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Original Research

Comparison of ESI and START Triage in Emergency Patient Prioritization: A Literature Review

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ABSTRACT

Background: *Emergency departments require effective triage systems to prioritize patients based on clinical urgency and resource needs. The Emergency Severity Index (ESI) and Simple Triage and Rapid Treatment (START) are widely used methods with distinct approaches and applications; however, comprehensive comparisons between them remain limited. This study aimed to analyze and compare the effectiveness of ESI and START in prioritizing emergency patients.*

Methods: *This study employed a systematic literature review of articles published between 2020 and 2026. Data were obtained from Google Scholar and ScienceDirect using keywords related to ESI, START, and emergency triage. Articles were selected based on predefined inclusion and exclusion criteria, focusing on relevance, study design, and population. A total of 10 articles met the criteria and were included in the analysis. Data were analyzed using critical appraisal to synthesize findings.*

Results: *START demonstrated significantly faster triage time (11 seconds) than ESI (18 seconds) ($p < 0.001$). ESI showed higher accuracy and predictive validity for clinical outcomes, including mortality, ICU admission, and resource utilization. Patients categorized as ESI level 1 had higher mortality (17%), with predictive performance (sensitivity 82.1% and negative predictive value 99.9%). In contrast, START showed acceptable sensitivity but carried risks of over-triage and under-triage. Some studies found no significant relationship between ESI and response time ($p > 0.05$).*

Conclusion: *ESI provides more accurate patient classification in routine emergency settings, whereas START enables faster decision-making and is suited for mass casualty incidents. The selection of triage systems should consider clinical context and resource availability.*

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INTRODUCTION

Emergency care services are a vital component of the healthcare system, aimed at saving lives and preventing disability through prompt and appropriate management (Khayudin, Wisnu, & Kusyani, 2025). The Emergency Department (ED) frequently experiences increasing patient volumes with diverse levels of severity; therefore, an

accurate triage system is essential to prevent delays in managing critically ill patients. Overcrowding in the Emergency Department is associated with increased mortality rates, delays in service delivery, and a decline in the quality of healthcare (Kim, et al., 2026).

Triage is the process of categorizing patients based on the urgency of their clinical condition to determine the priority of medical interventions. A well-designed triage system must be valid, reliable, and able to effectively predict resource needs (Gilboy et al., 2020). The implementation of a standardized triage system has been proven to improve patient safety and reduce mortality rates by enabling faster and more targeted management for patients with critical conditions (Uly, Rahman, & Putri, 2025). Therefore, selecting an appropriate triage system is essential to optimize emergency department efficiency and clinical outcomes.

Furthermore, accuracy in the triage process is crucial, as misclassification can delay treatment, worsen the patient's condition, and increase the risk of complications and hospitalization. (Sax, Wiler, & Welch, 2025). In global practice, several triage systems have been developed, including the Emergency Severity Index (ESI), the Canadian Triage and Acuity Scale (CTAS), the Manchester Triage System (MTS), and Simple Triage and Rapid Treatment (START), which are among the most widely used and studied triage systems in emergency care services across various countries (Zachariasse et al., 2019). Each system differs in assessment approach, complexity, and clinical application depending on emergency situations and available resources.

The Emergency Severity Index (ESI) is a five-level triage system that combines the assessment of patient condition severity with the prediction of medical resource needs. ESI is widely used in the United States and various other countries due to its good interrater reliability and its ability to predict the need for diagnostic examinations and therapeutic interventions (Gilboy et al., 2020). Recent studies have demonstrated that ESI shows strong validity in predicting hospital admissions, ICU requirements, and mortality among emergency department patients (Mistry et al., 2022). This capability makes ESI particularly suitable for routine emergency department settings requiring detailed patient prioritization.

Recent studies have shown that ESI improves emergency department service efficiency by facilitating rapid clinical decision-making, reducing waiting times, and enhancing patient safety (O'Reilly et al., 2022). Additionally, consistent ESI implementation supports early identification of patients with critical conditions, enabling interventions to be delivered more promptly (Shah, et al., 2021). The implementation of ESI still faces challenges, including variability in assessments across healthcare providers and the risk of misclassification, which can affect the quality of care. Therefore, continuous training and regular system evaluation are necessary to improve accuracy and consistency in the triage process (Van der Straten, van Stel, Spee, & Schrijvers, 2022). Strengthening competency-based training programs may help standardize clinical judgment and optimize triage performance.

