Artificial Intelligence as Clinician

An Argument for Ethical use of Future Technology in a Medical Setting

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In today's world, science fiction has become reality. The presence of artificial intelligence (AI) in societies around the world continues to grow, from pocket devices to globalized software. One field in particular, medicine, has taken careful note of the ways in which these technologies have been implemented and what lies on the horizon. It is no surprise that AI technologies will be implemented further into a healthcare setting, and with increased implementation comes increased concern over the ethics of using AI. As the technology has advanced, ethical concerns have always been present, but one area in particular will soon need to be at the center of these conversations—that of the patient-clinician relationship. The development and application of future technologies may place an AI in the role of medical decision-maker, thereby potentially influencing the patient-clinician relationship. A version of this technology, what I refer to as frontline AI clinicians, can be implemented in an ethical manner by following two criteria. First, frontline AI clinicians should be utilized in environments where the use of AI relieves a strain on the hospital system and allows for increased access to healthcare. Secondly, such technologies should be implemented in environments where patients have demonstrated an ability to connect on a personal level with AI technologies. In the United States, there is one hospital system that would be able to implement AI as a frontline clinician while adhering to these criteria: the Veterans Health Administration.

It is impossible not to consider the future applications of AI in medicine, given how society has already embraced AI. The Oxford English Dictionary defines *artificial intelligence* as "the theory and development of computer systems able to perform tasks that normally require human intelligence."[1]

1. Oxford English Dictionary Online, s.v. "artificial intelligence," November 2019. Oxford: Oxford University Press. https://www.oed.com/view/Entry/271625?redirectedFrom=artificial+intelligence#eid.

Under this definition, many technologies people use on a day-to-day basis indicate how entwined AI is with people's lives around the world. The phones we carry in our pockets are capable of quickly searching for not only the nearest place to eat with the highest ratings but can also tell you how to get there. Each of us has searched for an item online, only to see that product advertised to us across social media platforms and websites far removed from the original search. Finding new music is easier than ever, with streaming services offering new suggestions every day. These are only a few examples of AI that have easily integrated into daily life, but as the technology progresses, the presence of AI will only continue to grow. However, to examine the impact of the integration of future technologies not just in day-to-day activities, but specifically in a healthcare setting, more clarity than a dictionary definition of AI is required.

To further clarify between tasks performed by a human and technology "able to perform tasks that normally require human intelligence," AI has advanced to a stage where it can be discussed in terms of Weak AI and Strong AI. AI technologies considered to fall in the Weak AI category are those that are structured around a single human ability.[2] For example, probabilistic reasoning and visual perception. On the other hand, Strong AI covers hypothetical technologies considered to be equal to human intelligence, or even superhuman in terms of ability to execute intelligent tasks.[3] Strong AI technologies would be those that can understand symbolism, manage social settings, or have ideological thought processes of their own. In many ways, this division is synonymous with current technologies (weak) and future technologies (strong). However, this division is not binary, but exists on a scale. There are many technologies pushing the boundaries further from search algorithms or programs designed to find the next song for your playlist and toward what was once, and still in many ways, only considered possible in science fiction. Many of the ideas of AI in science fiction that focus on Strong AI technologies and how they are portrayed can and have greatly influenced AI's perception in a society. Depending on how AI is portrayed in these fictional examples, it can either harm or help how humans interact with developing technologies.

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2. Stuart J. Russell and Peter Norvig, *Artificial Intelligence a Modern Approach* (Boston: Pearson, 2016)
3. Erik Brynjolfsson and Andrew McAfee, *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies* (Vancouver, BC: Langara College, 2018).

While certainly not true everywhere in the world, the United States has a very suspect view of AI technologies. Theoretical AI capable of thinking for itself has been largely portrayed as a villain in American culture. Fears of AI in the Western world were documented well before the average person began to interact with AI on a daily basis. Isaac Asimov published *I, Robot*, his collection of short stories about AI-equipped robotics and how they interact with the world around them, in 1950. Within these short stories are the famous Three Laws of Robotics:

1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.[4]

These laws, while adjusted and expanded upon by authors, including Asimov himself, throughout the following decades have largely influenced not just science fiction, but also the field of Artificial Intelligence ethics. Much of the fiction examining the advancement of AI technologies builds off of what happens when these laws are pushed to the extreme, or even broken, and AI that was intended to help humanity becomes the enemy. In the most basic sense, much of the culture built in the United States around AI technologies is one of fear.

One of the most famous examples of this fear appears in the *Terminator* franchise where every plotline revolves around defeating Skynet, a self-aware, artificial superintelligence (the farthest point on the Strong AI scale). 1984 saw the release of the first of six movies, and by 2010, the whole franchise composed of movies, television shows, video games, comics, theme park rides, and likely every form of merchandise imaginable had grossed over $3 billion in revenue.[5] Two more movies in the franchise have been released since then. To the United States population, there is something compelling about the idea of an AI, in this case Skynet, being evil. And it's not only the *Terminator* franchise that built a massive fanbase off this idea. *The Matrix* franchise is another multi-billion-dollar United States pop culture staple

4. Isaac Asimov, "Runaround" *I, Robot*. Greenwich, CT: Fawcett Publications, 1950.
5. Business Wire, "Pacificor Names Latham & Watkins to Field Terminator Inquiries," *Berkshire Hathaway*, February 17, 2010, https://web.archive.org/web/20170306034914/http://www.businesswire.com/news/home/20100217005514/en/Pacificor-Names-Latham-Watkins-Field-Terminator-Inquiries.

centered around the story of human society falling to rogue AI. Along with these two franchises come countless one-off movies, television series, and books featuring evil AI systems. The trope is so popular in United States media that lists of favorite "killer AIs" can feature entries from everything from hard-hitting science fiction to children's cartoons.[6]

Not everywhere in the world shares this view of AI. Japan's view of AI technologies is almost completely opposite to the fear of AI seen in United States pop culture. Media in Japan largely portrays robots and Strong AI technologies as friends or in many cases, lovers.[7] This vastly different approach to AI has been attributed to a difference in overall culture, stemming from the different religious framework found in Japan.[8] The history of Buddhism and Shinto in Japan has led society to think of all things, both sentient and non-sentient, as worthy of respect rather than the Judeo-Christian notions of human hierarchy above all except God.[9] Due to this ability to see life in all things, Japanese society was then able to see life in AI and robotics, leading them to quickly view these technologies as the friends and lovers depicted in their media. Even in conversations about the medical AI technologies seen in Japan, the willingness to accept such technology has been directly attributed to the 1950s cartoon, *Astro Boy*.[10]

Unlike the friendliness of AI seen in Japan, the warnings of AI inherent in United States pop culture are not subtle. There is a sense of inevitability in these massive franchises that one day, science will go too far and AI that is meant to be helpful will one day turn on humanity, no matter whether the Three Laws are present in its code or other safety measures are taken. It's no wonder an online scholarly search of the keywords "artificial intelligence" and "too far" within Western publications returns with over 39,000 results.[11] However, these fears have not halted the progress of real-world AI technologies. This development has not always been successful, but each unsuccessful attempt is a step closer to success.

