REUE | Editorial

Artificial Intelligence and Emergency Medicine: an unavoidable paradigm shift

Inteligencia artificial y medicina de urgencias: un cambio de paradigma ineludible

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In recent years, artificial intelligence (AI) has gradually become embedded in our lives. We coexist with facial recognition systems, voice control, virtual assistants, and algorithms that personalize content without us even noticing. AI has also arrived in emergency and urgent care (EUC) medicine.[1] Never before have we had access to such vast amounts of clinical data, computational power, and technological innovation speed. Therefore, the question is no longer whether AI will transform emergency care, but rather how, at what pace, and under which ethical and professional conditions.

In emergency and urgent care services, high patient load, the need for rapid decision-making, and often complex environments with enormous variability in clinical presentation have favored the early adoption of tools such as structured triage systems and electronic health records to improve demand management and clinician access to information.[2] Techniques and procedures such as noninvasive mechanical ventilation and point-of-care ultrasound have also, undoubtedly, transformed clinical practice and professional roles in the 21st century. However, history teaches us that every disruptive innovation is accompanied by resistance, a necessary adaptation period, and the need to clearly define responsibilities. AI is no exception. Integrating it with sound clinical and organizational judgment requires leadership, critical thinking, and active engagement from emergency medicine specialists.

Between 2010 and 2020, major advances occurred in machine learning and big data.[3] Massive electronic health records became widespread, training of machine learning models began, and AI based on neural networks was consolidated.[4] Deep learning improved the interpretation of medical imaging (plain radiography, CT, ECG), and currently, generative AI is beginning to be used as a real-time clinical assistant, supporting diagnosis, protocol development, and medical report writing. Increasingly accurate predictive algorithms are now capable of anticipating acute complications.

In this issue of the *Revista Española de Urgencias y Emergencias,* Carballo *et al.* provide a comprehensive overview of the current state of AI in emergency medicine, addressing its foundations, applications, challenges, and immediate future.[5] This analysis highlights an essential point: AI should not be viewed as a competitor to health professionals, but as an extension of their capabilities.

Practical AI applications in emergency care are already underway with promising results. Digital self-triage systems allow classification of patients in waiting rooms,[6] predictive algorithms help detect sepsis hours earlier than conventional methods,[7,8] neural networks interpret radiological images with high precision,[9] and operational models anticipate hospital overcrowding and bed needs in real time, as well as optimize resource management and prioritization in mass casualty incidents and disasters.

The study by Nogué-Xarau *et al.*, also published in this issue, evaluates the performance of seven chatbot-type AI systems in answering clinical toxicology questions from national residency examinations (MIR), comparing them with expert responses.[10] The results are difficult to ignore: AI demonstrates a strong capacity to rapidly process information with results superior to those of clinicians, with no significant differences among the AI models evaluated. These results are consistent for both theoretical questions and clinical cases, indicating that models can interpret clinical scenarios.[11] However, the limited number of questions and participants represents important study limitations.

Far from being merely an academic experiment, this work anticipates a profound transformation: the possibility of having digital assistants[12] in emergency departments capable of delivering critical information within seconds, complementing human clinical reasoning.

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Although these advances generate legitimate enthusiasm, it is not enough for AI models to perform well in controlled environments. They must demonstrate real clinical impact, sustainability, and acceptance by patients and professionals.[13]

Technical errors or system failures, such as software problems or network outages, could compromise their use. Trust between patients and professionals may also be affected if decisions are perceived as being made by "machines" rather than empathetic, trained individuals.

As emphasized by Carballo *et al.*,[5] this technological revolution also raises important ethical challenges. Protection of clinical data and confidentiality must be fully guaranteed in particularly sensitive environments such as emergency care, where systems manage massive amounts of real-time information, often interconnected with external networks. Excessive reliance on algorithms may dehumanize care or generate bias if training data fail to adequately represent all populations. Finally, large language models consume significant energy and generate substantial carbon footprints, which requires reflection on responsible use.

We must not forget that EUC medicine is going through a historic moment. Following publication of Royal Decree 610/2024,[14] the specialty of Emergency and Urgent Care Medicine—already well established worldwide—has emerged in Spain with renewed strength and enthusiasm. Throughout 2025, the National Specialty Commission has worked tirelessly on an innovative competency- and skills-based training program, whose draft, published as a Ministerial Order proposal and submitted for public consultation, includes specific training in AI, as expected.[15]

AI is a technological revolution with undeniable transformative potential.[16,17] Therefore, emergency physicians, as highly trained clinicians with advanced competencies, must proactively lead the integration of these technologies, actively participating in their development, validation, and adaptation to real clinical environments. This includes collaboration with engineers and data scientists and demanding that solutions address genuine clinical needs[18]. We must not passively adopt technologies developed for other contexts.

In conclusion, AI will become a fundamental tool serving the clinician—not a substitute. Its real value emerges when it is ethically, responsibly, and transparently integrated into daily clinical practice, expanding clinicians' decision-making capacity. AI has the potential to become a powerful ally in EUC medicine, enhancing human capabilities, improving response times, opening doors to more equitable, faster, and more precise care, and improving resource management[19]—without ever losing the human essence that enables empathy and that only the trained clinical eye can truly interpret.

EUC services have repeatedly demonstrated their capacity to adapt and lead transformation. AI should be no different. The opportunity is ahead of us—and so is the responsibility.

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