

Designing and Developing a Cancer Chatbot in a Website

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Abstract

Cancer is a disease that affects millions of people worldwide each year and is characterized by the rapid growth of cells that are abnormal. The outcome is affected since numerous cases are discovered at advanced stages of the disease. Anxiety and depression are two mental health issues that frequently coexist with the illness, worsening its effects on sufferers. There were many medical apps that provide guidelines for patients, but these apps will not give specific-use case. Introducing a specialized chatbot integrated with a website specifically tailored to address cancer-related queries can significantly mitigate several challenges contributing to cancer deaths. Firstly, by providing a platform for individuals to seek information and guidance, the chatbot facilitates early awareness and encourages regular doctor visits, potentially leading to earlier detection and treatment. Secondly, by offering a confidential and non-judgmental space for users to express their concerns, the chatbot helps overcome the stigma associated with cancer, reducing the likelihood of individuals resorting to self-medication or avoiding seeking help altogether. Thirdly, by providing personalized support and resources, the chatbot combats feelings of loneliness and stress commonly experienced by cancer patients, thereby promoting better mental well-being and overall health outcomes. Unlike generic medical chatbots found in applications, this specialized website-integrated chatbot focuses solely on cancer-related queries, ensuring a high level of accuracy and effectiveness, thus serving as a valuable tool in the fight against cancer.

Keywords: Chatbot, user-friendly, conversation, appointment, clinicians

INTRODUCTION

Suddenly increasing and spreading abnormal cells are the hallmark of cancer. The majority of people discover cancer at an advanced stage. In 2018, there were roughly approximately 18 million instances of cancer worldwide, of which 8.5 million affected women and 9.6 million affected males. A study of data conducted by the American Institute of Cancer, the two most frequent cancers discovered to date are lung and breast cancer. It is completely unrealistic for cancer sufferers to hope for longer and better lives. A World Health Organisation (WHO) investigation indicates that when anxiety exists along with a chronic medical condition, it significantly impacts health. Depression is rapidly becoming one of the greatest challenging situations in the medical field. Effective communication is an important component in improving mental health. If patients are able to trust in someone about what they are going through, their problem is somewhat solved; however, there are occasions when no one

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is available at an appropriate moment. For this purpose, the cancer chatbot was created. When needed, individuals may communicate with chatbots that process natural language [1]. Natural language processing (NLP) is an important component of artificial intelligence (AI), which improves computers' language comprehension closer to that of humans. NLP evaluates and interprets the text in a systematic way. AI provides the chatbot with the ability to learn from chats and manage any circumstance that arises. Because a lot of knowledge regarding cancer has been gathered from online sources and preserved in a database, these bots are able to deliver precise and effective information to users depending on their particular requirements. After gathering sufficient keywords from the user's messages, the chatbot asks questions to guide the discussion while attempting to determine a few potential diseases the user might be experiencing [2]. After it has enough information, it determines which condition is most likely to be present and can address their concerns by providing details on symptoms, treatments, and other information, including recommendations for solutions. The chatbot's learning is made possible by machine learning (ML) algorithms and human supervisors. Researchers can take advantage of ML approaches such as supervised and unsupervised reinforcement learning to make sure our chatbot understands well.

PROBLEM STATEMENT

People with chronic disorders experience symptoms for up to a year and must visit the doctor frequently, at least once a month and sometimes twice, depending on their health. Patients who are receiving therapy from doctors are prescribed food, medications, and other supplements. While some patients forget to take them on time, and nowadays even elderly people are alone, and so they require someone to take care of them. Occasionally when we need to see a doctor right away because of serious symptoms, individuals are compelled to make appointments, and patients must wait, which may be uncomfortable for them. Individuals grappling with chronic disorders endure prolonged symptoms, necessitating frequent doctor visits, ranging from monthly to bi-monthly, contingent on their health status [3].

Therapeutic regimens involve doctors prescribing essential elements like food, medications, and supplements. AI has core branches like ML, which takes in data, searches for patterns, improves itself using the data, and displays the outcome. To lead a healthy lifestyle, is very much important. In few areas, it is quite hard to find a consultation with a doctor regarding health issues [4]. The main idea here is to make a healthcare chatbot based on AI using NLP that can diagnose the disease and provide required details about the specific disease before consulting or visiting a doctor. This reduces the healthcare costs and improves accessibility.

