Indonesian Journal of Global Health Research
Volume 7 Number 2, April 2025
e-ISSN 2715-1972; p-ISSN 2714-9749
http://jurnal.globalhealthsciencegroup.com/index.php/IJGHR

LITERATURE REVIEW: THE TRIAGE OPTIMIZATION WITH EMERGENCY SEVERITY INDEX (ESI) IMPACT ON EMERGENCY DEPARTMENT QUALITY OF CARE

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ABSTRACT
Emergency Departments are critical healthcare units where efficient triage plays an important role in ensuring optimal patient care. The Emergency Severity Index (ESI) is a widely used triage system designed to improve prioritization and resource allocation. Proper use of ESI-based triage will improve the quality of care. Objective: This literature review aims to analyze the impact of ESI-based triage optimization on Emergency Department service quality. Methods: A systematic search was conducted using Google Scholar, PubMed, ResearchGate, and SciSpace databases, using the keywords: Emergency Severity Index (ESI), Emergency Department, Triage, using the PCC (Population, Concept, Context) approach. The article selection process used PRISMA which was then subjected to critical appraisal. The initial search was conducted through Google Scholar (5,521 articles), PubMed (2,019 articles), ResearchGate (881 articles), and SciSpace (99 articles). The process of removing duplicate articles left 8,151 articles, the initial screening of 8,125 articles was eliminated, so only 26 articles entered the further screening stage. From this process, 16 articles did not meet the criteria and were excluded. Finally, 10 articles that met the inclusion criteria were selected and reviewed. Results: The findings showed that ESI optimization improved patient flow, reduced waiting time, and improved resource utilization, leading to better clinical outcomes and patient satisfaction. Conclusion: implementation of an optimized ESI-based triage system contributes significantly to the efficiency and quality of Emergency Department care, emphasizing the need for consistent training and protocol adherence.

Keywords: emergency severity index (ESI); emergency department; triage

How to cite (in APA style)
Mariana, M., Melastuti, E., Sari, D. W. P., & Wahyuningsih, I. S. (2025). Literature Review: The Triage Optimization with Emergency Severity Index (ESI) Impact on Emergency Department Quality of Care. Indonesian Journal of Global Health Research, 7(2), 1033-1044. https://doi.org/10.37287/ijghr.v7i2.5895.

INTRODUCTION

The Emergency Department (ED) is one of the health service units that has an important role in handling patients with critical conditions that require immediate action (Indri Wahyuningsih & Angelita Putri Wafa Pradita, 2024). An increase in the number of patient visits to the emergency room often leads to crowded services, long waiting times, and limited medical resources. This condition can have an impact on reducing the quality of care and patient safety (Siddiqui et al., 2020). Therefore, an optimal triage system is needed to ensure that patients receive appropriate treatment according to the severity of their condition.Triage is a crucial component of emergency care that aims to classify patients based on the severity of their condition (Irawan et al., 2020). This process ensures that patients with more serious conditions get faster treatment, while patients with milder conditions still receive priority care. One of the most widely used triage systems globally is the Emergency Severity Index (ESI), which categorizes patients based on medical urgency and clinical resource needs (Chmielewski & Moretz, 2022).

Challenges in the implementation of triage systems are still a problem in various health facilities, including delays in handling critical patients, mismatches in severity classification,

and overcrowding of patients in emergency departments (EDs). Triage optimization with ESI is one solution that can improve service efficiency, reduce patient waiting time, and ensure more effective use of resources (Minggawati et al., 2020).Research on triage optimization with ESI is essential to understand how this system can affect the quality of emergency care, including the speed of response of medical personnel, the accuracy of the initial diagnosis, and patient satisfaction with the services provided (Levkowitz et al., 2025). With the increasing number of patient visits in the emergency department, evaluation and optimization of the triage system is an urgent need to ensure that every patient receives prompt and appropriate care according to their needs (VatanKhah et al., 2024). Therefore, this study aims to explore the impact of triage optimization with the Emergency Severity Index (ESI) on the quality of emergency care, as well as identify factors that can improve the effectiveness of the triage system in the emergency department environment (Rifla & Sni Syam, 2024).

