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Expert Review

Methodology for Projecting Future Medical Care Costs: Why Artificial Intelligence Cannot Replace Human Expertise for Individual Patients

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ABSTRACT

Artificial Intelligence (AI) is being increasingly applied across healthcare contexts. It has demonstrated value in reducing administrative burden by automating several tasks. However, while AI can augment healthcare delivery, it is fundamentally limited in its ability to replace the clinical judgment and uniquely human aspects of expertise in healthcare. These limitations are particularly important when projecting future medical care costs for individual patients, as this process requires direct, hands-on patient assessment, evidence-based clinical recommendations, and defensible expert judgment. Here, we discuss the specific limitations of AI in the context of predicting future medical costs for individual patients.

Keywords: AI (Artificial Intelligence); Physical medicine; Physical medicine and rehabilitation; cost; Catastrophic injury

INTRODUCTION

Artificial Intelligence (AI) is impacting every industry worldwide and is raising questions about the consequent evolution of work within those industries. Of particular interest is the specific role that AI may play in physical medicine versus the role of humans and how AI may eventually replace human functions over time [1]. While much of the research has been dedicated to investigating how AI can replace or augment clinical medicine, there is also interest amongst payers, insurers, and litigation specialists as to how AI may transform personal injury medicine, and in particular, how AI may impact the projection of lifetime medical costs of catastrophically injured patients [2-4].

Within the healthcare industry, experimentation with AI has shown that AI models do provide true clinical impact [5]. Nevertheless, sensationalized claims about how AI can outperform clinicians become less shocking once examined more deeply. Specifically, while AI can reduce burden and augment outcomes by performing automated tasks (often more efficiently and potentially more accurately than humans). AI is totally unequipped to render clinical judgments. Thus, experts in AI agree that the future of AI in healthcare involves both human-AI collaboration, also known as Human-AI-Human (H-AI-H) decision-making, rather than a scenario in which AI completely replaces human expertise altogether [6,7].

Herein, we discuss the latest literature on the role of AI in physical medicine and rehabilitation healthcare and how its limitations in clinical care also render it incapable of ever fully replacing human expertise and judgment in projecting future medical care costs for individual patients.

AI may provide task-level automation in healthcare

AI is conducive to replacing effort on highly standardized, data-driven tasks because AI excels at retrieval and pattern recognition and can remember and process large amounts of data in a manner that human brains simply cannot [6,7]. As a result, AI is well positioned to support a range of healthcare functions, including:

Administrative work and documentation: AI can automate routine tasks like scheduling, data entry, and report generation, which can reduce the administrative burden on healthcare

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professionals, though human oversight remains necessary in order to verify accuracy [8].

Data analysis and predictive analytics: AI is proficient in synthesizing massive complex datasets to carry out tasks such as optimizing resource allocation, predicting rates of hospital admissions, and flagging patients at high risk for deterioration of their medical diagnoses [9].

Medical imaging and radiology: Perhaps the closest AI can come to "replacing" healthcare providers is in the context of medical imaging and radiology, as AI can interpret medical images and employ deep learning algorithms to accomplish tasks such as identifying certain lesions and extracting quantitative measurements. Performance in these tasks tends to meet or even exceed human performance in narrowly defined screening contexts [6,7]. Nonetheless, AI is not behaving as an autonomous agent that could replace radiologists and all of their expertise. Instead, certain discrete tasks that once fell under radiologists' purviews may now be offloaded to AI to enhance workflow efficiency, with radiologists still ultimately accountable for outcomes [7].

As scholars have noted while AI will likely increasingly be employed to replace effort on narrowly defined tasks above in order to augment healthcare delivery, the notion of AI replacing human physicians is a false dichotomy that relies on an oversimplified understanding of the practice of physical medicine and rehabilitation.

When it comes to the concept of projecting future healthcare costs, AI has been useful in forecasting costs at a population level [10]. While these advances have raised questions regarding whether AI could replace medical experts, including in the projection of lifetime medical costs for individual patients, AI lacks the nuanced clinical, contextual and individualized reasoning capabilities necessary for this type of prediction [6,11].