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6. Andrew Dyce, "Our 10 Favorite Killer A.I.'s in Movies," *Screen Rant*, April 18, 2014. https://screenrant.com/artificial-intelligence-movies-evil-computers/.
7. Cat Ana, "Why the Japanese Find Deep Love with Deep Learning," *Medium* (*Becoming Human: Artificial Intelligence Magazine*, February 12, 2019), https://becominghuman.ai/why-the-japanese-find-deep-love-with-deep-learning-829e1bb629c2.
8. Joi Ito, "Why Westerners Fear Robots and the Japanese Do Not," *Wired* (Conde Nast, July 30, 2018), https://www.wired.com/story/ideas-joi-ito-robot-overlords/
9. Joi Ito, "Why Westerners."
10. Don Lee, "Desperate for Workers, Aging Japan Turns to Robots for Healthcare," *Los Angeles Times*, July 25, 2019, https://www.latimes.com/world-nation/story/2019-07-25/desperate-for-workers-aging-japan-turns-to-robots-for-healthcare.
11. Results from a Google Scholar search on April 11, 2020, excluding patents and citations.

In a "simple" attempt to create an AI that functioned just as well as a human social media presence, Microsoft quickly found their bot was not up to the task. The AI, Tay, was introduced on Twitter in 2016 with her own account, but the experiment was pulled after a mere sixteen hours, which was enough time for Tay to go from a friendly chatbot to using racist slurs.[12] Facial recognition software, even though it's a version of AI many of us use on our current cell phones, has also shown to be less than reliable when implemented on a large scale. For example, China's widescale attempt to ticket jaywalkers in the interest of public safety ended up quickly racking up tickets for models and actors whose faces were advertised on the sides of public transportation.[13] When it is not a face being identified, but rather a single item, some non-specialized identification technology has not had the best outcome either. In one example, a turtle was mistaken for a gun.[14] But for every documented failure such as these, there exists a step toward progress.

In recent years, AI technologies that seem straight out of a science fiction novel and are closer to what would be considered Strong AI have seen great success. Google's AI might have mistaken a turtle for a gun, but there are many specialized item identification apps available that are capable of allowing the average person to identify even rare animal or plant species around them.[15] It's also not only animals in the backyard that have been impacted by AI advancement, with AI-equipped drones being used to halt poaching activities in Africa.[16] Cities have also begun looking to AI for ways to solve existing problems. Los Angeles has turned to AI as a source for a solution to its aging, vulnerable plumbing systems.[17] AI may not be perfect in all aspects

12. James Vincent, "Twitter Taught Microsoft's Friendly AI Chatbot to Be a Racist Asshole in Less Than a Day." *The Verge*. March 24, 2016. https://www.theverge.com/2016/3/24/11297050/tay-microsoft-chatbot-racist.
13. Melanie Ehrenkranz, "Facial Recognition Flags Woman on Bus Ad for 'Jaywalking' in China." *Gizmodo*. November 26, 2018. https://gizmodo.com/facial-recognition-flags-woman-on-bus-ad-for-jaywalking-1830654750.
14. James Vincent, Google's AI Thinks This Turtle Looks like a Gun, Which Is a Problem." *The Verge*. November 2, 2017. https://www.theverge.com/2017/11/2/16597276/google-ai-image-attacks-adversarial-turtle-rifle-3d-printed.
15. Emily Matchar, "AI Plant and Animal Identification Helps Us All Be Citizen Scientists," Smithsonian.com (Smithsonian Institution, June 7, 2017), https://www.smithsonianmag.com/innovation/ai-plant-and-animal-identification-helps-us-all-be-citizen-scientists-180963525/.
16. Builddie, "The Role of Artificial Intelligence in Wildlife Conservation," *Medium*, May 15, 2019, https://medium.com/builddie/the-role-of-artificial-intelligence-in-wildlife-conservation-5dc3af2b4222.
17. Gary Polakovic, "The next Big Effort in AI: Keeping L.A.'s Water Flowing Post-Earthquake," *USC News*, October 4, 2019, https://news.usc.edu/160680/ai-la-water-supply-earthquake-usc-research/.

and further development is still needed to prevent AI from failing as horribly as the bot Tay, but consumer AI technologies have found success. In the medical field, the story of newly developed AI is no different. Some attempts have been more successful than others, but the technology in a large sense has continued to advance. Throughout this progression, the use of AI in a medical setting has raised ethical concerns, even when the utilization of an AI technology has been successful. These concerns have only grown as AI begins to move closer to the side of Strong AI and AI systems begin to overlap in spaces previously reserved for human clinicians only. In this overlap exists the concern that AI will replace a clinician, thereby disrupting the ethics found within the well-established framework of principlism, the most prevalent ethical framework of modern medicine, particularly within the United States.

Beauchamp and Childress' work on principlism details an ethical framework based around how the clinician interacts with the patient. The four principles—nonmaleficence, beneficence, justice, and autonomy—guide how a clinician should interact with, support, or provide for a patient.[18] This relationship between a clinician and a patient is therefore key to the ethical practice of medicine. When the patient-clinician relationship is established, a sense of trustworthiness is created.[19] As said in *The Principles of Biomedical Ethics*, "nothing is more important in healthcare organizations than the maintenance of a culture of trust."[20] Literature discussed later in this paper indicate that worries about the introduction of AI in the medical field revolve around concerns of trust, largely boiling down to fears that a patient would be unable to trust any diagnoses, treatment, or interaction with an AI entity. These concerns have arisen throughout the history of AI in medicine, starting with early research.

