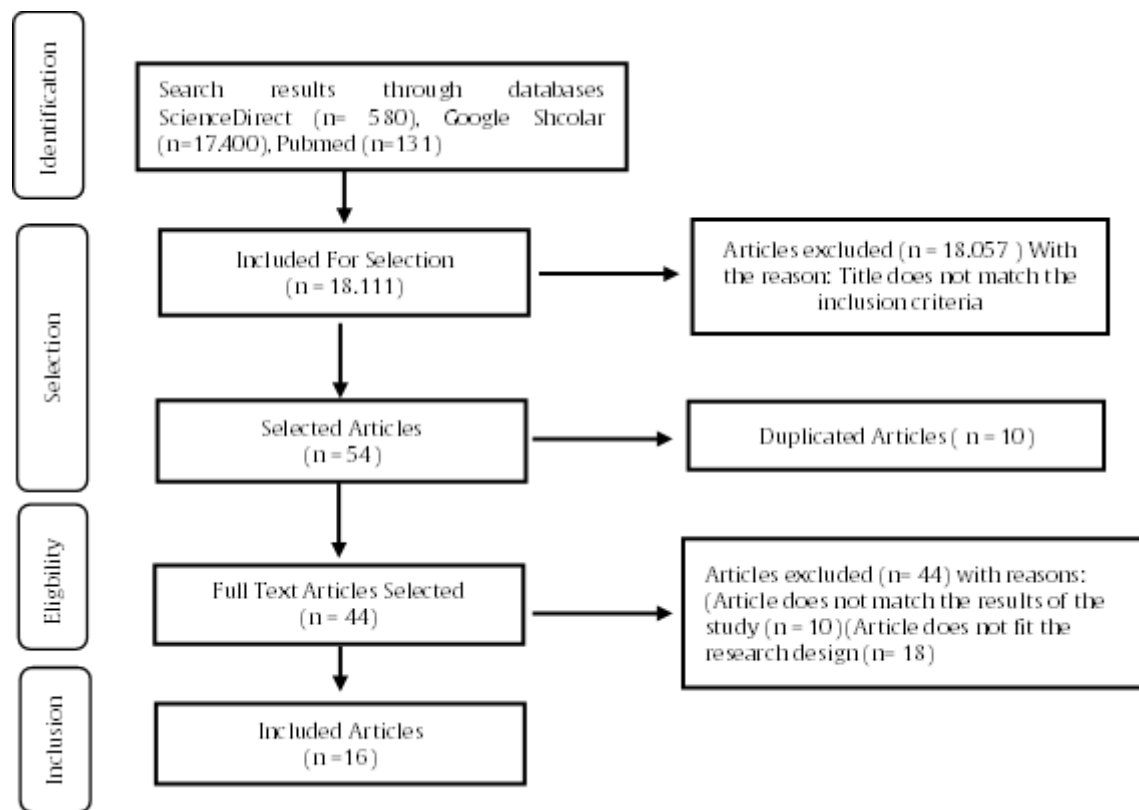
trriage system main goal is to quickly identify patients in an emergency and time-sensitive condition and prioritize what medical action should be done. Effective triage is needed when the need for medical action exceeds capacity, this factor becomes a major threat to patient safety and quality health services worldwide (Hinson et al., 2018).

METHOD

The author uses the method used to carry out a systematic review is to search through the internet. Literature search used PubMed, google scholar, and Science Direct with keywords in English: Emergency Severity Index (ESI), Emergency Department. Inclusion criteria in this study were articles discussing the Efficiency of Using the Emergency Severity index, articles in English and Indonesian, limitations of articles published in the last 5 years (2018-2023) discussing the efficiency of using ESI, and full text articles, Exclusion criteria and criteria abstract only exclusions, Articles with review type.