The WHO notes that around 60% to 90% of patients who come to emergency departments in various countries are not in life-threatening conditions, but still need fast and appropriate medical services. ED crowding is a major challenge in the global health system, causing increased waiting times, decreased quality of care, and patient safety risks. The WHO also reports that 1 in 10 patients experience preventable adverse events due to delays or errors in the triage system.In the United States, CDC data shows that more than 130 million ED visits occur each year, with more than 20% of patients experiencing wait times that exceed emergency care standards. Approximately 2.6 million patients experience critical conditions, but some experience delays in treatment due to triage system inefficiencies. Studies in large hospitals show that implementing the Emergency Severity Index (ESI) improves triage accuracy and reduces waiting times by 30%, thereby improving patient safety.In Asia, ED overcrowding is also a major challenge, especially in developing countries. Data from the Asia Pacific Journal of Emergency Medicine shows that in some hospitals in China, India and the Philippines, more than 40% of emergency department patients experience delays in care due to suboptimal triage systems. Lack of training and a triage system that has not been standardized make it difficult for medical personnel to identify patients with emergency conditions.

In Indonesia, data from the Indonesian Ministry of Health shows an increase in the number of emergency room visits every year. The 2023 report noted that more than 70% of emergency room patients are not in life-threatening conditions, while critical patients still experience delays in service due to the high workload of health workers and an unoptimized triage system. Research in several referral hospitals in Indonesia found that the implementation of the Emergency Severity Index (ESI) is still uneven, and many medical personnel still use conventional triage systems that are less accurate in classifying the severity of patients. From this problem, the purpose of this literature review is to systematically evaluate and analyze existing scientific evidence regarding Triage Optimization with Emergency Severity Index (ESI): Impact on the Quality of Emergency Care. The purpose of this literature review is to analyze the impact of implementing the Emergency Severity Index (ESI) on the quality and efficiency of care in the emergency department and identify factors that can cause a crisis.

METHOD

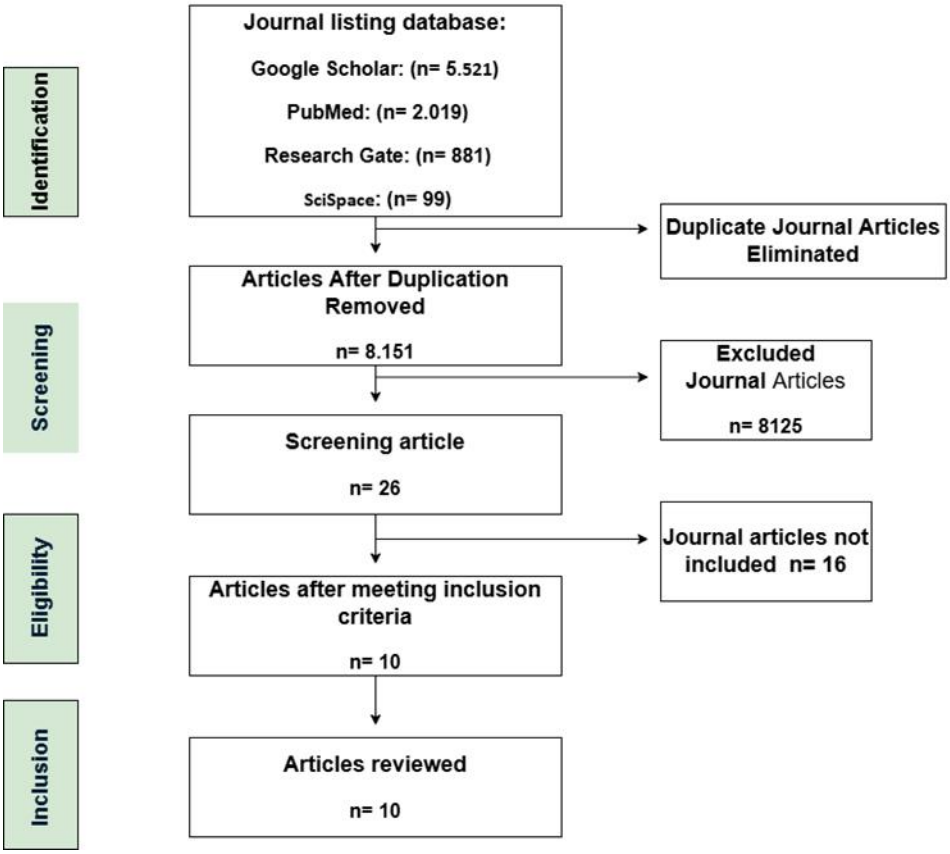
This research uses a literature study approach by reviewing national and international articles published in the range of 2020-2024. The selected articles were available in full text format for free. Literature search sources include Google Scholar, PubMed, ResearchGate, and SciSpace databases. Strategy searches were conducted using keywords: Emergency Severity Index (ESI). Emergency Care, and Triage, by applying the Population, Concept, Context (PCC) approach to limit the scope of the review. From the search results, 8,520 articles were

