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Digital Companions in Cancer Care: Exploring the Power of Chatbots

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Abstract

The increasing burden of cancer worldwide has placed immense pressure on healthcare systems to provide timely, continuous, and patient-centered care. Alongside conventional treatment strategies, digital health interventions have emerged as promising tools to improve healthcare delivery, patient education, and psychosocial support. Among these, chatbots artificial intelligence (AI)-powered conversational agentsare being increasingly adopted in oncological care. These systems, designed to simulate human-like conversations through text or voice interfaces, have found application in various stages of cancer management including patient education, symptom monitoring, psychological counseling, treatment adherence, and even clinical trial recruitment. Furthermore, chatbots are beginning to play a role in early cancer detection and screening programs, including oral, breast, cervical, and colorectal cancer screening. This narrative review aims to examine the current applications, benefits, limitations, and future potential of chatbots in oncological care. While chatbots offer several advantages such as 24/7 accessibility, cost-effectiveness, and scalability, challenges such as data privacy, limited emotional intelligence, and ethical considerations continue to restrict their widespread implementation. Nonetheless, with continuous technological advancements and proper integration into healthcare systems, chatbots have the potential to transform the landscape of cancer care.

Keywords: Chatbots, Artificial Intelligence, Oncology Care, Oral Cancer Screening,Cancer Early Detection

Introduction

Cancer remains one of the leading causes of morbidity and mortality worldwide, with an estimated 20 million new cases and nearly 10 million deaths in 2024 alone. The impact of cancer is particularly profound in low- and middle-income countries (LMICs) where healthcare resources are often limited, and late-stage presentation is common. Effective oncology care requires not only early detection and appropriate treatment but also continuous patient engagement, education, symptom monitoring, and psychosocial support throughout the cancer care continuum. However, the growing burden of cancer coupled with a shortage of trained healthcare professionals has strained the existing healthcare infrastructure, resulting in gaps in service delivery.[1,2,3] To address these challenges, digital health technologies have been increasingly integrated into clinical practice. Artificial intelligence (AI)-based tools have demonstrated significant potential in various domains of healthcare, including diagnostic imaging, predictive analytics, and clinical decision support. Among these AI applications, chatbotscomputer programs designed to

simulate conversation with human users via text or voicehave emerged as an innovative tool for enhancing patient engagement and delivering scalable, patient-centered care in oncology.[4] The increasing availability of smartphones and internet connectivity has further accelerated the adoption of chatbots in healthcare settings globally. This narrative review aims to explore the role of chatbots in oncological care, providing a comprehensive overview of their applications, advantages, limitations, and future directions, with a particular focus on their emerging use in cancer screening and early detection.

What Are Chatbots?

Chatbots, also known as conversational agents, are software applications designed to interact with users through natural language conversations. These interactions can occur via text-based platforms such as messaging applications or websites, as well as voice-enabled interfaces. Depending on their complexity, chatbots can be broadly classified into two categories: rule-based and AI-based systems.[5,6] Rule-based chatbots operate on predefined scripts and decision trees. They respond to specific keywords and prompts and are suitable for handling simple, structured interactions such as appointment scheduling or answering frequently asked questions. In contrast, AI-based chatbots utilize advanced technologies like natural language processing (NLP) and machine learning to understand complex inputs, learn from user interactions, and provide contextually relevant responses. These AI-powered systems can handle a wide range of queries, offer personalized health advice, and engage in meaningful conversations with users. In healthcare, chatbots have been implemented as virtual assistants capable of providing health-related information, monitoring symptoms, managing chronic conditions, and offering mental health support.[7,8] In oncology, where patients often require continuous information, reassurance, and support, chatbots have demonstrated promising applications across various stages of the cancer care pathway.[9]

Applications of Chatbots in Oncological Care

The versatility of chatbots has allowed them to be integrated into multiple facets of oncological care. Their applications span patient education, symptom tracking, mental health support, treatment adherence, and clinical trial management, among others.

One of the primary uses of chatbots in oncology is patient education and awareness. Many patients diagnosed with cancer experience anxiety and confusion, often seeking reliable information about their disease, treatment options, potential side effects, and lifestyle modifications. Chatbots can provide accurate, evidence-based information tailored to the patient's specific diagnosis and treatment stage. They can address frequently asked questions, dispel myths, and improve health literacy, especially in resource-constrained settings where access to healthcare professionals may be limited.Symptom monitoring and reporting represent another valuable application of chatbots in oncology. Patients undergoing chemotherapy, radiotherapy, or palliative care frequently experience distressing symptoms that require prompt management. Chatbots can collect daily symptom reports from patients, offering early detection of adverse effects such as nausea, fatigue, or febrile episodes. These real-time updates can be shared with healthcare providers, allowing timely interventions and potentially reducing the need for emergency department visits.

In addition to physical symptoms, psychological support and counseling are essential components of comprehensive cancer care. Many oncology chatbots are programmed to engage in supportive conversations, providing reassurance, coping strategies, and motivational messages. While they do not replace professional mental health services, these tools can serve as valuable adjuncts, helping patients manage feelings of anxiety, depression, and social isolation associated with a cancer diagnosis.

