

FROM THE EDITOR

Ethical Dimensions of Using Artificial Intelligence in Health Care

Michael J. Rigby

An artificially intelligent computer program can now diagnose skin cancer more accurately than a board-certified dermatologist.¹ Better yet, the program can do it faster and more efficiently, requiring a training data set rather than a decade of expensive and labor-intensive medical education. While it might appear that it is only a matter of time before physicians are rendered obsolete by this type of technology, a closer look at the role this technology can play in the delivery of health care is warranted to appreciate its current strengths, limitations, and ethical complexities.

Artificial intelligence (AI), which includes the fields of machine learning, natural language processing, and robotics, can be applied to almost any field in medicine,² and its potential contributions to biomedical research, medical education, and delivery of health care seem limitless. With its robust ability to integrate and learn from large sets of clinical data, AI can serve roles in diagnosis,³ clinical decision making,⁴ and personalized medicine.⁵ For example, AI-based diagnostic algorithms applied to mammograms are assisting in the detection of breast cancer, serving as a “second opinion” for radiologists.⁶ In addition, advanced virtual human avatars are capable of engaging in meaningful conversations, which has implications for the diagnosis and treatment of psychiatric disease.⁷ AI applications also extend into the physical realm with robotic prostheses, physical task support systems, and mobile manipulators assisting in the delivery of telemedicine.⁸

Nonetheless, this powerful technology creates a novel set of ethical challenges that must be identified and mitigated since AI technology has tremendous capability to threaten patient preference, safety, and privacy. However, current policy and ethical guidelines for AI technology are lagging behind the progress AI has made in the health care field. While some efforts to engage in these ethical conversations have emerged,⁹⁻¹¹ the medical community remains ill informed of the ethical complexities that budding AI technology can introduce. Accordingly, a rich discussion awaits that would greatly benefit from physician input, as physicians will likely be interfacing with AI in their daily practice in the near future.

This theme issue of the *AMA Journal of Ethics* aims to tackle some of the ethical dilemmas that arise when AI technology is used in health care and medical education. Some of the most exigent concerns raised in this issue include addressing the added risk to patient

privacy and confidentiality, parsing out the boundaries between the physician's and machine's role in patient care, and adjusting the education of future physicians to proactively confront the imminent changes in the practice of medicine. Additionally, dialogue on these concerns will improve physician and patient understanding of the role AI can play in health care, helping stakeholders to develop a realistic sense of what AI can and cannot do. Finally, anticipating potential ethical pitfalls, identifying possible solutions, and offering policy recommendations will be of benefit to physicians adopting AI technology in their practice as well as the patients who receive their care.

One major theme to be addressed in this issue is how to balance the benefits and risks of AI technology. There is benefit to swiftly integrating AI technology into the health care system, as AI poses the opportunity to improve the efficiency of health care delivery and quality of patient care. However, there is a need to minimize ethical risks of AI implementation—which can include threats to privacy and confidentiality, informed consent, and patient autonomy—and to consider *how* AI is to be integrated in clinical practice. Stakeholders should be encouraged to be flexible in incorporating AI technology, most likely as a complementary tool and not a replacement for a physician. In their commentary on a case of implementing an artificially intelligent computer algorithm into a physician's workflow, Michael Anderson and Susan Leigh Anderson emphasize the importance of user technical expertise in [interpreting AI-guided test results](#) and identify potential ethical dilemmas. In a similar case regarding the use of [IBM Watson™](#) as a clinical decision support tool, David D. Luxton outlines benefits, limitations, and precautions in using such a tool. Furthermore, in an empirical study, Irene Y. Chen, Peter Szolovits, and Marzyeh Ghassemi demonstrate that machine learning algorithms might not provide equally accurate predictions of outcomes across [race, gender, or socioeconomic status](#). Finally, in responding to a case that considers the use of an artificially intelligent robot during surgery, Daniel Schiff and Jason Borenstein affirm the importance of proper [informed consent](#) and responsible use of AI technology, stressing that the potential harms related to the use of AI technology must be transparent to all involved.

A second major theme in this issue revolves around the role AI can play in medical education, both in preparing future physicians for a career integrating AI and in directly using AI technology in the education of medical students. Steven A. Wartman and C. Donald Combs contend that, given the rise of AI, [medical education should be reframed](#) from a focus on knowledge recall to a focus on training students to interact with and manage artificially intelligent machines; this reframing would also require diligent attention to the ethical and clinical complexities that arise among patients, caregivers, and machines. In a related article, C. Donald Combs and P. Ford Combs explore the use of artificially intelligent, [virtual patients](#) (VPs) in medical education. With their exciting applications in teaching medical history taking, such as in psychiatric intake evaluation, VPs offer a readily accessible platform with several benefits over traditional

standardized patients; however, the disadvantages and shortcomings are equally important, emphasizing the need for clarity about the role of VPs in medical education.

A final theme addressed in this issue elucidates the legal and health policy conflicts that arise with the use of AI in health care. Hannah R. Sullivan and Scott J. Schweikart unveil [legal issues](#) such as medical malpractice and product liability that arise with the use of “black-box” algorithms because users cannot provide a logical explanation of how the algorithm arrived at its given output. Additionally, Nicole Martinez-Martin uncovers a policy gap governing the protection of patient photographic images as they apply to [facial recognition technology](#), which could threaten proper informed consent, reporting of incidental findings, and data security. Finally, Elliott Crigger and Christopher Khoury report on the American Medical Association’s recent adoption of [policy on AI in health care](#), which calls for the development of thoughtfully designed, high-quality, and clinically validated AI technology, which can serve as a prototypical policy for the medical system.

There is no doubt that AI will have widespread ramifications that revolutionize the practice of medicine, transforming the patient experience and physicians’ daily routines. The use of AI in health care can even extend into unexpected areas such as artistic practice, as investigated by Sam Anderson-Ramos, with new [dilemmas](#) emerging from the rise of thinking machines in previously human pursuits. Additionally, Elisabeth Miller visually depicts the potential impact of AI on [mechanized human bodies](#). Nonetheless, there is much work to do in order to lay down the proper ethical foundation for using AI technology safely and effectively in health care. This theme issue of the *AMA Journal of Ethics* intends to provide such a foundation with an in-depth view of the AI-induced complexities of black-box medicine, exploring patient privacy and autonomy, medical education, and more. Ultimately, patients will still be treated by physicians no matter how much AI changes the delivery of care, and there will always be a human element in the practice of medicine.

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