Search results on ScienceDirect with the keywords Emergency Severity Index (ESI) AND Emergency Department out of 580 found 4 relevant articles, search results with the keywords Emergency Severity Index (ESI) and Emergency Department on Pubmed out of 131 articles found 4 relevant articles, results a search on google scholar with the keywords Emergency Severity Index (ESI) and Emergency Department got 17,400 and found 8 relevant articles.

Prisma Flow chart diagram



No	Title Of Journals	Author	Country	Research Design	Result
1	Efficacy of Emergency Severity Index (ESI) in Early Identification of Patients with Sepsis and Septic Shock at Triage	Siddiqui & Ali, 2020	Pakistan	Cross-Sectional Study, the aim of the study was to determine the sensitivity and specifications for identifying diagnoses in patients with sepsis and septic shock using the Triage Emergency Severity Index (ESI).	This study shows that the Emergency Severity Index (ESI) has sensitivity and specifications in diagnosing sepsis and septic shock, data showing ESI Level 1 with a sensitivity value for diagnosing sepsis shock (88.5%) and a specification value for diagnosing sepsis shock (100%).
2	Utility of The Emergency Severity Index By Accuracy Of Interrater Agreement By Expert Triage Nurse In A Simulated Scenario In Japan : Arandomized Controlled Trial	Takaoka et al., 2021	Japan	A parallel group randomized trial, this study provides training and case scenarios that must be completed by respondents who are expert nurses in the ED after that comparing the ESI triage and the Japan Triage and Aquity Scale (JTAS) to expert nurses in the emergency department to measure acuity and classification triage decision.	In the ESI group, k = 0.82 (Very Good) while in the JTAS group k = 0.74 (substantial). Therefore, the triage decision in the ESI group was higher than the JTAS group.
3	An Artificial Intelligence Based Application for Triage Nurses in Emergency Department, Using the Emergency Severity Index Protocol	Kipourgos, 2022	Greece	Create a user-friendly application to assist triage nurses in procedures to get fast and precise triage decisions using the ESI algorithm.	The application of I-TRIAGE to patients who come to the emergency room with indications of heart disease and neurogenic disease has a 94% success rate for triage decisions. i-TRIAGE may in the future become a useful tool for all nurses in the emergency department to assist with triage decisions.
4	The Effectiveness of Writing Triage Emergency Severity Index (ESI) Documentation with the Canada Triage	Wibowo, 2020	Indonesia	This study used the Quasi Experimental method using the Mann Whitney test. The sampling technique used Accidental Sampling with a total of 50 samples of the Emergency Severity Index triage	The Effectiveness of Writing Triage Documentation Emergency Severity Index Using the Canada Triage Acuity Scale on Accuracy of Patient Triage Priorities. The data obtained shows that there is a

