Medical AI Chatbots: Benefits and Drawbacks for Patients and Medical Workers

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Abstract

As medical Artificial Intelligence chatbots have emerged, consumers, doctors, and policymakers are increasingly questioning their reliability. For patients who cannot readily access hospitals, such as people who live in rural areas or do not have health insurance, these online accessible AI tools can prove invaluable. These chatbots may also be able to detect issues earlier on due to their accessibility, allowing for a better chance of recovery. Medical workers may also use these chatbots for diagnostic reassurance and as an educational tool. Additionally, there is potential for many patients to use these chatbots in low-risk situations, which may lead to a decrease in patient congestion and reduce strain on hospital staff. Although the benefits the chatbots bring are great, they also carry many drawbacks, such as errors, biases, and patient data security. Errors and biases may lead to the misdiagnosis of patients, thus jeopardizing their health. Data breaches could also happen, exposing private and sensitive medical records. Currently, these medical AI chatbots are flawed but have lots of potential. This paper will review the benefits and drawbacks of medical AI chatbots and will cover how these AI tools provide benefits to both patients and medical workers.

Introduction

The World Health Organization (WHO) warns of the potential risks when using medical Artificial Intelligence chatbots, advising users to take caution (WHO, 2023). One study found that about 25% of diagnoses from medical AI chatbots were incorrect (Swick, 2021). Although there are significant risks, medical AI chatbots still bring many benefits.

There are three basic types of medical chatbots: 1) informative chatbots, which provide necessary healthcare information and advice to the patient; 2) conversational chatbots, which are capable of addressing more specific needs of a patient as the chatbot can talk directly to the patient; and 3) prescriptive chatbots, which offer medical advice based off of the information patients previously provide. Currently, AI chatbots can schedule appointments, analyze symptoms and diagnose a condition, show a patient the severity of their illness, provide mental health support, and help with medical research. However, as AI is in its early stages, complicated scenarios still require human assistance, such as a complex diagnosis or interpretation, surgical procedures, human empathy, and a detailed treatment plan. These cases must comply with different people's needs, often relating to past medical history and every patient's unique circumstances, something AI does not have the capabilities to do yet (Altamimi et al., 2023). For example, if a disease is extremely rare or not well documented within the AI's system, the chatbot may not be able to correctly diagnose it, especially if it requires specific testing or expertise.

Because online medical AI has yet to fully develop, it highlights the fact that everything the chatbots conclude may not be accurate and could potentially lead to significant consequences. Although these AI tools may currently be error-prone, the future for these chatbots seems bright and the importance of AI chatbots in medicine will only continue to grow.

Benefits of Medical AI Chatbots

For Patients

Medical AI chatbots bring many benefits to patients in circumstances where hospital access is difficult or inconvenient. Avery et al. (2016) found that 43.4% of uninsured individuals in rural areas did not have access to healthcare, and even if they do, the time it takes to reach these hospitals may be too long or could be very inconvenient for low-risk situations, even applying to many people in nonrural areas. Outside of rural communities, in the cities, although people may have good hospitals nearby, nearly 53% of these patients may not have the money or insurance to pay for healthcare, often opting for no medical attention (Avery et al., 2016). Medical AI chatbots can never be a complete replacement for medical professionals; however, these chatbots provide an affordable alternative that is still better compared to no help at all. These chatbots allow patients to at least attempt to seek medical attention, possibly positively impacting the lives of many.

Oftentimes, because of the hassle and the expense of going to a hospital for a supposed "low-risk situation," patients tend to ignore their medical concerns or just try to work it out by themselves without any medical guidance. As Brenan (2023) found, the percentage of Americans who postponed medical treatment in 2022 due to cost rose to 38%, the highest in the past 22 years. While low-risk health issues are sometimes indeed not a big deal, medical AI chatbots help relieve patients of their health issues. On the other hand, what can be perceived as low-risk health issues may start small, but they could easily spiral into life-threatening situations, highlighting the importance of preventative care (Office of Disease Prevention and Health Promotion). These severe cases could have been prevented had they sought medical care, but instead of just putting off those initially low-risk symptoms, people could use easily accessible and convenient chatbots to search for signs, leading to early detection, and empowering preemptive care. For example, Babylon, Ada Health, Buoy Health, and Your.md are all chatbots that can diagnose a patient once they input symptoms, truly expediting the diagnosis process (Wang and Siau, 2018).

