



Artificial Intelligence in Pain Management

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Perspective



Artificial intelligence (AI) has rapidly emerged as a transformative force in modern healthcare, enabling data-driven approaches to diagnosis, treatment planning, and clinical decision-making [1]. By incorporating techniques such as machine learning, deep learning, data mining, and natural language processing, AI systems are increasingly capable of analyzing complex clinical data and supporting personalized care [2]. One area that has recently gained attention is the application of AI in pain assessment and pain management.

Despite decades of research into the pathophysiology of pain, pain remains underdiagnosed and undertreated across healthcare settings [3]. Traditional pain assessment relies heavily on subjective self-report measures, which can be unreliable, particularly among older adults, patients with cognitive impairment, or individuals with communication difficulties [4]. AI-based approaches offer new opportunities to improve the recognition, prediction, and management of pain, especially in community and primary care environments [5].

AI interventions can be grouped into three main categories: AI-supported pain assessment, pain prediction and clinical decision support, and pain self-management. These approaches have demonstrated promising outcomes, including reduced pain intensity, improved adherence to treatment recommendations, decreased reliance on additional interventions, and enhanced therapeutic exercise support. Technologies such as mobile health applications, decision-support systems, and socially assistive robotics have shown potential benefits in both acute and chronic pain conditions [5-8].

However, the current evidence base presents several limitations. Many studies are pilot in nature, involve small sample sizes, and focus primarily on short-term outcomes. Heterogeneity in pain measurement tools, intervention duration, and patient populations limits the generalizability of findings. Additionally, challenges related to system usability, real-time clinical integration, data bias, and clinician acceptance remain significant barriers to widespread implementation [5-8].

In conclusion, AI-based interventions represent a promising and innovative approach to improving pain management. While early findings are encouraging, further high-quality, large-scale, and long-term studies are required to establish effectiveness, sustainability, and clinical value. Equally important is the ethical deployment of AI technologies, ensuring patient privacy, data security, transparency, and equitable access. With careful development and evaluation, AI has the potential to significantly enhance the quality, safety, and effectiveness of pain care [9, 10].

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Received Date: 11 Jan 2026

Accepted Date: 05 Feb 2026

Published Date: 07 Feb 2026

Citation:

Ioanna Tsatsou. Artificial Intelligence in Pain Management. *WebLog J Med Sci.* [wjms.2026.b0709](https://doi.org/10.5281/zenodo.18779147). <https://doi.org/10.5281/zenodo.18779147>

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