ISSN: 2584-0355
DOI: doi.org/10.51219/MCCRJ/Verena-Lengston/213

URF PUBLISHERS
connect with research world

Medical & Clinical Case Reports Journal

https://urfpublishers.com/journal/case-reports

Vol: 3 & Iss: 1

Opinion

The Intersection of AI and Internal Medicine

Verena Lengston*

The University of Edinburg, Department of computer engineering, South Bridge, Edinburg, United Kingdom

Citation: Lengston V. The Intersection of AI and Internal Medicine. *Medi Clin Case Rep J* 2025;3(1):807-811. DOI: doi.org/10.51219/MCCRJ/Verena-Lengston/213

Received: 06 March, 2025; **Accepted:** 19 March, 2025; **Published:** 21 March, 2025

***Corresponding author:** Verena Lengston, The University of Edinburg, Department of computer engineering, South Bridge, Edinburg, United Kingdom

ABSTRACT

Artificial intelligence (AI) is rapidly transforming various sectors and internal medicine is no exception. This field, focused on the diagnosis, treatment and management of complex adult diseases, is witnessing a paradigm shift with the integration of AI technologies. This abstract explores the multifaceted ways AI is revolutionizing internal medicine, encompassing advancements in diagnosis, personalized treatment approaches and enhanced patient care. AI-powered tools are enabling physicians to analyze vast amounts of patient data, including medical images, electronic health records and genomic information, to identify patterns and insights that may be missed by human observation. This leads to more accurate and timely diagnoses, particularly in areas like radiology, pathology and cardiology. Furthermore, AI is facilitating the development of personalized treatment plans tailored to individual patient characteristics, optimizing therapeutic interventions and improving patient outcomes. By automating routine tasks, AI is also freeing up physicians' time, allowing them to focus on more complex cases and enhance patient interaction. However, the successful implementation of AI in internal medicine requires careful consideration of ethical implications, data privacy and the need for human oversight. This abstract highlight the transformative potential of AI in internal medicine while acknowledging the challenges that need to be addressed to ensure its responsible and effective integration into clinical practice.

Keywords: Artificial intelligence; Internal medicine; Diagnosis, treatment; Personalized medicine; Patient care; Machine learning; Deep learning; Medical imaging; Electronic health records; Genomics; Ethics; Data privacy

Introduction

Internal medicine, the cornerstone of adult healthcare, grapples with the intricate challenge of diagnosing, treating and managing a vast spectrum of complex diseases. From cardiovascular ailments and metabolic disorders to infectious diseases and autoimmune conditions, internists navigate a landscape of ever-evolving medical knowledge and increasingly complex patient presentations. For decades, the field has relied on clinical acumen, experience and traditional diagnostic tools. However, the advent of artificial intelligence (AI)[1-5] is poised to revolutionize internal medicine, ushering in a new era of precision, efficiency and personalized care. This introduction explores the transformative potential of AI in reshaping the practice of internal medicine, highlighting its promise to augment physicians' capabilities and improve patient outcomes.

The sheer volume of medical data generated today - from electronic health records (EHRs) and medical images to genomic information and wearable sensor data - presents both an opportunity and a challenge. Traditional methods of analyzing this data can be time-consuming and may miss subtle but crucial patterns. AI, with its ability to process and analyze massive datasets at unprecedented speeds, offers a powerful

tool to extract meaningful insights that can inform clinical decision-making. Machine learning algorithms, a subset of AI, can identify complex relationships within data, enabling physicians to detect diseases earlier, predict patient responses to treatments and personalize care plans based on individual patient characteristics. This capability is particularly relevant in internal medicine, where patients often present with multiple comorbidities and require a holistic approach to their care.

The potential applications of AI in internal medicine are vast and varied. In diagnostics, AI-powered image analysis tools are enhancing the accuracy and efficiency of interpreting medical images, such as X-rays, CT scans and MRIs, leading to earlier and more precise diagnoses of conditions like cancer, cardiovascular disease and neurological disorders. AI algorithms can also analyze patient data from EHRs to identify individuals at high risk for developing certain diseases, allowing for proactive interventions and preventive care. Furthermore, AI is playing a crucial role in drug discovery and development, accelerating the identification of potential therapeutic targets and the design of novel treatments.

