What Are the Training Needs for Clinicians Using AI Systems?

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Abstract

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Introduction

The integration of Artificial Intelligence (AI) into the healthcare sector is not a distant prospect but a contemporary reality, fundamentally reshaping clinical practice and health management. This technological revolution presents both a profound opportunity and an urgent challenge to health professions education. The foundational philosophy of this guide is the principle of augmented intelligence, which posits that AI should serve to supplement, not supplant, the human clinician. The human mind is inherently limited in its capacity to process the vast and ever-growing sea of medical information. AI provides the means to manage this complexity, augmenting the clinician's cognitive capabilities and freeing them to focus on the uniquely human aspects of care: empathy, nuanced communication, and holistic patient understanding [1]. To this end, health professions education is faced with a dual mandate: training clinicians *in* AI and leveraging AI *in* training. This article delves into the essential training needs for clinicians to navigate this new AI-integrated landscape effectively and ethically, drawing upon the latest academic research and expert consensus.

The Tiers of Medical AI Expertise

A one-size-fits-all approach to AI training is insufficient for the diverse roles within the healthcare ecosystem. Consequently, a tiered model of medical AI expertise has been proposed to tailor education to the specific needs of different healthcare professionals [2]. This framework categorizes AI competency into three distinct levels:

| Tier | Definition | Key Skills | | :--- | :--- | :--- | | **Basic Skills** | The practical ability to use appropriate AI tools based on the clinical context and specialty. | Understanding the functionality of specific AI tools, interpreting their outputs, and recognizing their limitations within a given workflow. | | **Proficient Skills** | The ability to critically assess the utility of AI tools and their outputs, as well as the ethical implications of integrating AI in medicine. | Evaluating the evidence base for AI tools, identifying potential biases in algorithms, and navigating the ethical and legal responsibilities associated with AI-assisted care. | | **Expert Skills** | A deep technical understanding of AI and machine learning combined with clinical expertise, resulting in the ability to drive change and innovation. | Collaborating with data scientists to develop new AI solutions, leading research on the clinical application of AI, and shaping institutional and national policies on AI in healthcare. |

While every clinician should possess basic skills, the growing consensus is that proficient-level expertise is becoming a prerequisite for the safe and effective use of AI in clinical practice. This proficiency empowers clinicians to be not just end-users of technology, but also critical evaluators and ethical stewards of its application [2].

Core Competency Domains for the AI-Enabled Clinician

Leading medical organizations and researchers have outlined a set of core competency domains that must be integrated into health professions education to prepare a future-ready clinical workforce [3]. These domains extend beyond mere technical proficiency to encompass a holistic understanding of AI's role in the complex clinical environment.

1. Foundational Knowledge of AI: Clinicians must possess a fundamental understanding of AI, machine learning, and data science concepts. This does not necessitate coding skills, but rather a conceptual grasp of how algorithms are trained, how data quality and representativeness impact AI outputs, and how to apply basic statistical principles to interpret AI-generated results. **2. Data Literacy and Management:** In the age of AI, data is the new lifeblood of medicine. Clinicians must be trained in the principles of data stewardship, including data privacy, security, and the ethical implications of data collection and use. They must also be acutely aware of how factors such as data source, quality, and representativeness can introduce and amplify bias in AI models. **3. AI-Enhanced Clinical Encounters:** The clinical encounter itself is being transformed by AI. Training must equip clinicians to seamlessly integrate AI-generated insights into patient-centered care plans. This includes exercising sound clinical judgment when applying AI recommendations and developing enhanced communication skills to explain concepts of risk and uncertainty related to AI outputs to patients and their families. **4. Evidence-Based Evaluation of AI-Based Tools:** A cornerstone of modern medical practice is evidence-based medicine, and the same rigor must be applied to AI. Clinicians must be able to critically evaluate the quality, accuracy, safety, and contextual appropriateness of AI-based tools. This involves scrutinizing the evidence base, understanding the sources and representativeness of training data, and recognizing the boundary conditions and limitations of the algorithms. **5. Workflow and Team Collaboration:** The integration of AI inevitably leads to

changes in clinical workflows and team dynamics. Clinicians must be prepared to adapt to these new realities and collaborate effectively with a new set of colleagues, including data scientists, informaticians, and AI ethicists. **6. Ethical, Legal, and Social Implications (ELSI):** Perhaps the most critical competency domain, ELSI requires clinicians to understand the broader societal context in which AI operates. They must be able to identify and mitigate personal and structural biases that can be amplified by AI, understand their primary professional and legal responsibility for all patient care decisions, and advocate for the development of fair, equitable, and just AI systems.

A New Core Competency: AI Prompting Skills

The emergence of powerful generative AI tools, particularly large language models, has introduced a new and essential skill for clinicians: AI prompting literacy. The quality and reliability of AI outputs are heavily dependent on the quality of the prompts provided by the user. Therefore, health professions curricula must now incorporate specific training on AI prompting techniques. This includes hands-on practice with medical AI tools, case-based learning scenarios where students can practice crafting effective prompts for different clinical situations, and the critical evaluation of AI responses [3].

The Path Forward: Challenges and Opportunities

Integrating these comprehensive training needs into already packed health professions curricula presents a significant challenge. It will require a paradigm shift in medical education, moving away from a focus on rote memorization and toward the development of skills in knowledge navigation, critical appraisal, and data-informed decision-making [2]. Continuing professional development programs will be essential for upskilling the existing workforce. The ultimate goal is to foster a culture of lifelong learning, where clinicians are empowered to adapt to the rapid pace of technological change and to harness the power of AI to improve patient outcomes.

Conclusion

The integration of AI into healthcare is not a matter of if, but when and how. To ensure that this transformation is a positive one, we must invest in the education and training of our clinical workforce. By developing a structured, multi-tiered training approach that encompasses foundational knowledge, core competencies, and the practical skills of AI prompting, we can equip clinicians to not only use these powerful new tools but to lead their responsible and ethical integration into the very fabric of patient care. The objective is clear: to augment the capabilities of human clinicians, ensuring that technology serves the ultimate goal of improving human health and well-being.

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