	Acuity Scale (CTAS) on Accuracy of Patient Triage Priorities.			documentation and 50 samples of the Canada Triage Acuity Scale documentation.	difference in the effectiveness of writing triage documentation on the Emergency Severity Index and the Canada Triage Acuity Scale on the accuracy of patient triage priorities with a p value of 0.030. The number of triage priority accuracy in writing the Emergency Severity Index triage documentation was more, namely 46 (92%), while the number of triage priority accuracy in writing the Canada Triage Acuity Scale documentation was 38 (76%).
5	Effect of Emergency Severity Index Implementation on the Waiting Time for Patients to Receive Health Services in the Emergency Department	Sarvari et al., 2020	Iran	This quasi-experimental study There were a total of 736 patients, from where 368 patients were considered as preintervention group and 368 patients were considered as the post-intervention group.	The results of this study indicate that there is an implementation of ESI triage decrease in all specified time intervals, and in general reducing the patient's length of stay in the emergency department since the patient's arrival to patient transfer from 157.02 minutes to 86.96 minutes.
6	The Emergency Severity Index (ESI) Usage: Triage Accuracy and Causes of Mistriage	Sari & Fajarini, 2022	Indonesia	Descriptive research with this retrospective approach performed on the ESI triage documentation in a hospital in Jakarta, Indonesia. The inclusion criterion was ESI triage form filled out after triage by the ER nurse who has Basic Trauma and Cardiac Life Support (BTCLS) certificate, ESI triage form for patients over 18 years of age, ESI in the form of triage of patients treated in the emergency room, either outpatient, inpatient, or patient who died in the ED. That Exclusion criteria were the form of ESI triage of patients who canceled treatment before triage, and incomplete documentation of the ESI triage form.	Accuracy data based on the density of patients in the emergency room found that it was overcrowded (45.2%) while not overcrowded (34%), mistriage data on overcrowded (23.6%) and not overcrowded (14%) this shows that the accuracy of ESI triage quite high in crowded conditions in the emergency room.
7	Comparison of Four-Level Modification Triage with Five Level Emergency Severity Index (ESI) Triage Based on Level of Accuracy and Time Triase	Minggawati et al., 2020	Indonesia	This research design is quantitative research with a quasi-experimental approach. Implemented in two groups, viz the control group were patients with assessment using four modified ATS triage levels while the intervention group used five-level ESI triage method.	The average ESI triage takes 2 minutes 27 seconds while the triage of the four levels of ATS modification takes 3 minutes 3 seconds. The fastest time required for ESI is in 72 seconds and the longest takes 4 minutes 20 seconds. At the triage level of the four ATS modifications, the fastest time used is 75 seconds and a maximum of 4 minutes and 50 seconds. The fastest time difference is only 3 seconds and the longest difference is 30 seconds. From the minimum and maximum times in both triage there is a considerable distance. This is due to the variety of patient cases with different levels of severity.
8	Comparison between Emergency Severity Index plus Capnometer and Emergency Severity Index in the	Talebpour et al., 2021	Iran	This quasi-experimental (random assignment) study was conducted on the basis of a 6-hour follow-up obtaining short-term results in April 2019-February 2020. Effects of ESI with and without Capnometer	The results showed that the ESI was added to the capnometer examination that had a level of sensitivity, specificity, and accuracy for recognizing high-risk heart failure patients, namely

	dyspneic patients with Chronic Heart Failure			compared in miscarriage of HF patients with dyspnea in the ED. The intervention group consisted of patients who underwent ESI+Capno, whereas the control group received only ESI (version 4).	100%, 60%, and 90% for the ESI + Capno group and 62.5%, 42.86%, and 48.36% for the ESI group.
9	Accuracy of Emergency Severity Index in older adults	Kemp et al., 2022	Finland	This research is retrospective observational cohort study of adults who presented to the Finnish emergency department between 1 February 2018 and 28 February 2018. All data collected from electronic health records. The aim of this study was to compare the accuracy of the Emergency Severity Index (ESI) triage system among emergency department patients aged 18-64 and greater or equal to 65 years.	The results obtained by the emergency severity index (ESI) work well in predicting high dependency unit/ICU admission rates for both 18-64 years and greater than or equal to patients aged 65 years.
10	Effectiveness Of Implementing Emergency Severity Index Triage System In A Selected Primary Health Care Center In Oman: A Quasi-Experimental Study	Al Hasni & AL-Rawajfah, 2019	Oman	This study used a quasi-experimental pretest / posttest design used. The sample consisted of 187 patients before Emergency Implementation of Severity Index and 102 patients after implementation. waiting time, length of stay, patient satisfaction, and classification accuracy compared in 2 group.	On analysis, the results show a substantial reduction in ESI waiting times. In ESI level 3, the result have shown that the waiting time from triage to see physicians significantly decreased at 12 minutes (40% reduction) and 4 minutes (26% reduction) for ESI level 4 in the post-ESI group compared to the pre-ESI group. This suggests that patients with ESI levels 3 and 4 see doctor in a shorter time compared to the informal triage system. The results of the current study indicate that LOS decreased by 15 minutes (18% reduction) after implementation of the ESI compared to the informal triage system
11	Evaluation of the Emergency Severity Index (Version 4) in Postpartum Women after Cesarean Delivery	Kawakita et al., 2020	USA	This is a secondary analysis of a retrospective cohort study of all women who present to the ED within 6 weeks of cesarean delivery. Sharpness level assigned by the triage nurse at the time of triage presentation. Our main result is postpartum readmission. To check whether the addition of blood pressure to Vital sign abnormalities will improve predictions for readmission, we make a Modified ESI. We identified women who had ESI level 3 and transferred to a Modified ESI level 2 if blood pressure is in the severe range. The receiver is operating a characteristic curve with area under the curve (AUC) was created and compared between ESI and modified ESI	Results Of the 439 women, the distribution of ESI was 0.2% ESI 1, 23.7% ESI 2, 56.0% ESI 3, 19.4% ESI 4, and 0.7% ESI 5. Readiness rates by ESI level are 100% ESI 1, 47% ESI 2, 18% ESI 3, 3.2% ESI 4 and 0% ESI 5 (p <0.001). Of the 246 women who were given ESI 3, a total 25 had severe range BP and was transferred to a modified ESI from 2. Of these 25 women, 14 were readmitted. AUC of statistically modified ESI higher than standard ESI (AUC: 0.77 and 95% confidence interval: 0.72–0.82 vs. AUC: 0.73 and 95% confidence intervals: 0.68–0.78; p<0.01). The ESI is a useful tool for identifying women in need postpartum readmission. Incorporation of severe range blood pressure as a parameter of acuity improve the predictability of readmission.
12	Comparison between Emergency Severity Index plus	Hamechizfa hm et al., 2019	Turkish	This study was a randomized clinical trial conducted between July and October 2018. We randomized	Data were obtained on seventy COPD patients equally assigned to the ESI + PEF and ESI groups.