Beyond diagnostics and treatment, AI is also transforming patient care. Chatbots and virtual assistants can provide patients with 24/7 access to medical information, answer their questions and offer personalized health advice. AI-powered[6-9] remote monitoring systems can track patients' vital signs and other health data, alerting physicians to potential problems and enabling timely interventions. By automating routine tasks, AI is also freeing up physicians' time, allowing them to focus on more complex cases and spend more time interacting with patients, fostering stronger doctor-patient relationships.

However, the integration of AI into internal medicine is not without its challenges. Ethical considerations surrounding data privacy, algorithmic bias and the potential displacement of human physicians must be carefully addressed. Ensuring the accuracy and reliability of AI algorithms is paramount, as is the need for robust validation studies and regulatory frameworks. Furthermore, the successful implementation of AI requires seamless integration with existing healthcare systems and workflows, as well as adequate training for healthcare professionals to effectively utilize these new tools. Building trust in AI systems among both physicians and patients is also crucial for widespread adoption.

This exploration of AI in internal medicine will delve into the specific applications of AI in various subspecialties within the field, including cardiology, pulmonology, gastroenterology and endocrinology. It will examine the current state of research, highlighting both the successes and the limitations of AI-driven interventions. Furthermore, it will discuss the ethical, regulatory and practical considerations that must be addressed to ensure the responsible and effective integration of AI into the practice of internal medicine. By embracing the transformative potential of AI while acknowledging and addressing its challenges, internal medicine can move towards a future where healthcare is more precise, personalized and patient-centered.

Challenges in integrating AI into internal medicine

While the potential benefits of AI in internal medicine are substantial, its integration into clinical practice faces a number of significant challenges. Overcoming these hurdles is crucial for realizing the full potential of AI and ensuring its responsible and effective implementation.

Data-related challenges

- **Data availability and quality:** AI algorithms[10-13], particularly machine learning models, thrive on large, diverse and high-quality datasets. In internal medicine, data can be fragmented across different systems, incomplete or inconsistent. Standardizing data collection and ensuring data quality are essential for training robust and reliable AI models.
- **Data privacy and security:** Patient data is highly sensitive and requires stringent protection. Implementing AI systems necessitates robust data governance frameworks that comply with regulations like HIPAA and GDPR, safeguarding patient privacy while enabling data sharing for research and development.
- **Data bias:** AI algorithms can inherit biases present in the data they are trained on. If the training data underrepresents certain patient populations, the resulting AI model may exhibit biased predictions, leading to disparities in care. Addressing data bias requires careful attention to data collection, preprocessing and algorithm design.

Algorithmic and technical challenges

- **Explainability and interpretability:** Many AI algorithms, particularly deep learning models, are "black boxes," making it difficult to understand how they arrive at their conclusions. This lack of transparency can hinder physician trust and make it challenging to identify potential errors or biases in the model's reasoning. Developing more explainable AI (XAI) techniques is crucial for clinical adoption.
- **Model validation and generalizability:** AI models trained on one dataset may not perform well on other datasets or in real-world clinical settings. Rigorous validation studies are necessary to ensure that AI models are accurate, reliable and generalizable across different patient populations and healthcare settings.
- **Integration with existing systems:** Integrating AI systems into existing EHRs and clinical workflows can be technically complex and costly. Seamless interoperability is essential for maximizing the efficiency and effectiveness of AI tools.

Clinical and human factors

- **Physician trust and acceptance:** Physicians may be hesitant to adopt AI tools if they do not trust their accuracy or understand how they work. Building trust requires demonstrating the value of AI through rigorous validation studies, providing adequate training for physicians and ensuring that AI augments, rather than replaces, human expertise.
- **Ethical considerations:** The use of AI in internal medicine[14-16] raises several ethical concerns, including the potential for algorithmic bias, the impact on the physician-patient relationship and the responsibility for errors or adverse events. Developing ethical guidelines and regulatory frameworks is essential for ensuring the responsible use of AI in healthcare.
- **Workforce training and education:** The integration of AI into internal medicine requires a new generation of healthcare professionals who are knowledgeable about AI concepts and capable of using AI tools effectively. Medical

education and training programs need to adapt to prepare physicians for the AI-driven future of healthcare.

Regulatory and legal challenges

- **Regulatory frameworks:** Clear regulatory pathways are needed for the development, validation and deployment of AI-based medical devices and software. Regulators must ensure that AI systems are safe, effective and meet appropriate quality standards.
- **Liability and responsibility:** Determining liability in cases where AI systems make errors or cause harm is a complex legal issue. Clear legal frameworks are needed to address these challenges and ensure patient safety.

