

Potential functions of artificial intelligence chatbot ChatGPT in health management: Scoping review

Yapay zekâ sohbet robotu ChatGPT'nin sağlık yönetiminde potansiyel işlevleri: Kapsam incelemesi

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ABSTRACT

Chatbots are computer programs that simulate human speech using artificial intelligence (AI) and natural language processing (NLP) for conversation with people. After its beneficial results in various fields such as monitoring, surveillance, remote diagnosis and information provision of COVID-19, chatbots have started to be used more frequently for health purposes after the pandemic period. ChatGPT, an artificial intelligence chatbot launched as a prototype on November 30, 2022, and garnered attention for its detailed responses and articulate answers across many domains of knowledge. Trials and applications regarding the use of ChatGPT in many different areas became a trending topic in the first quarter of 2023, and the studies intensified on March 14, 2023, when ChatGPT-4 was released. The purpose of this study is to review studies which evaluate ChatGPT usage for health, healthcare management and policy fields. Although the use of AI and chatbots is not a novel subject in healthcare, ChatGPT's reliability, wide coverage, multi-linguality and being largely free of charge made it outstanding. While there are many concerns about patient safety, data privacy and confidentiality, ChatGPT has been seen to contribute in many areas, such as health management, policy,

ÖZET

Chatbot'lar, insanlarla diyalog için yapay zeka (AI) ve doğal dil işleme (NLP) tekniği kullanarak insan konuşmasını simüle eden bilgisayar programlarıdır. COVID-19'un izlemesi, surveansı, uzaktan teşhisi ve bilgi sağlanması gibi çeşitli alanlarında faydalı sonuçlarının görülmesi sonrasında sohbet robotları sağlık maksatlı olarak daha sık kullanılmaya başlandı. Prototip olarak 30 Kasım 2022'de kullanıma sunulan bir yapay zeka sohbet robotu olan ChatGPT, birçok bilgi alanında ayrıntılı ve açıklayıcı yanıtlarıyla dikkatleri üzerine çekti. ChatGPT'nin pek çok farklı alanlardaki kullanımlarına ilişkin denemeler ve uygulamalar 2023'ün ilk çeyreğinde trend bir konu haline gelmiş, çalışmalar ChatGPT-4'ün açıklandığı 14 Mart 2023'de daha da yoğunlaşmıştır. Bu derlemede, sağlık, sağlık yönetimi ve politika alanlarında ChatGPT kullanımını değerlendiren çalışmalar incelenmiştir. Yapay zeka ve sohbet robotlarının kullanımı sağlık hizmetlerinde yeni bir konu olmasa da, ChatGPT'nin güvenilirliği, geniş kapsamı, çok dilliliği ve büyük ölçüde ücretsiz olması onu farklı kılmıştır. Hasta güvenliği, veri mahremiyeti, gizlilik gibi pek çok konuda kaygılar bulunmakla beraber ChatGPT'nin sağlık yönetimi, politikası, halk sağlığı ve sağlığın teşviki gibi pek çok alanda katkı sunduğu

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public health, and health promotion. Studies conducted for the third version demonstrated that ChatGPT has been used for various mechanisms as decision support systems, administrative tools and public health agents. Research findings in a short period of time during the first phase of ChatGPT usage show that the newly established chatbot would also help increasing digital health literacy by its robustness and accuracy. ChatGPT also has promising potential for psychiatric and psychological support which other chatbots focus. ChatGPT is also anticipated to contribute to health management and policy research in the field of health management and policy research, which needs data analysis and forecasting from the clinical and hospital to the national and international levels.

Key Words: ChatGPT-4, health, healthcare management, health policy, scoping review

görülmüştür. ChatGPT'nin üçüncü sürümü için yapılan çalışmalar, ChatGPT'nin karar destek sistemleri, yönetim araçları ve halk sağlığı araçları gibi çeşitli mekanizmalar için kullanıldığını göstermiştir. ChatGPT kullanımının ilk aşamasında kısa sürede yapılan araştırma bulguları, yeni kurulan chatbot'un sağlamlığı ve doğruluğu ile dijital sağlık okuryazarlığının artmasına da yardımcı olacağını göstermektedir. ChatGPT ayrıca diğer sohbet robotlarının odaklandığı psikiyatrik ve psikolojik destek için umut verici bir potansiyele sahiptir. ChatGPT'nin klinik ve hastaneden ulusal ve uluslararası düzeye kadar veri analizi ve tahmin gerektiren sağlık yönetimi ve politika araştırmaları alanında sağlık yönetimi ve politika araştırmalarına da katkıda bulunması beklenmektedir.