However, ESI is designed for routine emergency department settings and is not intended for mass casualty incidents. In disaster situations, a faster, simpler triage system is required so it can be applied quickly and with limited resources. One of the most widely used systems in this context is START system (Lin et al., 2022). START assesses three main parameters—respiration, perfusion (capillary refill), and mental status to categorize patients in under 1 minute (Benson, Koenig, & Schultz, 2021). START has been proven effective in improving the speed of identifying high-priority victims in mass casualty incidents; however, several studies have reported risks of over-triage and under-triage,

particularly in specific populations such as children and the elderly (Montagner, de Sousa, & dos Santos, 2022). Furthermore, compared to emergency department–based triage systems such as ESI, START does not account for advanced resource needs, limiting its accuracy in routine care settings (Harahap & Wulandari, 2024).

The fundamental differences between ESI and START lie in their contexts of use, algorithmic complexity, and assessment indicators, with ESI used in emergency department settings through a clinical stratification approach that considers both severity and medical resource needs (Nusi, Lestari, & Suryanto, 2023). To date, systematic studies comparing both systems in a comprehensive synthesis remain limited, particularly in the context of evidence-based decision-making in emergency care. Therefore, a literature review is needed to analyze and compare ESI and START in prioritizing emergency patients, to provide more context-appropriate practice recommendations. This study contributes by synthesizing recent evidence on the comparative effectiveness of both triage systems, highlighting the strengths of ESI in accuracy and predictive validity, as well as the advantage of START in rapid decision-making. These findings provide practical insights for clinicians and policymakers in selecting appropriate triage methods based on clinical context and resource availability.

MATERIALS AND METHOD

Study Design

The research method used in this study is a systematic literature review aimed at identifying, evaluating, and synthesizing research findings comparing ESI and START for prioritizing emergency patients. The main objective of this review is to answer the research question: "Which triage method, ESI or START, is more effective and accurate in determining emergency patient priority across different clinical settings?" This approach allows comprehensive analysis of existing evidence to support clinical decision-making in emergency care.

Literature Search Strategy

The literature search was conducted using several electronic databases, including ScienceDirect and Google Scholar. The search strategy employed a combination of keywords and Boolean operators, such as ("ESI" OR "Emergency Severity Index") AND ("START" OR "Simple Triage and Rapid Treatment") AND ("triage emergency" OR "emergency department"), with a publication range limited to 2020–2026. The search process was performed systematically to ensure comprehensive identification of relevant studies.

Inclusion and Exclusion Criteria

Inclusion criteria for selecting articles were: (1) original research studies (quantitative or qualitative); (2) studies involving emergency patients or triage systems; (3) articles published in English; (4) publications between 2020 and 2026; and (5) availability of full-text articles. Exclusion criteria included: (1) review articles; (2) editorials; (3) conference proceedings; (4) duplicate publications; and (5) studies not directly comparing ESI and START. The article selection process followed the PRISMA flow approach, starting from identification, screening of titles and abstracts, eligibility assessment through full-text review, and final inclusion of relevant studies. A total of retrieved articles was screened, and only those meeting the criteria were included in the final analysis.

Quality Appraisal

Quality assessment of the selected studies was conducted using the Joanna Briggs Institute (JBI) critical appraisal tools to evaluate methodological rigor and risk of bias. The assessment process was carried out systematically by evaluating the appropriateness of the study design, sampling methods, measurement validity, and clarity of data analysis. Each article was assessed based on criteria established in the JBI instrument in accordance with its study design. The quality of studies is analysed by authors with expertise in the field of emergency medicine, ensuring that the interpretation of results is accurate and contextual. The results of the quality assessment are used to determine the level of confidence in the research findings being analysed. Studies with low methodological quality are still considered but are interpreted with caution in the discussion of the literature review findings.

