COMMENTARY

Family Medicine Must Prepare for Artificial Intelligence

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Artificial Intelligence (AI) is poised to revolutionize family medicine, offering a transformative approach to achieving the Quintuple Aim. This article examines the imperative for family medicine to adapt to the rapidly evolving field of AI, with an emphasis on its integration in clinical practice. AI's recent advancements have the potential to significantly transform health care. We argue for the proactive engagement of family medicine in directing AI technologies toward enhancing the "Quintuple Aim." The article highlights potential benefits of AI, such as improved patient outcomes through enhanced diagnostic tools, clinician well-being through reduced administrative burdens, and the promotion of health equity by analyzing diverse data sets. However, we also acknowledge the risks associated with AI, including the potential for automation to diverge from patient-centered care and exacerbate health care disparities. Our recommendations stress the need for family medicine education to incorporate AI literacy, the development of a collaborative for AI integration, and the establishment of guidelines and standards through interdisciplinary cooperation. We conclude that although AI poses challenges, its responsible and ethical implementation can revolutionize family medicine, optimizing patient care and enhancing the role of clinicians in a technology-driven future. (J Am Board Fam Med 2024;37:520–524.)

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Artificial intelligence (AI) refers to the capacity of human-made information-processing systems to adapt to environments despite limited knowledge and resources.^{1,2} AI systems often exhibit features reminiscent of biological (human) intelligence: abstraction, logical inference, and inductive reasoning. Rapid developments in AI are ongoing due to revolutionary advances in machine learning (ML), which encompasses statistical approaches to performing complex curve-fitting using large datasets.

The most promising recent developments in machine learning have been enabled by theoretical breakthroughs in use of artificial neural networks such as deep learning and transformer architectures. Recently, deep learning and transformer architectures have been applied to human languages, resulting in the creation of large language models (LLMs, eg, OpenAI's ChatGPT, Google's Gemini, and Meta's Llama) which can convincingly produce human-like text. Experts in AI have predicted that AI – coupled with other forthcoming technologies – will drive major transformative change throughout society. These changes may be more rapid that is commonly understood by family physicians. New techniques (eg, retrieval-augmented generation, "RAG") are being

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developed to ground LLM responses on expert-curated, evidence-based datasets. It seems likely that within the next few years EHRs will use RAG-guided LLMs to provide real-time, "copilot"-like, point-ofcare decision support to clinicians.

Family medicine must adapt - and adapt rapidly if we are to proactively direct this technology within health care, rather than simply be swept away as it is imposed on us by outside forces. We propose that family medicine physicians advocate for, and conduct new research on, using AI to support the "Quintuple Aim." In health care the Quintuple Aim has evolved to prioritize solutions which target (1) patient experience, (2) outcomes, (3) lower costs, (4) clinician wellbeing and (5) health equity. Here, we discuss the potential benefits, risks, and relevant applied research areas that are urgently needed for family medicine to adapt to the coming AI revolution. In each of the following paragraphs, we articulate potential positive impacts that AI could have. Each of these need transdisciplinary research to ascertain the actual impact, both positive and negative, as well as the costs and implementation opportunities and barriers. Finally, we offer specific recommendations for infrastructure and capacity building needed to meet these challenges.

Improving Patient Outcomes

Consider a family physician navigating the case of Jose during a follow up visit, a patient recently admitted for myocardial infarction with several comorbidities. The physician must grapple with information gathering, reviewing records, reconciling medication, examining the patient, note writing, and coding, all while striving for precise diagnoses and, of course, a connection that builds trust and relationship. AI-integrated diagnostic tools can aid by processing datasets, like summarizing the imported record of a hospital admission. AI information extraction can process consultant recommendations and the details of medications to update them in the EHR. Improving access, gathering and organization of information to support the diagnostic process has shown measurable clinical³ impact only expected to improve with enhancements via AI. AI assistance with such cognitive and administrative tasks could free up the family physician to listen carefully, make more consistent eye contact than is currently possible with EHR tasks and therefore help restore the traditional relationship and trust that is the essence of family medicine.

