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TRIAGE IN EMERGENCY MANAGEMENT IN THE EMERGENCY DEPARTMENT: A SYSTEMATIC REVIEW

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ABSTRACT
Triage is a vital process aimed at categorizing patients based on the severity of their conditions, allowing for quicker and more efficient management. This review gathers and analyzes the results of various studies related to triage methods used in the Emergency Department (ED), their impact on wait times, and patient clinical outcomes. The findings suggest that standardized triage systems can significantly enhance workflow efficiency in the ED, reduce mortality, and improve patient satisfaction. A total of 1,440 articles were identified from various databases: 251 from PubMed, 1,090 from ScienceDirect, 83 from Google Scholar, 3 from Scopus, and 13 from ProQuest. After removing duplicates, 1,125 articles remained, title screening reduced this to 114 articles, followed by abstract screening which resulted in 31 articles. Finally, 13 articles were selected for full-text review. In conclusion, there is a need for the integration of evidence-based triage systems to review the importance of developing adaptive triage protocols to improve the effectiveness of emergency case management in the ED. However, challenges in implementation, such as adequate training and resource limitations, need to be addressed to achieve optimal outcomes.

Keywords: emergency department; emergency management; triage

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INTRODUCTION

Emergency management in the Emergency Department (ED) is a critical aspect of the healthcare system, as many medical conditions require immediate intervention to prevent serious complications or even death. The ED serves as the first point of care for patients facing critical situations, and one of the key indicators of quality care in the ED is response time. One solution to address this challenge is the implementation of triage, a process of sorting patients to determine the level or severity of their condition that requires urgent care, as well as to categorize patients based on the severity of their injuries. Triage enables healthcare professionals to prioritize patients who need immediate attention, thereby increasing the likelihood of better clinical outcomes (Fong et al., 2018).Various internationally standardized triage instruments are widely used in the Emergency Department (ED), such as the Emergency Severity Index (ESI), Manchester Triage System (MTS), Canadian Triage and Acuity Scale (CTAS), Taiwan Triage and Acuity Scale (TTAS), and the Patient Acuity Category Scale (PACS), among others. All of these instruments aim to improve triage efficiency. The World Health Organization (WHO) estimates that approximately 20% of total ED visits are emergency cases that require immediate attention. In 2020, patient visits in the United States reached around 140 million annually, with about 30% of these visits being adult patients. In Indonesia, a similar situation is observed in the ED, with data from the Ministry of Health of the Republic of Indonesia in 2019 showing that approximately 15-25% of total ED visits in Indonesia were classified as emergency cases (red label) (Koo et al., 2024).

Triage is a system for prioritizing and classifying patients based on the severity of their condition or the urgency of care required. In triage, nurses and doctors have a time limit (response time) to assess the patient's condition and provide intervention as quickly as possible, typically within < 10 minutes. The triage system implemented in the Emergency Department (ED) can vary depending on the policies of individual hospitals or countries. In Indonesia, several triage methods are commonly used, including color-coded systems such as the START (Simple Triage and Rapid Treatment) method, as well as simpler color-coded triage systems used in some hospitals. Furthermore, the development of triage systems continues to evolve to improve their effectiveness and efficiency, both in terms of processes, time, and the integration of information technology (Zaboli et al., 2021).

Although triage is a crucial step in the management of emergency patients, its implementation still faces various challenges. Factors affecting the effectiveness of the triage system include the quality of healthcare training, the level of understanding of the importance of triage, and the availability of adequate medical equipment. Therefore, evaluation and development of a more structured and evidence-based triage system are necessary. This article aims to provide a systematic review of the role and implementation of triage in patient management in the ED. By understanding the various models and challenges within the triage system, it is hoped that solutions can be found to improve the quality of care in the ED, particularly in emergency situations that require rapid and accurate intervention. The aim of this study is to conduct a systematic review on the process of triage in emergency management within the emergency department (ED). The research seeks to evaluate and synthesize existing evidence regarding the effectiveness, methodologies, and outcomes of triage systems used in ED. By analyzing various triage approaches, the study intends to identify best practices and provide insights into improving patient flow, prioritization, and overall emergency care. Ultimately, the goal is to contribute to the enhancement of emergency department operations and the optimization of patient management during critical situations (Zaboli et al., 2021).