Anahtar Kelimeler: ChatGPT-4, sağlık, sağlık yönetimi, sağlık politikası, kapsam incelemesi

INTRODUCTION

Chatbots are computer programs that simulate human speech using artificial intelligence (AI) and natural language processing (NLP) to understand questions and automate responses to them (1). A novel conversational system, GPT-3 (Generative Pre-trained Transformer 3), which has been trained by artificial intelligence (AI) was launched on November 30, 2022. ChatGPT displayed a significant competency in language text understanding and generation (2). OpenAI's (San Francisco, CA) announced ChatGPT-4, suggesting to produce safer and more useful responses (3) became a trending topic in the first quarter of 2023 (4).

Since the introduction of the ChatGPT-3, it has been used in many areas of healthcare, health management and policy. Many research articles published focusing ChatGPT's functionality for diagnosis, triage, and decision support. Ethical, legal, and medical aspects

of ChatGPT and its consistency and validity were also published (2). The purpose of this scope review is to classify potential areas ChatGPT could contribute to healthcare, health management and policy and share opinions on concerns about the usage of ChatGPT in healthcare.

Chatbots and healthcare

To give "the machine" the ability to chat with humans using natural language has become one of the most challenging issues of artificial intelligence efforts since Turing's article published in Mind magazine in 1950 (5). Early speech systems such as Eliza (6) and Alice (7) and chatbots produced for conversations mimicking human in a text-based speech have been popular. Commercial health chatbots which are developed before ChatGPT focused merely to healthcare problems and provided service dominantly in English. OneRemission provides health information to cancer patients. Youper monitors emotional state. Babylon Health provides health information in line

with medical background. Florence reminds drugs. Healthily and Ada Health direct the patient according to complaints. These applications have become initial implications for usage of chatbots in healthcare (8).

COVID-19: a milestone for increasing interest of chatbot usage in healthcare

Increasing usage after COVID-19 pandemic, chatbots have become widespread in the healthcare field showing valuable results in various purposes as monitoring COVID-19, remote diagnosis and providing information about the disease (9). Omaolo developed by Finnish Institute for Health and Welfare was an example of chatbots which are used for pandemic. Advising to make a COVID-19 symptom assessment before hospital admission, the application prevented unnecessary visits to healthcare facilities (10). Chatbots which are established in limited time also used for screening health system employees during the pandemic (11). Chatbots were used for reducing mental health burden during the pandemic in many countries such as China, United States and Australia (12). Turkey also used telemedicine solutions, including remote screening and diagnosis for the first time in this period (13). Study results on user reactions to COVID-19 screening chatbots showed that trust and confidence in their ability encouraged people to use them (14). The reputation of ChatGPT on valid and reliable responses would increase interest on ChatGPT as a health information source.

ChatGPT's response to the question about its functionality in healthcare management

Before a scoping review of the literature on these usage examples, ChatGPT's response to our question "What would be the functions of ChatGPT in healthcare management and patient care" will be shared (15)

"ChatGPT-4 can be a valuable tool in healthcare management and patient care in a number of different ways. Here are some examples:

- Patient Care and Monitoring: ChatGPT-4 can be used to track patients' health status and provide

medical advice. ChatGPT-4 can analyze patients' symptoms, medications, and health history and monitor their health status based on this information. Additionally, ChatGPT-4 can answer patients' questions and help them access healthcare services.

- Personalized Treatment Plans: ChatGPT-4 can help patients create personalized treatment plans based on their personal health history, lifestyle, symptoms, and other factors. This can help patients achieve better health outcomes and be managed more effectively.

- Medical Education and Training: ChatGPT-4 can be used as an educational tool for medical students and healthcare professionals. ChatGPT-4 can provide information on medical terms, diseases, symptoms, and treatments. Additionally, ChatGPT-4 can teach healthcare providers about the latest trends and best practices in patient care and management.

- Data Analysis and Predictions: ChatGPT-4 can assist healthcare providers with big data analysis and predictions. ChatGPT-4 can model the spread and interactions of diseases and provide strategic advice to healthcare providers on preventing and controlling disease outbreaks.

- Medical Research and Innovation: ChatGPT-4 can be a valuable tool for medical research and innovation. ChatGPT-4 can access a vast medical database and analyze this data. Additionally, ChatGPT-4 can keep up with medical innovations and provide information on new technologies and methods that healthcare providers can use to achieve better treatments and outcomes.