Data Extraction

Data extraction was performed systematically by collecting key information from each article, including author(s), year of publication, study design, sample characteristics, intervention or triage method used, and main findings. The extracted data was then organised using a standard extraction format to ensure consistency across studies. All the information was subsequently compared and synthesised to identify similarities, differences and key trends in the research findings.

Data Synthesis

The data analysis was carried out using a narrative synthesis approach, allowing comparison and integration of findings across studies with heterogeneous designs. This approach enables a comprehensive understanding of the effectiveness, strengths, and limitations of ESI and START triage methods in various emergency care contexts. This approach also enables the identification of key findings and research gaps that still require further investigation in the field of emergency triage.

RESULTS

The article selection process in this study followed the PRISMA flow diagram. A total of 135 articles were initially identified through database searching, including Google Scholar (n = 47) and ScienceDirect (n = 88). During the screening stage, articles were filtered to the publication year range of 2020–2026, resulting in 51 relevant records (Google Scholar: n = 37; ScienceDirect: n = 14). Furthermore, 36 full-text articles were successfully retrieved (Google Scholar n = 19; ScienceDirect n = 8) and assessed for eligibility. The inclusion criteria consisted of: (1) articles published between 2020 and 2026 to ensure up-to-date evidence; (2) studies focusing on triage systems, specifically Emergency Severity Index (ESI) and Simple Triage and Rapid Treatment (START); and (3) studies involving emergency patients across all age groups. After applying these criteria, a total of 8 articles were included in the final analysis of this literature review.

