International Journal of **Health Science**

THE USE OF INTELLIGENT CONVERSATION AGENTS (CHATBOTS) AS A TOOL FOR PROMOTING THERAPEUTIC CONDUCTS IN HEALTHCARE

Matheus Calixto Lemos
Universidade Federal de Pernambuco – UFPE
Recife - PE
ORCID: 0009-0001-9346-5493

Carlos Miranda Santos Veloso
Universidade Federal de Pernambuco – UFPE
Recife - Pernambuco
ORCID: 0009-0001-1600-9742

Maria Fernanda Magalhães Santana
Universidade Federal de Pernambuco – UFPE
Recife - PE
ORCID:0009-0003-3912-7009

Sthefany Gracielly Silva Cabral
Faculdade Pernambucana de Saúde - FPS
Recife - PE
ORCID:0009-0004-0124-1225

Luiz Fernando Menezes Soares de Azevedo
Universidade Federal de Pernambuco – UFPE
Recife - PE
ORCID: 0009-0002-5834-1548

Matheus Henrique de Almeida Cassimiro
Universidade Federal de Pernambuco – UFPE
Recife - PE
ORCID: 0009-0003-5431-8380

Diego Cavalcanti Perrelli
Universidade Federal de Pernambuco – UFPE
Recife - PE
ORCID: 0000-0001-8730-3634

Gabriel José Souto Maior de França
Universidade Federal de Pernambuco – UFPE
Recife - PE
ORCID: 0009-0000-0078-1167

Vanessa Santana Oliveira
Universidade Federal de Pernambuco – UFPE
Recife - PE
ORCID:0000-0003-2499-9149

Felipe de Oliveira Xavier
Universidade Federal de Pernambuco – UFPE
Recife - PE
ORCID: 0009-0006-6563-4954

Fernando Castro Pessoa Lima
Universidade Federal de Pernambuco – UFPE
Recife - PE
ORCID: 0009-0005-0131-441X

Lucas Brasiliano Gomes
Universidade Federal de Pernambuco – UFPE
Recife - PE
ORCID:0009-0001-7966-4744

Abstract: **INTRODUCTION:** With technological advances, conversational agents, such as chatbots, and telemedicine emerge as allies to improve the quality of life and communication in the health sector (. These technologies allow the recording of symptoms and remote care, monitoring the state physical and psychological of patients, facilitating clinical practice. **OBJECTIVE:** analyze and evaluate how the use of chatbots is influencing the healthcare sector as a clinical assistance tool. **METHODS:** This study carried out a systematic review of the literature by searching the PUBMED and ACM Digital Library databases, using the descriptors "TELEMONITORING", "TELEMEDICINE" and "ARTIFICIAL INTELLIGENCE", for articles from the last 5 years, available in English. **RESULTS:** A table was created with the 6 selected articles, structured according to the year of publication, the chatbot used, the objective of the technology and its repercussion. **CONCLUSION:** The use of intelligent conversational agents (chatbots) has proven to be an effective tool in treatment, diagnosis and medical monitoring, in addition to providing benefits for the patient and the healthcare professional. However, it is necessary to increase the number of studies on the subject, so that more and more areas of health are reached by the benefits of this technology.

Keywords: Conversation; Technology; Health;

INTRODUCTION

With technological evolution, humanity has been seeking innovations in various areas of work, including Medicine, so that they can optimize their activities and improve their results. Among these technologies, conversational agents currently stand out, some of them intelligent, which have become great allies of human life (PEREIRA, J. et al. 2019).

"Chatbots", as they are called, are artificial intelligence applications that can use natural language processing (NLP) algorithms to interact with users through written or spoken conversations (OGAWA, M. et al. 2022). They are built to simulate a conversation, answer questions, provide information (SAKANE, N. et al. 2023), perform tasks and solve problems of the most diverse nature.

Therefore, it is important to use these agents, also for health promotion. In this context, the insertion of chatbots in Medicine is revolutionary as they overcome one of the greatest human limitations, time. This is because the machine is fully available at any time of the day for monitoring, stimulating, talking, recording symptoms and analyzing patients' prognoses, unlike human professionals (OLANO-ESPINOSA, E. et al. 2022). This way, this innovation can bring patients closer to the specialized care they need remotely. In this context, they provide monitoring and analysis of the patient's physical (OGAWA, M. et al. 2022) and psychological (HAUSER-ULRICH, S. et al. 2020) condition, being able to improve their prognosis possibilities while saving health system resources.

