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TECHNOLOGY THAT CARES: THE IMPACT OF ARTIFICIAL INTELLIGENCE ON EMERGENCY MEDICINE

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Abstract: This study addresses the application of Artificial Intelligence (AI) in emergency care, an area of health characterized by the approach and need for quick and accurate decisions, representing a transformative opportunity for process optimization and improvement of clinical care. AI has emerged as a tool with the potential to optimize triage, predict risks and support clinical decision-making in complex scenarios. This is an integrative, qualitative, retrospective and cross-sectional literature review, which analyzed scientific articles from the PubMed and Virtual Health Library databases, published between 2020 and 2025, obtaining a total of 12 articles for analysis. The review explores the transformative potential of AI in optimization, prediction and support tasks. It highlights studies that prove its effectiveness in screening patients, tracking conditions such as cognitive impairment, predicting mortality from sepsis and personalizing treatments for conditions such as heart failure. These applications demonstrate the technology's ability to process complex data to improve the efficiency of care. However, the success of AI depends crucially on its correct integration and human supervision, in which its analyses are validated by the clinical judgment of a professional, guaranteeing the safety and quality of care.
Keywords: Artificial Intelligence; Emergency; Decision.

INTRODUCTION

Emergency care is one of the most dynamic and challenging environments in the healthcare system. It is characterized by a continuous flow of patients with serious conditions, information overload and the need to make critical decisions under intense time pressure. In this scenario, optimizing triage, diagnosis and treatment processes is essential not only for operational efficiency, but also for patient safety and quality of care (Masoumian Hosseini et al., 2023).

In this context, Artificial Intelligence (AI) is emerging as a disruptive technology with the potential to fundamentally transform the provision of emergency care. Its ability to process and analyze large volumes of complex data in real time allows it to identify patterns that may be imperceptible to the human eye, offering robust clinical decision support. AI applications range from automating triage to prioritize urgent cases to predicting risks, such as sepsis mortality, and personalizing therapeutic interventions, such as in the management of heart failure (Sokołowska et al., 2024).

However, the successful integration of AI into emergency clinical practice is not without its challenges. It is crucial that these tools are rigorously validated and that their implementation takes place in synergy with human expertise. The interaction between the analysis of the algorithm and the clinical judgment of the healthcare professional is what ensures that the technology acts as a true ally, enhancing diagnostic accuracy and patient safety, rather than replacing indispensable clinical reasoning.

METHODOLOGY

The methodology of this study is based on a qualitative, retrospective and cross-sectional integrative literature review. The search was carried out in the PubMed and VHL databases, combining the terms "artificial intelligence" AND "medical emergency". The parameters for selection were open access articles published between 2020 and 2025 in English, Portuguese or Spanish and which dealt directly with the scope of the research.

The screening process involved excluding duplicate publications, articles that did not align with the study proposal or that did not meet the stipulated eligibility parameters. The initial survey of the databases resulted in 95 papers, of which 66 were located in PubMed and 29 in the VHL.

RESULTS AND DISCUSSION

The article selection process began with the identification of 95 studies in the databases consulted. Through rigorous screening, the sample was refined to 12 articles, 8 from the PubMed database and 4 from the VHL. The complete flowchart of this process is shown in Figure 1 below.

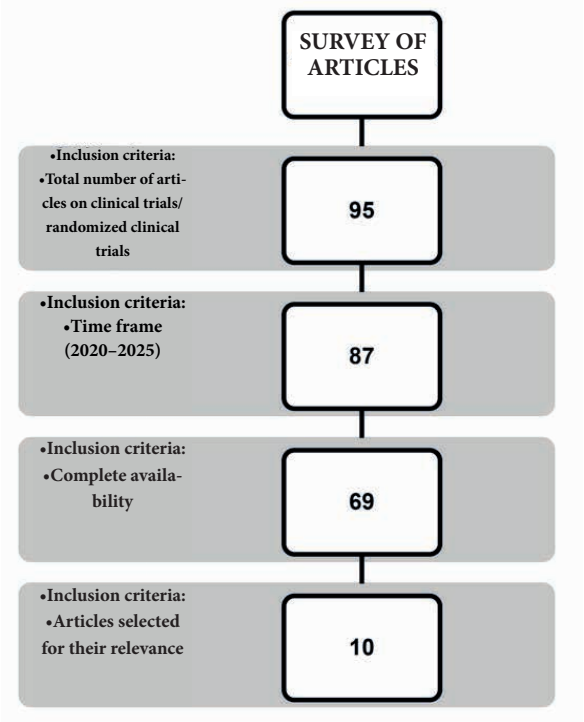

Figure 1. Flowchart for identifying and selecting the selected articles

Source: Authors (2024)

In the context of emergency care, artificial intelligence facilitates the application of scientific evidence, such as that extracted from 12 reference studies, to optimize treatment protocols. The evaluation of the use of these AI-assisted strategies demonstrates a significant clinical impact, improving the management of various acute pathologies and their clinical outcomes.