Clinical Decision Support Systems (CDSS) are mostly known to physicians as drug-drug interaction and allergy alerts. However, enhancing CDSS with AI can enhance diagnostic accuracy and treatment decisions, leading to better patient outcomes. CDSS have shown the ability to guide physicians on evidence-based medicine.⁴ For example, ensuring Jose's high-intensity statin therapy was not lost in the transition out of the hospital around after his myocardial infarction.

Beyond decision support, AI can predict patients at risk from chronic health conditions, potentially saving Jose's hospitalization by identifying him as a patient who needs closer follow up on hypertension or diabetes control. Having information about prognostic risk at a regular checkup would enable early intervention and preventive care. Aligned with teledermatology,⁵ automated image recognition and analysis will support his family physician in diagnosing and tracking Jose's rash as a drug reaction related to one of his new medications.

Enhancing Patient Experience

After discharge, Jose needs remote monitoring to follow up on his new heart failure with reduced ejection fraction. Telemedicine with virtual health assistants powered by AI will improve his access to care and streamline the health care experience. In addition to automatically logging information from cardiac telemetry into the EHR and alerting his physicians about abnormal results, Jose would be able to connect with his health care team from home with his safety at the forefront. AI-driven chatbots and virtual assistants are now able to engage patients, provide health education, offer medication reminders, and have been shown to broadly support access to health assessment and triage.⁶

Supporting Clinician Well-Being

The scarcity of time can limit the depth of patient interactions, potentially leading to incomplete assessments and hurried decision making. Physicians now spend a significant amount of time using the computer,⁷ thereby allotting less time⁸ with Jose to work through all his concerns and each of his conditions. The deluge of medical data compounds this issue, overwhelming physicians and increasing the risk of oversight, particularly in primary care. The computer in the examination room has become the focus, to

the detriment to the doctor-patient relationship.⁹ Confidence and trust can then be compromised, the capacity to listen carefully potentially diminished, the opportunity to show compassion and empathy often lost. These deficiencies negatively impact outcomes and satisfaction. Introducing AI holds promise in alleviating these challenges, but only if we are practice in its utilization.

Natural Language Processing (NLP) is a subspace of AI that elevates the level of current dictation software. This AI-driven work will automate documentation, and order placement, reducing paperwork and administrative burdens on family physicians by listening in. This would allow physicians to enter the examination room and devote their time to patient care, as if a scribe is present in the room with them, placing orders, referrals, and documenting the conversation. One example of AI automation is intended to facilitate ambient data collection and reduce not only documentation burden but also support physician well-being by reducing clerical data entry.¹⁰

More data can bring about greater burden on the provider, but with appropriate delineation and teambased approaches, physicians will leverage AI algorithms to help tailor treatment plans, potentially reducing stress and burnout by offering effective strategies. Care gaps and tasks lost from past notes would be addressed. Data integration from external sources will be summarized for the family physician, where interoperability and advancements in HIE can purposefully assist with efficiency of care.^{8,11} If AI can alleviate cognitive load, and thereby alleviate administrative burden, we believe physicians are more likely to find balance and workload optimization.

Health Equity

AI in family medicine can significantly enhance health equity by analyzing data to identify disparities in health outcomes. It enables tailored approaches for diverse populations and extends health care access to underserved communities through AI-driven telemedicine. AI can also assist in overcoming language and cultural barriers, making health care more inclusive and equitable.

Reducing Costs

AI integration in family medicine can lead to substantial cost reductions. By streamlining diagnosis and treatment planning, AI could minimize unnecessary procedures, saving resources. It also automates administrative tasks like scheduling and billing, reducing overhead costs. In addition, AI's predictive capabilities in early disease detection could lower longterm chronic disease treatment costs, resulting in more efficient and cost-effective health care delivery.

Risks of AI: The broader risks of disruption and threat of AI are well described in many sources. There are definite risks of automation without monitoring in the family medicine setting just like there are risks of having trainees making decisions without the oversight of attending physicians. In the same way, adoption of AI tools will help train them to their potential. Perhaps the greatest risk is that AI will move care further away from the quintuple aim. Furthermore, health systems may expect family physicians to see even larger numbers of patients thereby foregoing the potential benefits of more attention to the relational aspects of care or use AI to replace family physicians altogether.