obtained which were then selected using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method. The selection process was carried out through the stages of identification, screening, eligibility, and inclusion. After further analysis, 10 articles were obtained that met the inclusion criteria and analyzed in this study. The inclusion criteria in this study include articles that have relevance to the research topic, namely the application of the Emergency Severity Index (ESI) in emergency services, and can be fully and freely accessed. The exclusion criteria included publications in the form of books, proceedings, or documents other than scientific articles, articles that could not be accessed for free (paid or locked), and articles published before 2019. The Population, Concept, Context (PCC) framework was used as a basis to limit the scope of the study and ensure that the articles analyzed were relevant to the research objectives.

Table 1
Research keywords on PCC

PCC	KEYWORD
P	Emergency Department
C	Emergency Severity Index (ESI)
C	Triage

Databases used: Google Scholar, PubMed, ResearchGate, and SciSpace.
Keywords: Emergency Severity Index (ESI), Emergency Care, Triage



RESULT

Results from the search and selection process of journal articles based on the databases used. The initial search was conducted through Google Scholar (5,521 articles), PubMed (2,019 articles), ResearchGate (881 articles), and SciSpace (99 articles), resulting in a total of articles collected before duplication elimination. After the duplicate article removal process, 8,151 articles remained. An initial screening was then conducted, in which 8,125 articles were

removed, leaving only 26 articles to enter the further screening stage. From this process, 16 articles did not meet the criteria and were excluded. Finally, 10 articles that met the inclusion criteria were selected and reviewed.

Table 2.
Review Article Data

Title	Author (Year)	Research Objectives	Research Type	Population/Sample	Research Results
Accuracy of the Emergency Department Triage System using the Emergency Severity Index for Predicting Patient Outcome; A Single Center Experience.	Ganjali et al., (2020)	To evaluate the accuracy of the five-level triage system using the emergency severity index (ESI) and to determine the compliance of the triage level with patient outcomes.	Researchers used cross-sectional Research	400 Respondents	The study's findings indicate that a five-level triage system using ESI demonstrates high accuracy in triage processes and effectively predicts patient outcomes. As a result, this system can be considered an efficient method for hospital triage.
Effectiveness of ESI (Emergency Severity Index) Implementatio n on Triage Response Time in the Emergency Department of Rsud Undata, Central Sulawesi Province	(Rachma1 et al., 2023)	The purpose of this study was to analyze the relationship between the use of ESI in accordance with the SOP on triage response time.	Type of observatio nal analytic research with a cross sectional study approach	Sample 35 respondents	The statistical test results showed that there was no relationship between the use of ESI in accordance with the SOP and response time because the p value ≥ 0.05.
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)	The aim of this study was to compare four-level triage modified ATS and five-level triage ESI based on accuracy and triage time.	The research Design used was a quasi-experiment	Sample 76 respondents	ESI triage has more expected triage and less under triage than ATS modified triage
Evaluation of Emergency Severity Index (ESI) triage quality by nurses and associated factors in Iran	(Razavian et al., 2024)	The purpose of this study was to determine the quality of nurse triage using the Emergency Severity Index	The research design used was a descriptive study	900 respondents	There was no significant difference between the level of quality of triage by nurses and doctors (P > 0.05), the

		(ERI) method and related factors.			results of an independent t-test showed that nurses in the over triage group had a higher average age and work experience. At the under triage level, the frequency of female nurses was significantly higher than male nurses (P < 0/05).
EVALUATION OF THE ACCURACY OF THE EMERGENCY DEPARTMENT'S NURSES' TRIAGE DECISION USING THE ESI SYSTEM	(AKYOL et al., 2023)	The purpose of this study was to compare the accuracy of the triage nurse's categorization decision with the Emergency Severity Index (ESI) system categorizatio n determined after patient evaluation in the emergency room.	Methods in cross- sectional descriptiv e research	3324 respondents	The kappa concordance value between the scores of the triage nurses and the scores of the doctors who used the ESI was found to be 0.416. It was determined that the triage staff gave a triage score 1/4 lower than the ESI. In the presence of tachypnea, an increase in the low triage rate and a decrease in the high triage rate of patients were found. It was determined that the most accurate triage scores were given in nephrology and cardiovascul ar disorders. The most incorrect triage decisions were ophthalmic disorders and oncologic emergencies. In patients