METHOD

This review employs a systematic approach by collecting data from various studies discussing triage in the context of emergency care. Literature searches for journal articles were conducted across five databases: PubMed, Science Direct, Google Scholar, Scopus, and ProQuest. Boolean logic (AND, OR, or NOT) was applied between keywords. The search used keywords such as “Triage” AND “Emergency Department” OR “Emergency Care,” with article filtering based on limitations including publication years (2018-2024), full-text availability, and English language. This process resulted in the selection of relevant articles. Inclusion criteria for articles were: 1) Published within the last 6 years; 2) Studies with designs such as quasi-experimental, case reports, cross-sectional, RCT, and cohort studies; 3) Articles written in English. Full-text articles that provided detailed explanations on the research topic were included, while articles without full text were excluded. The data from the 13 relevant journals identified in the systematic review were thoroughly analyzed by first extracting key findings and methodologies from each study. Each article was carefully examined to understand its research design, such as quasi-experimental, case reports, cross-sectional studies, RCTs, and cohort studies, ensuring that the selected studies met the established inclusion criteria. The review process involved comparing the results across these studies to identify common themes, trends, and discrepancies related to triage systems in emergency departments. Special attention was given to the effectiveness of various triage methods, the outcomes they yielded, and any limitations or gaps pointed out by the authors. The findings were then synthesized to draw broader conclusions about the current state of triage practices, the impact of different approaches, and recommendations for enhancing

emergency care. By systematically evaluating and integrating the data from these 13 studies, the review aimed to provide a comprehensive overview of the existing evidence on triage in emergency management, while also highlighting areas for future research and potential improvements.