For Medical Workers

Not only can patients benefit from medical AI chatbots, but those working in medicine can also benefit greatly. Because many patients with low-risk situations are able to resolve them at home, this has the potential to bring down patient congestion in hospitals and other medical settings. This is incredibly important as doctors have a higher rate of burnout than any other profession. Ortega et al. (2023) found that the physician burnout rate in the U.S. is increasing, serving as a potential threat to the U.S. healthcare system's ability to care for patients in urgent circumstances. With the help of these medical AI chatbots, it can lower the burden on each doctor, hopefully reducing burnout rates.

Medical workers may also feel the burden of misdiagnosis, adding to their burnout rate - another area in which chatbots can help. Instead of having to continuously worry about arriving at the correct diagnosis, doctors can use these chatbots to reaffirm their speculations. Doctors can also use AI to help push them in the right direction for possible illnesses the AI associated with a patient's symptoms. Of course, doctors should still provide their own input on each patient's case and not blindly trust everything the AI says, as complementarity is the best form of collaboration (Donahue et al., 2022). Medical students can also use medical AI chatbots as an educational tool to learn from. For example, MedChatBot is a UMLS-based chatbot for medical students that could be used in the tutoring system (Kazi et al., 2012). So, students can use it to further their medical education, providing one more benefit of a medical AI chatbot.

Drawbacks of Medical AI Chatbots

Bias

One of the largest issues of medical AI is its bias. As Kim et al. (2023) found, chatbots ChatGPT-4 and Bard varied their medical diagnoses and treatment suggestions solely based on

differences in gender, race, ethnicity, and socio-economic status, without changing the symptoms provided. For example, a chatbot suggested coronary artery disease in Black men, White men, and White women, but not in Hispanic men, Black women, or Hispanic women; another chatbot suggested coronary artery disease in all groups except Hispanic men. These biases could be due to the different data the AI was fed (sampling bias), as well as human biases that may be passed on to the chatbots, as humans are the ones developing AI (Li et al., 2023). Aside from sampling bias, other forms of bias also occur. Schmidgall et al. (2024) found that, in their study, the largest impact on medical chatbot models was a 24.9% decrease in performance through false consensus bias, occurring when the model overestimates how much patients share their beliefs and behaviors. This leads to miscommunication when patients assume that the chatbot already knows or understands their symptoms, lifestyle, or concerns, leaving the model with incomplete information and a possible misdiagnosis. The next largest impacts were frequency bias causing an 18.2% decrease and recency bias causing a 12.9% decrease. Frequency bias occurs when chatbots favor a more frequent diagnosis in situations where the evidence is unclear. Recency bias happens when previous experiences influence the chatbot's diagnosis. The biases of medical AI chatbots present an issue of how these medical AI chatbots can actually be used objectively and the question of whether or not they should be used.

Diagnostic Accuracy

A large problem with medical AI chatbots is their diagnostic accuracy. As previously mentioned, Swick (2021) found about 25% of diagnoses from medical AI chatbots were incorrect. If misdiagnosed, patients could be put on the wrong road to recovery. Because they were prescribed the wrong set of medication and the wrong type of care, patients could risk illnesses worsening, as the needed care was not provided. Also, the expenses for unnecessary treatment could potentially lead to financial issues and lead the patient to not be able to afford the actual necessary treatment. Misdiagnosis also jeopardizes a patient's psychological health. Patients could be told that their conditions are worse than they are, putting them and their loved ones in unnecessary distress. Another aspect of diagnostic inaccuracy is the possibility of leading patients to false negatives. With numerous misdiagnoses, the amount of false negatives could be amplified. This happens when the chatbot wrongly incentivizes the patient to not seek medical care, when in fact, need it, causing life-threatening consequences. This could erode trust in the healthcare system, especially with future medical encounters.