In the 1970s, the medical field got its first glimpse at the implementation of AI technologies. MYCIN, an early AI system designed by Stanford School of Medicine researchers, was used to identify certain bacteria such as meningitis and bacteremia and suggest treatment options to prevent severe infection.[21] A full decade before the invention of the internet, MYCIN was able to create a treatment plan with a 65% acceptability rating according to

18. Thomas L. Beauchamp and James F. Childress, *Principles of Biomedical Ethics*. New York: Oxford University Press, 2013.

19. Mark A. Hall et al., "Trust in Physicians and Medical Institutions: What Is It, Can It Be Measured, and Does It Matter?," *The Milbank Quarterly* 79, no. 4 (2001): 613.

20. Beauchamp and Childress, *Principles*, 40.

21. V. L. Yu, "Antimicrobial Selection by a Computer. A Blinded Evaluation by Infectious Diseases Experts," *JAMA: The Journal of the American Medical Association* 242, no. 12 (1979): 1279–282.

the study's parameters. In comparison, five faculty members were asked to create a treatment plan based on the same data and the acceptability ratings assigned to those plans fell between 42.5% and 62.5%. Even with such promising results, the ethics of MYCIN's use were immediately called into question due to an individualized treatment plan being determined by probability modeling rather than an actual physician.[22] In short, how could a machine create an accurate plan if it did not have a relationship with the patient in order to determine what treatment plan would be effective? Although MYCIN was never implemented in a medical setting, these initial questions persisted as AI advanced and began to gain a foothold in medical settings.

The most prevalent attempts to entwine AI with Western medicine can be found in clinical decision support systems (CDSS), specifically diagnostic decision support systems (DDSS.) The intent behind DDSS is to interpret data in order to aid clinicians. Assistance offered through DDSS can, in theory, then help a clinician better diagnose a medical problem by identifying conditions and warning signs of developing conditions in order to flag them for a clinician to view.[23] The field most impacted by DDSS at this point has been radiology, due to the technology's application to medical imaging systems such as MRIs and CAT scans. Traditional methods of examining medical images can result in misdiagnoses, resulting in the need for second opinions which can sometimes complicate the matter further.[24] Additionally, these methods also leave clinicians increasingly exhausted by the end of their shifts, leading to fewer accurate diagnoses as the shift progresses.[25] DDSS that have already been developed and those on the horizon of implementation in the medical field are meant to alleviate some of these issues by providing a real-time second opinion. The DDSS can provide immediate suggestions in these cases, but it is the clinician who makes the final decision on diagnosis and treatment.

Building off the excitement around the idea of DDSS being fully incorporated into the medical field, IBM introduced arguably one of the most

22. David E. Heckerman, and Edward H. Shortliffe, "From Certainty Factors to Belief Networks," *Artificial Intelligence in Medicine* 4, no. 1 (1992): 37.

23. Eta S. Berner and Tonya J. La Lande, "Overview of Clinical Decision Support Systems," in *Clinical Decision Support Systems: Theory and Practice*, ed. Eta S. Berner (Switzerland: Springer International Press, 2016), 3.

24. Christopher Eakins et al., "Second Opinion Interpretations by Specialty Radiologists at a Pediatric Hospital: Rate of Disagreement and Clinical Implications," *American Journal of Roentgenology* 199, no. 4 (2012): pp. 916-920.

25. Elizabeth A. Krupinski et al., "Long Radiology Workdays Reduce Detection and Accommodation Accuracy," *Journal of the American College of Radiology* 7, no. 9 (2010): pp. 698–704

famous examples of AI being used in medical diagnostics—Watson for Oncology. IBM's Watson, a computer capable of understanding natural language and content, was developed far beyond its original purpose in order to introduce the technology to the medical field.[26] Watson was initially designed to compete against human contestants in the television game show, *Jeopardy!*, and ultimately found success in its victory over Ken Jennings, a *Jeopardy!* "greatest of all time," in 2011.[27] After such a public win for AI technologies, IBM shifted the focus of Watson toward medicine, finally releasing Watson for Oncology in 2016.[28] Touted as the next frontier of medicine, Watson was portrayed as an AI system capable of not only assisting in the interpretation of diagnostic imaging, but also capable of supplying actual, effective treatment plans without approval from a clinician. Proponents of AI looked to Watson for Oncology as a way to prove the benefits of introducing more advanced AI into the field of medicine, but still, ethical concerns around a machine making medical decisions were prevalent.[29] As later learned through internal messages from IBM made public in July of 2018, many of these concerns regarding the use of Watson for Oncology were valid.

A STAT report revealed that IBM executives were well aware of the problems found within Watson for Oncology's systems, highlighting that Watson provided "multiple examples of unsafe and incorrect treatment recommendations."[30] Many of these problems were not unknown to IBM employees. Records show that IBM attempted to contact clinicians to notify them of Watson's "very limited" abilities.[31] These attempts were largely unsuccessful and hospital systems continued to operate under the assumption that Watson was providing valid treatment options for patients. After the STAT report was released and Watson's unsafe treatment plans came to light, many hospital systems rushed to issue statements to assuage fears

26. IBM, "Watson Overview," The DeepQA Research Team, July 25, 2016, https://researcher.watson.ibm.com/researcher/view_group.php?id=2099.
27. Eric Brown, "Watson: The *Jeopardy*! Challenge and beyond," 2013 *IEEE 12th International Conference on Cognitive Informatics and Cognitive Computing*, 2013.
28. IBM Newsroom, "Manipal Hospitals Announces National Launch of IBM Watson for Oncology," July 26, 2016, https://www-03.ibm.com/press/in/en/pressrelease/50290.wss.
29. Jennifer Bresnick, "Artificial Intelligence in Healthcare Market to See 40% CAGR Surge," HealthITAnalytics, July 24, 2017, https://healthitanalytics.com/news/artificial-intelligence-in-healthcare-market-to-see-40-cagr-surge.
30. Casey Ross and Ike Swetlitz, "IBM's Watson supercomputer recommended 'unsafe and incorrect' cancer treatments, internal documents show," *STAT*, July 25, 2018.
31. Julie Spitzer, "IBM's Watson recommended 'unsafe and incorrect' cancer treatments, STAT report finds," *Becker's Healthcare*, July 25, 2018.

that AI had gone too far and had replaced the clinician in medical decision making. In a statement reassuring the public that Watson had only been used as a tool, not a decision maker, one hospital spokesperson said, "No technology can replace a doctor and his or her knowledge about their individual patient."[32] The message is clear: the patient-clinician relationship was not weakened through the use of Watson for Oncology because clinicians weren't actually using the AI system to make important decisions; those decisions were entirely the clinicians. However, even after the accuracy of Watson's oncology decisions were called into question, the software is still being implemented in healthcare systems today, including in at least seventy Veterans Affairs Medical Centers (VAMCs) in the United States.[33]

Watson for Oncology's continued use is not the only sign that healthcare systems are still interested in exploring AI's function in the medical field. Yes, AI assisted diagnosis has been implemented—along with assurances that it's still the clinician who is actually making the final call—but companies around the world are developing AI technologies that push further into the medical domain. So far, in fact, that very real concerns have arisen regarding AI replacing clinicians.[34] Currently, there are multiple programs that have been able to successfully complete medical board examinations.

