LETTER TO THE EDITOR
Response to "Emerging Roles of Virtual Patients in the Age of AI"
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We appreciate the *AMA Journal of Ethics'* forward-looking issue on artificial intelligence (AI), and we select ideas in C. Donald Combs and P. Ford Combs' article, "Emerging Roles of Virtual Patients in the Age of AI," for further discussion.

1. *Conflation of virtual patients and virtual humans.* The term *virtual patient* (VP) has been applied to numerous applications with different designs, technologies, and educational objectives. This heterogeneity can lead to confusion.[1] The Association of American Medical Colleges' definition of VP that the authors reference was developed in 2006 and refers to computerized clinical case simulations.[2] These applications, which are largely text based with multimedia content, focus on clinical reasoning and decision making and do not utilize AI.[1,3,4] The authors conflate VPs of this type with virtual humans (VHs), computer-driven conversational agents with human form that interact with humans using the full range of behaviors found in human-to-human, face-to-face interaction.[5] VHs utilize AI in computer-based interpersonal communication training simulations—as virtual standardized patients,[4,6] physicians, or any other human across the health care enterprise.

2. *Overstatement of virtual patient perils.* The authors present material about "sexist AI," cybercrime, malicious intent in programming, and psychopathic AI. Without an accompanying account of educational software, AI, or VH development, readers may overestimate the risk of using these agents. The following clarification should mitigate the sense of menace the article evokes.

   AI is broadly defined as any task performed by a program or machine that, if performed by a human, would require applied intelligence to accomplish.[7] The current state-of-the-art is *narrow AI*,[8] which might utilize natural language processing and machine learning to solve specific problems. By contrast, *strong AI* is an assemblage of cognitive processes sufficient to enable self-awareness and intentionality. Strong AI is far removed from realization and may not even be possible.[9,10,11] Personified as Norman Bates, the serial killer in Alfred Hitchcock's *Psycho*,[12] the Norman program mentioned in the article is suggestive of the strong AI of dystopian films like *Ex Machina* and *Blade Runner*. By referring to the

program using the personal pronoun "he" and stating that "Norman was subjected to the darkest corners of Reddit," as if a person had been subjected to a terrifying ordeal, the authors make Norman seem much "stronger" than it is. Norman is merely a sensationalized example of narrow AI that was *intentionally* derived using data-driven machine learning applied to an unvetted set of data from a now-banned Reddit website where users posted videos of people dying and gave textual explanations of the manner of death.[13,14] When shown a series of Rorschach inkblots, Norman unsurprisingly interprets inkblots as people dying, because that's what MIT researchers trained it to do.[14]

By generalizing from this example to VH creation, the article misses the point that development of VHs for medical education is wholly under the control of medical educators and trusted experts. It would be ethically irresponsible for educators to use unvetted data sets to train a VH, to implement AI algorithms that allow unwanted degrees of freedom from desirable VH behaviors, or to abrogate responsibility for human oversight in VH program development.[15] To ensure positive learning outcomes, educators must stipulate evidence-based design requirements, create content, and then iteratively evaluate the sufficiency of materials passed back to them by software engineers. This agile development process[16,17] requires transparency to stakeholders, effectively eliminating the "black box" of programming and minimizing the risk of VH applications being tainted by the unintended introduction of undesirable content.

3. *VH opportunities*. The article overlooks the most noteworthy opportunity that AI-enabled VH simulation offers to medical education: training in basic *and complex* communication skills (eg, facial expression, verbal and nonverbal behaviors) along with cultivating awareness and application of ethical principles. Communication and ethics are deeply interrelated. Verbal and nonverbal communication proficiency[18,19,20] is necessary for clinicians to develop trust, encourage patient disclosure, and determine patients' needs, values, beliefs and concerns.[21,22,23] Good practice in complex communication is therefore inseparable from the ethical practice of medicine.[24,25] Ethics and communication have both proven challenging to teach, however.[26,27,28,29]

With its capacity for standardized presentation of materials, distributed learning across institutions, and fine-grained uniform assessment, AI-enabled VH simulation can help address the variability of current undergraduate and graduate ethics education.[30,31] Learners can engage one-on-one with VH patients, family members, or colleagues in realistic situations drawn from everyday clinical encounters that focus on ethical challenges and complex communication.[32,33,34,35] These simulated situations can pose a range of ethical challenges for learners—from informed consent to breaking bad news, dealing

with cultural disparities, and more. AI-enabled VH simulation can improve how students learn, remember, perceive, and make decisions.[29] By scaffolding learning materials, simulations can increase in complexity as learners advance along their educational trajectory from premedical study to postgraduate continuing medical education. Moreover, their round-the-clock accessibility provides flexibility for busy learners.

In summary, VH education offers a promising frontier in health care education into which educators should not fear to stride.

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Conflict of Interest Disclosure

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