How Does AI Support Evidence-Based Medicine?

Rasit Dinc

Rasit Dinc Digital Health & AI Research

Published: August 17, 2015 | AI in Clinical Decision Support

DOI: 10.5281/zenodo.17999309

Abstract

Evidence-Based Medicine (EBM) has long been the cornerstone of modern clinical practice, guiding healthcare professionals to make informed decisions based on...

How Does AI Support Evidence-Based Medicine?

Author: Rasit Dinc

Evidence-Based Medicine (EBM) has long been the cornerstone of modern clinical practice, guiding healthcare professionals to make informed decisions based on the best available scientific evidence. However, in an era of explosive information growth, the traditional EBM model faces significant hurdles. The sheer volume of new research makes it nearly impossible for clinicians to keep up, creating a gap between cutting-edge evidence and daily practice. Furthermore, the population-based nature of most clinical evidence often falls short of addressing the unique needs of individual patients. Enter Artificial Intelligence (AI), a transformative force with the potential to revolutionize EBM and usher in a new era of personalized, data-driven healthcare.

The challenges confronting traditional EBM are multifaceted. Firstly, the timeliness of evidence is a major concern. The process of developing and updating clinical guidelines is notoriously slow, often taking years. By the time a guideline is published, the evidence it is based on may already be outdated, particularly in rapidly evolving fields [1]. Secondly, a significant gap persists between the evidence we have and its implementation in practice. Barriers such as lack of time, resources, and even conflicting patient preferences can hinder the adoption of evidence-based recommendations [1]. Finally, the fundamental mismatch between population-derived evidence and the need for personalized medicine remains a core tension in EBM. True personalized care requires evidence tailored to an individual's unique genetic makeup, lifestyle, and comorbidities, a level of detail that traditional EBM struggles to provide [1].

To address these challenges, a structured approach for integrating AI into

EBM is essential. A proposed L0-L5 evolutionary framework offers a roadmap for this integration, outlining a progressive path from current practices to a future of AI-driven, personalized medicine [1]. This framework delineates six levels of AI integration:

L0: Traditional EBM: *The baseline, with no AI involvement.* **L1: AI-Assisted Evidence Retrieval:** AI tools help clinicians find relevant evidence more efficiently. ***L2: AI-Powered Evidence Synthesis:*** *AI automates parts of the systematic review and guideline development process.* **L3: Real-World Data Evidence Generation:** AI generates new evidence from real-world data sources like electronic health records. ***L4: Personalized Evidence via Digital Twins:*** *AI creates virtual patient models to generate personalized evidence.* **L5: Generative Model-Driven Evidence:** AI generates synthetic evidence through simulations, overcoming the limitations of existing data.

This framework not only provides a path for technological advancement but also emphasizes the need for a bidirectional relationship where EBM principles are used to evaluate and validate AI-generated recommendations, ensuring that the integration of AI into clinical practice is both responsible and effective [1].

A tangible example of AI's potential in this domain is the Semantic Clinical Artificial Intelligence (SCAI) tool developed at the University at Buffalo. This powerful AI has demonstrated remarkable performance, outperforming other AI tools and even most physicians on the United States Medical Licensing Exam (USMLE) [2]. SCAI's success lies in its ability to reason semantically, drawing upon a vast knowledge base of 13 million medical facts and their interconnections. Unlike other AI models that rely on statistical associations, SCAI can understand and respond to complex medical questions in a manner that mimics human clinical reasoning [2]. This capability makes it a valuable partner for clinicians, augmenting their decision-making process with data-driven insights.

It is crucial to emphasize that the role of AI in medicine is not to replace healthcare professionals but to empower them. As Dr. Peter L. Elkin, the lead author of the SCAI study, aptly puts it, “Artificial intelligence isn’t going to replace doctors, but a doctor who uses AI may replace a doctor who does not” [2]. AI tools like SCAI can help democratize medical knowledge, improve patient safety, and provide access to specialized care. By handling the heavy lifting of data analysis and evidence synthesis, AI can free up clinicians to focus on what they do best: providing compassionate, patient-centered care.

In conclusion, the integration of AI into Evidence-Based Medicine holds immense promise for the future of healthcare. By addressing the limitations of traditional EBM and providing powerful new tools for clinicians, AI can help us realize the vision of a truly personalized and data-driven approach to medicine. The journey has just begun, but with structured frameworks for development and a commitment to rigorous evaluation, AI is poised to become an indispensable partner in the quest for better health outcomes for all.

References

[1] Li, N., Shi, Y., Zhao, Y., & Zhan, S. (2025). Artificial intelligence

empowering evidence-based medicine: an L0-L5 evolutionary framework toward personalized precision medicine. *Intelligent Medicine*, *5*(4), 262-268. https://doi.org/10.1016/j.imed.2025.07.002

[2] Goldbaum, E. (2025, April 22). *An AI tool grounded in evidence-based medicine outperformed other AI tools – and most doctors – on USMLE exams*. University at Buffalo. https://www.buffalo.edu/news/releases/2025/04/AI-evidence-based-medicine-outperforms-USMLE-exams.html

---