The first country to see an AI pass a medical licensing exam was China in 2017. The AI-equipped robot Xiaoyi, Mandarin for "Little Doctor," made headlines for scoring 456 points of 600 on China's medical licensing exam, a full 96 points above a passing grade.[35] It is important to note that the Chinese exam cannot be passed with rote memorization alone. The exam is structured so that hopeful clinicians must examine cases and determine the appropriate answer based on the information given, therefore showing that they can interpret the information presented to them and make an informed, educated decision.[36] Xiaoyi's first attempt at passing the exam hints at the difficulty of the exam, with the AI only earning a score of

32. Spitzer, "IBM's Watson."
33. Eliza Strickland, "How IBM Watson Overpromised and Underdelivered on AI Health Care," *IEEE Spectrum: Technology, Engineering, and Science News*, April 2, 2019, https://spectrum.ieee.org/biomedical/diagnostics/how-ibm-watson-overpromised-and-underdelivered-on-ai-health-care.
34. Kyle E. Karches, "Against the iDoctor: Why Artificial Intelligence Should Not Replace Physician Judgment," *Theoretical Medicine and Bioethics* 39 (2): 92
35. Ma Si, and Cheng Yu, "Chinese Robot Becomes World's First Machine to Pass Medical Exam," *China Daily*, November 10, 2017, http://www.chinadaily.com.cn/business/tech/2017-11/10/content_34362656.htm.
36. Alice Yan, "How a Robot Passed China's Medical Licensing Exam," *South China Morning Post*, November 20, 2017, accessed April 20, 2019.

slightly above 100. Before the next attempt was made, the research team made Xiaoyi "study" by introducing the robot to numerous textbooks and medical case files.[37] Like all other clinicians who passed the exam during that time, Xiaoyi needed to learn in order to pass the written exam. However, when Xiaoyi demonstrated that the AI was certainly knowledgeable of medical ailments, the research team was quick to announce that Xiaoyi was only able to "make suggestions to doctors, to help them identify problems quicker and avoid some risks."[38] Even though the AI passed a licensing exam, it still needed to be made clear that patients would receive their care from human clinicians, not an AI.

A very different reaction was seen the next time an AI passed a medical board examination. In June of 2018, Babylon Health's AI passed the UK's Membership of the Royal College of General Practitioner's (MRCGP) exam. The MRCGP is the last in a series of exams meant to test medical student's knowledge of the field they are eager to enter. In short, passing the MRCGP means a medical student is finally, after many years of study, ready to practice medicine independently. The average score from 2012 to 2017 was 72%. Babylon's AI scored an 81%.[39] In a statement released after the success of Babylon's AI, Babylon's founder and CEO, Dr. Ali Parsa, did not reassure people that this technology would not replace clinicians or was not able to make medical decisions directly with a patient. In fact, he did the opposite. Pointing out that there are many areas where the ability to see a clinician is extremely limited and the healthcare systems are overloaded, Dr. Parsa claimed the AI's successful completion of the MRCGP "clearly illustrated how AI-augmented health services can reduce the burden on healthcare systems around the world."[40] A shift in the narrative is clear with Babylon AI's success; the future role of AI in medicine may not be as a tool for clinicians to consult, but may very well act as the clinician itself.

Recent changes to the field of medicine have shown that Dr. Parsa's vision for the future use of AI may very well come to pass. Currently, one area of medicine growing exponentially is telemedicine and with that growth comes conversations regarding the changing nature of how medicine is delivered

37. Si and Yu, "Chinese Robot."
38. Yan, "How a Robot."
39. Babylon Health, "Babylon AI Achieves Equivalent Accuracy with Human Doctors in Global Healthcare First," *PR Newswire: News Distribution, Targeting and Monitoring*, June 27, 2018.
40. Babylon Health, "Babylon AI Achieves Equivalent Accuracy with Human Doctors."

to patients.[41] In the United States, telehealth options, defined in one study as "videoconferencing, remote monitoring, electronic consults, and wireless communications," were offered to patients through their hospital systems increased from 35% to 76% in the years between 2010 and 2017.[42] One common aspect of telemedicine is the option for virtual appointments like those offered through the Cleveland Clinic, meant to treat basic, frontline illnesses such as the common cold, allergies, and even the flu that do not necessarily require a patient to meet with a clinician face-to-face—the precise kind of appointment Babylon's Dr. Parsa referenced in his statement on the possible applications of Babylon's AI.[43]

People within the United States have begun to grow more comfortable seeking medical advice and treatment through technology. Examples from around the country and the world demonstrate that individuals are not only willing to work with a human via technology but may be willing to see AI technologies as a stand-in for the clinician. One of the most prominent examples in current medical practice is the use of therapy chatbots. These chatbots have been shown to help patients better understand their diagnosis as well as adhere to their treatment plan.[44] Another study showed that patients dealing with post-traumatic stress were more open and able to acknowledge their trauma when disclosing their symptoms to a chatbot than an in-person appointment.[45] It is not as if this particular version of AI in healthcare is ready to replace our current therapy models though.

