Artificial Intelligence and the Health Workforce: An Annotated Bibliography

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Overview

There is limited evidence about the ways in which artificial intelligence (AI) affects the health workforce. Given the nascent stage of adoption and integration of AI into health care, most of the identified literature is conceptual and based on consensus or commentary. However, there is valuable information in these early reports and studies. Several themes were identified in a review of this literature:

- **Automation vs. human expertise.** While AI can streamline administrative tasks, there is consensus that humans are indispensable for tasks that involve direct patient interaction and nuanced clinical judgments.
- **Impact on clinical roles and skills.** There is a tension around upskilling vs. deskilling that reflects broader concerns about the evolving nature of clinical work and the need for ongoing professional development to effectively integrate AI. Current studies are largely focused on physicians.
- **Enhancing efficiency and reducing burnout.** There is significant promise in AI's ability to alleviate cognitive and administrative burdens, thus having the potential to address workforce shortages and burnout. However, careful implementation is critical to prevent additional cognitive load and ensure AI tools genuinely support clinicians.
- **Impact on doctor-patient relationships.** Concerns about whether AI will distance patients from their providers highlight the importance of balancing AI for efficacy and maintaining compassionate, person-centered care.
- **Workforce implications and job dynamics.** Potential job displacement and skill shifts urge a collaborative approach to ensure that AI complements rather than replaces human expertise. Training and education are pivotal to preparing the workforce for these changes.

- **Ethical, regulatory, and trust issues.** There are concerns about AI's "black box" nature, potential biases, and the importance of transparency and regulatory oversight to build clinician and patient trust in AI systems.
- **Research to understand the impact of AI** is necessary to ensure sustainable integration into care. Investigation into task suitability for automation, deskilling, and the cognitive burden is needed to inform the training and preparation of health workers. Development of measures to monitor AI's impact on workers is also essential.

While AI holds significant potential to transform health care, its integration must be approached thoughtfully. Balancing automation with human expertise, addressing ethical and regulatory concerns, and ensuring that AI enhances rather than diminishes clinical roles and patient care are essential for realizing AI's benefits in health care.

Background

Since the public release of ChatGPT in November 2022, AI has been adopted across many industries, including health care. While numerous opinion pieces have emerged in response to the growing interest in AI's influence on health care, there remains a paucity of research specifically examining its effects on the health workforce.

This annotated bibliography aims to highlight seminal articles, reports, editorials, and other key pieces of literature that explore AI's impact on the health workforce in a rapidly evolving landscape. It will be updated over time to reflect new developments.

Methods

In January 2025, a PubMed literature search was conducted using the query ("artificial intelligence" AND "health workforce"), filtered for articles published in English within the past five years (January 2020 to January 2025). The search yielded 28 articles, three of which are included here. Citations within these articles were also reviewed to identify additional relevant literature, resulting in the inclusion of three more articles. A review of those citations led to the identification of one additional article; although this article was published before January 2020, it was included in this annotated bibliography due to its relevance and its publication within one year of the search timeframe.

An additional scan was conducted to identify literature produced by organizations such as government agencies, academic institutions, research institutes, nonprofits, and private companies outside of traditional publishing and distribution channels (i.e., grey literature) not captured by the PubMed search. This scan involved reviewing websites and email newsletters from organizations known to produce content on AI in health care. As a result, two more reports were included in the bibliography. An additional report was identified through the Pathfinder Council, the advisory group guiding the research conducted at Policy at Healthforce Center, including this work on AI's impact on the health workforce.

Lastly, in-person events and webinars related to AI in health care were attended for further information gathering. One peer-reviewed article and one grey literature publication were identified through these events and included in the bibliography.

The following inclusion criteria were used to identify literature for this annotated bibliography:

- Published in English between January 2019 and January 2025
- Focused on the United States
- Primarily addressed the impact of AI on the health workforce

Articles or reports that were not specific to the health workforce (i.e., centered on occupations outside of health care) or that did not include elements addressing the health workforce were excluded. A total of 12 pieces of literature are included in this bibliography and summarized below.

Annotated information sources

Peer-reviewed literature

Research studies

Aquino YSJ, Rogers WA, Braunack-Mayer A, et al. Utopia versus dystopia: Professional perspectives on the impact of healthcare artificial intelligence on clinical roles and skills. *Int J Med Inform*. 2023;169:104903. doi:10.1016/j.ijmedinf.2022.104903

This qualitative study of 72 professionals with expertise in AI and/or professional or clinical practice revealed diverse views on the effects of AI and deskilling. Participants shared opinions on which tasks should be automated; however, the authors were unable to determine definitive boundaries between tasks suitable or unsuitable for automation. Participants' views varied depending on the nature of the task and the broader sociotechnical context. The authors identified a cluster of task characteristics that are less suitable for automation, specifically tasks that require or benefit from clinical skills related to communication and care, such as touch, empathy, and physical intimacy. Participants were also divided in their views on AI's impact on clinical skills, with some adopting a utopian perspective (AI leads to clinician upskilling) and others a dystopian one (AI leads to clinician deskilling). The authors highlighted areas for future research, including the potential for deskilling, the identification of tasks suitable for AI-enabled automation, and the underlying values and priorities that influence decision-making.