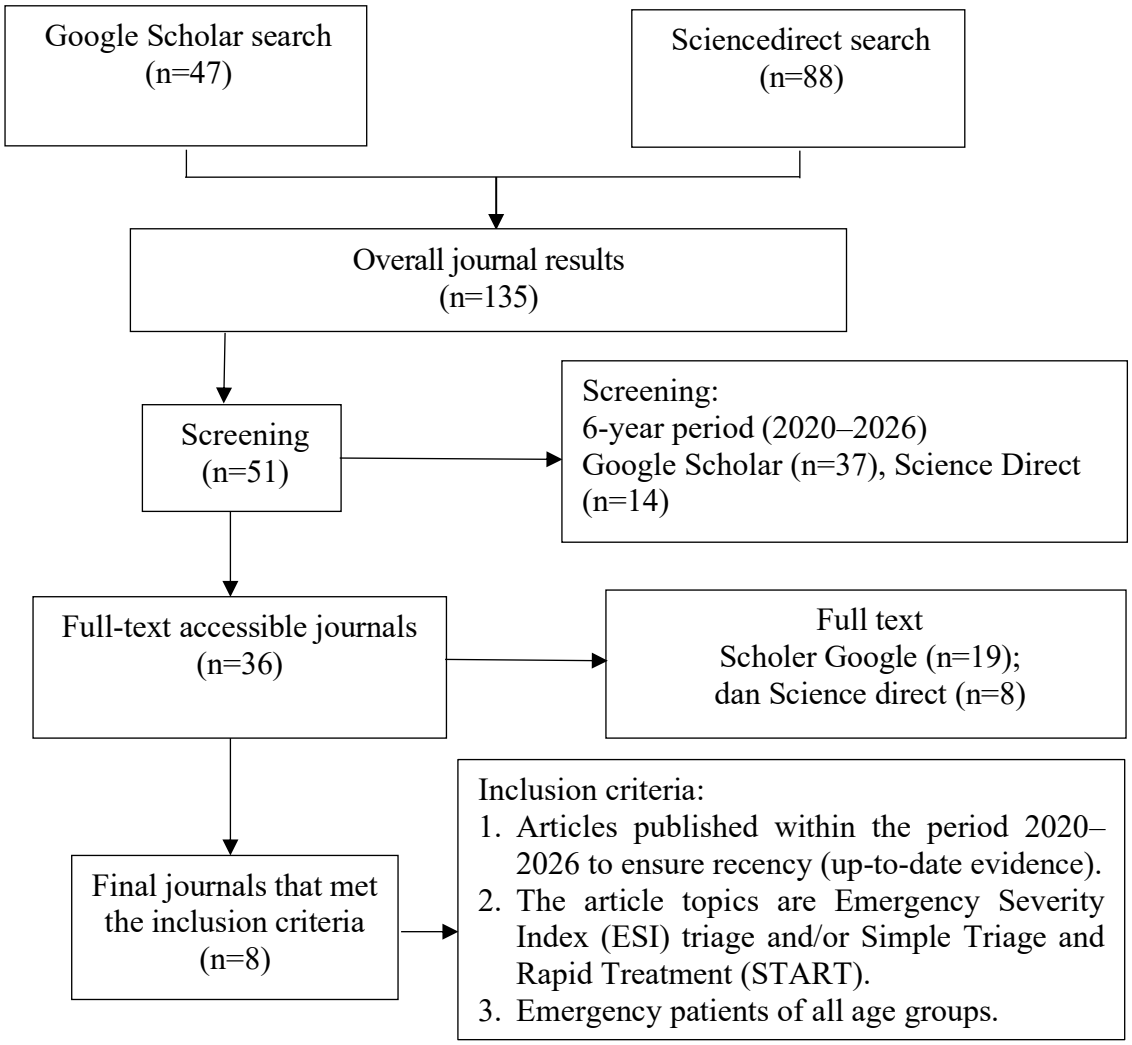

Figure 1. PRISMA Flow Diagram

DISCUSSION

The findings of this literature review highlight important differences and complementarities between ESI and START systems in determining emergency patient prioritization. Overall, the evidence suggests that both triage systems have distinct advantages depending on the clinical context, particularly in terms of speed, accuracy, and predictive capability for patient outcomes. Therefore, appropriate system selection is essential to optimize emergency care delivery.

One of the most consistent findings across the included studies is the difference in the time required to implement triage. The study by (Whardani, et al., 2026) demonstrated that the START method is significantly faster than ESI, with an average triage time of 11.29 seconds compared to 18.39 seconds for ESI ($p < 0.001$). This finding aligns with previous research indicating that START is specifically designed for rapid decision-making in high-pressure situations such as mass casualty incidents, where time efficiency is critical (Benson, Koenig, & Schultz, 2021). The simplicity of START, which relies on three primary parameters: respiration, perfusion, and mental status, allows healthcare providers to quickly categorize patients, making it highly suitable for a disaster setting (Lin et al., 2022).

Table 1. Results of The Literature Review

Authors	Study Design	Population & Sample	Main Findings	Conclusion
Patimah, S (2022) Indonesian	This research is a descriptive-analytical study using a cross-sectional design. using the Chi-Square test, instruments using observation sheets, and primary data (triage categories).	Emergency Room patients at Marthen Indey Class II Hospital and Bhayangkara Class III Hospital, 55 respondents	Based on the results of the Chi-Square test, the P value was 0.982, indicating that the LOS assessment was not effective with the ATS triage method used in the Emergency Department triage service at the Marthen Indey II Kindergarten Hospital. The results of the Chi-Square test yielded a P value of 0.594, indicating that the LOS assessment was not effective with the START triage method used in the Emergency Department triage service at the Bhayangkara III Kindergarten Hospital.	ATS triage is ineffective because health workers do not understand how to use it. START triage is easier to use because color-based classification is simpler. Neither method has a significant effect on LOS.
Farilya, Mita, Alfian Alfian, Evie Sulahyuningsih, and Syahril (2023), indonesian	This research is a quantitative, observational analysis with a cross-sectional study design. Instruments used include the RSUD Undata triage SOP, response time observation, Data analysis using the Fisher exact test as an alternative test	The population in this study comprised all nurses in the Emergency Room of Sumbawa Regional Hospital, totaling 43 people, with a sample of 35 drawn using non-probability sampling.	Based on the Fisher exact test, the results were p=0.220 for the morning shift, p=0.698 for the afternoon shift, and p=0.369 for the night shift. The statistical test results showed no relationship between ESI use according to SOP and response time, as the p-value was ≥ 0.05.	This study shows that, during ESI triage, most nurses have carried it out in accordance with the Hospital's SOP. Meanwhile, the ESI triage response time is in accordance with the SOP, based on ESI