Specific chatbots act as virtual medical assistance, which helps the patient know more about their disease and helps to improve their health. The user can achieve the real benefit of a chatbot only when it can diagnose all kinds of diseases and provide the necessary information [1]. A text-to-text medical chatbot involves patients in online conversation considering their health problems which provides a set of personalized diagnoses based on their provided symptoms. These bots connect with the potential patients visiting the site, helping them discover specialists, booking appointments, and getting them access to correct treatment. This chatbot uses NLP techniques to process and analyze the data and give the output in appropriate manner. It helps to generate health data and automatically delivers the information of reports to medical management. By asking the questions in series it helps the patient by guiding what exactly the user is looking for queries.

EXISTING SYSTEM

Ada Health

Ada Health provides a personalized health assessment through its AI-powered chatbot. Users input their symptoms and medical history, and the chatbot uses advanced algorithms to analyze the data and provide personalized health advice. It offers insights into possible conditions, recommended actions, and when to seek medical help as shown in Figure 1.

Buoy Health

Buoy Health is a symptom checker chatbot that uses artificial intelligence to assess user-reported symptoms. It guides users through a series of questions to gather information about their condition and then provides personalized health recommendations. These recommendations may include self-care advice, suggestions for over-the-counter treatments, or recommendations to see a healthcare professional as shown in Figure 2.

Babylon Health

Babylon Health offers a suite of AI-powered healthcare services, including a symptom checker chatbot and virtual consultations with healthcare professionals. The symptom checker chatbot helps users evaluate their symptoms and provides information on potential causes and next steps. Additionally, users can schedule virtual appointments with doctors for further evaluation and treatment recommendations as shown in Figure 3.



Figure 1. App logo of Ada: It is used to clarify doubt on medicine.

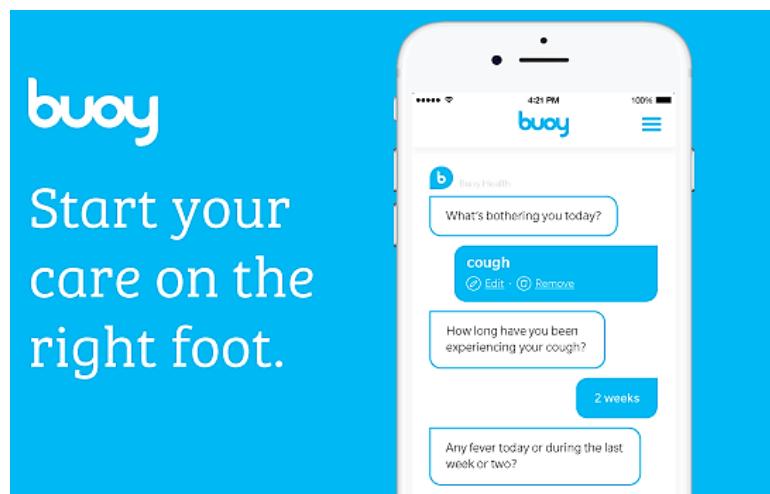


Figure 2. App logo of Buoy Health: It is used to control diabetes.



Figure 3. App logo of Babylon Health: It is used to communicate.

These chatbot solutions aim to provide users with convenient access to medical information and guidance, helping them make informed decisions about their health and well-being. There is no specific chatbot for cancer.

LITERATURE REVIEW

From Table 1, it is seen that there are three projects that have chatbot in app which result in good efficiency. These reviews focus only on app basis and contain several drawbacks. To overcome this, we created a chatbot integrated with a website, which responds only to cancer-related queries.

Table 1. Analysis of models by different authors.