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. doi:10.1186/s12911-023-02162-y

This literature review examined how AI impacts the doctor-patient relationship and person-centered care. The authors identified three key tensions regarding AI's influence on this relationship: 1) AI's potential to increase patient autonomy versus create a new form of paternalism, 2) whether time saved through AI use will enhance the doctor-patient relationship versus increase patient throughput, and 3) whether "black box" AI will cause harm due to its lack of transparency versus be justified by the health benefits that may result from its accuracy. The review also highlighted two ways in which AI could positively support person-centered doctor-patient relationships: by assisting (rather than replacing) the

role of the doctor and by adapting medical education to ensure that doctors learn how to operate AI tools while also developing humanistic and compassionate care skills (i.e., soft skills).

Editorials

Cutler DM. What artificial intelligence means for health care. *JAMA Health Forum*. 2023;4(7):e232652. doi:10.1001/jamahealthforum.2023.2652

The author of this commentary posited five potential ways in which AI could affect medicine, drawing on theory and experience from other industries:

- *AI will perform rote tasks currently done by humans,* such as billing, appointment scheduling, and facility management. While this could lead to significant financial savings, it will likely result in a gradual reduction in administrative staff positions.
- *AI will complement, rather than replace, clinicians.* This will require clinicians and health systems to learn how to integrate human decision-making with AI tools.
- *AI should enhance the efficiency of care.* For instance, remote monitoring could shift care from high-cost settings (e.g., hospitals, post-acute facilities) to lower-cost alternatives (e.g., home care, step-down observation units).
- *AI should aim to exceed human cognitive processes* to avoid poor, biased, or inconsistent decisions. To achieve this, AI models must be trained on large datasets based on "ground truths" rather than subjective perceptions, so that algorithms do not replicate human errors and biases.
- *AI will excel at some tasks,* such as identifying data patterns and generating hypotheses, but will fall short in others, like hypothesis testing and making causal determinations. Recognizing the limits of AI is essential to its responsible integration into medicine.

Gandhi TK, Classen D, Sinsky CA, et al. How can artificial intelligence decrease cognitive and work burden for front line practitioners? *JAMIA Open*. 2023;6(3):ooad079. doi:10.1093/jamiaopen/ooad079

The article evaluated AI's potential to reduce clinician burnout and improve care by easing the cognitive and workload burden associated with tasks such as data gathering, data synthesis, documentation, and clinical decision-making (e.g., decision support, prediction tools, targeted outreach). The authors emphasized that successful AI implementation requires engagement of both internal stakeholders (clinicians, frontline workers, IT professionals, bioengineers, system redesign experts, and researchers) and external stakeholders [vendors of electronic health records (EHRs), clinical data warehouses, and command centers; patient advocates; and researchers]. Additionally, the article highlighted the need to assess performance and the unintended consequences of AI use, particularly regarding the cognitive burden on health workers. Recommended data sources and monitoring tools include EHR event logs (e.g., total time spent in the EHR), surveys (e.g., NASA Task Load Index, System Usability Scale), and direct observations (e.g., time-motion analysis, eye tracking).

Hazarika I. Artificial intelligence: opportunities and implications for the health workforce. *Int Health*. 2020;12(4):241-245. doi:10.1093/inthealth/ihaa007

The author of this article argued that while AI is unlikely to replace health care providers, it can serve as a cognitive assistant by supporting clinical thinking and decision-making. The author identified five ways in which AI could help address workforce shortages and burnout: increasing productivity, reducing workload, improving performance, enhancing teamwork and collaboration, and boosting job satisfaction. The author also outlined several challenges associated with AI adoption, including professional liability, labor market implications (such as the increased use of less skilled staff), provider competencies, ethical concerns, regulatory compliance, and potential effects on the provider-patient relationship.

Langlotz CP. Will artificial intelligence replace radiologists? *Radiol Artif Intell*. 2019;1(3):e190058. doi:10.1148/ryai.2019190058

This commentary opined that fears of AI replacing radiologists are overstated and cited several historical examples in which the promise of technological advancements was exaggerated. The author described how the initial excitement around computer-aided detection for mammography ultimately led to high false-positive rates and "no appreciable effect on the accuracy of radiologists." Similarly, concerns that MRI would replace radiologists were dispelled once it became clear that radiologists are essential for MRI configuration, operation, and image interpretation. The author also referenced other professions affected by AI (bank tellers and pilots) to illustrate how technology has often transformed, rather than eliminated, these roles by advancing their scope and responsibilities. The author stated that the same will hold true for radiologists, suggesting that AI "will elevate the cognitive universe of radiologists to the top of their license," and that human-machine collaboration will continue to outperform either humans or machines alone.