While participants in studies have been willing to speak to a chatbot and have revealed more than they might initially with an in-person or video call therapy appointment, research has shown that there may be some caveats. In particular, some studies have indicated that some individuals are willing to disclose more information to a chatbot only once they know a human clinician will go back to read over the transcript at a later time.[46] That being

41. Tommaso Iannitti et al., "Narrative Review of Telemedicine Consultation in Medical Practice," *Patient Preference and Adherence*, 2015, 65.
42. American Hospital Association, "Fact Sheet: Telehealth," February 2019.
43. "Cleveland Clinic Express Care® Online," Cleveland Clinic, 2019.
44. Aditya Vaidyam and John Torous. "Chatbots: What Are They and Why Care?" *Psychiatric Times*, June 27, 2019. https://www.psychiatrictimes.com/telepsychiatry/chatbots-what-are-they-and-why-care.
45. Myrthe L. Tielman et al., "A Therapy System for Post-Traumatic Stress Disorder Using a Virtual Agent and Virtual Storytelling to Reconstruct Traumatic Memories," *Journal of Medical Systems* 41, no. 8 (2017): 125.
46. Timothy W. Bickmore et al., "Response to a Relational Agent by Hospital Patients with Depressive Symptoms," *Interacting with Computers* 22, no. 4 (2010): 289.

said, even though these participants found comfort in knowing any final psychological diagnoses or therapeutic feedback would come from a human clinician, they were still willing to work with an AI during the beginning of the treatment process for that session. And considering the commercial success of therapy apps and the fact that the American Psychiatric Association has begun tracking and rating the potential effectiveness of these apps, often containing a chatbot component, there is little reason to think people will not utilize this technology more in the future.[47]

The idea of a virtual therapist poses a different dynamic than the traditional model, even if there is a human clinician at the end of the process. With this new model, the clinician-patient relationship begins to look different from the face-to-face, human-to-human interactions described by Beauchamp and Childress. Although participants still wanted to be sure that the end decider was human, the initial relationship-building was not with a human, but rather an AI. This marks a divergence from the attitudes seen toward DDSS like Watson for Oncology that function behind the scenes. Those AI systems are designed to be used as tools behind the scenes and in conjunction with a clinician's expertise. A virtual chatbot designed for therapy interacts with the human first and later relays information gathered from a human to another human. These chatbot AIs are not looking at images, they are working with dialogue and building a relationship with a client. The relationship may not look directly like the clinician-patient relationship modern medicine has developed, but in these circumstances, AI is undeniably becoming entwined in the relationship between a patient and a clinician. And while the mentioned chatbots obviously cannot replace an in-person interaction with a clinician, other technologies being developed in the world are beginning to push against that boundary as well.

In Japan where AI is already seen in a favorable light, AI technologies helping patients in a direct manner have gone one step further than online therapists. Japan has started implementing AI-equipped care robots that are capable of doling out the correct dosage of medications and seeing to the basic needs of their aging population in ways as simple as adjusting the temperature in their rooms.[48] The demand has grown so great for robotics

47. Jessica Truschel, "Top 25 Mental Health Apps for 2020: An Alternative to Therapy?," Psycom.net– Mental Health Treatment Resource Since 1986, March 19, 2020, https://www.psycom.net/25-best-mental-health-apps.

48. Naomi Tajitsu, "Japanese Automakers Look to Robots to Aid the Elderly," *Scientific American*. April 12, 2017, https://www.scientificamerican.com/article/japanese-automakers-look-to-robots-to-aid-the-elderly.

within the geriatric care field that many automakers have turned away from designing autonomous vehicles and are instead providing technologies such as beds that transform into wheelchairs or cybernetic legs that allow the care workers to lift heavy patients on their own.[49] In more direct, personal ways, AI-equipped humanoid robots such as SoftBank Robotics' Pepper have also been developed to sing to elderly patients and also answer basic questions such as "where is the bathroom?"[50] Even Japanese-designed companion animals such as the robotic seal, Paro, have been explicitly created to react to human interaction and provide the means for elderly patients to build a relationship with a non-living entity.[51]

Technologies such as Paro and Pepper are intentionally designed to capitalize on the distinct cultural ability for Japanese patients to connect with AI and have seen great success because of this. Considering this previously discussed ability for Japanese individuals to view AI in a positive light, it no surprise they are on the forefront of adopting AI in a healthcare setting. In these examples, the technology was implemented to meet the needs of Japan's aging population by addressing the lack of available care workers. By utilizing the AI technology in that environment, Japanese humanoid AI robots meet the first requirement to implement AI in a healthcare setting ethically. The second requirement of ensuring the ability to maintain the patient-clinician relationship is partially met, as the patients have demonstrated a clear ability to connect with these technologies, but not in the manner of patient and decision-making clinician. While the humanoid AI in Japan does not fully reach to the levels of future technology that could be implemented within a healthcare setting, these current technologies are certainly a step in that direction.

Overall, the United States might not be ready for the large-scale implementation of AI-equipped humanoid robotics like those seen in Japan. Rather, AI technology more realistically adaptable to United States healthcare systems would be something more akin to Babylon's AI where the AI would act as a frontline clinician. As a frontline clinician, AI would quickly diagnose basic ailments such as colds and flu and would refer to a human clinician or specialist when necessary. AI of that caliber could be implemented in the United States while adhering with the two ethical requirements of meeting a documented need and maintaining the patient-clinician relationship.

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49. Don Lee, "Desperate for Workers."
50. Don Lee, "Desperate for Workers."
51. Amy Harmon, "A Soft Spot for Circuitry," *The New York Times*. July 5, 2010, https://www.nytimes.com/2010/07/05/science/05robot.html?_r=2&pagewanted=1.

At least regarding concerns related to an aging population, the United States healthcare system is seeing the same needs as those addressed with AI in Japan. There are growing worries in the United States that there is not enough support available to elderly patients and this concern was addressed in a March 2019 report released by the Trump Administration.[52] The report, *Emerging Technologies to Support an Aging Population,* clearly indicates the current healthcare model is simply not working and emerging technologies should be implemented in order to ease the burden placed on current health providers. By implementing technology, the United States would be less reliant on home healthcare aids which is a growing field due to the sheer numbers of people needing care, but concerns about low pay and the physical demands of the job are likely to continue contributing to a dearth of home healthcare aides within the workforce.[53] The lack of available care of the United States' population is certainly not the only environment where documented shortfalls in current care may be or have already been addressed with technology.

Rural populations pose a particular challenge for the modern model of healthcare. With more centralized hospital systems focused around the nation's largest cities, clinicians have been pulled further away from the ideal of the small-town doctor able to make house calls. The challenges brought forth by patients in remote areas has led to calls for telemedicine options to be more readily available.[54] By implementing the ability for patients to see a doctor virtually, patients do not have to drive to the nearest health facility, find transportation when a car is not readily available, or rely on a clinician to travel to them. Babylon Health has explicitly targeted opportunities to assist these remote populations. After passing the UK medical licensing exam, Babylon's AI was rolled out for remote populations in Africa, allowing a system where there are too few clinicians to see a greater number of patients and more importantly, spend more time with patients who need additional care.[55] Babylon has grown since then, with the London-based

52. Mark Mather, Paola Scommegna, and Lillian Kilduff, "Fact Sheet: Aging in the United States," Population Reference Bureau, July 15, 2019, https://www.prb.org/aging-unitedstates-fact-sheet/.