Therefore, the objective of this systematic literature review is to analyze the use of chatbots in Medicine as an instrument to facilitate therapeutic behaviors. That is, virtual monitoring of patients, in order to record symptoms, stimulate activities, generate prognoses, so that the professional team can provide adequate treatment that promotes health.

METHOD

A systematic review of the literature was carried out, in which the databases used were Pubmed and the ACM Digital Library. The inclusion criteria were: publication in the last 5 years, that is, between 2018 and 2023, articles in Portuguese and English were included. The exclusion criterion was systematic reviews. The descriptors used were "TELEMONITORING", "TELEMEDICINE" and "ARTIFICIAL INTELLIGENCE" and the Boolean used was "AND". Finally, by reading the abstract and the full articles, 6 articles were selected for the review.

RESULTS

After fully reading the 6 articles, the analyzed results were structured in Table 1 according to the following criteria: ChatBot used, the area of activity in health, the objective of the technology and the repercussions and conclusions. Thus, it is observed that the study includes the insertion of intelligent conversational agents in various areas of activity, but with the common objective of promoting a more personalized therapeutic approach to individuals.

DISCUSSION

The studies analyzed allow us to observe that the use of ChatBots in medicine has several advantages when it comes to communication and patient monitoring. The continuous evolution of technology makes it possible to create constant and personalized support for the individual that, often, cannot be offered by traditional means of healthcare. The study by Juanan Pereira et al. 2019, which carried out a survey of data on various ChatBots and their actions and repercussions, demonstrated that the technology's power of personalization is one of the main aspects that affect the change in patient behavior and, therefore, neurological and nutritional disorders become the main

	Authors	Year	ChatBot	Area of activity	Objective	Repercussion
1.	Eduardo Olano-Espinosa et al	2022	Dejal@bot	Addictions	Effectiveness of using Chatbot to combat smoking	In combating smoking, the use of chatbots proved to be more effective than usual clinical practice in primary care.
2.	Juanan Pereira et al.	2019	Several	Behavioral disorders	Mapping study on the use of chatbots in changing patient behavior	It has been mapped that nutritional disorders and neurological disorders are the main diseases being treated with chatbots, "affecting" is the most targeted human competence to achieve behavior change and "personalization" and "consumability" are the most appreciated technical details in these technologies.
3.	Mayuko Ogawa et al.	2022	AI-powered chat with NLP and ASR	Parkinson's disease	The use of chatbot to improve smiling and speaking skills in Parkinson's disease patients and generate prognoses of their motor and cognitive capacity through facial and speech recognition	Using AI-based chatbot can positively affect smiling and speaking in PD. In addition to using these characteristics to capture the motor, cognitive and mental state of patients, generating prognoses with significant sensitivity
4.	Naoki Sakane et al.	2023	KENPO	Obesity	Use of chatbot to facilitate weight loss in adults with obesity and hypertension through questionnaires and specific health guidelines	The chat proved to be efficient in losing weight and building healthy lifestyle habits, such as increasing daily steps.
5.	Ryuhei So et al.	2020	GAMBOT	Addictions	Use of the chatbot, which acts according to predetermined rules and scenarios, to help individuals addicted to gambling through periodic messages	Due to the inflexibility of GAMBOT, chat may work better as a preventive intervention than a therapeutic intervention for players.
6.	Sandra Hauser-Ulrich et al	2020	SELMA	Pain	Using CBT to cope with chronic pain	Participants reported improved behavior in the face of pain

Table 1: Comparison between selected studies. Source: Own authorship

areas of activity of ChatBots. Naoki Sakane et al. 2023, for example, demonstrated that the use of this technology facilitated the adoption of specific health behaviors for obese and hypertensive patients, as the application used has a ChatBot that creates a questionnaire for storing data, such as personality traits, which directs messages according to the generated profile.

Mayuko Ogawa et al. 2022, in turn, demonstrated a distinct sphere of activity for ChatBots. The study concerns an application that, integrated with a chatbot, performs automatic speech recognition (ASR) and natural language processing (NLP) in Parkinson's patients. This way, the system analyzes individuals' ability to smile and speak as an index of cognitive and motor capacity and also of patients' mood, facilitating, for example, the generation of more personalized prognoses.