Our Recommendations

The future generation of family medicine physicians must be well-versed in AI's capabilities and limitations. To ensure that physicians are capable of optimizing the use of this technology while meeting both expectations of their patients and practice administration, proficiency in using in AI is critical. Further education in the principles of clinical informatics offers a roadmap for physicians to delve further into AI applied to clinical practice.^{12,13} We are calling for medical schools and residencies to adjust their curricula to include AI, interpreting AI-generated insights and making informed decisions based on evidence-based, validated algorithmic outputs.

Translating AI's promise into reality requires a unified effort that transcends individual practices. Using the tenets of the learning health care system,¹⁴ we suggest establishing a central family medicine community surrounding AI. Imagine a Practice-Based Research Network (PBRN)-like community, where family medicine practitioners, educators, and researchers collaborate seamlessly. This network becomes a crucible for testing, refining, evaluating and implementing AI-driven tools, ensuring they align with real-world health care scenarios and desirable outcomes. Within this ecosystem, the establishment of a centralized center could be pivotal. This center would serve as a hub for AI implementation, offering standardized protocols, best practices, and a repository of validated AI applications. AI engaged practice implementations can be harnessed, worked out and disseminated to family physicians. Together, the PBRN and Innovation Center form the backbone of an integrated AI ecosystem, harnessing collective wisdom for improved patient care.

The integration of AI must transcend disciplinary boundaries. It calls for the engagement of all "teams" - clinicians, educators, researchers, administrators, and national organizations. These stakeholders converge to collaboratively develop AI guidelines and standards. Physicians can exchange insights with educators about AI's practical implications in medical training. Researchers can align their investigations to address pertinent clinical questions, bolstered by AI-powered analytics. Administrators and national organizations can provide the necessary infrastructure and advocacy, creating an ecosystem conducive to AI's integration.

To make this happen, we encourage leadership and financial support from the national associations, including AAFP (American Academy of Family Physicians), ABFM (American Board of Family Medicine), STFM (Society of Teachers of Family Medicine), ADFM (Association of Departments of Family Medicine), NAPCRG (North American Primary Care Research Group), and AFMRD (Association of Family Medicine Residency Directors). These steps would facilitate collaborative efforts between physicians, technology experts, and policy makers to develop and implement AI and identify research gaps.

Conclusion

As AI redefines practice, collaboration must be prioritized. By dismantling silos, engaging diverse stakeholders, nurturing AI literacy, and upholding ethical standards, family medicine is poised to harness AI's potential. The envisioned AI-focused PBRN and Innovation Center for Family Medicine provide guiding pillars, steering family medicine toward an AI-integrated future that optimizes patient health, patient experience, physician experience, medical education, and research.

The Quintuple Aim will be redefined. From AIdriven diagnostic support to personalized treatment plans and predictive analytics as well as assistance with administrative tasks, family medicine stands at the precipice of a new era that positions primary care rightfully as the centerpiece of health care delivery.

We believe that AI-driven tools can assist in routine tasks, which in turn enables clinicians to concentrate on nuanced diagnoses and patient interactions. Just as autopilot systems do not replace pilots but enhance their abilities, AI does not replace family medicine physicians but empowers them to provide optimal patient care. The use of AI in primary care also heralds the reduction of costs through both the enhancement of preventive medicine and the reduction of administrative burden. As AI gains prominence, we must incorporate an antidiscrimination lens with AI through the detection and prevention of biased data. In addition, systems interacting with patient data must adhere to rigorous standards of ethics and HIPAA compliance.

This transformation necessitates a concerted. collaborative effort to realize AI's benefits and address the challenges it brings. Ongoing, timely research will uncover new possibilities and refine existing approaches. Responsible implementation, guided by transparent guidelines and patient-centric values, ensures that AI remains a tool that empowers clinicians while maintaining the fundamental human connection that defines family medicine. Through continuous research, collaboration, and ethical implementation, family medicine can harness AI's benefits while upholding its commitment to compassionate and comprehensive patient care. Not only will clinicians benefit from AI's potential, but patients like Jose will experience a level of care that has not yet been possible, all in the context of his relationship with his family medicine doctor.

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