Several barriers prevent AI from replacing clinicians

Simply put, AI cannot replace clinicians, whether in the context of clinical or individualized healthcare costs projections, because AI is not a reasoning agent in the way a human is and in the way that effective clinical practice requires [12]. Specific deficiencies of AI that make this clear include that AI:

Lacks clinical judgment: While AI can perform well on standardized medical exams due to its sophisticated pattern matching, this skill is based on statistical correlations that prevent AI from properly evaluating atypical patient presentations, rare diseases, or outliers [12]. Human clinicians with clinical experience are able to seamlessly adapt to these scenarios [7].

Is unable to perform physical examinations: A critical limitation of AI in the clinical setting is its inability to perform a proper physical examination and/or patient observation. While AI has evolved to support surgical procedures, it lacks the complex sensorimotor capabilities and experience of tactile feedback that allows humans to adapt in real time to optimize patient care [6-7].

Is incapable of empathy: As a digital tool, AI cannot replace the emotional connection forged by human healthcare providers [13-15]. As a result, it has been argued that AI use in healthcare risks dehumanizing patients [6].

Misunderstands patient language: Most patients describe their symptoms in everyday language rather than in medical terminology. AI is often imprecise in translating the subjective experience of patients into interpretable clinical data [6].

Hallucinates: Without human oversight, the "hallucinations" that AI generates, whereby AI confidently but falsely provides medical information, diagnoses, or research citations which are fabricated. This places patient safety at risk [7-16].

Inherently lacks accountability: Given that AI is an assistive tool, it cannot be accountable for medical errors. Medicine requires that someone bears the moral and legal responsibilities for clinical decisions, which precludes AI from replacing healthcare providers in this context [7,8].

AI cannot replace humans in projecting future medical costs for individual patients

AI is being used more and more often to help forecast general healthcare spending, with algorithms frequently employed to predict future resource utilization or to classify patients at high risk [10]. However, there are fundamental reasons why AI cannot replace human medical experts in providing accurate projections of future medical costs for individual patients. These reasons operate at three distinct levels: Clinical, methodological, and epistemic to include:

The need for clinical assessment

Defining the cost of future medical care for individual patients requires comprehensive clinical and non-clinical evaluation that AI is structurally incapable of performing [17]. Medical professionals (such as physical medicine specialists) are needed to record patient histories, perform physical examinations and/or patient observation, and assess real-world patient functioning, and given that AI lacks this physical embodiment, it cannot perform these evaluations [6].

The methodology for defining the cost of future medical care requires the physician to collect and review medical records, physically examine and or observe the patient, formulate life expectancy and diagnostic conclusions, develop evidence-based recommendations for future care needs and conduct direct surveys accounting for treating physicians and vendors to obtain geographically specific retail cost data [17]. Each of these steps is grounded in direct patient contact and embodied clinical judgment, neither of which AI is capable of providing [6,7]. The physical examination and/or patient observation alone generates diagnostic information about a patient's real-world functioning, pain behavior, and capacity for activity that cannot be inferred from a claims database or medical review [7,11]. Conclusions, which if needed by other experts such as medical economists for legal resolutions, make it practical and reasonable in that setting.

The specific methodology for cost projections must also be defensible. Expert cost projections in personal injury litigation are subject to Daubert standards for scientific expertise, and the physician must be able to independently defend his/her conclusions under adversarial cross examination. No algorithmic system can be examined, cross-examined, or held professionally accountable for its conclusions. Just as non-physician practitioners who attempt to perform medical cost projections without formal clinical training may face important methodological limitations, AI is similarly limited when used in this context [17].

The algorithmic bias that leads to cost projection errors

AI relies on historical data to predict healthcare costs, which can lead to the conflation of lack of access to healthcare and ultimately the lack of need for healthcare [18]. The results are that those who have not accessed care will be deemed as not needing the extraordinary care. When lack of need results, this may not be the reason for low utilization. For instance, those without access to care will have low utilization but not necessarily low need.

This problem has been empirically documented. One study examined a widely deployed commercial algorithm and found that it systematically underestimated need in patients with equivalent illness burden, precisely because it used historical cost as the outcome measure rather than using a direct measure of the medical condition [18,19]. The algorithm was therefore not adequately capturing health status but instead was simply measuring what had previously been billed for care. For any given plaintiff, such a model cannot distinguish between a patient who needed less care and a patient who received less care when that distinction is warranted.

