The AI Revolution in Pediatric Emergency Medicine: Transforming Care in the Golden Hour

Zulfiker Ali[a]

a. Former Head of the Department, Emergency Medicine and Critical care (Adult& Pediatrics), Medical College Pariyaram, Kannur, Kerala, India; Director, Curanova Institute for Global Innovation (CIGI*

Published on 30th March 2026

ABSTRACT

Artificial intelligence (AI) is rapidly transforming in clinical practice, but its impact is especially profound in paediatric emergency medicine, where a few minutes can influence an entire life. Building on the work summarized in "The AI Revolution in Medicine" and related studies on digital phenotyping and autonomous diagnostic tools, this article reviews how AI is beginning to change pediatric emergency care: from pre-arrival assessment and triage to diagnostic imaging, deterioration prediction, and decision support.[1]

We summarize emerging evidence on triage and risk stratification models, sepsis and clinical deterioration prediction systems, AI-assisted diagnostic imaging, and the first large-scale language model applications in pediatric emergency departments (PEDs). Machine learning tools have been shown to outperform traditional triage scales in identifying critically ill children, improving the early detection of sepsis, and supporting the interpretation of pediatric images, although much of the work remains retrospective and single-center. At the same time, pediatric evidence is scarcer than in adults, and issues of data shortages, bias, workflow integration, and ethics are particularly sensitive when dealing with children.

Keywords: Artificial Intelligence; Pediatric Emergency Medicine; Golden Hour; Triage; Machine learning; Digital phenotype; Sepsis; Ethics

*See End Note for complete author details

INTRODUCTION

Pediatric emergency departments face a complex dilemma: high complexity, limited time, and a vulnerable population that is often unable to explain what is happening to them. Infants and children present with nonspecific symptoms, their condition deteriorates rapidly, and they may arrive at already overburdened services. The COVID-19 pandemic intensified these pressures and accelerated interest in digital tools that allow for more efficient and equitable prioritization, monitoring, and guidance of care.

At the same time, AI has moved from experimental prototypes to real clinical systems. Computer vision can interpret images and subtle behavioral cues, deep neural networks read electrocardiograms and X-rays, and machine learning (ML) models are beginning to assist with documentation and diagnostic reasoning. Much of this progress comes from adult medicine, but the underlying methods are highly relevant to children. The key question is not whether AI will be incorporated into pediatric emergency medicine, but how we can ensure that it helps rather than harms.

From Digital Phenotyping to the Emergency Room Door

Digital phenotyping illustrates how AI can change the timing and setting of pediatric care. The some mobile app, for example, uses computer vision and machine learning to analyse young children's gaze, facial expressions, and movements as they watch short videos and play a simple game. Early identification of developmental disorders can reduce emergency room visits by enabling proactive support.

The same basic components—off-the-shelf cameras, on-device analytics, automated quality controls—could be used in emergency settings: to monitor breathing, detect seizures, or identify a child whose condition

Cite this article as: Ali Z. The AI Revolution in Pediatric Emergency Medicine: Transforming Care in the Golden Hour. Kerala Medical Journal. 2026 Mar 30;19(1):19-21.

Corresponding Author:
Dr. Zulfiker Ali, MD, Former Head of the Department, Emergency Medicine and Critical care (Adult& Pediatrics), Medical College Pariyaram, Kannur, Kerala, India; Director, Curanova Institute for Global Innovation (CIGI)
Email: drzulfi@curanova.ai, drzulfi@gmail.com

is silently deteriorating in the waiting room. These tools also demonstrate that families are willing to use AI-based apps, an important signal for any prehospital triage system or AI-powered remote monitoring.

At the entrance to the emergency department, AI-based triage models learn from large datasets of vital signs, reasons for visit, and outcomes. Studies with over a million visits have shown that machine learning models are better at predicting critical illnesses than rule-based triage, particularly by reducing under-triage.[2] Studies focused on pediatrics report very high classification accuracy, and the latest models can even explain which characteristics—such as a respiratory condition—are more likely to be classified as critical.

Artificial Intelligence for Rapid Response in Pediatric Emergencies

Sepsis is a compelling example of both the potential and limitations of AI. Early-onset sepsis in children is notoriously difficult to recognize: fever, tachycardia, and irritability are common and nonspecific symptoms. Data-driven prediction models for pediatric sepsis show values ranging from moderate to excellent, and some specialized early warning systems can anticipate septic shock hours in advance by monitoring subtle changes in vital signs and laboratory trends.[3] Outside of pediatrics, systems have already demonstrated improved antibiotic delivery times and reduced mortality. Safely incorporating similar tools into pediatric emergency care will require careful recalibration to children's physiology and safeguards against alarm fatigue.