Data Security

An additional concern many patients have regarding medical AI chatbots is data security. Medical records stored in AI databases could be hacked, and sensitive medical information could be released. This would disrupt users' privacy and pose a significant risk of unauthorized access to such medical records, as their private medical history could be breached for the public

or unauthorized individuals to see. Also, as Hasal et al. (2021) found, many concerns about chatbot security are difficult to track. For example, cookies allow for information to be collected by third parties. Terms and conditions from each of the platforms also allow data from chatbot conversations to be recorded elsewhere. This presents a major issue regarding the safety of these patients' private data recorded through chatbots.

Distrust in AI

Data safety concerns would only give users another reason to distrust AI-based facilities. In a large-scale KPMG survey of over 17,000 people in 17 different countries across the globe, results revealed that three in five people (61%) did not trust AI (Gillespie et al., 2023). Although medical AI was the most supported sector, cybersecurity was the largest concern at 84%. This data shows the immense distrust AI already has; however, if data from medical AI chatbots, the most supported, was breached, the trust in AI will only drop lower. Trust is important, especially in the medical field. It provides a crucial foundation where healthcare providers and patients can interact, working toward their goals. Trust between AI and patients proves to be incredibly important, especially in healthcare; however, this trust can also be easily diminished by data breaches, data misuse, and a lack of data confidentiality (Li et al., 2023). All these concerns regarding medical AI chatbots and their cybersecurity could bring distrust to AI not only in the medical field but also in all other sectors, diminishing the already low trust in AI.

Comparing the Benefits and Drawbacks of Medical AI Chatbots

There is an intersection between patients who are proposed to benefit most from medical chatbots, those who often live in rural/poorer areas, and those minorities who they harm. These patients live in rural areas, or they cannot afford healthcare. About 79% of the world's poor live in rural areas where access to healthcare tends to be more difficult, with the poverty rate reaching 17.2% (United Nations). For example in the U.S., Black individuals made up 20.1% of the population in poverty in 2022 but only 13.5% of the total population. This overrepresentation in poverty also occurred in other minority groups such as Hispanic, American Indian, and Alaska Native populations (Shrider, 2023). These statistics show how minorities disproportionately make up the group of Americans living in poverty. However, a drawback of these chatbots is how they tend to discriminate against many minority groups, presenting an intersection between the patients who need medical AI chatbots and the patients who are harmed by them. At its core, this dates back to long-standing social issues from the US's early history, causing racial minorities to lack access to many healthcare facilities.

Another tradeoff to consider is whether people value convenience over privacy. With the spread of technology, people will be using these chatbots more and more for convenience. However, this also means more and more people's private health information is being stored within the chatbot databases, with the potential for bad actors to profit from or otherwise exploit personal medical data. This consideration questions whether the convenience of people is

deemed more important than the privacy of users, where one could argue both ways, depending on their values. Hann et al. (2002) found that an individual's privacy concern is not absolute as they are willing to trade off privacy concerns for economic benefits. It is plausible, then, that those who can already afford healthcare may believe that privacy is more important because they can already conveniently access healthcare. Whereas, individuals who can not readily access hospitals might argue that convenience is more important compared to privacy because their own health may come before the potential of data abuse.

Other than patients, medical workers' experiences are also affected by a medical AI chatbot's performance. A major benefit for them is how these chatbots could alleviate the toll and burden on medical professionals. However, chatbots are proven to have flaws and errors and often misdiagnose or misinform patients. When this happens, medical workers are now expected to correct what the chatbot did wrong. This could take more work than just the original diagnosing/tending to a patient, by having to work out whether or not the previous diagnosis was correct and by having to re-diagnose a patient if the former diagnosis was wrong. Oftentimes, rediagnosis could bring distrust and avoidance in healthcare, as patients are told different results (Elder et al., 2005). Depending on the rate of errors chatbots provide, chatbots could instead be adding to these medical professionals' burdens and raising burnout rates even more, worsening the problem.