In conclusion, ChatGPT-4 can be a valuable tool in healthcare management and patient care in various ways."

ChatGPT as a decision support system

One of the potential uses of ChatGPT in healthcare management was in decision support. In a study evaluating the contribution of ChatGPT as a clinical decision support system, the responses of ChatGPT were presented to physicians for their evaluation

in terms of usefulness, acceptability, relevance, understanding, bias and unnecessary repetitions. It has been stated that ChatGPT has significant potential with its answers that are very understandable and relevant, moderately useful, and contain low bias and error (16). A study comparing the physician and patient in triage and diagnosis determined that the decisions made by the artificial intelligence software called Babylon AI were safer than the decisions of the human doctor (17). In another study by Feldman et al., three pre-prepared scenarios were given to residents and they were asked to give their own disease management recommendations. Afterwards, the result of the decision support system was given to them and their changes for disease management recommendations were evaluated. The differences between the scenarios showed that the residents changed their decisions between 25% and 60%. Some specialty students who did not request laboratory testing, imaging or consultation added these requests after seeing the response of the chatbot, and most of them stated that artificial intelligence support was useful (18).

A decision support system depending AI and having conversation in a safe, accurate and understandable would contribute the healthcare system. Being evaluated as “useful” by doctors and specialists as a decision support system, ChatGPT promises to make significant contributions.

ChatGPT as an administrative tool

Studies also evaluated ChatGPT as an administrative tool. A study discussed the potential of ChatGPT to create patient file forms. ChatGPT's responses to 38 hypothetical scenarios were evaluated in terms of readability, accuracy and humanism. It has been stated that ChatGPT has the potential to be used in the writing of clinical letters and abstracts. However, it has been emphasized that human monitoring and verification steps (especially in the early stages of technology) should be included in the processes to avoid situations that may seriously impair patient

safety and cause morbidity and mortality (19).

Biswas (2023), in his study of the use of ChatGPT in public health, states that it can be used for community health workers and health educators (especially in promoting the health of the public in rural and remote areas) to promote the scope of health facilities and programs in a way that will reduce health inequalities. This study emphasized that ChatGPT might positively contribute to public health, but some obstacles and limitations need to be carefully evaluated.

It was stated in an editorial that ChatGPT cannot capture many nuances such as the patient's body language, tone of voice and family relations, cannot ask questions and therefore cannot replace the physician, but can assist physicians in following processes (20):

- Supporting the physician to continue their work by making fewer “clicks” and entering less data on information technologies.
- Accelerating the preparation of patient file by making predictions from patient notes,
- Supporting the billing process by standardizing the patient's statements about his illness,
- Converting clinical notes of physician to ICD-10 code by acting like a coder.

Each of any type of ChatGPT usage in administrative functions would facilitate the steps in health management and provide more faultless, faster and effortless business processes.

ChatGPT as a health information and health literacy source

Digital health literacy has become more important after development of achievements of digital technologies such as AI, VR and AR, and machine learning. Patients from all ages would access to health information via chatbots like ChatGPT. In this context, validity, reliability and readability of responses of ChatGPT to health-related questions is important (21).

In a study, hypothetical antimicrobial diagnosis scenarios were asked to ChatGPT, and its answers were evaluated in terms of relevance, consistency, and safety components (22). It was found that ChatGPT understood the questions asked correctly, its answers were accurate and clear. But it is unable to ask questions to further clarify scenarios. Another study (23) compared ChatGPT responses with Google's featured search result snippets and evaluated ChatGPT results as more comprehensive. ChatGPT responses to questions about cirrhosis were evaluated (24) It was stated that the chatbot answers exhibited more than 70 percent accuracy and extensive knowledge. Another study compared the National Cancer Institute (National Cancer Institute) responses with ChatGPT responses, evaluating the health information regarding cancer-related misunderstandings. Total accuracy rates for both sources were close to one hundred percent (25).

Another study evaluated the ability of an AI chatbot assistant (ChatGPT) to provide quality and empathetic responses to patient questions, comparing physician responses. It was found that the chatbot generated quality and empathetic responses to patient questions (26).

Research findings in a short period of time during the first phase of ChatGPT usage show that the newly established chatbot would help increasing digital health literacy by its robustness and accuracy. People would more frequently use the software after their perception of its reliability change in positive manner.

ChatGPT for psychiatric and psychologic support

Chatbots were released before ChatGPT was used for psychiatric counseling, therapies and psychological support. As a therapy agent (27, 28), a tool to relieve symptoms of mental diseases (29) or an application for mental well-being (30), chatbots were in the challenge of supporting mental health disorders. ChatGPT, a sound and multi-functional innovation, would also be used for these purposes.