Furthermore, ChatBots showed notable performances when related to behavioral disorders, such as smoking and gambling addiction. Eduardo Olano-Espinosa et al. 2022 and Ryuhei So 2020 et al. showed, through an application with periodic conversations between the ChatBot and the individual, that technology can influence users' daily choices. However, it was concluded that the assembly of messages based on the standards and rules stipulated by the articles showed

inflexibility in communication and, therefore, this technology would be better used as a preventive use than as a therapeutic use.

CONCLUSION

In short, the use of chatbots in medicine has been increasingly expanded and some of their fruitful studies and publications were presented in this review. Based on the knowledge disclosed in the articles listed, we can conclude that this tool has shown itself to be promising and innovative, with the potential to revolutionize the way health is promoted.

In general, one of the main advantages of using chatbots is the possibility of continuous and accessible communication with patients, allowing remote monitoring of their conditions without the need for professionals to be released synchronously. As noted in the clinical research carried out by Mayuko Ogawa et al., the great technological advances in the areas of NLP (Natural Language Processing) and ASR (Automatic Speech Recognition) allow this replacement of the human with the artificial, at some points in the monitoring, is made possible in a smooth and beneficial way.

Furthermore, as the mapping carried out by Juanan Pereira et al. The customization capacity of this tool is one of the most interesting features in the healthcare sector. However, some research reveals that chatbots still have an insufficient level in this regard. In this logic, this technology allows for a more efficient allocation of human resources, which are so precious in medical practice, and also

reduces healthcare system costs by replacing humans with machines. However, there are still deficiencies that need to be developed so that the expansion of the use of chatbots in Medicine is consolidated.

Furthermore, the use of chatbots combined with Artificial Intelligence and other tools based on Machine Learning, when well trained, are capable of generating accurate analyzes with a significant level of detail. In this context, it is worth emphasizing that such results are powerful support for medical opinion, but they do not replace it. All studies presented in this review do not exclude the role of health professionals but rather complement and optimize their work. There are spaces with more affinity for the machine and others for the human, in the age of technology the great expertise lies in getting the best of each of these worlds.

In addition, most of the articles presented show that chatbots can act on changing patients' behavior and lifestyle by offering personalized information, helping them to better understand their condition and promoting adherence to treatments. However, qualitatively it was also assessed that in some cases there is a lack of depth in the information and insight in the association between the factors discussed by the intelligent agent.

Therefore, the use of chatbots in Medicine is a promise that is already yielding results. It is necessary to expand research and experiments so that more and more areas of health are reached by the benefits of this technology and also so that its challenges are overcome.

REFERENCES

1. HAUSER-ULRICH, S. *et al.* **A Smartphone-Based Health Care Chatbot to Promote Self-Management of Chronic Pain (SELMA): Pilot Randomized Controlled Trial**. JMIR Mhealth Uhealth, 8(4):e15806, 2020.

2. OGAWA, Mayuko et al. **Can AI make people happy? The effect of AI-based chatbot on smile and speech in Parkinson's disease**. Parkinsonism & Related Disorders, v. 99, p. 43-46, 4 mai. 2022.

3. OLANO-ESPINOSA, Eduardo et al. **"Effectiveness of a Conversational Chatbot (Dejal@Bot) for the Adult Population to Quit Smoking: Pragmatic, Multicenter, Controlled, Randomized Clinical Trial in Primary Care."** JMIR MHealth and UHealth, vol. 10, no. 6, 27, p. e34273, 2022.

4. PEREIRA, J. *et al.* **Using Health Chatbots for Behavior Change: A Mapping Study**. J Med Syst, 43(5):135, 2019.

5. PEREIRA, Juanan; DÍAZ, Óscar. **Using Health Chatbots for Behavior Change: A Mapping Study**. Journal of Medical Systems, v. 43, n. 5, p. 135, 4 abr. 2019.

6. SAKANE, N. *et al.* **The Effect of a mHealth App (KENPO-app) for Specific Health Guidance on Weight Changes in Adults With Obesity and Hypertension: Pilot Randomized Controlled Trial**. JMIR Mhealth Uhealth, 11:e43236, 2023.

7. SO, R. *et al.* **Unguided Chatbot-Delivered Cognitive Behavioural Intervention for Problem Gamblers Through Messaging App: A Randomised Controlled Trial**. J Gambl Stud, 36(4):1391-1407, 2020.