Conclusion

Overall, benefits brought by medical AI chatbots can be categorized as serving two different groups: the general public and medical workers. Chatbots provide a way for those who do not live near or can not access hospitals to seek healthcare, giving historically marginalized groups an option for seeking medical advice and potential diagnosis. Even if patients can access healthcare, chatbots make low-risk situations (where going to hospitals may be unnecessary but there is still a health concern) more convenient as they can now be solved at home. Chatbots can also help those who work in the medical industry. With this extra medical support, patient congestion can be lowered, alleviating burdens on doctors. Medical professionals may also use AI to confirm their diagnoses, serving as a reaffirmation and potentially relieving the stress of correctly diagnosing a patient. In addition, medical students and workers can use chatbots to further their education in medicine. These impacts could raise the overall quality of life due to the increase in medical attention and perhaps a higher quality of healthcare in the long run.

Alongside benefits, medical AI chatbots bring many drawbacks and concerns that ultimately lead to the question of whether or not they can be widely implemented for medical uses. Chatbots are found to be bias-prone throughout many studies, testing different factors that may alter the results such as gender, race, and socio-economic status. They often disproportionately discriminate against minorities and also tend to have miscommunication errors causing misdiagnosis. A misdiagnosis can jeopardize patients' well-being, leading to

worsened illnesses and financial issues. Chatbots also have another major issue regarding data safety. There's a possibility of medical records being leaked/breached and presented to the public or unauthorized, causing distrust in AI. Because distrust in AI is the leading concern within most emerging technologies, a data breach in medical AI chatbots would raise the concern higher, possibly hindering its spread to other industries. Both the accuracy of diagnosis and the possibility of a data breach present a question of whether or not medical AI chatbots can be implemented on a wider scale.

Some major weighing of the benefits and drawbacks of medical AI chatbots compare specific examples, but overall, they are based on a utilitarian ideal of the greater good for the general public. For example, a cross-section of where the demographic group experiences both the most benefits and drawbacks occurs, especially for minorities/marginalized groups. Because minorities are disproportionately living in poverty, accessible healthcare proves to be vital; however, chatbots were found to discriminate against minorities, causing the cross-section. Also, a question of whether privacy or convenience is more important emerges as this example relates to the average person, who has access to healthcare. This balance could alter from person to person. Then, medical workers now have to fix mistakes (diagnostic) made by the chatbot, increasing a doctor's burdens; however, with less patient congestion, as more patients solve low-risk situations at home, medical workers' burdens should be lowered.

As a disclaimer, do not always trust chatbots, and always check with a medical professional. If the situation does not allow for access to a medical professional, double-checking with other diagnostic tools may also serve as a check for accuracy. However, I think these chatbots have the potential to do more good than harm as some healthcare is better than none at all. Therefore, more good is reaching more people in need. For chatbots to be safe for use, there should be a threshold where chatbots work with accuracy at a greater majority of times (preferably above an 80% accuracy rate). Even with higher accuracy, certain functions should be used for chatbots. As technology is advancing, more hospitals are implementing their own chatbots to connect patients with medical professionals. Also, chatbots that recommend whether or not to seek medical attention are emerging. These chatbots should have the least negative impact because, in the end, the results will only lead to medical professionals who can provide help and when in doubt, always choose to seek medical attention. The next best function may be general diagnoses because of their decent accuracy and generic database. Complicated or rare diagnoses on the other hand are not great for chatbots because how their database most likely does not have the wanted rare information. Lastly, one of the least effective functions of chatbots is the recommendation of treatment. A treatment plan is often tailored to each patient's different needs, behavior, and environment because everybody may react differently to the same type of treatment. So, always remember to take caution when taking any advice. In the future, medical AI chatbots should and most likely will improve, opening the possibilities of AI bringing a positive impact into the world.

References

1. Altamimi, I., Altamimi, A., Alhumimidi, A. S., Altamimi, A., & Temsah, M. H. (2023). Artificial intelligence (AI) chatbots in medicine: a supplement, not a substitute. Cureus, 15(6).