ChatGPT for medical education and training

The success of ChatGPT on exams was verified for various fields. ChatGPT answers for the operational management course in Wharton Business School exam were correct (31) and answered the questions of law school exams (32). ChatGPT also passed USMLE exam in the medical education field (33).

In a letter to the editor, how ChatGPT presented the information on the basic life support practice. In this article, it is stated that although this topic is presented online in treatment protocols and guidelines, open books and articles, understanding them will not be easy for the average person who has not received basic life support training. According to the websites, it was emphasized that ChatGPT was able to provide both faster and more well-tailored answers to the questions by accessing the latest research and guides (34).

According to the initial results, ChatGPT would have promising potential in medical education and continuous training. Remote education solutions and in-class usage of AI-based software will be a trend in the following years.

Promising contributions to healthcare management and policy research

Healthcare management and policy research need data analysis and predictions from clinic and hospital to country and international level. ChatGPT-4 assistance to research efforts with big data analysis and predictions would facilitate the process. ChatGPT-4 can be a valuable tool for healthcare management research and innovation. ChatGPT-4 can access a vast medical database and analyze this data. Although there is no study on the use of ChatGPT in health management and policy, it is expected that this field will be among the trending topics in the field.

It is seen that ChatGPT will have many contributions and usage patterns in the field of health. The studies carried out less than one year after the release of the third version of ChatGPT showed that it will bring significant benefits in the future.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

1. IBM. What is a chatbot? 2023; www.ibm.com/topics/chatbots, (Accessed: May 2023).
2. Sallam M. ChatGPT Utility in Healthcare Education, Research, and Practice: Systematic Review on the Promising Perspectives and Valid Concerns. *Healthc (Basel)*, 2023; 11 (6). <http://www.ncbi.nlm.nih.gov/pubmed/36981544>. 10.3390/healthcare11060887.
3. Almazyad M, Aljofan F, Abouammoh NA, Muaygil R, Malki KH. Enhancing Expert Panel Discussions in Pediatric Palliative Care : Innovative Scenario Development and Summarization With ChatGPT-4. 2023;15 (4): e38249.
4. OpenAI. GPT-4 Technical Report, 2023. <https://cdn.openai.com/papers/gpt-4.pdf> (Accessed: May, 2023).
5. Turing A. Computing Machinery and Intelligence, *Mind*, 1950; 59(236):433-60. <https://academic.oup.com/mind/article/LIX/236/433/986238>.
6. Weizenbaum J. ELIZA: A Computer Program for the Study of Natural Language Communication Between Man and Machine. *Commun ACM*, 1966; 9 (1): 36-45.
7. Wallace RS. The anatomy of ALICE In Parsing the Turing Test: Philosophical and Methodological Issues in the Quest for the Thinking Computer (pp. 181-210). Dordrecht: Springer; 2009.
8. Top 12 Health ChatBots. *Med. Futur.* 2023;<https://medicalfuturist.com/top-12-health-chatbots>.
9. Parviainen J, Rantala J. Chatbot breakthrough in the 2020s? An ethical reflection on the trend of automated consultations in health care. *Med Heal Care Philos*, 2022; 25 (1): 61-71.
10. Tiirinki H, Tynkkynen LK, Sovala M, et al. COVID-19 pandemic in Finland - Preliminary analysis on health system response and economic consequences. *Heal Policy Technol*, 2020; 9 (4) :649-62.