	peak flow meter and Emergency Severity Index in the dyspneic patients with chronic obstructive pulmonary disease: A randomized clinical trial		assigned COPD patients with dyspnea to the ESI + PEF or ESI group. Triage level, disposition level, count resources used, and time to first physician contact compared to patients admitted to the Intensive Care Unit (ICU), Pulmonary Care Unit (PU), or discharge from the ER. The reliability of the ESI was evaluated using interobserver agreement (Kappa).	Rates under triage were 11.42% and 0%, the over-triage rate was 31.42% and 2.85% respectively in the ESI and ESI + PEF groups. Triage rate of patients admitted to ICU (2 vs. 3), PU (2 vs. 4), or discharged from The ED (3 vs. 2) differed significantly between the ESI + PEF and ESI groups. The addition of PEF to the ESI provides a more accurate method for triaging COPD patients compared with ESI alone. We recommend the use of PEF for triage of COPD patients in the ED.
13	Validity and Reliability of Emergency Severity Index and Conventional ThreeTier Triage System in the Emergency Department, Hospital Universiti Sains Malaysia	Jin et al., Malaysia 2020	Methods: This study was conducted in the HUSM ER for two study periods. In the first three months, 300 patients were prioritized under a three-level triage system, and, in three months later, 280 patients were prioritized under ESI. The patients are prioritized by junior paramedics and triage records are kept and then re-prioritized by senior paramedics. Interrater reliability was evaluated using Kappa Cohen statistics. Sharpness rating of junior paramedics were compared with a panel of experts to determine sensitivity and the specificity of each acuity level for ESI and the three-level triage system. Excessive triage rate, under-triage rate, amount of resources used, entry rate and discharge rate as well determined.	The results obtained The agreement between assessors for the three-level triage system was 0.81 while for ESI is 0.75. ESI had a higher average sensitivity of 74.3% and a transient specificity of 94.4%. the mean sensitivity of the three-level system was 68.5% and the specificity was 87.0%. The mean under-triage and over-triage rates for ESI were 10.7% and 6.2%, respectively, which were lower than the average under-triage level of the three-level system is 13.1% and the over-triage rate is 17.1%. Urgency ESI level and three-level systems are associated with increased acceptance rates and resources used in the ER. The inter-rater reliability of ESI is comparable to that of three-level triage system and it showed better validity than the existing three-level system.
14	Validity and Reliability of the Emergency Severity Index and Australasian Triage System in Pediatric Emergency Care of Mofid Children's Hospital in Iran	Ghafarypour iran -Jahrom, 2018	This study used a prospective study conducted at Mofid Children's Hospital in Iran from August 2017 to November 2018 and children aged ≤ 14 years and presenting to the ED with medical symptoms deemed eligible to participate. This research is divided into two phases: in the first phase, we define inter-rater reliability of ESI version 4 and ATS by triage nurses and pediatric residents. In the second phase, to analyze the validity, sensitivity, and specificity of each triage system. Reliability and deal rate are measured using the kappa statistic.	Results of the data: ESI showed inter-rater reliability with a kappa of 0.65–0.92 ($p < 0.001$) and ATS showed inter-rater reliability with a kappa of 0.51–0.87 ESI has a sensitivity ranging from 81% to 95% and a specificity ranging from 73% to 86%. Moreover, the sensitivity range of ATS is 80% to 95% and the specificity ranges from 74% to 87%. Under triage and over triage occur in 12% and 15% of patients in ESI and 13% and 15%, respectively. each patient in ATS. ESI and ATS apply to triage of children in the Emergency Department of Mofid Children's Hospital pediatric. ESI reliability is good, moderate to good for ATS.
15	Accuracy of Emergency Room Triage Using Emergency Severity	Rashid et al., Pakistan 2021	This study using a prospective observational study was conducted at Hayatabad Medical Complex, Peshawar, from October 2020 to	The data obtained is that the greatest chance of undertriage to moderate acuity is associated with age ≥ 65 years; OR 1.49, 95%