					between the ages of 18-65 years, the triage performed was statistically significantly higher. Patients with chronic diseases and a history of continuous drug use were given a lower triage.
Effectiveness of Writing Emergency Severity Index (ESI) Triage Documentation with the Canada Triage Acuity Scale (CTAS) on the Accuracy of Patient Triage Prioritization by Ners Students of STIKES Cahaya Bangsa in the Emergency Room of Ulin Hospital Banjarmasin	(Doni Wibowo, 2020)	The purpose of this study is to study the effectiveness of the Emergency Severity Index triage discussed with the Canadian Triage Acuity Scale on the accuracy of patient triage priorities	The research design used was Quasi Experimen tal	50 responden untuk Emergency Severity dan 50 responden untuk Canada Triage Acuity Scale	Here is a difference in the accuracy of the triage priorities of patients between the triage documentation of the Emergency Severity Index and the Canada Triage Acuity Scale with a p value of 0.030.
Evaluation Of the Emergency Severity Index Triage For Improving Emergency Room Services Quality In Indonesian Hospital	(Ramli et al., 2024)	This study aims to evaluate the implementati on of triage based on the Emergency Severity Index (ECI) in improving the quality of emergency services in hospitals in Indonesia.	The research design used was Quantitativ e descriptive	100 respondents	the majority of patients were categorized as ESI level 3, comprising 82 (82%) respondents. There was overuse of triage resources beyond projections, and patient placement did not always adhere to standards, although average response times were within the acceptable range. Patient satisfaction was evaluated

					across five dimensions; the most satisfactory dimensions were assurance and empathy, with 90% of respondents rating them positively, while the tangible dimension received the lowest satisfaction rating at 84%. The correlation between ESI triage implementation and patient satisfaction was not statistically significant (p-value = 0.101, higher than 0.05).
ESI Triage Distribution in U.S. Emergency Departments	(Chmielewski & Moretz, 2022)	The aim of this retrospective observational study was to examine the 2019 triage distribution of 954,847 ED encounters across 25 hospitals. A comparison was then made with the distribution identified in the ESI Implementation Handbook	observational retrospective	954,847 respondents	The study results reflect a wide variation in distribution when compared to the expected distribution. The percentage of Level 2 ESIs varied from as low as 2.6% to as high as 69% of each facility's ED visit population.
The Effect Of Emergency Severity Index (Esi) Triage On Length Of Stay In The Emergency Departmen T Of The Harapan Anda Islamic Hospital, Tegal	(Irawan et al., 2020)	The purpose of this study is to measure the "Triage Emergency Severity Index (ESI) Effect on Duration of Emergency Department	This research is a quasi-experiment design using Post Test Only Non- equivalent Control Group Design.	110 respondents	There is an effect of Emergency Severity Index (ESI) triage implementation on length of stay in the ED.

City.		Organizing".			
Efficacy of Emergency Severity Index (ESI) in Early Identification of Patients with Sepsis and Septic Shock at Triage Shock at Triage	(Siddiqui et al., 2020)	Objectives The objective of this study was to determine the efficacy of " Emergency Severity Index (ESI) tool in early recognition of "sepsis" and "septic shock" in emergency room triage at a tertiary care hospital in Pakistan	cross-sectional study	240 respondents	ESI proved to be a useful "triage-tool" with high sensitivity and specicity in the identication and prioritization of patients with sepsis and septic shock in a busy emergency department.

DISCUSSION

Triage is the process of prioritizing care for patients in the emergency department based on the severity of their medical condition. This process aims to optimize the use of medical resources to improve the efficiency and effectiveness of health services (AKYOL et al., 2023).The Emergency Severity Index (ESI) is a five-level-based triage system used in emergency departments to classify patients based on their medical resource needs and level of clinical urgency (Meral et al., 2024). ESI allows medical personnel to identify patients who need immediate intervention and optimize patient care flow in an environment that often has limited resources (Gholizadgougjehyaran et al., 2024). The quality of emergency care reflects the effectiveness, efficiency, safety, and timeliness of providing care to patients in the emergency department (Yuksen et al., 2023). This quality of care is influenced by various factors, including speed in triage, accuracy in determining the severity of the patient, and optimal use of medical resources (Razavian et al., 2024).