11. Judson TJ, Odisho AY, Young JJ, et al. Implementation of a digital chatbot to screen health system employees during the COVID-19 pandemic. *J Am Med Informatics Assoc*, 2020; 27 (9): 1450-5.
12. Zhou X, Snoswell CL, Harding LE, et al. The Role of Telehealth in Reducing the Mental Health Burden from COVID-19. *Telemed e-Health*, 2020; 26 (4): 377-9.
13. İleri YY, Kara B. Covid-19 Pandemi Sürecinde Kullanılan Güncel Sağlık Bilişim Uygulamaları ve Yenilikçi Teknolojiler : İnsanlığa Katkıları ve Temel Kaygılar. *Sağlık ve Toplum*, 2022; 32 (1): 33- 52.
14. Dennis AR, Kim A, Rahimi M, Ayabakan S. User reactions to COVID-19 screening chatbots from reputable providers. *J Am Med Informatics*, 2020; 27 (11): 1727-31.
15. ChatGPT. Personal Conversation. Pers Conversation, 02.05.2023.
16. Liu S, Wright AP, Patterson BL, Wanderer JP, Turer RW, Nelson SD, McCoy AB, Sittig DF, Wright A. Assessing the Value of ChatGPT for Clinical Decision Support Optimization. *medRxiv [Preprint]*. 2023 Feb 23:2023.02.21.23286254..
17. Razzaki S, Baker A, Perov Y, Middleton K, Baxter J, Mullarkey D, et al. A comparative study of artificial intelligence and human doctors for the purpose of triage and diagnosis. *arXiv preprint arXiv:180610698*. 2018.
18. Feldman MJ, Hoffer EP, Barnett GO, Kim RJ, Famiglietti KT, Chueh HC. Impact of a Computer-Based Diagnostic Decision Support Tool on the Differential Diagnoses of Medicine Residents. *J Grad Med Educ*, 2012; 4 (2): 227-31.
19. Ali SR, Dobbs TD, Hutchings HA, Whitaker IS. Using ChatGPT to write patient clinic letters. *Lancet Digit Heal*. 2023.
20. DiGiorgio AM, Ehrenfeld JM. Artificial Intelligence in Medicine & ChatGPT: De-Tether the Physician. *J Med Syst*, 2023; 47 (1).
21. Rasekaba TM, Pereira P, Rani. G V, Johnson R, McKechnie R, Blackberry I. Exploring Telehealth Readiness in a Resource Limited Setting: Digital and Health Literacy among Older People in Rural India (DAHLIA). *Geriatrics*. 2022;7(2):28.
22. Howard A, Hope W, Gerada A. ChatGPT and antimicrobial advice: the end of the consulting infection doctor? 2023.
23. Hopkins AM, Logan JM, Kichenadasse G, Sorich MJ. Artificial intelligence chatbots will revolutionize how cancer patients access information: ChatGPT represents a paradigm-shift. *JNCI Cancer Spectr*, 2023; 7 (2).
24. Yeo YH, Samaan JS, Ng WH, Ting P-S, Trivedi H, Vipani A, et al. Assessing the performance of ChatGPT in answering questions regarding cirrhosis and hepatocellular carcinoma. *medRxiv*. 2023:2023.02. 06.23285449.
25. Johnson SB, King AJ, Warner EL, Aneja S, Kann BH, Bylund CL. Using ChatGPT to evaluate cancer myths and misconceptions: artificial intelligence and cancer information. *JNCI Cancer Spectr*, 2023; 7 (2).
26. Ayers JW, Poliak A, Dredze M, Leas EC, Zhu Z, Kelley JB, et al. Comparing physician and artificial intelligence chatbot responses to patient questions posted to a public social media forum. *JAMA internal medicine*. 2023.
27. Sukanuma S, Sakamoto D, Shimoyama H. An embodied conversational agent for unguided internet-based cognitive behavior therapy in preventative mental health: Feasibility and acceptability pilot trial. *JMIR Ment Heal*, 2018; 5 (3).

28. Andersson G, Cuijpers P, Carlbring P, Riper H, Hedman E. Guided Internet-based vs. face-to-face cognitive behavior therapy for psychiatric and somatic disorders: A systematic review and meta-analysis. *World Psychiatry*, 2014; 13 (3): 288-95.
29. Fulmer R, Joerin A, Gentile B, Lakerink L, Rauws M. Using Psychological Artificial Intelligence (Tess) to Relieve Symptoms of Depression and Anxiety: Randomized Controlled Trial.
30. Inkster B, Sarda S, Subramanian V. An empathy-driven, conversational artificial intelligence agent (Wysa) for digital mental well-being: Real-world data evaluation mixed-methods study. *JMIR mHealth uHealth*, 2018; 6 (11).
31. Terwiesch C. Would Chat GPT3 Get a Wharton MBA? A Prediction Based on Its Performance in the Operations Management Course.
32. Choi JH, Hickman KE, Monahan AB, Schwarcz D. CHATGPT GOES TO LAW SCHOOL. <https://towardsdatascience.com/can-chatgpt->.
33. Mbakwe AB, Lourentzou I, Celi LA, Mechanic OJ, Dagan A. ChatGPT passing USMLE shines a spotlight on the flaws of medical education. *PLOS Digit Heal*, 2023; 2 (2): e0000205.
34. Ahn C. Exploring ChatGPT for information of cardiopulmonary resuscitation. *Resuscitation*, 2023; 185: 109729.