Index (ESI): Independent Predictor of Under and Over Triage	March 2021. All data from our emergency department was captured and recorded using appropriate procedures and software. Triage accuracy was determined by comparing the use of proposed resources (severity 3-5), with the actual resources used in this hospital as the amount of agreement between standard guidelines and local observations.	CI. (1.25-1.72) and OR 2.18 CI (1.22-3.73) for under-triage designation for low acuity. Severe, severe hypoxia bradycardia, and severe tachycardia were all strongly associated with an under-triage risk of moderate acuity OR level 2.19 95% CI (1.49-3.13); OR 2.54 (1.53-4.01); and OR 2.17 (1.61-2.88), respectively. The main thing is, there was also a significant association with acuity under triage to moderate oxygen deprivation saturation measurement. Hypertension (≥ 200 mmHg) is associated with an increased likelihood of undertriage moderate acuity with OR 1.29 95% CI (0.68-2.01). There were no anomalous vital signs associated with increased likelihood of over-triage to high and moderate ESI acuity levels.	
16 Patient disposition using the Emergency Severity Index: a retrospective observational study at an interdisciplinary emergency department	Völk et al., Germany 2022	This study used a retrospective single center study. Data of all patients who come to interdisciplinary ED of a tertiary care hospital in Munich, Germany, this study measures ESI scores, medical specialties according to chief complaint, method of arrival, admission rates and evaluates the purpose of transferring patients from the ED.	Data obtained in the critical patient group, 30% of patients with neurological or medical symptoms required immediate intensive care, whereas only 17% of patients with surgical problems were admitted to the ICU. A large number of patients (especially with neurological or medical problems) required hospital (and in some cases even ICU or IMC) admission despite high ESI scores. Overall, the ESI appears to be a useful tool for anticipating the need for specialized resources in the arrivals hospital. Patients with symptoms suggestive of a neurological or medical problem require special attention because the ESI may fail to adequately predict the level of care facilities for this group of patients