Table 1 below shows case studies and randomized studies.

The relevance of artificial intelligence lies in its multifaceted ability to optimize sys-

tems, improve diagnoses and personalize care throughout the patient's journey in the medical emergency. Studies prove its value in speeding up triage and initial assessment, improving the logistical coordination of patient transport and enabling faster and more accurate diagnoses, especially to guide personalized therapeutic regimens, pointing towards a more proactive and effective medicine.

In the study by Gelman et al. (2023) on congestive heart failure (CHF) and diuretic resistance, an artificial intelligence system was tested that personalizes and varies drug doses and schedules. The findings suggest that variable therapeutic regimens guided by AI are promising, but require larger controlled studies for confirmation.

A randomized clinical trial by Hwang et al.(2023), investigated whether an AI computer-aided detection system (AI-CAD) improves the accuracy of chest X-ray interpretation by radiologists in the emergency room, although the technology did not improve doctors' diagnostic performance compared to conventional methods.

Kim et al. (2025) analyzed the CONNECT-AI digital platform, which uses artificial intelligence to optimize the transport of patients in critical condition , providing first aid guidance, severity prediction and hospital recommendations. Although the overall transportation time did not decrease, the system significantly reduced delays for specific groups, such as patients with fever.

The application of artificial intelligence was evaluated in a clinical trial by Hong; Cheng; Zheng (2021), in the care of patients with Chronic Obstructive Pulmonary Disease (COPD). A reduction in the rate and length of hospitalization was observed, although the preliminary results are positive, the single factor analysis did not reach statistical significance, indicating the need for further research to confirm the effectiveness of the treatment.

Goh et al. (2024), in a randomized clinical trial, evaluated whether the use of a broad language model (LLM) improves physicians' diagnostic reasoning. The results showed that access to the LLM did not significantly improve doctors' performance compared to the use of conventional resources. However, an exploratory analysis revealed that the LLM, operating independently, outperformed doctors.

A care management intervention carried out by Raldow et al. (2024), aimed at high--risk patients identified by artificial intelligence, was evaluated by means of a randomized study. The analysis showed that the approach resulted in a one-off, statistically significant 27% reduction in potentially avoidable hospital admissions.

To optimize screening for cognitive impairment (CD) in the elderly in the emergency room, Yadgir et al. (2021), used a study developed a machine learning model using data from electronic medical records. The best--performing algorithm (XGBoost) was able to identify a subgroup of patients at high risk of CD, reducing the manual screening burden by more than 60% (from 200 to 77 patients in a hypothetical scenario) to detect the majority of cases.

In order to facilitate the prediction of mortality in patients with sepsis in the emergency room, Park et al. (2024), addressed six machine learning (ML) models using 44 clinical variables. The CatBoost model showed the best performance, with an accuracy (AUC) of 0.800, significantly outperforming prediction based only on the components of the SOFA score (AUC of 0.678). Variables such as albumin and lactate were identified as crucial, confirming that the use of a broad set of initial clinical data by ML models can provide earlier and more accurate predictions.

Kessler et al. (2024), developed and tested an artificial intelligence algorithm to detect lung consolidation in point-of-care ul-

