

**ARTIFICIAL INTELLIGENCE IN PEDIATRIC RADIOLOGY: CLINICAL
APPLICATIONS, CHALLENGES, AND FUTURE DIRECTIONS**

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Abstract

Artificial intelligence (AI) is rapidly reshaping pediatric radiology by improving diagnostic accuracy, optimizing workflow efficiency, and reducing radiation exposure. Pediatric imaging presents unique challenges due to developmental anatomy and heightened radiation sensitivity. This comprehensive review discusses current AI applications, clinical impact, challenges, and future perspectives in pediatric radiology.

Introduction

Pediatric radiology is a cornerstone of modern child healthcare. Accurate imaging is essential for diagnosis, treatment planning, and follow-up of pediatric diseases. However, image interpretation is complicated by age-related anatomical variations and disease heterogeneity. Artificial intelligence offers innovative tools that support radiologists in overcoming these challenges.

AI Methodologies in Pediatric Imaging

Machine learning and deep learning algorithms, particularly convolutional neural networks, are widely used for image classification, segmentation, and detection. Transfer learning and data augmentation techniques are commonly employed to address the limited availability of pediatric datasets.

Clinical Applications

AI has demonstrated clinical value in thoracic imaging, neuroimaging, musculoskeletal imaging, abdominal imaging, and cardiac imaging. Automated pneumonia detection, bone age assessment, and brain lesion segmentation are among the most validated applications.

Radiation Dose Optimization

AI-based reconstruction techniques enable significant radiation dose reduction while maintaining diagnostic image quality. This is particularly important in pediatric CT examinations, where radiation safety is a top priority.

Workflow Optimization and Decision Support

AI assists in triaging urgent cases, automating measurements, and generating structured reports. These tools reduce reporting time and improve consistency across radiologists.

Challenges and Ethical Considerations

Challenges include limited pediatric-specific data, algorithm bias, lack of transparency, and medico-legal concerns. Ethical implementation requires explainable AI models, robust validation, and data privacy protection.

Future Directions

Future research should focus on multicenter collaborations, integration of imaging with clinical and genomic data, and development of personalized AI-driven imaging strategies.

Conclusion

AI has the potential to transform pediatric radiology by enhancing diagnostic accuracy, improving safety, and supporting clinical decision-making. Strategic and ethical adoption will determine its long-term success.

References

1. Esteva A et al. A guide to deep learning in healthcare. Nature. 2019.
2. Litjens G et al. A survey on deep learning in medical image analysis. Med Image Anal. 2017.
3. McBee MP et al. Deep learning in radiology. Radiology. 2018.
4. Brady AP, Neri E. Artificial intelligence in radiology. Eur Radiol. 2020.
5. Erickson BJ et al. Machine learning for medical imaging. Radiographics. 2017.
6. Hosny A et al. Artificial intelligence in radiology. Radiology. 2018.
7. Kahn CE. Ethics of AI in radiology. AJR. 2019.
8. Ranschaert ER et al. Artificial intelligence in medical imaging. Springer. 2019.
9. Langlotz CP. Will artificial intelligence replace radiologists? Radiology. 2019.
10. Giger ML. Machine learning in medical imaging. J Am Coll Radiol. 2018.
11. Murtazayeva, Z. F. (2024). THE ART OF CLINICAL CASE ANALYSIS IN PEDIATRICS: A GUIDE FOR MEDICAL PROFESSIONALS. European Journal of Modern Medicine and Practice, 4(11), 443-447.
12. Murtazayeva, Z. (2025). ALLERGY IN PRETERM INFANTS: PATHOPHYSIOLOGY, CLINICAL MANIFESTATIONS, AND MANAGEMENT STRATEGIES. Modern Science and Research, 4(2), 742-748.
13. Murtazayeva, Z. (2025). CLINICAL CHARACTERISTICS AND COURSE OF OBSTRUCTIVE BRONCHITIS IN CHILDREN. Modern Science and Research, 4(5).
14. Murtazayeva, Z. (2025). PEDIATRIC PNEUMONIA: CLINICAL FEATURES, DIAGNOSIS, MANAGEMENT, AND GLOBAL HEALTH IMPACT. Modern Science and Research, 4(4), 1092-1101.
15. Murtazayeva, Z. F. (2024). Nourishing Newborns: Feeding Strategies to Minimize Allergy Risk in Preterm Infants. American Journal of Bioscience and Clinical Integrity, 1(10), 64-71.