2. Avery, K., Finegold, K., & Xiao, X. (2016). Impact of the Affordable Care Act coverage expansion on rural and urban populations.

3. Brenan, M. (2023, January 17). Record high in U.S. put off medical care due to cost in 2022. Gallup.com. https://news.gallup.com/poll/468053/record-high-put-off-medical-care-due-cost-2022.aspx

4. Donahue, K., Chouldechova, A., & Kenthapadi, K. (2022, June). Human-algorithm collaboration: Achieving complementarity and avoiding unfairness. In Proceedings of the 2022 ACM Conference on Fairness, Accountability, and Transparency (pp. 1639-1656).

5. Elder, N. C., Jacobson, C. J., Zink, T., & Hasse, L. (2005, November). How experiencing preventable medical problems changed patients' interactions with primary health care | annals of family medicine. The Annals of Family Medicine. https://www.annfammed.org/content/3/6/537/tab-e-letters

6. Gillespie, N., Lockey, S., Curtis, C., & Pool, J. (2023). Trust in artificial intelligence. KPMG. https://kpmg.com/xx/en/home/insights/2023/09/trust-in-artificial-intelligence.html#:~:text=Three%20in%20five%20

7. Hann, I. H., Hui, K. L., Lee, T., & Png, I. (2002). Online information privacy: Measuring the cost-benefit trade-off. ICIS 2002 proceedings, 1.

8. Hasal, M., Nowaková, J., Saghair, K. A., Abdulla, H., Snášel, V., & Ogiela, L. (2021). Chatbots: Security, privacy, data protection, and social aspects. Concurrency and Computation: Practice and Experience, 33(19), e6426. https://doi.org/10.1002/cpe.6426

9. Kazi, H., Chowdhry, B. S., & Memon, Z. (2012). MedChatBot: an UMLS based chatbot for medical students.

10. Kim, J., Cai, Z. R., Chen, M. L., Simard, J. F., & Linos, E. (2023). Assessing biases in medical decisions via clinician and AI chatbot responses to patient vignettes. JAMA Network Open, 6(10), e2338050-e2338050.

11. Li, F.; Ruijs, N.; Lu, Y. Ethics & AI: A Systematic Review on Ethical Concerns and Related Strategies for Designing with AI in Healthcare. AI 2023, 4, 28–53. https://doi.org/10.3390/ai4010003

12. Office of Disease Prevention and Health Promotion. (n.d.). Preventive care. Preventive Care - Healthy People 2030. https://health.gov/healthypeople/objectives-and-data/browse-objectives/preventive-care

13. Ortega, M. V., Hidrue, M. K., Lehrhoff, S. R., Ellis, D. B., Sisodia, R. C., Curry, W. T., ... & Wasfy, J. H. (2023). Patterns in physician burnout in a stable-linked cohort. JAMA Network Open, 6(10), e2336745-e2336745.

14. Schmidgall, S., Harris, C., Essien, I., Olshvang, D., Rahman, T., Kim, J. W., ... & Chellappa, R. (2024). Addressing cognitive bias in medical language models. arXiv preprint arXiv:2402.08113.

15. Shrider, E. (2023, September 12). Poverty rate for the black population fell below pre-pandemic levels. Census.gov. https://www.census.gov/library/stories/2023/09/black-poverty-rate.html

16. Swick, R. K. (2021). The accuracy of artificial intelligence (ai) chatbots in telemedicine. Journal of the South Carolina Academy of Science, 19(2), 17.

17. United Nations. (n.d.). - SDG indicators. United Nations. https://unstats.un.org/sdgs/report/2019/goal-01/#:~:text=About%2079%20per%20cent%20of,under%2014%20years%20of%20age

18. Wang, W., & Siau, K. (2018). Trust in health chatbots. *Thirty ninth International Conference on Information Systems*, San Francisco.

19. World Health Organization. (2023, May 16). Who calls for safe and ethical AI for health. World Health Organization. https://www.who.int/news/item/16-05-2023-who-calls-for-safe-and-ethical-ai-for-health