Author	Year	Type of study	Main conclusions
Gelman et al.	2023	Clinical Trial (n=10)	The intervention demonstrated success in reversing resistance, resulting in significant clinical improvement in quality of life (KC-CQ), physical capacity and biological markers (NT-proBNP) for all patients, as well as reducing hospitalizations.
Hwang et al.	2023	Randomized study (n= 1,761)	The study concluded that the use of AI did not result in a significant improvement in the sensitivity to detect acute illness or in the false positive rate.
Kim et al.	2025	Case series (n= 14.853)	The mortality rate was significantly lower in the group that used hospital transfer optimized by AI, demonstrating its potential to improve outcomes in emergency situations.
Hong; Cheng; Zheng	2021	Randomized Clinical Trial (n= 447)	Patients who received an AI-based medical intervention for 12 months showed significant improvements in quality of life and emotional state compared to the control group.
Goh et al.	2024	Randomized Clinical Trial (n=50)	Advances in development and training are needed for collaboration between doctors and AI to be effective in clinical practice.
Raldow et al.	2024	Case Series (n= 3.007)	AI integration with proactive care management has considerable potential to prevent acute hospitalizations.
Yadgir et al.	2021	Case series (n= 1.736)	The tool proved to be effective in focusing screening resources on the patients who need it most, making the process more efficient.
Park et al.	2024	Case series (n=5112)	Recently established artificial intelligence-based models have achieved good prediction of mortality in patients with sepsis.
Kessler et al.	2024	Randomized Clinical Trial (n=107)	The algorithm addressed demonstrated high accuracy for identifying features of consolidation on pediatric chest ultrasound in children with pneumonia.
Veyron et al.	2024	Case series (n=194)	The Presage Care system has been successfully implemented in assisted living facilities. It was well accepted3 and performed well in predicting emergency hospitalizations.
Harari et al.	2024	Randomized study (n=54)	The study presents the importance of clinical supervision and further refinement of AI systems to improve safety and reliability.
Liu et al.	2024	Randomized study (n=45)	The results showed that AI obtained high scores from medical specialists and demonstrated an agreement of over 93% with human triage.

Table 1. Characterization of articles according to year of publication, type of study and main conclusions

Source: Authors (2025)

trasounds in children. The study, conducted with pediatric participants, showed that the model achieved high accuracy (88.5%), with sensitivity and specificity of 88% and 89%, respectively. The ability to provide automated diagnostic support in a portable device has important implications for global health, especially in resource-limited environments.

Veyron et al. (2024), addressing an innovative monitoring system (Presage Care), based on AI, was implemented in nursing homes to predict the risk of emergency hospitalization. The system, which analyzes functional data entered by caregivers, demonstrated high specificity and successfully predicted hospitalizations. Although technically effective, the study highlights the need to improve the integration of the tool into the workflow in order for its benefits to be fully realized.

Ryan et al. (2024) investigated the effectiveness of ChatGPT as a clinical decision support system during cardiac arrest scenarios, comparing it to a traditional paper guide and a physician-supervised version. The fact that standalone ChatGPT suggested a risky option underscores the crucial importance of clinical supervision to ensure patient safety when using generative AI in medical emergencies.

Liu et al. (2024), when evaluating the effectiveness of ChatGPT in outpatient triage through the analysis of responses to common questions and a prospective patient study, noted that ChatGPT responses were considered professional and humanized, indicating its potential to streamline care, improve diagnoses and relieve pressure on healthcare professionals.

The studies demonstrate the clear and measurable success of artificial intelligence in specific diagnostic and management tasks. Authors such as Raldow et al. (2024) and Yadgir et al. (2021) prove that AI can optimize resources by identifying high-risk patients, resulting in fewer admissions and more efficient triage. Similarly, research by Park et al. (2024) into sepsis prediction and Kessler et al. (2024) into ultrasound diagnosis shows the ability of algorithms to outperform traditional methods in accuracy, providing doctors with more robust predictive and diagnostic tools.

Some other researchers demonstrate that where the simple implementation of AI does not guarantee better results or require strict supervision. Studies such as those by Hwang et al. (2023) and Goh et al. (2024) point out that providing doctors with an AI tool did not necessarily improve their diagnostic performance compared to conventional methods. Ryan et al. (2024) point out that ChatGPT in cardiac arrests demands the critical need for human supervision, as AI can generate risky recommendations, showing that patient safety depends on careful and validated implementation.

FINAL CONSIDERATIONS

This integrative review of 12 articles (2020-2025) shows that artificial intelligence has transformative potential in emergency care, excelling in optimization, prediction and support tasks. Studies have proven its effectiveness in screening patients, tracking conditions such as cognitive impairment, predicting mortality from sepsis and personalizing treatments, such as heart failure. These applications show the ability of technology to process complex data to improve efficiency, however, the success of AI depends crucially on its correct integration and the indispensable human supervision in which its analyses are validated by the clinical judgment of a professional, guaranteeing the safety and quality of care.

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