S.N.	Year	Title	Authors	Methods	Results	Drawbacks
1	2020	Mobile apps for self-management of chronic diseases: A meta-analysis [5]	Raymond L Ownby Drenna Waldrop Joshua Caballero	Develop a tailored information app for chronic disease self-management. Used mobile app technology for wider dissemination at reasonable costs.	All groups showed overall increases in activation, self-efficacy, and health-related quality of life, but no change in medication adherence. No between-group differences were observed.	Intervention's impact on participants' outcomes not fully clarified. Further research needed on mediators and moderators of change in outcome measures.
2	2022	Mobile applications for the management of chronic physical conditions [6]	Laura Jiménez-Muñoz, Luis Gutiérrez-Rojas, Alejandro Porras-Segovia, Philippe Courtet, Enrique Baca-García	Maintenance of healthy lifestyle habits crucial for chronic physical conditions (CPC) management. Diabetes and cardiovascular diseases most commonly addressed by apps. Some apps tested in randomized controlled trials, showing effectiveness in symptom improvement and parameter control.	54 articles were reviewed on oncology app development. Most articles focused on early cancer detection, especially melanoma. 21 studies discussed specific apps.	Different mobile apps for chronic physical conditions vary in effectiveness, making it hard to identify the best ones. Concerns about data security, usability, and accessibility hinder the widespread use of mobile health technologies in clinical practice.
3	2023	Randomized double-blind placebo-controlled study of olanzapine for chemotherapy-related anorexia in patients with locally advanced or metastatic gastric, hepatopancreatic obiliary, and lung cancer [7]	Lakshmi Sandhya, Nirmala Devi Sreenivasan, Luxitaa Goenka, Biswajit Dubashi, S. Kayal, M, Solaippan, R. Govindarajalou R, H. Kt, P. Ganesan P	It analyzes various app features, targeted symptoms, and study outcomes, offering insights into the potential benefits and limitations of these tools.	112 patients were included in the analysis (58 on olanzapine, 54 on placebo). Majority had metastatic cancer, with gastric being the most common (55%).	The study focused on patients with untreated, locally advanced, or metastatic gastric, and lung cancers. Thus, the findings may not be applicable to patients with other types of cancer or those at different stages of treatment.

PROPOSED SYSTEM

The innovative chatbot in a website bridges the gap between patients and doctors by enabling physicians to monitor their patients comprehensively, even outside traditional hospital settings. This app serves as a pivotal tool for healthcare, fostering continuous care and remote monitoring. The proposed method for developing the system consists of web application. Firstly, a chatbot is created which can help the users to get the symptoms of their diseases. Then we will add the chatbot link over the respective hospital website which will help the other people to gain the information of medical reports [1]. Database of the system helps to store the records of the users. We had to train a chatbot using chatterbot library and also trained the bot to identify certain types of keywords in order to recognize the user's intent. This information shall then be forwarded to the backend. The chatbot can be trained to perform some logical reasoning and responses without referring to the backend.

The proposed method for developing the system consists of healthcare applications. It elaborates the business aspects of the proposed system [8]. Firstly, chatbot is created which can help the users to get the symptoms of their diseases. Then the hospital website is integrated which will help the other people to gain the information of hospital and their staff. Database of the system helps to store the records of the users backend is responsible to use the processed input from the chatbot and convert it into action to be performed in the database. The proposed system is accessed by two entities namely, Admin and User. Admin needs to log in with their login credentials. A chatbot was trained using chatterbot library and also trained the bot to identify certain types of keywords in order to recognize the user's intent. This information shall then be forwarded to the backend. The chatbot can be trained to perform and respond without the proposed method for healthcare web [7, 9–11].

Admin needs to log in with their login credentials first in order to access the healthcare web application [12]. The user queries in the form of text are segregated by NLP. The resolve engine helps to make decisions from the input data and passed to custom data source. The output data is fetched and transferred to natural language generation engine for checking syntax and grammar of the text. The final message is returned to local host server and displayed in the interface of the healthcare chatbot. The conversation records are stored in the database which is accessed by admin and manipulated by adding or removing data.

DESIGN OF CHATBOT

A chatbot's design is not straightforward, but when we analyse each of its components independently, we realize that each of them allows individuals to experience comfortable. The bot itself is the first element in the chatbot's architecture. He/She is the one communicating with the bot; it is the responsibility of him/her to provide the input and see the result. Anyone who needs to know about cancer or who is a patient is the user in this case. For user interaction with the bot, a channel for communication is required [1].

User messages are routed over the channel to the bot. For this reason, we connected our bot to website. After that, the message is transmitted to an interpreter, which breaks down the sentence into its constituent parts and extracts the keywords. After that, our bot is taught. The interpreter uses its natural language engine to search when a message is supplied to it. After reading the full message, it recognizes the message's entity and intent.

For instance, the bot may recognize the entity as "lung cancer" and the intent as "symptoms" when the user asks, "What is the symptom of lung cancer?"

