With Great Power Comes Great Responsibility: AI and Its Future in Medical Education

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Abstract
NA

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With Great Power Comes Great Responsibility: AI and Its Future in Medical Education
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Introduction
The recent widescale availability of artificial intelligence (AI)-powered chatbots has significant implications in the medical field. Multiple developers have created large language models (LLM) such as PaLM 2 and LlaMA, that can interact with human users through chatbots. For the most part, their user interface is similar, but they utilize different frameworks for data acquisition and interpretation. Much like the human brain, these frameworks use structures called neural networks to analyze data and find patterns which allows these chatbots to sound and behave like humans. ChatGPT, one example of a chatbot, has demonstrated the ability to pass the United States Medical Licensing Exams (USMLEs) and holds the potential for integration in medical education and clinical practice in the future. AI-assisted medical education marks a new landmark in the evolution of information accessibility, and medical schools should prepare for its widespread use and potential for misuse.

Pre-AI Medical Education
Medical education has evolved over the decades from print-based literature as a primary reference, to readily accessible information via the internet. Wikipedia and Google are two prominent examples of how the internet has radically changed the way that students at all levels obtain information, not only published in peer-reviewed sources, but also self-published material. Research that previously required travel to the library and hours of searching could now be conducted from the comfort of home or a coffee shop. Many individuals felt, appropriately, that this new wealth of online information was not only efficient but also seemingly accurate information and are undergoing constant iterative changes to evolve and improve their accuracy. The ability to personalize education catered to an individual’s learning style to enhance understanding presents a unique opportunity for the future of medical education. AI has the potential to identify trends in learning and adapt the curriculum to strengthen weaknesses. Learners could have “on-demand” office hours, asking clarifying questions about complicated disease entities or how to interpret certain blood tests in real time – as opposed to waiting for a professor’s office hours or email response (Figure 1). AI generated imaging software (such as DALL-E, OpenAI) has the potential to help generate infographics for more visual learners.

Post-AI Medical Education
AI powered chatbots such as Google Bard, Bing Chat, or ChatGPT can rapidly generate seemingly accurate information and are undergoing constant iterative changes to evolve and improve their accuracy. The ability to personalize education catered to an individual’s learning style to enhance understanding presents a unique opportunity for the future of medical education. AI has the potential to identify trends in learning and adapt the curriculum to strengthen weaknesses. Learners could have “on-demand” office hours, asking clarifying questions about complicated disease entities or how to interpret certain blood tests in real time – as opposed to waiting for a professor’s office hours or email response (Figure 1). AI generated imaging software (such as DALL-E, OpenAI) has the potential to help generate infographics for more visual learners.

AI augmented education need not be limited to the classroom. One future application of this technology will be through e-Learning integration. AI can develop clinical scenarios that would better mimic true clinical practice than case studies due to the adaptive and realistic feedback based on learner response. Skills that are classically difficult to adopt or measure (such as emotional intelligence, teamwork, bedside manner) would improve through AI-augmented e-Learning platforms. However, there are significant limitations and concerns in integrating AI into medical education. At this point in time, for most medical educators, there is an absence of understanding of the availability as well as the actual capabilities and downsides of this technology, limiting implementation. For example, AI is designed to limit “I don’t know” responses and will create a plausible response to answer a query, even if this is inaccurate. AI at times does provide incorrect information and even provides fake references. Another limitation is the time, energy, and cost of onboarding staff who understand this technology and how it would be implemented effectively. Lastly, legal issues regarding ownership of educational material and what is acceptable as curriculum is also an area that needs to be clarified. In the realm of scholarly activity, given the ease of rapidly synthesizing information by chatbots, AI software has already been utilized in the publication of scientific manuscripts and pass peer-review. However, these chatbots also have the potential to be used as scientific ghostwriters and we believe that without appropriate disclosure and transparency there is a significant risk of plagiarism. As a result, there will need to be a greater emphasis in medical education on critical analysis of journal articles and avoidance of predatory journals.

Conclusion
At this time, AI is too convenient to fade away and it will impact every industry that uses computer technology. The potential benefits to education are exciting, but awareness of negative consequences is crucial. AI integration and responsibility are important and require thoughtful consideration. Teachers and curriculum designers have a responsibility to educate themselves on this technology, as learners will be using it and should avoid harmful practice patterns in terms of use of AI (continuously delegating meaningful work to AI such as small group assignments, presentation preparation). Programs need to be prepared to combat AI hallucinations, defined as unsubstantiated information given under the guise of fact. In addition, we do not currently have the ability to accurately validate what is AI generated, and in fact, have seen false positives where non-AI generated material was flagged as AI-generated. These could have significant negative implications for clinical understanding and practice. From a residency application standpoint, stratifying applicants into programs based on publications may need to be evaluated as it is difficult to understand or know the input of AI versus the authors. These are just a few important areas of concern.

Although AI cannot yet manage a patient, it will have an impact on how a future physician studies, acquires new skills, conducts research, and makes clinical decisions. Medical education must prioritize strategies to ensure that AI’s impact is a positive one. As a great man once wrote, “with great power there must also come great responsibility.”
AI was not utilized in the drafting or writing of this article.

**Conflicts of Interest**
The authors report no conflicts of interest with the subject matter of this manuscript.

**References**


**Figure 1.** Question and answer regarding hyperaldosteronism with a chatbot.