Benefits of integrating AI into internal medicine

The integration of artificial intelligence (AI) into internal medicine offers a plethora of potential benefits, promising to transform the field and improve patient care significantly. These advantages span across various aspects of medical practice, from diagnosis and treatment to patient management and research.

Enhanced diagnostic accuracy and efficiency

- **Improved image analysis:** AI-powered image analysis tools can detect subtle patterns and anomalies in medical images (X-rays, CT scans, MRIs) that might be missed by human observation, leading to earlier and more accurate diagnoses of conditions like cancer, cardiovascular disease and neurological disorders.
- **Faster diagnosis:** AI algorithms can analyze vast amounts of patient data much faster than humans, accelerating the diagnostic process and reducing time to treatment.
- **Integration of multi-modal data:** AI can integrate and analyze data from various sources, including medical images, EHRs, genomic information and wearable sensor data, providing a more holistic view of the patient and improving diagnostic accuracy.

Personalized treatment and precision medicine

- **Tailored treatment plans:** AI can analyze individual patient characteristics, including genetic makeup, lifestyle factors and medical history, to develop personalized treatment plans that are most likely to be effective.
- **Drug discovery and development:** AI is accelerating[17-19] the identification of potential therapeutic targets and the design of novel drugs, leading to more effective and targeted therapies.
- **Predictive analytics:** AI can predict patient responses to different treatments, allowing physicians to choose the most appropriate interventions and avoid unnecessary or ineffective therapies.

Improved patient care and outcomes

- **Proactive and preventive care:** AI can identify individuals at high risk for developing certain diseases, enabling proactive interventions and preventive care to improve long-term health outcomes.
- **Remote patient monitoring:** AI-powered remote monitoring systems can track patients' vital signs and other health data, alerting physicians to potential problems and enabling timely interventions, reducing hospital readmissions and improving patient well-being.
- **Enhanced patient engagement:** Chatbots and virtual assistants can provide patients with 24/7 access to medical information, answer their questions and offer personalized health advice, improving patient engagement and adherence to treatment plans.

Increased efficiency and productivity

- **Automation of routine tasks:** AI can automate routine tasks, such as data entry and report generation, freeing up physicians' time to focus on more complex cases and patient interaction.
- **Streamlined workflows:** AI can optimize clinical workflows, improving efficiency and reducing costs.
- **Improved resource allocation:** AI can help hospitals and clinics allocate resources more effectively, ensuring that patients receive the care they need in a timely manner.

Advancements in medical research

- **Data-driven insights:** AI can analyze massive datasets to identify patterns and insights that would be impossible to detect using traditional methods, accelerating medical research and leading to new discoveries.
- **Drug repurposing:** AI can identify new uses for existing drugs, reducing the time and cost associated with drug development.
- **Personalized medicine research:** AI is enabling researchers to develop personalized medicine approaches tailored to individual patient characteristics, leading to more effective and targeted therapies.

Enhanced physician experience

- **Reduced administrative burden:** AI can automate many administrative tasks[20,21], reducing the burden on physicians and allowing them to focus on patient care.
- **Improved clinical decision support:** AI-powered clinical decision support systems can provide physicians with real-time access to the latest medical evidence and best practices, improving the quality of care.
- **Increased job satisfaction:** By automating routine tasks and improving efficiency, AI can help reduce physician burnout and increase job satisfaction.

Future directions and research opportunities for AI in internal medicine

The integration of AI into internal medicine is still in its early stages and the future holds immense potential for further advancements and transformative applications. Several key areas represent exciting avenues for future research and development.

Explainable AI (XAI) and trust

- **Developing XAI techniques:** A crucial area of focus is developing more sophisticated XAI techniques that can provide clear and understandable explanations for AI-driven decisions. This will be essential for building physician trust and facilitating the integration of AI into clinical practice.
- **Human-centered AI:** Research should focus on designing AI systems that are human-centered, empowering physicians and patients to understand and interact with AI-driven insights effectively.

Addressing bias and ensuring fairness

- **Bias detection and mitigation:** Further research is needed to develop robust methods for detecting and mitigating bias in AI algorithms, ensuring that AI systems are fair and equitable for all patient populations.
- **Diverse and representative datasets:** Efforts should focus on building larger and more diverse datasets that accurately represent the patient population, minimizing bias and improving the generalizability of AI models.