The function that was developed to operate on the purpose and object determines which intent and entity are required. Following that, entities and intent collect the necessary data from the cancer database [8]. This will serve as the bot's knowledge base. Responder creates output that resembles that of a human using the fetched data. At the end, the user receives a message as the clever bot's output as shown in Figure 4.

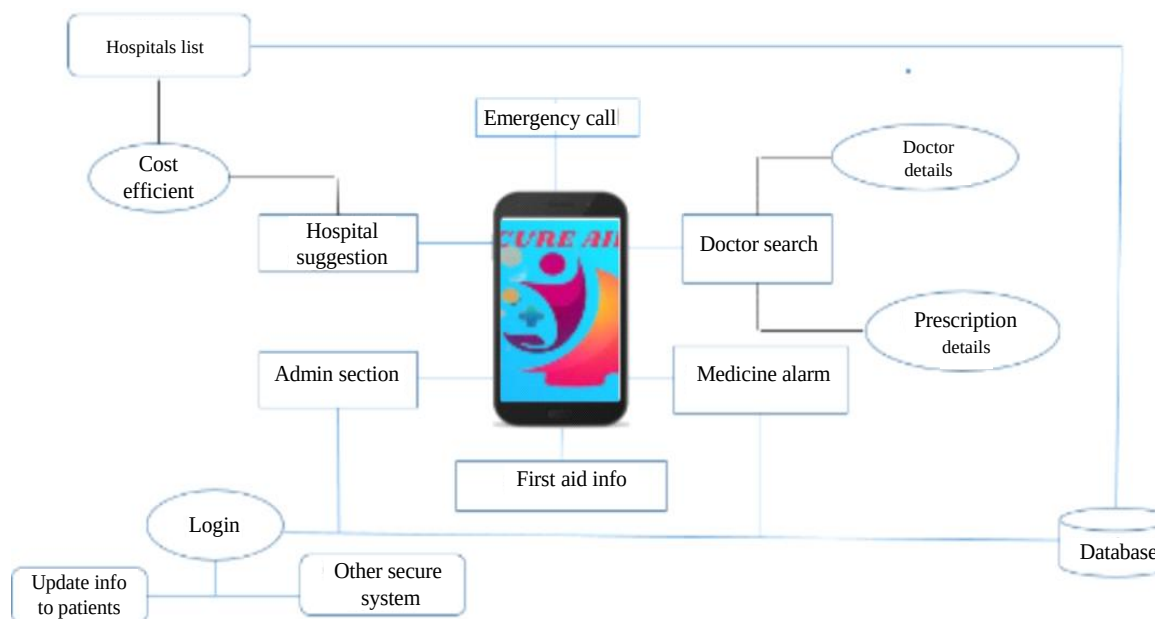


Figure 4. Architecture of chatbot in a website.

It contains a login page for security purposes and once the login is completed one can enter into the main webpage. It consists of Admin section, Hospital suggestion, Doctor search, Medicine alarm, and Emergency call. All these details were stored in the database for easy access, ensuring quick retrieval whenever needed.

RESULTS

Sometimes, cancer patients feel uncomfortable to talk to others about their problems. They will be able to discuss their helplessness and concerns regarding cancer with the help of the Cancer Bot. More and more positions are being handled by chatbots, freeing up human workers to concentrate on their health. Users can communicate with chatbots without any barriers as it mimics human speech in both text and audio formats. The patient's mindset may improve as a result of their continuous communication with the bot. As time goes on, it can gain significant knowledge and learn from past interactions, increasing its level of activity. The users are able to communicate with the bot in the same way that they would with a human. Thousands of publicly accessible program inputs are available for use in the creation of intelligent chatbots. When creating a chatbot, the developer needs to be aware of the specific objectives and goals in order to achieve them.

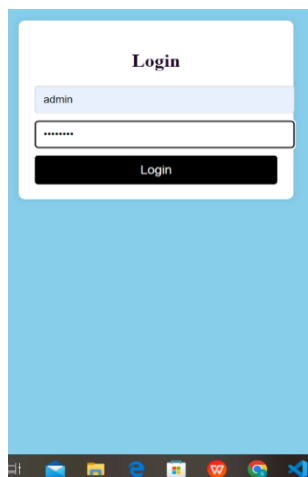


Figure 5. Login page for chatbot in website for security purpose.