RESULTS AND DISCUSSION

Comparison of the ESI triage system and other triage systems

the data obtained by the average ESI triage takes 2 minutes 27 seconds while the triage of the four levels of ATS modification takes 3 minutes 3 seconds. The fastest time required for ESI is in 72 seconds and the longest takes 4 minutes 20 seconds. At the triage level of the four ATS modifications, the fastest time used is 75 seconds and a maximum of 4 minutes and 50 seconds. The fastest time difference is only 3 seconds and the longest difference is 30 seconds. From the minimum and maximum times for both triage there is a considerable distance (Minggawati et al., 2020), while the study conducted by (Sarvari et al., 2020)

used a quasi-experimental method on 736 patients where 368 patients were considered as a group pre-intervention and 368 patients considered as post-intervention groups, it was found that the implementation of ESI triage decreased in all specified time intervals, and generally reduced the patient's length of stay in the emergency department from patient arrival to patient transfer from 157.02 minutes to 86, 96 minutes.. The Effectiveness of Writing Documentation of the Triage Emergency Severity Index Using the Canada Triage Acuity Scale on Accuracy of Patient Triage Priorities. The data obtained shows that there is a difference in the effectiveness of writing triage documentation on the Emergency Severity Index and the Canada Triage Acuity Scale on the accuracy of patient triage priorities with a p value of 0.030. The number of triage priority accuracy in writing the Emergency Severity Index triage documentation is more, namely 46 (92%), while

the number of triage priority accuracy in writing the Canada Triage Acuity Scale documentation is 38 (76%) (Wibowo, 2020), while in triage decisions compared The ESI and JTAS (Japan Triage and Acuity Scale) obtained in the ESI group obtained $k = 0.82$ (Very Good) while in the JTAS group $k = 0.74$ (Substantial) for that the triage decision in the ESI group was higher than the JTAS group. Based on the results obtained on the comparison of ATS and ESI, it was found that the time needed for ESI in intervention triage decisions required less duration than ATS triage, as well as on the accuracy of priorities in writing documentation between ESI and CTAS and JTAS, it was found that ESI was more efficient than CTAS triage documentation. Based on the literature obtained, the researcher assumed that the time of triage intervention and the accuracy of documentation compared to other triage systems, ESI was superior, while the comparison between ESI and JTAS found that triage decisions were better. of stay of patients in the ED.

Use of ESI in patients with certain diseases

Based on research conducted (Siddiqui & Ali, 2020) it was found that the Emergency Severity Index (ESI) has sensitivity and specifications in diagnosing sepsis and septic shock, data showing ESI Level 1 with a sensitivity value for diagnosing sepsis shock (88.5%) and a value specifications for the diagnosis of sepsis shock (100%) and research conducted (Talebpoor et al., 2021) that the results found that ESI was added to a capnometer examination that had a level of sensitivity, specificity, and accuracy for recognizing high risk heart failure patients was 100%, 60 %, and 90% for the ESI+Capno group and 62.5%, 42.86%, and 48.36% for the ESI group, as well as the study conducted (Hamechizfahm et al., 2019) Data obtained in seventy COPD patients were equally assigned to the ESI + PEF and ESI groups. Under triage rates were 11.42% and 0%, over-triage rates were 31.42% and 2.85% respectively in the ESI and ESI + PEF groups. Triage rates of patients admitted to ICU (2 vs. 3), PU (2 vs. 4), or discharge from the ED (3 vs. 2) differed significantly between the ESI + PEF and ESI groups. The addition of PEF to the ESI provides a more accurate method for triaging COPD patients than ESI alone. Based on the literature, researchers assume that ESI has high sensitivity, specificity and accuracy in certain diseases.