Le Lagadec D, Kornhaber R, Cleary M. Navigating the impact of artificial intelligence on our healthcare workforce. *J Clin Nurs*. 2024;33(7):2369-2370. doi:10.1111/jocn.17191

This editorial identified current uses of AI in health care (e.g., screening, diagnostics, treatment planning, surgery, patient care, education, and research) and highlighted positive workforce implications of this AI use, including increased work efficiency; streamlined processes; and the ability to quickly, accurately, and cost-effectively analyze large datasets. The article focused on potential negative effects of AI on workers, such as deskilling (loss of skills after task automation), loss of autonomy, increased reliance on AI leading to complacency, and the risk of developing a "completion mentality" (prioritizing form completion over patient-centered care).To mitigate these risks, the author recommended education and training for health workers, the implementation of supportive policies, and the use of disclosures and safeguards to protect privacy.

Pavuluri S, Sangal R, Sather J, Taylor RA. Balancing act: The complex role of artificial intelligence in addressing burnout and healthcare workforce dynamics. *BMJ Health Care Inform*. 2024;31(1):e101120. doi:10.1136/bmjhci-2024-101120

This article explored AI's potential to reduce clinician burnout by decreasing both administrative and cognitive burdens. Potential solutions for administrative burdens include digital scribes, chatbots, and other tools (e.g., generative AI, Microsoft Copilot, and text auto-completion) to manage clinician

inboxes, enhance digital health communication, and streamline billing systems. Suggested solutions to reduce cognitive burdens include synthesizing large volumes of data (e.g., generating discharge summaries), providing diagnostic support to improve clinical efficiency and accuracy (e.g., in dermatology and pathology), and using forecasting tools for early detection of deterioration of clinical status. The authors also highlighted risks associated with AI, including deskilling, overreliance on AI, overburdening clinicians with complex cases, alienation between patients and providers, job displacement, and the potential to worsen existing health inequities.

Grey literature

The Center for Artificial Intelligence & the Future of Work. The AI-Ready Workforce: How Leaders and Workers Can Prepare for a Reshaped Future of Work. Accessed January 29, 2025. https://info.jff.org/ai-ready

This report provided a framework and industry-specific profiles, including one for health care, to assess AI's impact on jobs. It posited that AI's effect will depend on whether it increases or decreases the need for particular skills or tasks (across five levels of AI impact) and how critical those tasks and skills are to a given occupation or industry. The report found that across the industries analyzed, human and interpersonal tasks and skills remain highly valued, with nearly 80% of jobs indicating these skills are important or very important, suggesting that many roles may be resilient to AI-driven disruption. The report concluded with a series of recommendations and key strategies for policy leaders, employers, and postsecondary institutions, organized across three levels of preparation: preparing humans, preparing institutions, and preparing ecosystems.

Gondi S, Shah T. Fulfilling the promise of AI to reduce clinician burnout. February 13, 2025. Accessed March 3, 2025. doi:10.1377/forefront.20250210.120366

This commentary categorizes clinician-facing uses of AI as assisting with, augmenting, or automating tasks, each of which has the potential to reduce clinician workload and mitigate burnout. However, the authors cautioned that AI tools could have the opposite effect by increasing clinicians' cognitive load if the human-technology interface is not thoughtfully designed. The authors proposed a set of guiding principles to prevent AI from exacerbating cognitive strain or fostering unrealistic expectations of its capabilities. They also suggested measuring clinician experience, cognitive load, and burnout using validated surveys, objective metrics (e.g., pupillometry, heart rate), and EHR data.

How physicians are using AI, in 5 charts. February 17, 2025. Accessed March 3, 2025. https://www.advisory.com/daily-briefing/2025/02/17/ai-use

This blog presented findings from the American Medical Association's November 2024 survey on physicians' attitudes toward AI. The results showed that most respondents were using AI in some capacity. Top use cases included documentation (e.g., billing, charting, visit notes) and the creation of care plans, discharge instructions, and progress notes. Respondents identified AI's greatest potential in reducing administrative burdens, and most agreed that AI offers at least some benefit to patient care. However, many also expressed a lack of trust in the technology. Respondents shared opinions on which regulatory actions could build trust in AI and which attributes might support broader adoption.

Reddy S. The impact of AI on the healthcare workforce: Balancing opportunities and challenges | HIMSS. April 11, 2024. Accessed May 15, 2025. https://gkc.himss.org/resources/impact-ai-healthcare-workforce-balancing-opportunities-and-challenges

This commentary explored current challenges facing the health workforce and the various ways in which AI might help address them. Specifically, AI has the potential to streamline administrative tasks, enhance diagnostic accuracy, improve treatment planning, and expand access to telemedicine. However, the adoption of AI also presents challenges that must be addressed, including job displacement, shifts in required skills, overreliance on technology, and ethical concerns. The author argued that these potential negative impacts should be mitigated through a commitment by health care professionals to collaborate with AI systems, ensuring that such technologies enhance rather than replace human expertise.

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