Personalized medicine and precision health

- **Integrating multi-omics data:** Future research should focus on integrating[22,23] multi-omics data (genomics, proteomics, metabolomics) with clinical data to develop more personalized and precise treatment approaches.
- **Predictive modeling for personalized interventions:** Developing AI models that can predict individual patient responses to different therapies will be crucial for optimizing treatment strategies and improving patient outcomes.

AI-driven drug discovery and development

- **Accelerating drug discovery:** Further research is needed to leverage AI for accelerating drug discovery and development, identifying new therapeutic targets and designing novel drugs.
- **Drug repurposing and personalized drug selection:** AI can play a key role in identifying new uses for existing drugs and developing personalized drug selection strategies based on individual patient characteristics.

AI for remote patient monitoring and telemedicine

- **Developing advanced remote monitoring systems:** Future research should focus on developing more sophisticated remote patient monitoring systems that can track a wider range of health data and provide real-time alerts to physicians.
- **AI-powered telemedicine platforms:** AI can enhance telemedicine platforms by providing personalized health advice, triaging patients and supporting remote diagnosis and treatment.

AI for clinical decision support

- **Real-time clinical decision support:** Developing AI-powered clinical decision support systems that can provide real-time access to the latest medical evidence and best practices will be crucial for improving the quality of care.
- **Integration with EHRs:** Seamless integration of AI-driven clinical decision support systems with EHRs will be essential for maximizing their effectiveness.

Ethical and regulatory considerations

- **Developing ethical guidelines:** Further research and discussion are needed to develop clear ethical guidelines for the use of AI in internal medicine, addressing issues such as data privacy, algorithmic bias and responsibility.
- **Establishing regulatory frameworks:** Regulators need to develop appropriate regulatory frameworks for the development, validation and deployment of AI-based medical devices and software.

Education and training

- **Training the next generation of physicians:** Medical education[24,25] and training programs need to adapt to prepare physicians for the AI-driven future of healthcare, equipping them with the knowledge and skills to use AI tools effectively.
- **Developing AI literacy among healthcare professionals:** Efforts should be made to improve AI literacy among all healthcare professionals, enabling them to understand the potential and limitations of AI in medicine.

Validation and implementation research

- **Rigorous validation studies:** More rigorous validation studies are needed to ensure that AI models are accurate, reliable and generalizable across different patient populations and healthcare settings.
- **Real-world implementation studies:** Research should focus on evaluating the effectiveness of AI interventions in real-world clinical settings and identifying best practices for implementation.

Conclusion

The integration of artificial intelligence into internal medicine represents a paradigm shift with the potential to revolutionize the field and reshape the future of healthcare. From enhancing diagnostic accuracy and personalizing treatment plans to improving patient care and accelerating medical research, the benefits of AI are vast and far-reaching. As we have explored, AI offers powerful tools to augment the capabilities of physicians, allowing them to navigate the complexities of modern medicine with greater precision, efficiency and insight.

The ability of AI to analyze massive datasets, identify subtle patterns and generate[26,27] actionable insights is transforming how we approach disease diagnosis, treatment and prevention. AI-powered image analysis is leading to earlier and more accurate diagnoses, while personalized medicine approaches, driven by AI[28-31], are tailoring treatments to individual patient characteristics, optimizing therapeutic interventions and improving outcomes. Furthermore, AI is empowering patients by providing them with access to information, facilitating remote monitoring and enhancing engagement in their own care.

References

1. Panahi P, Bayılmış C, Çavuşoğlu U, Kaçar S. Performance evaluation of lightweight encryption algorithms for IoT-based applications. Arabian J Sci Eng 2021;46(4):4015-4037.
2. Panahi U, Bayılmış C. Enabling secure data transmission for wireless sensor networks based IoT applications. Ain Shams Eng J 2023;14(2):101866.
3. Panahi O and Panahi U. AI-Powered IoT: Transforming Diagnostics and Treatment Planning in Oral Implantology. J Adv Artif Intell Mach Learn 2025;1(1):1-4.
4. Panahi O, Raouf MF, Patrik K. The evaluation between pregnancy and periodontal therapy Int J Acad Res 2011;3:1057-1058.
5. Panahi O, Melody FR, Kennet P, Tamson MK. Drug induced (calcium channel blockers) gingival hyperplasia. JMBS 2011;2(1):10-12.
6. Omid P. Relevance between gingival hyperplasia and leukemia. Int J Acad Res 2011;3:493-494.