53. U.S. Bureau of Labor Statistics, "Home Health Aides and Personal Care Aides: Occupational Outlook Handbook," September 4, 2019. https://www.bls.gov/ooh/healthcare/home-health-aides-and-personal-care-aides.htm.

54. Ahmed Hosney and Hugo J.W. L. Aerts, "Artificial Intelligence for Global Health." American Association for the Advancement of Science, November 22, 2019, https://science.sciencemag.org/content/366/6468/955.full.

55. Babylon Health, "Babylon AI Achieves Equivalent Accuracy with Human Doctors."

company developing an iOS and Android app intended to get that same frontline healthcare into the hands of anyone in the United States with a smartphone. The idea behind the technology is a simple one—in a system where access to healthcare is a challenge, find a way to increase access.

If AI as a frontline clinician can interact with a patient and diagnose common illnesses and ailments such as allergies, the common cold, or even the flu, then human patient-clinician interaction can, in theory, be reserved for more complicated matters. Since the clinician would not need to reserve time in order to see patients who could be diagnosed quickly and easily with the use of AI, the clinician would then be able to have a longer, more in-depth conversation with patients in need of more specific care. Not only would this maintain a patient-clinician relationship between a human and a frontline AI medical decision-maker, but also increase the patient-clinician relationship between the human patient and the human clinician. However, many have been quick to point out a problem in a model where AI is the end decision maker for medical diagnosis, even for simple matters. Known as the black box problem, the worry is that should a patient's diagnosis come from an AI, even if the end decision seems to make sense, there is no way for a human to understand *why* that diagnosis was made.[56]

The black box nature of AI may be seen as frustrating due to the inability to fully grasp why an AI made the decision it did, but this frustration is likely born from past medical practices regarding patient-clinician relationships. The black box problem poses a very similar ethical issue as was seen with the prevalence of paternalistic approaches to medicine. The AI makes a decision, and the patient would be expected to accept that decision without question. As medicine progressed, an increased desire for autonomy in medical decision making was seen in order for patients in the Western healthcare environment to have more control over their own medical care.[57] However, future technologies may not have this same problem as AI improves. The AI may make the decision, but by identifying the black box problem now, it well within the realm of possibility that researchers will design future AI technologies to have the ability to explain why certain conclusions were reached based on given data. Such progress would be a remarkable move from Weak AI to Strong AI and to reexamine the previous examples of

56. Robin C. Feldman, Ehrik Aldana, and Kara Stein. 2019. "Artificial Intelligence in the Health Care Space: How can we trust what we cannot know," *Stanford Law & Policy Review* 30 (2): 406.

57. Beauchamp and Childress, *Principles*, 220.

diagnostic systems and AI systems passing medical licensing exams, steps toward this progress are already happening.

Without devolving into a full argument of the potential for paternalism within AI versus remaining paternalistic habits of human clinicians who aim for beneficence, there is one additional point suggesting that the black box should not be considered a significant flaw of AI technologies. Quite simply, if an AI is not able to fully explain to a patient why a decision was reached, it is not wholly different from a specialist attempting to fully explain their reasoning to a patient with no medical knowledge. Miscommunications and misunderstandings between clinicians and their patients are well documented in literature, indicating that even though a clinician theoretically possess the means to explain their decision, they do not always do so accurately.[58] All this indicates, however, is that no matter whether it's a human clinician or a future AI delivering a diagnosis directly to a patient, steps must be taken in order prevent miscommunication and maintain trust between the patient and their care provider. With developing AI systems, researchers should strive to mitigate the black box problem, but it's current existence within AI does not itself indicate without a doubt that the technology is unethical.

Even in a future where the black box problem is overcome or we as a society fully trust the AI's decision without explanation, other realistic problems of the use of AI still remain. One of the most prominent concerns of individuals relying on AI rather than their own expertise is the possibility that a person will ignore their own intelligence and rely on the technology, even when it is clearly wrong. An example of this phenomenon already seen with AI is that of the many people who have followed their GPS directions straight into a body of water.[59] Those people ignored their own sense of direction, ignored all signs indicating the paths they were driving down were not meant for them, and followed the instructions of their GPS, ultimately finding themselves submerged. While no one was injured in these situations and the end result is a damaged car, a bit of embarrassment, and a decent headline for the local newspaper the next day, not all instances of reliance on faulty technology are as innocent. To once again mention Watson for Oncology, it ultimately became clear that

58. Dennis Rosen. *Vital Conversations: Improving Communication Between Doctors and Patients*. New York: Columbia University Press, 2014, 161–162.
59. Malone Kircher. "Yet Another Person Listens to GPS App and Drives Car into Lake." *Intelligencer*, January 24, 2018. https://nymag.com/intelligencer/2018/01/waze-app-directs-driver-to-drive-car-into-lake-champlain.html.

the proposed treatment plans would not be effective for patients and may have done more harm than good. Had clinicians only listened to the AI's suggestions rather than used their own medical training to recognize when something didn't make sense regarding the patient's treatment, it very well could have led to a patient's death. A death caused directly by inaccurate information given by an AI and a clinician's trust that the AI "knew better."

The black box problem and the potential for a clinician to ignore their own training and completely defer to an AI implemented in a health system are certainly issues to address as AI inevitably becomes further entwined in medical decision making. However, these concerns should not prevent the application of future technologies in healthcare systems. Acknowledging that based on the current trends of AI technologies around the globe and in the United States, it is imperative to discuss the ethical applications of near-future technologies. As stated, a logical next step of AI in healthcare is that of AI as a frontline clinician. The key to ethically implementing such AI systems within a medical setting is twofold: the AI must fill a need within the healthcare setting and the patient must be able to connect with the AI in order to preserve the patient-clinician relationship. There may be specific doctor's offices or a certain branch of a hospital system that might me some facets of this criteria, but there is one United States healthcare system as a whole that would provide the groundwork for the ethical application of frontline AI clinicians—the Veterans Health Administration (VHA).