Authors	Study Design	Population & Sample	Main Findings	Conclusion
	to the chi square test sheet, and digital timer			level, with an average in the fast category. However, the statistical test showed that there was no relationship between ESI use and triage response time, whether on the morning, afternoon, or night shift, indicating that ESI is ineffective to implement in the Emergency Room of Sumbawa Regional Hospital.
Thanat Tangpaisarn, Thummasorn Phurisetthasak, Marturod Buranasakda, Sukanya Khemtong, Praew Kotruchin, & Parwat Phungoen (2026) Thailand	Retrospective cohort study at a tertiary care hospital in Thailand	331,182 ED patients from January 2016 to December 2021. Data on demographics, ESI level, comorbidities, and outcomes (mortality, ICU admission, and length of stay) were analyzed	The overall in-hospital mortality rate was 0.6%. However, mortality was significantly higher among patients triaged as ESI level 1 (17%), compared with those at levels 2 (1.7%), 3 (0.3%), 4 (<0.1%), and 5 (0%). ICU admission rates were highest among ESI level 1 patients (35%), followed by those at level 2 (9.8%), with rates	ESI level 1 was associated with significantly higher in-hospital mortality, ICU admissions, and resource utilization compared with other levels. These findings support the continued use of the ESI for ED triage, especially in

Authors	Study Design	Population & Sample	Main Findings	Conclusion
			declining as triage acuity decreased. ESI levels 1 and 2 demonstrated strong predictive performance for mortality, with a sensitivity of 82.1% and a negative predictive value of 99.9%. Patients classified as ESI level 1 had the highest utilization of diagnostic and therapeutic interventions, including blood tests (93%), supplemental low-flow oxygen (36%), and mechanical ventilation (30%).	middle-income setting hospitals.
Yun-Kuan Lin., Kun-Chuan Chen, Jen-Hung Wang, Pei-Fang Lai (2022), Taiwan	retrospectively reviewed the records of victims who presented to our ED during a MCI response after a train crash	47 patients. The study population was predominantly women (68.1%) with a median age of 39.0 years.	This study enrolled 47 patients (predominantly women, 68.1%; median age: 39.0 years). Most victims were triaged into the START minor category (61.7%) and discharged from the ED (68.1%). Twenty-nine patients had matched START and outcome-based categories, whereas 2 patients were over-triaged and 16 patients were under-triaged. Additionally, the START system had acceptable AUC and sensitivities for	This study demonstrated poor agreement between START categories, as determined in the ED, and the consensus-based standard categories. However, the START protocol was acceptable in terms of identifying emergent patients (100% sensitivity for the immediate and

Authors	Study Design	Population & Sample	Main Findings	Conclusion
			predicting surgery and ED disposition (AUC/sensitivity/specificity for surgery: 0.850/100%/69.1%; AUC/sensitivity/specificity for admission: 0.917/93.3%/87.5%; AUC/sensitivity/specificity for intensive care unit (ICU)/ED death: 0.994/100%/97.8%).	deceased categories) and predicting ED disposition (surgery, admission, and ICU/ED mortality). Although START is not perfect, our findings suggest that it could be used for the ED triage of trauma-related MCI victims.
Zustantria Agustin Minggawati, Achmad Faried, Ayu Prawesti Priambodo (2020), Indonesian	The design of this study is quantitative research with a quasi-experimental approach. This research is set in Emergency Unit Cibabat Hospital. The Data was collected in October 2017. Univariate analysis consisted of frequency distribution for nurse characteristics, time triage, and accuracy; bivariate analysis used the Mann-Whitney test.	The researcher used a quantitative quasi-experimental design with samples of triage activities totaling 38 in the control group and 38 in the intervention group, using accidental sampling techniques.	The results showed there were no differences, triage modification of ATS with ESI triage in accuracy (p-0.488), and length of triage (p-0.488) ESI triage accuracy was in the expected triage category (76.3%), under triage (13.2%), and over triage (10.5%).	His study shows there is no significant difference in the level of accuracy and duration of triage. However, based on data distribution, ESI triage gives more expected triage decisions, less under triage and 16 seconds faster. Suggestions given to the Cibabat Hospital, can use ESI triage as an alternative triage assessment option because easy to use,