This type of error is predictable when applying population-level historical cost data to the individualized question of what a specific patient will need for the remainder of their lives.

The lack of transparency and adaptability of AI models

Much of the predictive modeling used by the private sector to forecast healthcare costs relies on proprietary algorithms, limiting the ability of clinicians and researchers to evaluate the assumptions and variables driving model outputs [18]. Consequently, it may be difficult to determine whether projected costs accurately reflect the individualized clinical trajectory and long-term medical needs of a specific patient. This lack of transparency poses a fundamental challenge in litigation, where expert opinions must be explainable, reproducible, and subject to adversarial scrutiny [11].

AI models also have limited ability to adapt and account for the evolving and highly individualized nature of long-term medical care, making them poorly suited for projecting lifetime healthcare costs for individual patients. Predictive models are typically trained on historical datasets and optimized to estimate expenditures over relatively short time horizons. As a result, a model designed to predict healthcare costs over five years may not reliably forecast four decades of care for a patient injured in early adulthood [11,18-20].

Because future medical needs evolve over time and may be influenced by aging, emerging complications, and changes in standards of care, AI-generated projections fail to reflect the individualized clinical trajectory of a specific patient [11,18-21]. These limitations may be particularly consequential in catastrophically injured patients, whose long-term care needs are often highly dynamic and difficult to model reliably. By contrast, physician experts can apply longitudinal clinical judgment, prospectively evaluate changing clinical circumstances, and clearly explain and defend their reasoning before a court [1,11,18].

AI limitations may be the most detrimental when used with catastrophically injured patients

The limitations described above apply to any individual lifetime cost projection, but they converge with particular force in cases involving catastrophic injury. A patient who has sustained a severe spinal cord injury, a traumatic brain injury, or a catastrophic orthopedic injury presents a clinical picture that is simultaneously highly individualized, rapidly evolving, and profoundly difficult to characterize from population-level historical data [11,18-22].

AI performs well on typical cases that are abundantly represented in training data but fails when confronted with rare, atypical, or out-of-distribution presentations [7,12]. Catastrophically injured patients frequently fall into the latter category. Their future care needs may change substantially over time due to aging, delayed complications, evolving standards of care, and variable responses to treatment, limiting the reliability of algorithmic projections based primarily on historical utilization patterns [11,19,21,23].

In personal injury litigation, these projections directly influence the resources available to support an injured patient's future care [11]. Accepted methodology therefore requires qualified physician experts to perform comprehensive clinical rehabilitation evaluations and develop evidence-based recommendations regarding future medical needs, which may then be translated into economic estimates by medical economists [17]. Because this process depends on individualized clinical assessment, methodological transparency, and accountability, AI systems cannot independently replace physician expertise in projecting lifetime healthcare costs for those who have suffered catastrophic injuries [6,7,11].

CONCLUSION

AI is providing significant benefits in healthcare, and its role in medicine is likely to continue to expand. However, as we integrate AI into the healthcare industry, it is critical that we distinguish where AI can augment clinical care and the long-term protection of our patients and where it adds risk and compromises patient outcomes. When it comes to projecting lifetime medical costs for individual patients, AI may be capable of supporting certain fundamental tasks. However, because this type of projection requires clinical judgment and other human

capabilities that evade AI, AI cannot ever replace the clinical expert in this role.