To address the first need in the ethical use of AI as a frontline clinician, the VHA has a well-documented history of long wait times, inadequate care, and an overall reputation of not meeting the needs of its patients. Even the process of receiving benefits through the VHA can be a nightmare for some service members of the United States Armed Forces. In particularly atrocious examples of the VHA's mishandling of disability claims, one man who had received documented injuries during his time in the Coast Guard spent thirty-four years appealing the Department of Veterans Affairs for disability benefits.[60] Another veteran with diabetes had to fight for care, ultimately losing a foot and by the time her claim was approved, her other foot had been amputated as well.[61] Even when a veteran is granted approval to seek care or receive payment, problems remain.

60. Dave Philipps, "Veterans Claiming Disability Pay Face Wall of Denials and Delays," *The New York Times*, November 13, 2017, https://www.nytimes.com/2017/11/13/us/veterans-affairs-department-benefits-delays.html.
61. Dave Phillips, "Veterans Claiming Disability Pay."

The VHA has a history of veterans unable to schedule timely appointments, even for life-threatening illnesses.[62] This concern made headlines around the United States when CNN released a report on the Veterans' Affairs healthcare system in Phoenix, AZ, where veterans died due to their inability to be seen by a clinician. CNN exposed that these deaths were the result of a "secret list" created by VHA managers to hide the fact that around 1,500 patients were forced to wait months to see a doctor, ultimately killing at least forty veterans due to lack of care.[63] The VHA has taken steps to identify areas where wait times exceed their requirement that patients be seen in a timely manner, but difficulties arise in trying to define what constitutes a long wait time for patients as well as contending with a system that will schedule an appointment for a veteran, but ultimately reschedule the appointment many times.[64] Progress has been made since the scandal in Phoenix, but wait times are still a concern for the VHA even with the steps taken over the last several years to improve scheduling systems and increase oversight.[65] While the actual act of scheduling (and often rescheduling) has been cited as a reason for long wait times, another issue is a lack of care providers.

Estimates have suggested that by 2025, there will be a nationwide clinician shortage in the United States, particularly affecting rural hospital systems and those that are unable to provide competitive salaries.[66] Unfortunately, the VHA often falls into both of those categories causing increased concerns for under supported VAMCs. Potential problems caused by a future clinician shortage have already been seen in the VHA. From the years 2011 to 2015, the number of clinicians leaving the VHA increased

62. *Waiting for Care: Examining Patient Wait Times at VA Committee on Veterans' Affairs Committee on Veterans' Affairs*, 2013, Statement of Chairman Mike Coffman, Subcommittee on Oversight and Investigations of Veterans' Affairs. http://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,shib&db=cat07006a&AN=cwru.b4081068&site=eds-live.

63. Scott Bronstein and Drew Griffin, "A Fatal Wait: Veterans Languish and Die on a VA Hospital's Secret List," *CNN* (Cable News Network, April 24, 2014), https://www.cnn.com/2014/04/23/health/veterans-dying-health-care-delays/index.html.

64. Brendan McGarry, "VA Audit Confirms Veterans' Wait Times Complaints," Military.com, 2014, https://www.military.com/daily-news/2014/06/10/va-audit-confirms-veterans-wait-times-complaints.html.

65. Patricia Kime, "5 Years After Nationwide Scandal, VA Still Struggles to Track Wait Times," Military.com, July 26, 2019, https://www.military.com/daily-news/2019/07/26/5-years-after-nationwide-scandal-va-still-struggles-track-wait-times.html

66. Department of Health and Human Services, Health Resources and Services Administration, Designated Health Professional Shortage Areas Statistic, HRSA Data Warehouse, 2017.

every fiscal year due to retirements and voluntary resignations.[67] A 2018 report from the United States Government Accountability Office (GAO) clearly demonstrated that the VHA struggles to recruit and retain full-time VHA clinicians and while steps have been taken to improve retention, many VAMCs rely on part-time contracted clinicians, those who volunteer their time, or clinicians in training who ultimately leave.[68] Understandably, the VHA has identified hiring new clinicians as a top priority, but the GAO discovered in 2019 that attempts to increase clinician staffing resulted in more clinicians, yes, but many of them lacked necessary credentialing.[69] In one particularly egregious example given in the report, a clinician who had previously had her license revoked for patient neglect was hired by the VHA. All of these reports of patient wait times, clinician availability, and clinician hiring paint a clear picture—the VHA needs help.

While not all of the challenges faced by the VHA can be resolved by AI, the implementation of AI as a frontline clinician would address many of these established concerns, meeting the first of the two requirements to implement AI as a frontline clinician ethically. Utilizing AI in such a manner would not be the first time AI has been presented as a solution to VHA problems. A 2008 hearing before the Committee on Veterans' Affairs presented a proposal to use AI to increase the VHA's claims processing system.[70] From the previous discussion on processing claims and the Phoenix VHA scandal, the proposals put forth in this hearing did not result in much improvement. However, in 2021, a new software system is scheduled to be implemented throughout the VHA with the intent to vastly improve on current scheduling processes and wait times.[71] It will, of course, take time to see whether adopting AI in the manner of scheduling software will see a reduction in complaints filed related to issues with patients being able to see a clinician in a timely manner. Even if the system makes it easier to track appointment scheduling and create appointments to begin with, the problem of the lack

67. *Steps Taken to Improve Physician Staffing, Recruitment, and Retention, but Challenges Remain*. Statement by Director of Health Care, Debra Draper Before the Subcommittee on Health, Committee on Veterans' Affairs, House of Representatives Veterans Health, 2018.

68. *Steps Taken to Improve Physician Staffing.*

69. Kathy Larin, "Veterans health administration: Greater focus on credentialing needed to prevent disqualified providers from delivering patient care," *Nova Science Publishers, Inc.* 2019: 205.

70. *The Use of Artificial Intelligence to Improve the U.S. Department of Veterans Affairs' Claims Processing System*, 2008. Hearing before the Subcommittee on Disability Assistance and Memorial Affairs of the Committee on Veterans' Affairs U.S. House of Representatives

71. Patricia Kime, "5 Years After Nationwide Scandal."

of qualified clinicians will still remain and must be addressed. The current use of Watson for Oncology in more than seventy VAMCs is intended to support clinicians but future implementation of AI as a frontline clinician would directly assist with the overall need for manpower. By using AI as a frontline clinician, VHA patients would be able to schedule immediately with an AI for basic care or to get a referral, freeing up existing clinicians to address the concerns of veterans who need more focused care.