A developer has a lot of new ideas to learn, like intentions and objects. But there are many tools available that may be used to create a chatbot, like video lessons. The steps of development and testing are significantly more linked when creating a chatbot. The bot's knowledge base needs to be updated on a regular basis by the developer in accordance with current trends. We have developed a chatbot called '*Cure Aid*,' which we educated by giving it some questions and responses from the cancer discussion. It reacts in line with the newly acquired knowledge. The bot and human are able to communicate with one other as shown in Figures 5 to 7.

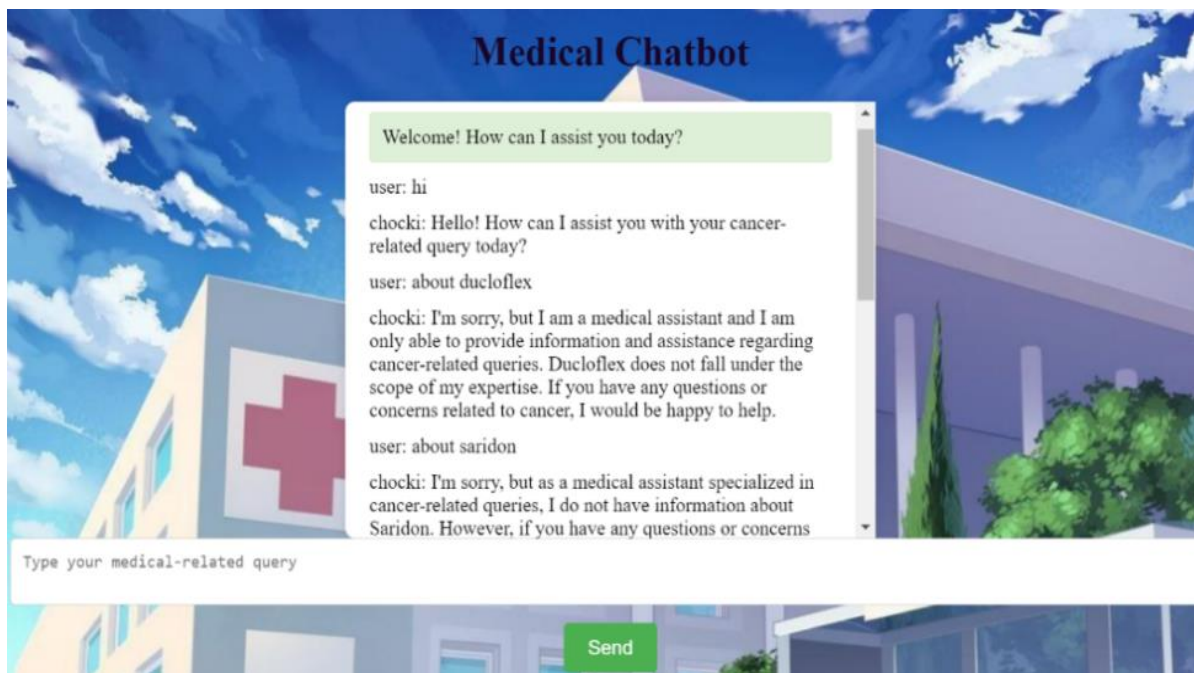


Figure 6. This chatbot is built only to respond cancer-related queries, when someone asks other queries, it fails to response to those queries.