7. Panahi O and Çay FK. Nano Technology, Regenerative Medicine and, Tissue Bio-Engineering. Acta Scientific Dental Sciences 2023;7(4):118-122.
8. Panahi O. Dental Pulp Stem Cells: A Review. Acta Scientific Dental Sciences 2024;8(2):22-24.
9. Panahi O and Zadeh MJ. The Expanding Role of Artificial Intelligence in Modern Dentistry. On J Dent Oral Health 8(3):2025.
10. Omid P, Shabnam D. Mitigating Aflatoxin Contamination in Grains: The Importance of Postharvest Management Practices. Adv Biotech Micro 2025;18(5):555996.
11. Panahi O, Farrokh S. Building Healthier Communities: The Intersection of AI, IT and Community Medicine. Int J Nurs Health Care 2025;1(1):1-4.
12. Panahi O, Ezzati A. AI in Dental-Medicine: Current Applications Future Directions. Open Access J Clin Images 2025;2(1):1-5.
13. Panahi O and Amirloo A. AI-Enabled IT Systems for Improved Dental Practice Management. On J Dent Oral Health 8(3):2025.
14. Panahi O, Ezzati A and Zeynali M. Will AI Replace Your Dentist? The Future of Dental Practice. On J Dent Oral Health 8(3):2025.
15. Omid P, Sevil Farrokh E. Bioengineering Innovations in Dental Implantology. Curr Trends Biomedical Eng Biosci 2025;23(3):556111.
16. Panahi O, Eslamlou SF. Artificial Intelligence in Oral Surgery: Enhancing Diagnostics, Treatment and Patient Care. J Clin Den Oral Care 2025;3(1):1-5.
17. Panahi O, Dadkhah S. Transforming Dental Care: A Comprehensive Review of AI Technologies. J Stoma Dent Res 2025;3(1):1-5.
18. Koyuncu B, Gokce A, Panahi P. Reconstruction of an Archeological site in real time domain by using software techniques. In 2015 Fifth Int Conference on Communication Systems and Network Technologies 2015:1350-1354.
19. Panahi O, Farrokh S. The Use of Machine Learning for Personalized Dental-Medicine Treatment. Glob J Med Biomed Case Rep 2025;1:001.
20. Panahi U. AD HOC Networks: Applications, Challenges, Future Directions, Scholars' Press 2025.
21. Panahi O. Artificial intelligence in Dentistry, Scholars Press Academic Publishing.
22. Panahi P, Freund M. Safety Application Schema for Vehicular Virtual Ad Hoc Grid Networks. Int J Academic Research 2011;3(2).
23. Panahi P. New Plan for Hardware Resource Utilization in Multimedia Applications Over Multi Processor Based System, MIPRO 2009, 32nd Int Convention Conference on Grid and Visualization Systems (GVS) 2009:256-260.
24. Koyuncu B, Panahi P. Kalman Filtering of Link Quality Indicator Values for Position Detection by Using WSNS, Int'l J Computing, Communications Instrumentation Engg (IJCCIE) 2014:1.
25. Panahi P, Bayılmış C, Çavuşoğlu U, Kaçar S. Performance Evaluation of L-Block Algorithm for IoT Applications 2018:609-612.
26. Panahi P, Bayılmış C, Çavuşoğlu U, Kaçar S. Comparing PRESENT and L Block ciphers over IoT Platform, 12th International Conference on Information Security and Cryptology 2019:66-69.
27. Panahi U. Nesnelerin interneti için hafif sıklet kriptoloji algoritmalarınadayalı güvenli haberleşme modeli tasarımı. Sakarya Üniversitesi, Fen Bilimleri Enstitüsü, Sakarya 2022.
28. Koyuncu B, Panahi P, Varlioglu S. Comparative Indoor Localization by using Landmarc and Cricket Systems. Int J Emerging Techno and Advanced Eng 2015; 5(6):453-456.
29. Panahi O. Secure IoT for Healthcare. European J Innovative Studies and Sustainability 2025;1(1):1-5.
30. Omid P, Evil Farrokh E. Beyond the Scalpe: AI, Alternative Medicine and the Future of Personalized Dental Care. J Complement Med Alt Healthcare 2024;13(2):555860.
31. Panahi O, Farrokh S. Ethical Considerations of AI in Implant Dentistry: A Clinical Perspective. J Clin Rev Case Rep 2025;10(2):1-5.