AI is also being explored in respiratory and cardiac emergencies. Models that analyse pulse oximetry, capnography, or respiratory sounds can help classify severity or anticipate the need for escalation of services. In adult cardiology, AI-enhanced ECG interpretation has reduced treatment time for myocardial infarction. In children, similar approaches could one day help detect rare but fatal arrhythmias or myocarditis earlier, once pediatric training data becomes available. In trauma and neurological emergencies, machine learning models that combine clinical features with imaging can help refine decision rules for computed tomography (CT) scans, avoiding both missed injuries and unnecessary radiation.

Radiology is one of the most mature fields of AI. Deep learning systems for adult chest X-rays are already in use; pediatric chest imaging has lagged behind, but is progressing.[4] Early studies show that models trained on adults can be adapted to detect pneumonia, pleural effusions, or cardiomegaly in children with clinically meaningful accuracy. In busy or resource-limited emergency departments, an AI system that detects a pneumothorax or a misplaced chest tube in seconds could be a vital safety net, especially when a pediatric radiologist is unavailable.

Complex Language Models and Human Interaction

Complex language models are perhaps the most visible face of AI. Their potential in pediatric emergency medicine is a double-edged sword. On the positive side, machine learning models could assist clinicians by drafting clear notes from conversations between the physician and the family, tailoring discharge instructions to the family's language and literacy level, or providing guideline-based checklists when a case description suggests sepsis, anaphylaxis, or traumatic brain injury. If used carefully, they could free up clinicians' time to focus on talking with families and examining children.

However, MLAs also introduce new risks. Randomized studies suggest that access to an MLA does not automatically improve diagnostic accuracy and may create new cognitive biases. Analyses of medical AI systems have shown that models can encode and amplify existing health inequalities, sometimes offering different recommendations based solely on demographic variables. When it comes to children, such biases are ethically unacceptable. Therefore, any use of MLA in pediatric emergency care must include bias audits, robust controls, and clear mechanisms for clinicians and families to challenge or override AI-generated outcomes.

Ethics, Equity, and the Way Forward

Several themes are recurring across all these applications. Pediatric data are scarcer and less representative than adult data. Many AI tools are developed in leading centers in high-income countries and may not be scalable to community hospitals or resource-limited settings. Even the best models will fail if they are not properly integrated into workflows, generate too many alerts, or erode the trust of healthcare professionals. And because children are a particularly vulnerable group, issues of accountability, regulation, privacy, and consent are of paramount importance.[5]

The AI revolution in pediatric emergency medicine is a reality, but it is still incomplete. To ensure that it helps rather than harms, future systems must undergo rigorous testing in pediatric populations, be designed

in collaboration with the clinicians who use them and the families they serve, and be governed in a way that respects children's rights and dignity. If we succeed, AI will not replace the human encounter in the critical first hour, but rather support it: transforming the chaos and data of the emergency department into timely and reliable information that helps save young lives and supports those who care for them.

END NOTE

Author Information

1. Dr Zulfiker Ali, MD, Former Head of the Department, Emergency Medicine and Critical care (Adult& Pediatrics), Medical College Pariyaram, Kannur, Kerala, India; Director, Curanova Institute for Global Innovation (CIGI)

Conflict of Interest: None declared

REFERENCES

1. Di Sarno L, Caroselli A, Tonin G, De Luca E, Campagna G, Ricci G, et al. Artificial intelligence in pediatric emergency medicine: applications, challenges, and future perspectives. Biomedicines. 2024;12(6):1220.
2. Goto T, Camargo CA Jr, Faridi MK, Freishtat RJ, Hasegawa K. Machine learning–based clinical outcome prediction in children during emergency department triage. JAMA Netw Open. 2019;2(1):e186937.
3. Le S, Hoffman J, Barton C, Fitzgerald JC, Allen A, Pellegrini E, et al. Machine learning–based prediction of severe pediatric sepsis. Front Pediatr. 2019;7:413.
4. Padash S, Mohebbian MR, Adams SJ, Henderson RDE, Babyn P. Interpretation of pediatric chest radiographs: how far has artificial intelligence gone? A systematic review of the literature. Pediatr Ra.
5. Chng SY, Tern MJW, Lee YS, Ho CWL, Lim JX, Tan JKH, et al. Ethical considerations in AI for child health and recommendations for child-centered medical AI. NPJ Digit Med. 2025;8(1):152.