Authors	Study Design	Population & Sample	Main Findings	Conclusion
				structured, simple, and clear.
Sitti Rachma, Elin Hidayat, Benny H.L Situmorang (2023), Indonesian	quantitative method, analytical research type, observational with a cross-sectional study approach. The research instrument used an ESAI assessment observation sheet compiled based on the Undata Regional General Hospital triage SOP, a response time observation sheet, and a digital timer. Data analysis used Fisher's exact test as an alternative to the chi-square test.	The population in this study comprised all 43 emergency room nurses at Undata Regional Hospital, with a sample of 35 selected using a non-probability sampling technique: inclusion criteria: Implementing nurses, nurses who have worked for more than 1 year, and exclusion criteria: Head of Emergency Department/Head of Team, intern nurses (practicing students).	The Fisher Exact test showed p=0.220 for the morning shift, p=0.698 for the afternoon shift, and p=0.369 for the night shift. The statistical test results showed no correlation between ESI use according to SOPs and response time (p-value> 0.05).	Data obtained during ESI triage showed that most nurses followed the hospital's established SOP. Meanwhile, the ESI response time was in accordance with the SOP based on the ESI level, with an average categorized as fast. However, statistical tests showed no correlation between ESI use and triage response time across the morning, afternoon, and night shifts. Therefore, ESI is considered ineffective for implementation in the Emergency Department of Undata Regional Hospital, Central Sulawesi Province.

Authors	Study Design	Population & Sample	Main Findings	Conclusion
Setiadi (2026) indonesian	Quantitative research with an analytical observational design using a cross-sectional approach, Bivariate analysis to determine the relationship between the implementation of ESI triage and the quality of emergency department services using the Chi-Square test.	The study population consisted of all patients who visited the Emergency Room at Sari Asih Hospital. Using a purposive sampling technique, the sample was selected based on inclusion and exclusion criteria established by the researcher, including patients receiving triage services in the emergency room and willing to participate as research respondents. The research was conducted at the Emergency Room of Sari Asih Cipondoh Hospital. through observation of triage implementation and patient satisfaction questionnaires.	The research results show that effective ESI triage is significantly associated with improved ER service quality, particularly in service speed and patient satisfaction.	The conclusion of this study confirms that the implementation of ESI triage is an important factor in efforts to improve the quality of ED services.

Authors	Study Design	Population & Sample	Main Findings	Conclusion
Wardhani, Annalia & Maria, Insana & Rusdi, Rusdi & Nugraha, Fir'ad & Sari, Winda & Fadhila, Zahara (2026). Indonesian	This study uses a quantitative design with a comparative approach and was conducted in the Emergency Unit of Ratu Zalecha Hospital, Martapura. Data analysis was carried out univariately and bivariately using the Chi-Square test and the Mann-Whitney test.	The study sample consisted of 25 nurses selected using a non-probability, accidental sampling method. The research instruments included an observation sheet on triage time, a questionnaire on the use of triage methods, and patient medical records as supporting data.	The results showed that most nurses used the ESI method (18 people (72%), while the START method was used by 7 people (28%), with a significant difference ($\chi^2 = 4.840$; $p = 0.028$). The average triage implementation time of the ESI method was 18.39 ± 2.45 seconds, while the START method was 11.29 ± 1.11 seconds. The Mann-Whitney test results showed a significant difference between the two methods ($Z = -3.786$; $p < 0.001$) with a large effect size ($r = 0.76$).	It was concluded that the START method was faster in implementing triage, while the ESI method provided a more comprehensive classification of patient emergencies.

However, while START excels in speed, several studies highlight its limitations in triage accuracy and consistency (Lin et al., 2022). Reported discrepancies between START classifications and actual patient outcomes, including cases of under-triage and over-triage. Similarly, the study emphasized that START may not perform optimally in specific populations such as pediatric and geriatric patients (Montagner, de Sousa, & dos Santos, 2022). These findings suggest that although START is effective for rapid screening, it may lack the depth required for precise clinical decision-making in routine emergency department settings (Rachma, Hidayat, & Situmorang, 2023).