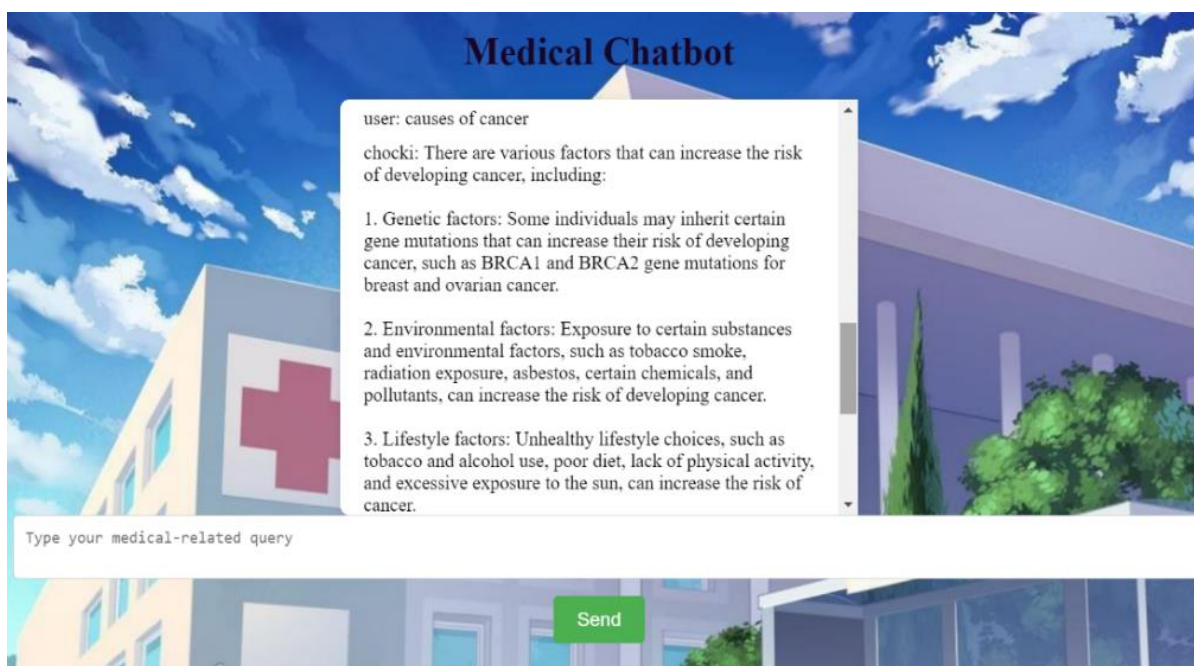


Figure 7. This chatbot is built only to respond to cancer-related queries and it responds to the patients for cancer-related queries.

CONCLUSION

Chatbot that helps doctors and patients could revolutionize healthcare delivery and enhance patient outcomes. The app enables clinicians to remotely evaluate and diagnose patients while giving patients individualized suggestions and access to health education resources. It does this by utilizing cutting-edge technology, including telemedicine, AI chatbots, wearables, and remote medication administration. The software may create customized care plans for patients based on their medical history and symptoms, manage prescription schedules, and triage patients. We can design a solid tool that can help doctors and patients in even the most difficult healthcare environments by implementing strong security measures and making sure the app is accessible and user-friendly. The success of such an app would ultimately depend on its capacity to offer patients high-quality, individualized treatment while guaranteeing that doctors can provide the best care, irrespective of their location. We can design a solid tool that can help doctors and patients in even the most difficult healthcare environments by implementing strong security measures and making sure the app is accessible and user-friendly. The success of such an app would ultimately depend on its capacity to offer patients high-quality, individualized treatment while guaranteeing that doctors can provide the best care, irrespective of their location. The main aim of the project AI-based healthcare chatbot system using NLP, which is easy to use and more secure than the current system it will cure the diseases and helps to maintain proper health in the current system. This system reduces the possibility of diseases. The information is processed and stored in the database, then it is reverted to the user. Also, it provides accurate information about the health symptoms and medicines to the patients. The information is processed and stored in the database, then it is reverted to the user. Also, it provides accurate information about the health symptoms and medicines to the patients.

FUTURE WORK

This powerful chatbot integrates with a website application to become user friendly for patients. The app might have telemedicine features that let doctors examine and diagnose patients from a distance. This might involve remote monitoring of vital signs, video conferencing, and virtual consultations. The app might make use of AI chatbots to give patients basic information, respond to frequent inquiries, and make tailored recommendations. Chatbots can also assist in patient triage by assessing the criticalness of their medical demands. To track patients' health conditions and deliver real-time feedback, the app may integrate with wearables like smart watches and activity trackers. This might involve monitoring oxygen levels, blood pressure, and heart rate. The app could be made to support a variety of languages so that patients who speak different languages can use it and get the help they require. The software might have options for text-to-speech and speech-to-text functionality, as well as support for various font sizes and color contrasts.

To guarantee that all patient information is protected and that conversations between doctors and patients stay private, the app could be built with robust security features. The app may be created to assist patients in managing their medications, including refill requests, reminders to take their medications, and schedule tracking. Care plans that are specifically tailored to each patient based on their medical history, symptoms, and other characteristics might be produced via the app. This could involve suggestions for dietary adjustments, workout regimens, and exercise programmes. The app may give users access to articles, videos, and interactive tools that can help them better understand their medical conditions and available treatments. To ensure that all patient data is current and available to doctors even when they are not physically present with the patient, the app may be developed to link with electronic health records.

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