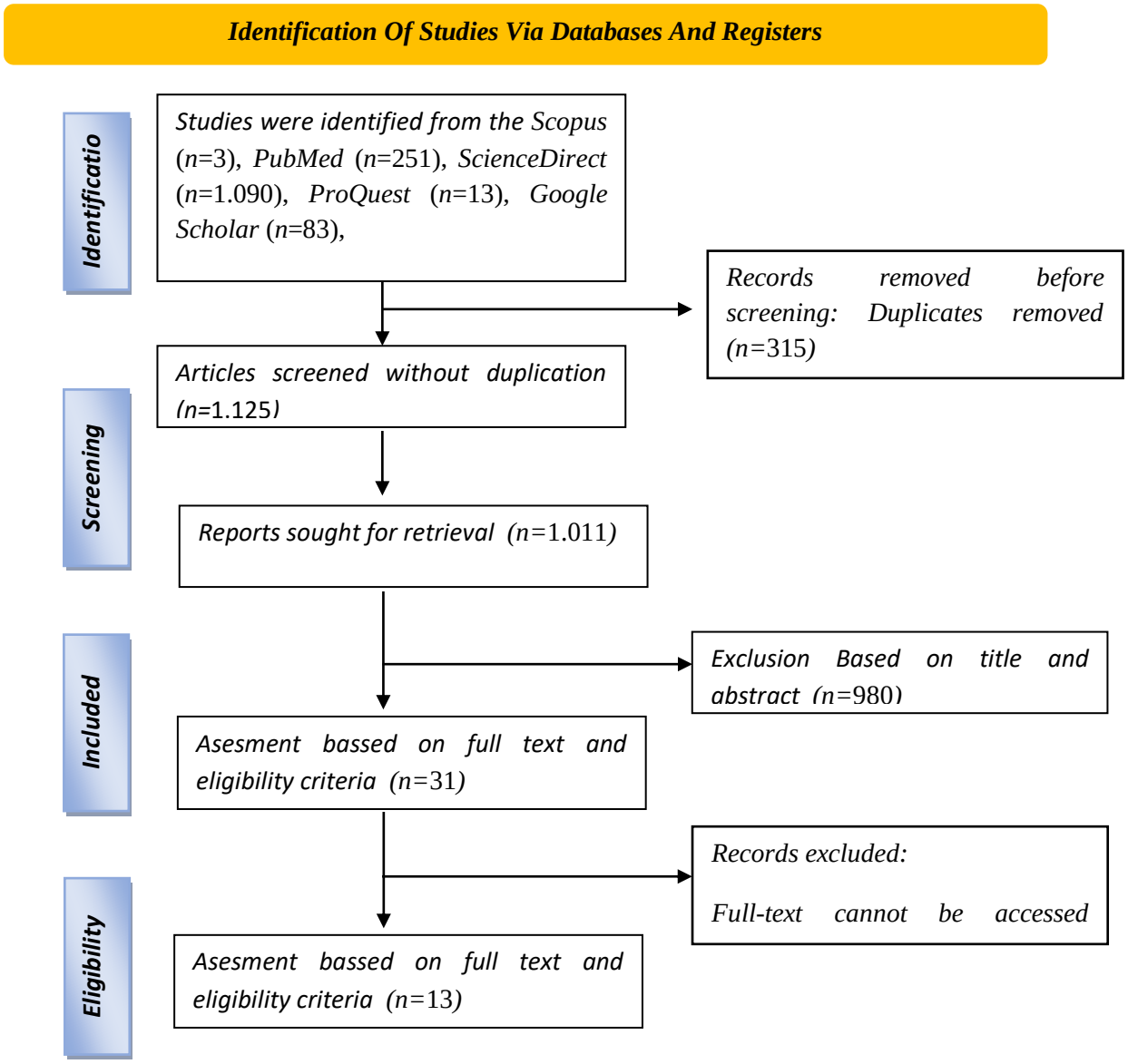

Figure 1. PRISMA Selection Process

RESULT

The total number of articles identified was 251 articles from PubMed, 1,090 articles from ScienceDirect, 83 articles from Google Scholar, 3 articles from Scopus, and 13 articles from ProQuest, resulting in a total of 1,440 articles. After duplicate removal, 315 articles were excluded, leaving 1,125 articles. Screening based on title identification resulted in 114 articles. Next, screening based on abstracts led to 31 articles. After reviewing the full-text articles, 13 articles remained for further review. Below is the flowchart diagram illustrating the study selection process:

