THE USE OF ARTIFICIAL INTELLIGENCE IN PEDIATRIC KIDNEY STONE DISEASE

PEDİATRİK BÖBREK TAŞI HASTALIĞINDA YAPAY ZEKA KULLANIMI

Hülya Gözde ÖNAL[1*] (iD)

Corresponding Author
drhulyagozde@hotmail.com
[1]Samsun Training and Research Hospital, Department of Pediatric Nephrology, Samsun, Türkiye

Dear Editor

Artificial intelligence (AI) offers valuable tools for improving early diagnosis, personalized treatment, and efficient management of pediatric kidney stone disease. The existing literature supports the potential benefits of AI applications in this field, highlighting its ability to enhance clinical outcomes for pediatric patients.

Machine learning algorithms integrated into AI systems demonstrate high accuracy when combined with medical imaging data. For example, Convolutional Neural Networks can effectively identify kidney stones in ultrasound or computed tomography images. Panthier et al.'s (2024) pivotal systematic review provides evidence that AI models perform well in diagnosing kidney stones and may reduce errors and delays in intervention (1). Activating AI tools within ultrasound equipment settings may further enhance detection and diagnostic precision.

Individualized management is recommended in the treatment of pediatric kidney stone disease due to the unique clinical history of each child. AI can analyze genetic, metabolic, and clinical data to support the selection of appropriate therapeutic approaches. Predictive models can be used to estimate the risk of recurrence and determine the most effective preventive strategies.

Close patient monitoring is essential, as adherence can significantly impact treatment efficacy and reduce the risk of relapse. With the aid of wearable technology and mobile applications, AI can continuously track health-related data—such as fluid intake, physical activity, and self-reported symptoms—in real time. These systems can alert the care team to concerns such as inadequate hydration or early signs of stone formation, enabling timely intervention. The literature indicates that patients under remote monitoring through AI-enhanced devices demonstrate better compliance with treatment plans and, consequently, improved outcomes (2,3).

AI technology can also be used to develop personalized educational and entertaining materials for children and their families. AI chatbots and virtual assistants can provide real-time updates, helping families identify risk factors or symptoms and take preventive measures. Evidence suggests that such tools enhance patient engagement and understanding (3,4).

In addition, AI holds significant potential in advancing research on pediatric kidney stone disease through the analysis of Big Data patterns. While conventional research methods have limitations, machine learning algorithms can identify emerging risk factors and novel treatment options, thereby expanding current knowledge of kidney stone pathophysiology and driving innovation in treatment strategies (5).

Therefore, this paper highlights the significant potential of further integrating AI into the management of pediatric kidney stone disease. From early diagnosis and appropriate treatment planning to recurrence prevention, holistic follow-up, and effective patient education, AI offers valuable contributions to improving the quality of care for affected children. To fully realize these possibilities, more focused research and continued investment in AI applications within this field should be actively encouraged.

REFERENCES

1. Panthier F, Melchionna A, Crawford-Smith R, et al. Can artificial intelligence accurately detect urinary stones? A systematic review. J Endourol. 2024; 38(8): 725-40.

2. Yuan Q, Zhang H, Deng T, et al. Role of artificial intelligence in kidney disease. Int J Med Sci. 2020; 17(7):970-84.

3. Kothamali PR, Srinivas N, Mandaloju N, Kumar Karne V. Smart healthcare: Enhancing remote patient monitoring with AI and Iot. Rev Intel Artif Med. 2023;14(1): 113-46.

4. Mlakar I, Lin S, Aleksandraviča I, et al. Patients-centered SurvivorShIp care plan after cancer treatments based on big data and artificial intelligence technologies (PERSIST): A multicenter study protocol to evaluate efficacy of digital tools supporting cancer survivors. BMC Med Inform Decis Mak. 2021; 21:1-14.

5. Sabuncu Z. Artificial intelligence model to assist and evaluate the kidney stone on computed tomography image. Near East University, Thesis Submitted to the Graduate School of Applied Sciences;2021.