Research Results Based on the results of the reviewed research, the implementation of the ESI system in the triage process in the emergency department is proven to improve service efficiency and speed up patient waiting time. Studies show that consistent use of ESI can reduce the incidence of delays in the treatment of patients with critical conditions, thereby improving safety and quality of care. Several studies have also reported an increase in patient and health worker satisfaction associated with a more structured and objective triage system (Chmielewski & Moretz, 2022; AKYOL et al., 2023; Rachma1 et al., 2023). Some challenges in the implementation of ESI were also found, especially in the aspect of training medical personnel and the diversity of interpretations between practitioners in determining the severity of patients. Some studies revealed that without adequate training, there is a potential for errors in patient categorization that can affect the flow of care and allocation of medical resources (Hoffman et al., 2022).

Results The findings of this study have significant implications for the practice of emergency care. Effective implementation of ESI can improve patient safety by ensuring that those in need of immediate care receive prompt and appropriate intervention. In addition, the system can assist in resource planning and workload reduction of medical staff with a more systematic workflow. Therefore, continuous training is needed for medical personnel so that the implementation of ESI runs optimally and can improve accuracy in the triage process (Siddiqui et al., 2020; Doni Wibowo, 2020; Ramli et al., 2024). Triage optimization using the

Emergency Severity Index (ESI) in improving the quality of emergency services is influenced by several main factors. The availability of resources, such as medical personnel, treatment rooms, medical equipment, and other supporting facilities, determine the smoothness and effectiveness of triage. In addition, the level of training of medical personnel plays an important role, where competence in understanding and applying the ESI system will affect the accuracy in categorizing patients according to severity. Protocol adherence is also a crucial factor, as consistent implementation of ESI standard operating procedures (SOPs) can help avoid patient misclassification and improve service efficiency (Ganjali et al., 2020; Minggawati et al., 2020; Razavian et al., 2024; Irawan et al., 2020).

Another factor is patient load and emergency department overcrowding, where the placement of a certain number of patients in a given time can cause delays in triage and increase pressure on medical personnel (Sax et al., 2024; Mugula et al., 2023). Technology and information system support contribute to triage optimization by enabling more accurate recording, real-time patient monitoring, and data-driven decision-making (Chmielewski & Moretz, 2022). In addition, the diverse conditions and variability of patient cases affect the effectiveness of triage, especially in allocating resources appropriately. Finally, good coordination of the medical team, with effective communication between doctors, nurses, and other healthcare personnel, is crucial in ensuring a smooth triage process as well as optimal patient management (Carenzo et al., 2024); (Fotland et al., 2024).The main strengths of this study are the broad coverage of data and the use of evidence-based analysis methods, thereby increasing the validity of the results obtained. In addition, the study covered a wide range of emergency department contexts in different countries, allowing generalization of the findings to different healthcare systems (Nggosual et al., 2024) (Gibiino et al., 2024). Notable weaknesses. One is the variation in ESI implementation across different healthcare facilities, which may affect the uniformity of the results. In addition, most of the studies reviewed used observational designs, which cannot fully control for external factors that may affect the results (Siddiqui et al., 2020) (Gibiino et al., 2024) Therefore, further experimental studies are needed to strengthen the findings regarding the impact of ESI on the quality of emergency care. Considering the findings, implications, and strengths and weaknesses of this study, it can be concluded that optimizing triage with ESI has great potential in improving the quality of emergency care. However, successful implementation depends on adequate training as well as consistent application of the system in various health facilities (Ganjali et al., 2020; AKYOL et al., 2023; Rachma1 et al., 2023; Irawan et al., 2020).

CONCLUSION

Triage optimization by applying the Emergency Severity Index (ESI) has a positive impact on the quality of emergency services. The implementation of this system can improve the efficiency of patient waiting time, ensure more appropriate resource allocation, and improve patient safety and satisfaction. Factors such as availability of resources, training of medical personnel, adherence to protocols, and utilization of technology greatly influence the effectiveness of ESI implementation. Despite its advantages, challenges such as differences in clinical interpretation and patient overcrowding remain a concern that needs to be addressed through continuous training and strengthening of health information systems. Therefore, continuous efforts are needed to develop and adjust the implementation of ESI so that it can provide maximum benefits in improving the quality of emergency services in various health facilities.

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