Acknowledging that the use of AI as a frontline clinician would address many of the documented needs of the VHA, the second requirement of the ethical use of such technology still remains. In order to be used ethically, members of the United States Armed Forces must be able to maintain the patient-clinician relationship with an AI as a frontline clinician. Fortunately, during their time of service, many service members have demonstrated an ability to form personal connections with cutting-edge technologies. This is particularly evident with explosive ordinance disposal (EOD) units and their use of bomb-disposal robots that first began in 1972.[72] In the years since these robots were implemented in the field, EOD units have shown a remarkable ability to form emotional bonds with the robot to the point where units will create names for the robot and treat it like a pet.[73] Some units have developed strong enough relationships with their robots that when the robot suffers irreparable damage, the unit will exhibit genuine grief and hold a funeral for their "fellow soldier."[74] Examples from EOD units and their fallen robots may show that soldiers are able to form relationships with non-human entities. Veterans with PTSD, too, have shown a willingness to disclose more information to an AI chatbot than they would in a typical setting.[75] This direct relationship with AI is likely to grow given the military's demonstrated willingness to turn to advancing technology to meet the needs of servicemembers.

Throughout history, military research has been at the forefront of medical advancement. While the root cause for the need to develop such technology

72. Military.com, "The Very First Bomb Disposal Robot," January 15, 2014, https://www.military.com/video/ammunition-and-explosives/explosive-ordnance-disposal/the-first-bomb-disposal-robot/3059244734001.

73. Doree Armstrong, "Emotional Attachment to Robots Could Affect Outcome on Battlefield," Office of Minority Affairs Diversity, September 13, 2013, https://www.washington.edu/news/2013/09/17/emotional-attachment-to-robots-could-affect-outcome-on-battlefield/.

74. Megan Garber, "Funerals for Fallen Robots," *The Atlantic*. September 20, 2013. https://www.theatlantic.com/technology/archive/2013/09/funerals-for-fallen-robots/279861/.

75. Myrthe L. Tielman et al., "A Therapy System for Post-Traumatic Stress Disorder."

is often tragic, the military has always provided an environment in which prosthetic limbs have seen great advancement and methods for salvaging limbs and increasing their functionality has improved.[76] Even things as seemingly basic as the tourniquet or the mass production of antibiotics originated in a military context.[77] These advances went from a military context to entering all healthcare systems and future medical developments can be expected to do the same.

Current declassified research from the Defense Advanced Research Projects Agency (DARPA) indicates an interest in implementing medical AI technologies in the U.S. Armed Forces. One of DARPA's programs, Warfighter Analytics using Smartphones for Health (WASH), aims to use the technology built into a smartphone in order to track the health and overall readiness of a solider, down to identifying minor changes in a soldier's gait, muscle tension, and perspiration level.[78] Another project announced in 2019, Bioelectronics for Tissue Regeneration (BETR), aims to use AI in combination with sensors to track the body's response to biochemical or biophysical stimulations to tissue in order to provide data to actuators that will be able to heal wounds.[79] As military technology advances and AI becomes more integrated in interactions within the military, examples of servicemembers connecting with technology during their time of service will only grow. And in addition to interactions with AI that occur during their time of service, members of the U.S. Armed Forces will also have access to AI technology developed for mass consumers as well.

These interactions with AI then create the foundation on which service members seeking treatment through the VHA can receive treatment in a timely manner and still maintain the patient-clinician relationship with AI acting as the frontline clinician. Understandably, not all service members will have the same level of interaction with AI as others, particularly of elderly patients who did not encounter AI during their time of service. In order to best adhere to an ethical use of AI as a frontline clinician,

76. Melissa Block, "Orthotic Brace Takes Soldiers from Limping to Leaping," *NPR*, March 31, 2014, https://www.npr.org/sections/health-shots/2014/03/31/295328707/orthotic-brace-takes-soldiers-from-limping-to-leaping.
77. Leah Samuel, "6 Battlefield Medical Innovations That Moved to Mainstream Medicine," *STAT*, November 10, 2017, https://www.statnews.com/2017/11/10/medical-innovations-war/.
78. Jonathan M. Smith, "Warfighter Analytics Using Smartphones for Health (WASH)." https://www.darpa.mil/program/warfighter-analytics-using-smartphones-for-health.
79. Dr. Paul Sheehan, "Bioelectronics for Tissue Regeneration (BETR)." https://www.darpa.mil/program/bioelectronics-for-tissue-regeneration.

servicemembers seeking treatment at a VAMC should be given the choice to interact first with an AI or to wait until a human clinician is available. To do otherwise, to ask that an individual who would not be willing to speak to a chatbot or have an AI assist them in diagnosing a cold or flu do so despite their comfort, would harm the patient-clinician relationship and make the implementation of the technology unethical. But given the nature of humanity's progressing relationship with AI overall, and the indications of future application within the U.S. Armed Forces, the coming years will likely see an increase in patients willing to first interact with an AI. As previously discussed in relation to patients with PTSD and their interactions with a chatbot and the overall success of telehealth appointments that are readily available, it may be that patients would rather speak to an AI if it meant they could receive care in that moment.

At the heart of AI's implementation in medicine is a desire to provide better, more accurate, more accessible care. In many ways, proposing the application of AI as a frontline clinician in a United States healthcare system poses a greater challenge due to an ingrained societal mistrust of AI. Ethical concerns rooted in this mistrust have not been able to prevent technological advancement, however and it is now imperative to shift the conversation from "should AI be allowed" to "how should AI be implemented?" To ensure the ethical use of future technologies in a healthcare system, two requirements must be met. The technology must meet a documented need and the implementation of the technology must not damage the potential for the development of the patient-clinician relationship.

The Veterans Health Administration's documented inability to fully care for patients to the established standard could be addressed through the use of AI as a frontline clinician. Not only that, but many members of the U.S. Armed forces who seek care at VAMCs in the future will have interacted with, and developed a unique relationship with, AI technologies during their time of service. These interactions would make them capable of maintaining trust in a medical decision when AI is the clinician, preserving the patient-clinician relationship. AI may not yet fully able to act as a frontline clinician, but it is imperative to identify now how to ethically implement AI in the future. While future AI technologies will undoubtedly improve healthcare overall, the Veterans Health Administration stands to benefit greatly from this technology and provides an environment in which AI's implementation can adhere to principles at the foundation of Western medical ethics.

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