Appointment scheduling and navigation assistance is another area where chatbots contribute by simplifying administrative tasks. Patients can use chatbot interfaces to book appointments, receive reminders, and access information about hospital services and procedural requirements, thereby reducing missed consultations and improving care coordination.

Chatbots also play a role in enhancing treatment adherence. Non-compliance with prescribed medications or treatment protocols is a significant challenge in oncology. Chatbots can send timely reminders for medication intake, upcoming procedures, or follow-up visits, along with motivational messages that reinforce the importance of adherence to improve treatment outcomes.[10]

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Furthermore, chatbots have been utilized for clinical trial recruitment, an often challenging aspect of oncology research. These systems can pre-screen patients based on eligibility criteria, provide information about available studies, and guide interested individuals through the enrollment process, thereby improving participation rates and supporting research efforts.

Chatbots in Cancer Screening and Early Detection

One of the most exciting emerging applications of chatbots is in cancer screening and early detection, particularly in settings where healthcare access is limited. Early diagnosis significantly improves cancer survival rates, yet barriers such as lack of awareness, cultural taboos, and logistical challenges often hinder effective screening efforts.

In the context of oral cancer screening, AI-powered chatbots can educate high-risk populations about the importance of regular oral self-examinations, risk factors such as tobacco and alcohol use, and early warning signs like persistent ulcers or red and white patches. Chatbots can prompt users to perform self-checks, answer questions about symptoms, and advise individuals to seek professional evaluation if suspicious findings are reported.Similarly, in breast and cervical cancer screening, chatbots can overcome informational and cultural barriers by providing women with accurate, culturally sensitive information about self-examination techniques, screening schedules, and available services. They can send personalized reminders for mammography or Pap smear appointments and offer step-by-step guidance to reduce anxiety associated with these procedures.

For colorectal cancer, chatbots can engage individuals in risk assessment surveys, educate them about warning symptoms such as rectal bleeding or changes in bowel habits, and recommend appropriate screening tests like colonoscopy or fecal occult blood testing.[11]

Advantages of Chatbots in Oncological Care

Chatbots offer several unique advantages in oncological care. Their 24/7 availability ensures that patients can access support, information, and symptom monitoring services at any time, irrespective of healthcare facility operating hours. This is particularly beneficial in rural or remote areas with limited access to specialist care.

From an economic perspective, chatbots are **cost-**effective and scalable. Once developed, they can simultaneously engage with multiple users without additional operational costs, making them ideal for population-wide health interventions. Moreover, chatbots facilitate real-time data collection, generating valuable patient-reported outcomes and symptom data that can inform clinical decision-making, monitor treatment tolerability, and contribute to research. By handling administrative and informational tasks, chatbots can also reduce the workload of healthcare professionals, allowing them to focus on complex clinical decision-making and direct patient care.[12]

Despite their advantages, chatbots face several limitations that must be addressed before widespread implementation in oncology care. One major concern is their limited emotional intelligence. While chatbots can provide supportive messages, they lack the human empathy and nuanced understanding required for sensitive conversations, particularly in palliative care or end-of-life settings.

Data privacy and security represent another significant challenge. Chatbots handle sensitive health information, necessitating strict data protection protocols, encryption measures, and compliance with regulations such as the General Data Protection Regulation (GDPR) and the Health Insurance Portability and Accountability Act (HIPAA).

There is also a risk of misdiagnosis or misinformation. Chatbots should not be viewed as substitutes for clinical evaluation, and their recommendations must be carefully monitored to avoid delays in appropriate medical care.

Lastly, the digital divide—referring to disparities in internet access and digital literacy—can limit the reach of chatbot-based interventions, particularly in marginalized populations. The future of chatbots in oncological care is promising. AI-enhanced conversational agents with advanced NLP capabilities are being developed to engage in more natural, empathetic, and context-aware conversations. Integration with electronic health records (EHR) will allow chatbots to access patient-specific data, enabling personalized care recommendations and automated alerts for high-risk findings.Additionally, efforts are underway to develop multilingual, culturally sensitive chatbots capable of serving diverse populations in their preferred languages and dialects, thereby

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improving accessibility and reducing health disparities. In the coming years, chatbots are likely to play an integral role in tele-oncology services, remote patient monitoring programs, and community-based cancer screening initiatives, particularly in LMICs where healthcare resources remain scarce.

Conclusion

Chatbots represent a novel and versatile tool in oncological care, offering scalable, cost-effective solutions for patient education, symptom monitoring, psychosocial support, and treatment adherence. Their emerging role in cancer screening and early detection, particularly for oral, breast, cervical, and colorectal cancers, holds significant potential for improving patient outcomes and reducing healthcare disparities. While limitations related to empathy, data privacy, and digital accessibility persist, ongoing technological advancements and thoughtful integration into healthcare systems can help overcome these challenges. With appropriate regulatory oversight and ethical frameworks, chatbots are poised to become a valuable adjunct in the multidisciplinary management of cancer patients.

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