CONFLICTS OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

REFERENCES

1. Ghosh D, Ghosh R, Roy Chowdhury S, Ganguly B. AI-exposure and labour market: A systematic literature review on estimations, validations, and perceptions. Manag Rev Q. 2025;75(1):677-704.
2. Maisog JM, Li W, Xu Y, Hurley B, Shah H, Lemberg R, et al. Using massive health insurance claims data to predict very high-cost claimants: A machine learning approach. ArXiv. 2019;1912:13032.
3. Brati E, Braimllari A, Gjeçi A. Machine Learning Applications for Predicting High-Cost Claims Using Insurance Data. Data. 2025;10(6):90.
4. Zhang W, Shi J, Wang X, Wynn H. AI-powered decision-making in facilitating insurance claim dispute resolution. Ann Oper Res. 2023:1-30.
5. Kelly CJ, Karthikesalingam A, Suleyman M, Corrado G, King D. Key challenges for delivering clinical impact with artificial intelligence. BMC. 2019;17(1):195.
6. Monajemi A. Why is the idea of AI completely replacing physicians a pseudo-problem? A philosophical analysis. J Med Ethics Hist Med. 2025;18:1.
7. Obuchowicz R, Piórkowski A, Nurzyńska K, Obuchowicz B, Strzelecki M, Bielecka M. Will AI Replace Physicians in the Near Future? AI Adoption Barriers in Medicine. Diagnostics. 2026;16(3): 396.
8. Nasef D, Nasef D, Sawiris V, Weinstein B, Garcia J, Toma M. Integrating artificial intelligence in clinical practice, hospital management, and health policy: Literature review. J. Hosp. Manag Health Policy. 2025;9:20.
9. Yelne S, Chaudhary M, Dod K, Sayyad A, Sharma R. Harnessing the power of AI: A comprehensive review of its impact and challenges in nursing science and healthcare. Cureus. 2023;15(11):49252.
10. Huang AW, Haslberger M, Coulibaly N, Galárraga O, Oganisian A, Belbasis L, et al. Multivariable prediction models for health care spending using machine learning: A protocol of a systematic review. Diagn Progn Res. 2022;6(1):4.
11. Lichtblau CH, Pettingill B. Methodology for defining the cost of future medical care. Int J Phys Med Rehabil. 2023;11:682.
12. Kim J, Podlasek A, Shidara K, Liu F, Alaa A, Bernardo D. Limitations of large language models in clinical problem-solving arising from inflexible reasoning. Sci Rep. 2025;15(1):39426.
13. Montemayor C, Halpern J, Fairweather A. In principle obstacles for empathic AI: Why we can't replace human empathy in healthcare. AI Soc. 2022;37(4):1353-1359.
14. Sauerbrei A, Kerasidou A, Lucivero F, Hallowell N. The impact of artificial intelligence on the person-centred, doctor-patient relationship: Some problems and solutions. BMC Med Inform Decis Mak. 2023;23(1):73.
15. Jo HK. Why nursing cannot be replaced with artificial intelligence. Womens Health Nurs. 2024;30(4):340-344.
16. Omar M, Sorin V, Collins JD, Reich D, Freeman R, Gavin N, et al. Large language models are highly vulnerable to adversarial hallucination attacks in clinical decision support: A multi-model assurance analysis. MedRxiv. 2025:03.
17. Lichtblau C, Pettingill B, Cardillo T, Meli G, Warburton C. Costs of future medical care in the United States: The unique contribution of the physiatrist. Int J Phys Med Rehabil. 2019;7(4):519
18. Tan M, Hatef E, Taghipour D, Vyas K, Kharrazi H, Gottlieb L, et al. Including social and behavioral determinants in predictive models: Trends, challenges, and opportunities. JMIR Med Inform. 2020;8(9): 18084.
19. Lee JT, Li VC, Hsu SH, Lu TP, Wang C, Perianayagam A, et al. Correcting Algorithmic Bias in Machine Learning Prediction of Healthcare utilization in India. medRxiv. 2025:2025-2009.
20. Lee JT, Shen TK, Liu VT, Chen TH, Lee CC, Lu C, et al. Costing Methods for Artificial Intelligence: Systematic Review and Recommended Cost Inventory for in Health Technology Assessment. medRxiv. 2025:2025-2010.
21. Kim Y, Jeong H, Chen S, Li SS, Park C, Lu M, et al. Medical hallucinations in foundation models and their impact on healthcare. ArXiv. 2025:2503.05777.
22. Nyam TT, Tu KC, Chen NC, Wang CC, Liu CF, Kuo CL, et al. Predictive modeling of long-term care needs in traumatic brain injury patients using machine learning. Diagnostics. 2024;15(1):20.
23. Hunter OF, Perry F, Salehi M, Bandurski H, Hubbard A, Ball CG, et al. Science fiction or clinical reality: A review of the applications of artificial intelligence along the continuum of trauma care. World J Emerg Surg. 2023;18(1):16.