In contrast, the ESI system demonstrates superior performance in terms of clinical accuracy and outcome prediction. The large-scale retrospective cohort study involving over 331.000 emergency department patients, showed that ESI levels strongly correlate with key clinical outcomes, including mortality, ICU admission, and resource utilization. Patients categorized as ESI level 1 had significantly higher mortality rates (17%) and ICU admission rates (35%), indicating that ESI is highly effective in identifying critically ill patients (Tangpaisarn & Phurisetthasak, 2026). These findings are consistent with other studies showing that ESI has high sensitivity and negative predictive value in predicting severe outcomes (Van der Straten et al., 2022).

Furthermore, ESI incorporates resource prediction into its triage algorithm, a major advantage in emergency department management. This capability allows healthcare providers to anticipate diagnostic and therapeutic needs, thereby improving workflow efficiency and resource allocation (Gilboy et al., 2020). The study also found that the effective implementation of ESI is significantly associated with improved emergency department service quality, particularly in response time and patient satisfaction (Setiadi, 2026). This indicates that ESI not only contributes to clinical outcomes but also enhances overall healthcare delivery.

Despite these advantages, several studies have reported challenges in implementing ESI. Research by Farilya et al. (2023) and Rachma et al. (2023) found no significant relationship between ESI use and response time, suggesting variability in its practical application. These inconsistencies may be attributed to differences in healthcare provider training, adherence to standard operating procedures, and institutional factors (Rachma et al., 2023). Sax, Wiler, and Welch (2025) further emphasized that misclassification in triage can negatively impact patient outcomes, highlighting the need for continuous training and evaluation.

Another important aspect identified in this review is the context-specific applicability of both systems. START is more appropriate in disaster and prehospital settings due to its speed and simplicity, whereas ESI is better suited for hospital-based emergency departments where comprehensive assessment and resource planning are required (Harahap & Wulandari, 2024). This distinction underscores that the two systems should not be viewed as competing approaches but rather as complementary tools tailored to different clinical scenarios. Additionally, several studies indicated that neither system is universally perfect. Minggawati, Faried, and Priambodo (2020) found no significant difference in accuracy between modified ATS and ESI, although ESI showed better distribution in expected triage categories. Meanwhile, Patimah (2022) reported that both ATS and START had no significant impact on length of stay (LOS), suggesting that triage effectiveness may also depend on broader system factors beyond the triage method itself.

From a clinical perspective, the findings of this review support a hybrid or context-adaptive approach to triage. Emergency healthcare systems may benefit from integrating the strengths of both ESI and START, using START for initial rapid screening in high-

volume or disaster situations and ESI for more detailed assessment in hospital settings. This approach could optimize both efficiency and accuracy in patient prioritization.

In summary, the comparison between ESI and START highlights distinct methodological strengths and limitations that influence their clinical applicability. ESI demonstrates stronger methodological robustness, particularly in its multidimensional assessment approach, which incorporates both patient acuity and anticipated resource needs. This results in higher predictive validity for clinical outcomes and more accurate patient prioritization. However, its complexity may require more training and time to implement consistently, which can be a limitation in high-volume or disaster settings.

In contrast, START is methodologically simpler and highly efficient, enabling rapid patient categorization based on basic physiological parameters. Its primary strength lies in its speed and ease of use during mass-casualty incidents or time-critical emergencies. Nevertheless, its simplicity also poses a limitation, as it may reduce diagnostic precision and underestimate patient severity compared to more comprehensive systems such as ESI. Based on these findings, it is recommended that ESI be prioritized in emergency department settings where adequate resources, trained personnel, and time allow for detailed assessment to optimize patient outcomes. Meanwhile, START should be used in disasters and mass-casualty situations where rapid triage is essential, and resource constraints limit more detailed evaluation. A blended approach, supported by ongoing training and simulation, may further enhance triage accuracy and responsiveness across varying clinical contexts.

CONCLUSION

This literature review confirms that both ESI and START play crucial roles in emergency patient prioritization, with distinct strengths and limitations. These findings have practical implications for healthcare professionals when selecting triage methods appropriate to resource constraints, the level of urgency, and healthcare capacity. Future research is recommended to explore integrated triage models and evaluate their effectiveness across diverse healthcare settings, particularly in low- and middle-income countries.

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