

Letter to the Editor

# Critical Reflections on Artificial Intelligence Applications in Orthopedics and Traumatology

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0000-0001-6576-1802**ABSTRACT**

Artificial intelligence (AI) technologies are increasingly integrated into orthopedic and traumatology practice, offering significant potential in imaging analysis, surgical planning, complication prediction, and rehabilitation. Recent studies demonstrate that AI can improve diagnostic accuracy in fracture classification, implant identification, and postoperative risk assessment, thereby supporting clinical decision-making and personalized treatment approaches. However, limitations such as dataset bias, lack of contextual interpretation, and ethical concerns—including patient privacy and data security—must be carefully addressed. AI should not be considered a standalone solution but rather a complementary tool to human expertise. Ensuring clinical validation, ethical compliance, and equitable access will be essential for the effective and responsible integration of AI into orthopedic and traumatology disciplines.

**Özet**

Yapay zekâ (YZ) teknolojileri, görüntüleme analizi, cerrahi planlama, komplikasyon öngörüsü ve rehabilitasyon gibi alanlarda önemli potansiyeller sunarak ortopedi ve travmatoloji pratiğine giderek daha fazla entegre edilmektedir. Güncel çalışmalar, YZ'nin kırık sınıflandırması, implant tanımlama ve ameliyat sonrası risk değerlendirmesinde tanısız doğruluğu artırabildiğini; böylece klinik karar verme süreçlerini ve kişiselleştirilmiş tedavi yaklaşımlarını desteklediğini göstermektedir. Bununla birlikte, veri seti yanlılığı, bağlamsal yorum eksikliği ve hasta mahremiyeti ile veri güvenliği gibi etik sorunlar dikkatle ele alınmalıdır. YZ, bağımsız bir çözüm olarak değil, insan uzmanlığını tamamlayan bir araç olarak değerlendirilmelidir. Klinik doğrulama, etik uyum ve eşit erişimin sağlanması, YZ'nin ortopedi ve travmatoloji disiplinlerine etkili ve sorumlu bir şekilde entegre edilmesi için kritik öneme sahiptir.

**Doi:**<https://doi.org/10.5281/zenodo.18996206>**Introduction**

Dear Editor,

In recent years, the use of artificial intelligence (AI) technologies in medicine has grown rapidly, and they hold significant potential in the fields of orthopedics and traumatology. AI-based systems, particularly in the analysis of imaging data, surgical planning, prediction of complications, and patient follow-up, have accelerated clinical decision-making processes and improved diagnostic accuracy (Cabitza et al., 2018).

One of the most notable contributions of AI to orthopedics is the development of decision support systems for fracture classification and implant selection. Misir et al. demonstrated that AI algorithms can enhance diagnostic accuracy in trauma cases and support clinical decision-making (Misir, 2025). Similarly, Karnuta et al. showed that AI can identify hip arthroplasty implants from radiographs with high accuracy (Karnuta et al., 2021). Such applications reduce clinicians' workload and minimize error rates.

AI also offers advantages in predicting postoperative complications and enabling personalized approaches in rehabilitation (Myers et al., 2020). Ramkumar et al. emphasized that AI can play a crucial role in forecasting complication risks in orthopedic surgery and improving patient outcomes (Bini, 2018). Furthermore, the integration of sensor data into AI

algorithms during rehabilitation allows for the development of individualized treatment plans (Song et al., 2025).

Despite these promising developments, AI should not be regarded as a standalone solution. Limitations of training datasets, context-independent interpretations, and ethical concerns must be carefully considered. Issues such as data security, patient privacy, and algorithmic bias are particularly critical in the integration of AI into clinical practice (Topol, 2019). Additionally, disparities in access to these technologies among early-career researchers may negatively affect scientific productivity.

In conclusion, AI technologies represent a promising tool in orthopedic and traumatology practice; however, they should not be used as the sole criterion in clinical evaluation. Ethical principles, data security, and clinical validation processes must be prioritized. We believe that AI should be considered as a complementary element to human expertise rather than a replacement.

Respectfully,

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The author declares no conflict of interest.

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## Ethical approval

No ethics committee approval was obtained for this study. The nature of the study is based on a critical review of the existing literature and the evaluation of bibliometric indicators. As the study does not involve experimental research, clinical practice, or observational data collection conducted on human or animal subjects, ethics committee approval was not required. Only previously published scientific articles were used as sources, and the analysis was limited to secondary evaluations and conceptual discussions. At no stage of the research were personal data, patient information, or experimental interventions involved. Throughout the process, ethical principles were observed, and the study was conducted within the framework of academic integrity. The primary aim of this study is to highlight the limitations of existing metrics and to draw attention to alternative approaches in academic evaluation. In this context, the study represents a theoretical and methodological assessment rather than an empirical research requiring ethical approval.

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