Table 1.
Evidance Based Practice

Title of the Scientific Paper	Authors	Method	Result
Emergency department service utilisation of older patients with urgent conditions	Koo et al., 2024	Desain: Cross-sectional observational study Sample: 235 Patients Variable: department service utilisation Instrument: Kuisioner Analisis: Chi-square tests, t-tests or Wilcoxon signed-rank tests	There are several factors that influence the use of the Emergency Department (ED) by the elderly, such as complex medical conditions, limited access to primary healthcare services, and socio-economic barriers. It is important to strengthen the integration between primary healthcare services and preventive care to reduce the elderly's dependence on emergency services, as well as the need for enhanced training for healthcare professionals in managing age-specific medical conditions.
Patient experience of emergency department triage	Janerka et al., 2024	Desain: Case control study Sample: 29 review Variable: Patient experience of emergency department triag Instrument: Kuisioner Analisis: Chi-square tests, t-tests or Wilcoxon signed-rank tests	Patient experiences with triage in the Emergency Department (ED) are significantly influenced by how well they are informed, how long they have to wait, and the quality of communication with healthcare providers. There is a need to improve training for healthcare professionals in communication skills, as well as efforts to shorten wait times and provide clearer information to patients about the triage process.
Triage: A Global Perspective	Peta et al., 2023	Desain: Case studi Sample: 5 triage Variable: Patient experience of emergency department triage Instrument: Kuisioner Analisis: Chi-square tests, t-tests or Wilcoxon signed-rank tests	This study highlights the importance of a structured and efficient triage system in Emergency Departments (ED) worldwide, particularly in the context of countries with limited resources. While the triage systems implemented in different countries vary, the challenges faced and opportunities for improvement are often similar.
Validity of the Korean triage and acuity scale in older patients compared to the adult group	Chung et al., 2023	Desain: retrospective analysis Sample: 254 patients Variable: prospectively collected clinical data at the ED Instrument: Kuisioner Analisis: Uji functionality dan uji coba produk	This study concludes that the Korean Triage and Acuity Scale (KTAS) has good validity in identifying the severity of conditions in elderly patients in the Emergency Department (ED), but there are several challenges that need to be addressed. Specifically, KTAS needs to be adjusted to account for the more complex medical conditions often seen in the elderly.
Improving Triage Accuracy Through A Modified Nurse-Administered Emergency Department Assessment Of Chest Pain Score On Patients With Chest Pain At Triage (EDACT): A Prospective Observational Study	Ng et al., 2022	Desain: Prospective observational study Sample: 284 patients Variable: Modified Nurse-Administered Emergency Department Assessment Of Chest Pain Intrument: Kuisioner Analisis: Chi-square, t-test	The Modified Nurse-Administered Emergency Department Assessment of Chest Pain Score (EDACT) is effective in improving triage accuracy for patients presenting with chest pain in the Emergency Department (ED). By using this tool, nurses can perform quicker and more accurate assessments in identifying patients at high risk for acute cardiac conditions. This not only enhances triage precision but also reduces patient wait times and improves the clinical management of patients requiring immediate intervention.
Improving The Performace Of A Triage Scale For Chest Pain Patients Admitted To Emergency Department: Combining Cardiovascular Risk Factors And Electrocardiogram	Casarin et al., 2022	Desain: Observational Study Sample: 505 responden Variable: Performace Of A Triage Scale For Chest Pain Patients Admitted To Emergency Department Intrument: Kuisioner Analisis: Chi-square, t-test	Incorporating cardiovascular risk factors and electrocardiogram (ECG) results into the triage scale for chest pain patients in the Emergency Department (ED) can enhance the accuracy, sensitivity, and specificity of risk assessment. This leads to faster and more precise patient management, as well as a reduction in the likelihood of misdiagnosis or delays in treatment for patients at high risk of acute cardiac conditions.
Effect of the Emergency Department Assessment of Chest Pain Score on the Triage Performance in	Zaboli et al., 2021	Desain: single-center prospective observational study Sample: 1.596 pasien Variable: Triage Performance in Patients With Chest Pain Instrument: lembar observasi,	The Emergency Department Assessment of Chest Pain Score (EDACPS) can significantly improve the accuracy of triage for patients presenting with chest pain. The use of this tool enhances the sensitivity and specificity of triage, reduces wait times, and accelerates the management of patients