ESI modification with other methods

Based on research conducted by (Kipourgos, 2022) modified ESI using Artificial Intelligence and data obtained that patients who come to the emergency room with indications of heart disease and neurogenic disease have a 94% success rate for triage decisions. i-TRIAGE may in the future become a useful tool for all nurses in the emergency department to assist with triage decisions. Research conducted by (Talebpoor et al., 2021) The results showed that the ESI was added to the capnometer examination, which had a sensitivity, specificity, and accuracy level for recognizing high-risk heart failure patients, namely 100%, 60%, and 90% for the ESI+ group Capno and 62.5%, 42.86% and 48.36% for the ESI group. study conducted by (Hamechizfahm et al., 2019) The data obtained in seventy COPD patients were equally assigned to the ESI + PEF and ESI groups. Under triage rates were 11.42% and 0%, over-triage rates were 31.42% and 2.85% respectively in the ESI and ESI + PEF groups. Triage rates of patients admitted to ICU (2 vs. 3), PU (2 vs. 4), or discharge from the ED (3 vs. 2) differed significantly between the ESI + PEF and ESI groups. The

addition of PEF to the ESI provides a more accurate method for triaging COPD patients than ESI alone. We recommend the use of PEF for triage of COPD patients in the ED. A study conducted by (Talebpoor et al., 2021) found that the ESI was added to the capnometer examination, which has a sensitivity, specificity, and accuracy for identifying high-risk heart failure patients, namely 100%, 60%, and 90% for the ESI group +Capno and 62.5%, 42.86% and 48.36% for the ESI group. from the literature obtained the researcher assumed that the modified ESI would increase the sensitivity, specificity, accuracy and triage decisions.

Use of ESI in vulnerable groups

Research conducted by (Kemp et al., 2022) found that the emergency severity index (ESI) worked well in predicting a high dependency unit / ICU admission rate for both 18-64 years and greater than or equal to patients aged 65 years . Research conducted (Ghafarypour-Jahrom, 2018) ESI has a sensitivity ranging from 81% to 95% and a specificity ranging from 73% to 86%. Moreover, the sensitivity range of ATS is 80% to 95% and the specificity ranges from 74% to 87%. Under triage and over triage occurred in 12% and 15% of patients in ESI and 13% and 15% of patients in ATS, respectively. ESI and ATS apply to triage of children in the emergency department of the Mofid Pediatric Children's Hospital. ESI reliability is good, moderate to good for ATS. Research conducted by (Kawakita et al., 2020) Results Of 439 women, the ESI distribution was 0.2% ESI 1, 23.7% ESI 2, 56.0% ESI 3, 19.4% ESI 4, and 0.7% ESI 5. Readiness rates by ESI level were 100% ESI 1, 47% ESI 2, 18% ESI 3, 2% ESI 4, and 0% ESI 5 ($p < 0.001$). Of the 246 women who were given ESI 3, a total of 25 had severe range BP and were transferred to a modified ESI of 2, of these 25 women, 14 were readmitted. The AUC of the modified ESI was statistically higher than that of the standard ESI (AUC: 0.77 and 95% confidence interval: 0.72–0.82 vs. AUC: 0.73 and 95% confidence interval: 0.68–0.78; $p < 0.01$). The ESI is a useful tool for identifying women in need postpartum. From some of the literature that has been presented, researchers assume that ESI can be applied to vulnerable groups entering the ER with a high level of accuracy, high specification sensitivity.

Researchers assume that the emergency severity index (ESI) can be applied in emergency departments with a high level of sensitivity, specificity, accuracy and triage decisions, ESI can be modified with other methods and can work well, ESI can also be used in vulnerable groups such as the elderly, children and post partum mothers.

CONCLUSIONS AND SUGGESTIONS

The emergency severity index (ESI) can be applied in emergency departments with a high level of sensitivity, specificity, accuracy and triage decisions. ESI can be modified by other methods and works well. ESI can also be used for vulnerable groups such as the elderly, children. and post partum mothers. Suggestion Emergency severity index can be one of the references to be applied in emergency departments in Indonesia because it has high efficiency.

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Conflict of Interest Statement

The authors declare that there is no potential conflict of interest in connection with the writing and publication of this article.

Reviewer's Advice

The author fully leaves it up to the manager to review our article, and the reviewer's results are conveyed back to us if they need to be corrected according to input from the examining team.

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