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Artificial intelligence applicability in emergency departments — a new promising tool

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[Letter to the Editor]

ARTIFICIAL INTELLIGENCE APPLICABILITY IN EMERGENCY DEPARTMENTS — A NEW PROMISING TOOL

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Dear Editor,

In this letter, we highlight some recent advancements in the use of artificial intelligence (AI) in emergency medicine. With the recent leap in AI development, a significant number of opportunities for its usage have emerged. Its ability to process vast amounts of data, far exceeding human capacity, carries the potential to revolutionize emergency department management. This can be especially beneficial in situations where the number of patients exceeds available resources, allowing for a fast and accurate assessment of patients when needed.

AI has proven its effectiveness in triaging patients in emergency departments. Based only on the information documented in notes from emergency department admissions, AI was able to determine which of the two patients required more urgent medical attention 89% of the time, a performance comparable to that of resident physicians [1]. Another study on the potential use of a large language model (LLM) in patient triage showed an almost perfect agreement between the decisions made by GPT-4 and the triage team, as well as between GPT-4 and the gold standard in five emergency department areas [2]. In time-limited tasks, the effectiveness of GPT-4, Gemini, and emergency medicine specialists was compared. The results showed the superiority of GPT-4 in the correct triage rate compared to Gemini and the triage team [3].

Another useful aspect in the context of an emergency department is the use of AI in electrocardiography (ECG) analysis. A significant reduction in mortality was demonstrated through the use of an AI-enabled ECG alert system that identifies patients at high risk of mortality and communicates this information to physicians [4]. Additionally, in a study comparing GPT-4 with cardiology and emergency medicine specialists based on answers to 40 questions related to each analyzed ECG recording, GPT-4 demonstrated superior performance compared to both groups of physicians [5].

Promising results are also provided by studies focused on the potential application of AI for evaluating radiological images. According to its authors, the first AI study to evaluate chest radiographs in clinical conditions showed the sensitivity and specificity of AI reports in detecting any abnormalities to be 84.8% and 98.5%, respectively, compared to the sensitivity of 91.5% and specificity of 97.0% for teleradiology for the same task. Particularly, the specificity of the study using AI gives hope for using such tools to prioritize examinations

with high confidence [6]. Staying on the topic of imaging studies evaluation, a large meta-analysis considering 23 studies and over 34,000 patients demonstrated the effectiveness of deep learning algorithms in the assessment of pneumothorax with a pooled sensitivity and specificity level of 87% and 95%, respectively [7].

Another potential assistance from AI tools could be the prediction of complications in diagnosed diseases in patients admitted to hospital emergency departments. The first real-time prediction AI model implemented into the hospital information system for predicting complications of acute pancreatitis showed favourable initial results [8]. Even more interesting was the study aimed at creating an artificial neural network (ANN) and comparing its effectiveness with two machine learning algorithms, random forest (RF) and logistic regression (LR), in the early prediction of major adverse cardiac events (MACE) in patients admitted to the hospital emergency department. The differences in the effectiveness of classifiers for predicting MACE were minimal, with the highest sensitivity for RF at 99.4% and the highest specificity for ANN at 94.5% [9].

The above-mentioned articles show artificial intelligence's potential for revolutionizing emergency care by enhancing diagnostic accuracy, optimizing workflows, and enabling proactive patient monitoring. There are still some limitations that need to be acknowledged, including ethics, the black-box nature of AI, small training datasets, and algorithmic bias. The results obtained using these solutions still need human verification and should be independently interpreted. Further research and development are needed to overcome these deficiencies and establish transparent protocols. Despite this, the capabilities of AI improve significantly year by year, leading to increasingly better study results. Therefore, it seems crucial to monitor technological advancements, which may soon provide tools useful in everyday medical practice.

Article information and declarations

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Conflict of interest

The authors declare no conflict of interest.

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Supplementary material

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REFERENCES

1. Williams CYK, Zack T, Miao BY, et al. Use of a large language model to assess clinical acuity of adults in the emergency department. JAMA Netw Open. 2024; 7(5): e248895, doi: 10.1001/jamanetworkopen.2024.8895, indexed in Pubmed: 38713466.
2. Paslı S, Şahin AS, Beşer MF, et al. Assessing the precision of artificial intelligence in ED triage decisions: Insights from a study with ChatGPT. Am J Emerg Med. 2024; 78: 170–175, doi: 10.1016/j.ajem.2024.01.037, indexed in Pubmed: 38295466.
3. Meral G, Ateş S, Günay S, et al. Comparative analysis of ChatGPT, Gemini and emergency medicine specialist in ESI triage assessment. Am J Emerg Med. 2024; 81: 146–150, doi: 10.1016/j.ajem.2024.05.001, indexed in Pubmed: 38728938.
4. Lin CS, Liu WT, Tsai DJ, et al. AI-enabled electrocardiography alert intervention and all-cause mortality: a pragmatic randomized clinical trial. Nat Med. 2024; 30(5): 1461–1470, doi: 10.1038/s41591-024-02961-4, indexed in Pubmed: 38684860.
5. Günay S, Öztürk A, Özerol H, et al. Comparison of emergency medicine specialist, cardiologist, and chat-GPT in electrocardiography assessment. Am J Emerg Med. 2024; 80: 51–60, doi: 10.1016/j.ajem.2024.03.017, indexed in Pubmed: 38507847.
6. Huang J, Neill L, Wittbrodt M, et al. Generative artificial intelligence for chest radiograph interpretation in the emergency department. JAMA Netw Open. 2023; 6(10): e2336100, doi: 10.1001/jamanetworkopen.2023.36100, indexed in Pubmed: 37796505.
7. Katzman BD, Alabousi M, Islam N, et al. Deep learning for pneumothorax detection on chest radiograph: a diagnostic test accuracy systematic review and meta analysis. Can Assoc Radiol J. 2024; 75(3): 525–533, doi: 10.1177/08465371231220885, indexed in Pubmed: 38189265.
8. Chang CH, Chen CJ, Ma YS, et al. Real-time artificial intelligence predicts adverse outcomes in acute pancreatitis in the emergency department: comparison with clinical decision rule. Acad Emerg Med. 2024; 31(2): 149–155, doi: 10.1111/acem.14824, indexed in Pubmed: 37885118.
9. Raheem A, Waheed S, Karim M, et al. Prediction of major adverse cardiac events in the emergency department using an artificial neural network with a systematic grid search. Int J Emerg Med. 2024; 17(1): 4, doi: 10.1186/s12245-023-00573-2, indexed in Pubmed: 38178007.