Title of the Scientific Paper	Authors	Method	Result
Patients With Chest Pain		kuisioner Analisis: uji eksak Fisher, chi-square, uji *t* Student, dan uji Mann-Whitney	at high risk for acute cardiac conditions. Additionally, EDACPS helps to reduce diagnostic delays and improve patient management, ultimately enhancing the quality of care in the Emergency Department (ED).
A modified cardiac triage strategy reduces door to ECG time in patients with ST elevation myocardial infarction	Su et al., 2021	Desain: Descriptive Analysis Sample: 117 Pasien Variable: cardiac triage strategy reduces door Instrument: Kuisioner Analisis: Chi-square tests, t-tests	Modified cardiac triage strategies can significantly reduce door-to-ECG time in patients with ST-elevation myocardial infarction (STEMI). Hospitals should consider implementing this modified cardiac triage strategy as part of the standard protocol for STEMI patients, with the goal of accelerating treatment and improving clinical outcomes.
Diagnosis and risk stratification of chest pain patients in the emergency department: focus on acute coronary syndromes	Stepinska et al., 2020	Desain: Descriptive Analysis Sample: - Variable: Diagnosis and risk stratification of chest pain Intrument: Form ESC guidelines Analisis: descriptive statistics	Accurate diagnosis and risk stratification in patients with chest pain in the Emergency Department (ED) are crucial for identifying those at high risk of Acute Coronary Syndromes (ACS). Faster and more comprehensive ACS diagnostic protocols should be implemented in the ED to improve diagnostic speed, reduce the risk of complications, and enhance clinical outcomes for patients with chest pain suspected to be part of an acute coronary syndrome.
Clinical Decision Support Systems for Triage in the Emergency Department using Intelligent Systems	M. Fernandes et al., 2020	Desain: scoping review Sample: - Variable: Clinical Decision Support Systems for Triage Intrument: Digital library Analisis: Deskriptif analisis	By integrating AI and machine learning technology, Clinical Decision Support Systems (CDSS) can assist healthcare providers in prioritizing patients, reducing wait times, and improving efficiency and accuracy in emergency case management. With proper training and effective implementation, CDSS can offer significant benefits in enhancing the quality of medical care in the Emergency Department (ED).
Scoring System to Triage Patients for Spine Surgery in the Setting of Limited Resources	Daniel et al., 2020	Desain: eksperiment study Sample: 500 patiennt Variable: Scoring System to Triage Patients for Spine Surgery Intrument: Digital kuisioner Analisis: Uji functionality dan uji coba produk	The score-based assessment system developed for triaging spine surgery patients in resource-limited hospitals has proven effective in improving the accuracy of patient priority determination. This system helps ensure that patients who require immediate surgery receive faster attention, while those with less severe conditions can be managed conservatively or rescheduled.
Comparison of the Emergency Severity Index versus the Patient Acuity Category Scale in an emergency setting	Fong et al., 2018	Desain: Deskriptif, korelasional, dan cross-sectional Sample: 27 nurses, 300 patients Variable: Emergency Severity Index versus the Patient Acuity Category Scale Instrument: Kuisioner Analisis: Uji Korelasi Spearmen	The Emergency Severity Index (ESI) has advantages over the Patient Acuity Category (PAC) Scale in terms of ease of implementation, evaluator consistency, and reliability in predicting patient care needs. While the PAC Scale can be used in the Emergency Department (ED) setting, ESI is more effective in ensuring accurate triage prioritization, minimizing wait times, and optimizing the allocation of medical resources.
Integrating heart rate variability, vital signs, electrocardiogram, and troponin to triage chest pain patients in the ED	Sakamoto et al., 2018	Desain: Descriptive Analysis Sample: 797 pasien Variable: triage chest pain patients in the ED Instrument: Data Source and Extraction Analisis: descriptive statistics	The implementation of a triage system that integrates this data can reduce wait times, ensure that patients who require immediate care receive timely attention, and improve clinical decision-making processes in the Emergency Department (ED). Therefore, this study recommends adopting a data-integrated approach for triaging chest pain patients, which in turn can enhance patient safety and clinical outcomes in the ED.

DISCUSSION

The findings from the literature review conducted on 13 articles indicate that chest pain is commonly observed in patients with cardiovascular disorders, as evidenced by abnormal findings on the ECG. Therefore, a clear screening process is required before treatment is administered to the patient. A study by Arian (2021) found that triage systems face difficulties

in categorizing patients with chest pain who may have acute cardiovascular conditions. Using the Chest Pain Assessment Score in the Emergency Department for Triage Performance of Chest Pain Patients with the Emergency Department Assessment of Chest Pain Score (EDACS) makes it easier to detect patients in urgent need with cardiac chest pain (Zaboli et al., 2021). The study by Koo *et al.*, 2024 found the need to modify the PACS scale to improve the grouping of patients according to their emergency or outpatient care needs. However, the use of questionnaires as an instrument may be susceptible to subjective bias and limitations in obtaining complete information. Janerka et al (2024) identified interventions that could improve patient experience, one of which is relevant triage management aimed at enhancing service quality. This study is limited to a single location and focuses on patients with low-to-medium triage severity, which may not reflect experiences in different hospitals or with patients in more acute conditions.

The studies above highlight various approaches to improving the effectiveness of triage in the Emergency Department (ED), particularly for patients with chest pain or heart-related issues. In general, the implementation of more objective triage scores or systems, whether based on algorithms (such as EDACS), digital systems (such as urgency calculators), or the use of various physiological parameters, has proven to enhance the speed and accuracy of patient management. However, while most studies show improvements in triage performance and faster response times, some studies have limitations, such as designs that do not allow for causal conclusions, limited sample sizes, and a lack of long-term analysis. Therefore, it is important to continue conducting further research with more robust designs and testing across various ED settings to ensure the successful widespread implementation of these triage systems.

Triage is a selection process used to determine the priority of patient care based on the severity of their medical condition. The main goal of triage is to ensure that patients experiencing life-threatening conditions receive the necessary care promptly, to identify patients at high risk for serious complications such as those with acute heart disease or stroke who require quick evaluation and intervention, and to prevent the use of limited medical resources on patients who do not require immediate emergency care, thereby allowing resources to be focused on those who need them more urgently. The triage process in the ED typically begins with an initial assessment of the arriving patient, where healthcare providers will identify vital signs such as pulse, blood pressure, body temperature, and respiratory rate. This assessment is followed by an evaluation of the patient's primary complaints, such as chest pain, shortness of breath, or loss of consciousness (Widiyanto et al., 2019).

This process involves several steps, often carried out by competent triage nurses. In some hospitals, the triage process also involves other medical staff, such as the on-call doctor, who can help determine the urgency of care. Several factors can influence the success of triage in managing patients in the Emergency Department (ED), including:

1. Training and Skills of Healthcare Providers
   The success of triage heavily depends on the skills and expertise of healthcare providers, especially triage nurses. Adequate training in patient assessment and quick decision-making is crucial to reduce errors in triage.
2. Availability of Resources
   Limited medical resources (e.g., intensive care unit beds, diagnostic equipment) can impact triage decisions. In some cases, triage also involves considerations about the availability of ventilators, emergency units, or medical staff.
3. Technology

The use of technology-based systems, such as automatic vital signs monitoring and medical data integration, can enhance triage efficiency. The use of algorithm-based decision support systems can also assist in making faster and more accurate decisions.

4. Patient Volume

The ED often faces high patient volumes, particularly in hospitals with large populations or during infectious disease seasons. This can add challenges to the triage process, where priority is given to patients with more severe conditions who need quicker attention (Widiyanto et al., 2019).

Evaluating the triage system implemented in the Emergency Department (ED) is crucial for identifying potential areas for improvement. Gathering feedback from nurses and doctors involved in triage to understand what is working well and which areas need improvement, analyzing clinical data on how triage relates to patient outcomes such as treatment time, mortality rates, or complications after care, and considering the use of new technologies, such as artificial intelligence (AI)-based triage systems, which can help improve accuracy and efficiency in the triage process (Chung et al., 2023).

CONCLUSION

Effective emergency management in the Emergency Department (ED) is crucial for preventing serious complications and improving patient outcomes, with triage serving as the primary process for prioritizing care based on the severity of the patient's condition. Addressing the challenges in the implementation of triage can enhance emergency services in the ED, ultimately contributing to patient safety and better healthcare quality. The triage process in the ED is a critical component of emergency patient management, aimed at ensuring quick and accurate treatment based on the severity of the patient's condition. While various triage methods are used, it is essential for hospitals to continually evaluate and develop existing systems, considering factors such as medical staff training, resource availability, and the potential use of technology to improve efficiency and accuracy in triage (Chung et al., 2023).

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