



## Assessing the Efficacy of ChatGPT in Facilitating Self-Management Strategies among Diabetic Patients

Muzamil Ahmad Khan, *MBBS*. (Research Scholar Fellow)

The George Washington University School of Medicine and Health Sciences,

Washington DC, United States

E-mail: Muzamilkhan1411@gmail.com

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ChatGPT is an AI chatbot developed by OpenAI and launched in November 2022. It employs unsupervised learning, analyzing a wide range of data to establish connections between words and phrases, and generates human-like response [1]. In the field of healthcare and medicine, ChatGPT has made significant contributions, particularly in the domain of diabetes. According to the IDF Diabetes Atlas [2021], 10.5% of the adult population currently has diabetes and this number is projected to increase by 48% by 2045, with 1 in 8 adults living with diabetes. Managing diabetes requires continuous self-care, including monitoring blood sugar levels, administering insulin, making healthy lifestyle choices, and regular visits to healthcare providers. However, there is a shortage of medical professionals, which poses a challenge in providing ongoing care for diabetic patients. ChatGPT can play a role in overcoming these challenges by providing real-time, personalized education and support [1]. This has the potential to improve patient engagement and adherence to treatment plans, while also reducing the burden on medical staff [1]. However, it is important to acknowledge that ChatGPT also has several pitfalls. The purpose of this study is to discuss the feasibility of utilizing ChatGPT in self-management strategies for patients.

ChatGPT has proven to be an invaluable resource, offering concise, well-organized, and easily comprehensible information on a wide range of topics. With the ability to address multiple inquiries simultaneously, it provides responses akin to those of a human, accompanied by sound advice.

One of the remarkable features of ChatGPT is its capacity to remember previous user input, allowing for seamless follow-up corrections and interactions. Moreover, the model is specifically trained to decline inappropriate requests, ensuring a safe and reliable experience for users. By being accessible from anywhere, ChatGPT eliminates the need for individuals, particularly those residing in remote areas, to physically visit hospitals. This accessibility has the potential to improve drug compliance and reduce missed appointments, ultimately leading to better health outcomes [1]. Overall, the incorporation of ChatGPT as an educational tool and interactive assistant has demonstrated immense potential in the realm of diabetes care. Its ability to provide comprehensive information, offer support, and proactively detect critical health indicators can contribute to better patient outcomes and a more efficient healthcare system.

In a study conducted in June 2023, involving 150 individuals with type 2 diabetes, it was concluded that diabetes education facilitated by ChatGPT had a profound impact on acceptability, satisfaction, and engagement. Notably, users reported enhanced self-care confidence, as well as improvements in their HbA1c levels. Furthermore, the study revealed that ChatGPT's engagement with users enabled the timely detection of high and low blood glucose levels, as well as medication-related issues. This capability holds significant promise, particularly in emergency situations such as diabetic ketoacidosis (DKA).[2]

ChatGPT offers a valuable tool for patients seeking a comprehensive understanding of their condition and making informed decisions regarding diabetes screening and management. A recent study conducted on April 16, 2023, revealed the remarkable capability of ChatGPT to address all 24 questions in the 24-DKQ, a specialized questionnaire meticulously designed to assess patient's knowledge about diabetes. This exceptional performance underlines the potential of ChatGPT as a reliable and accessible resource for individuals seeking accurate information and guidance in their journey towards effective diabetes care [3].

ChatGPT generates knowledge by combining words and phrases, but it does not rely on specific knowledge-based studies. This lack of specialization can potentially lead to misleading information, which could have negative consequences, especially in medical contexts. The text produced by ChatGPT should not be considered completely accurate or reliable. In one previous study, when asked about the Empa Kidney Trial, ChatGPT provided an answer with multiple factual errors, including information from unrelated trials like the Empa Reg trial [4]. During one previous study, certain inaccuracies were observed in ChatGPT's responses. Specifically, it failed to recognize that insulin analogs should be stored at room temperature after being opened [5]. ChatGPT's training is based on general information and does not utilize a database specifically dedicated to medical knowledge. Consequently, it may struggle to differentiate between some terminologies. It has limited understanding of complex medical concepts. Therefore, it may not be suitable for fields like medical research, where precise language and accurate terminology are crucial [4]. Moreover, ChatGPT's knowledge is limited to information available prior to 2021, and it may not be up to date with the latest research and studies [4]. ChatGPT cannot provide medical advice or conduct medical examinations and lacks the ability to reproduce images; instead, it describes them when asked about them [4]. While ChatGPT offers information easily and passively, this convenience might hinder an individual's deeper conceptual learning on a subject [4]. Moreover, ChatGPT is not compliant with the Health Insurance Portability and Accountability Act (HIPAA), meaning it cannot access or handle protected health information (PHI). Therefore, using ChatGPT for healthcare workflows involving PHI, like analyzing and summarizing clinical notes, would violate the terms of use [4]. One significant drawback of ChatGPT is its inability to provide emotional support and empathy, which are often generated through human interactions[1]. While ChatGPT can be a feasible platform for the younger generation, older individuals may not feel comfortable or familiar with this technology[1]. Additionally, patients may be hesitant to disclose sensitive information to a machine, as they may not feel as comfortable as they would with a human healthcare provider[1]. ChatGPT acknowledges that it is not updated with current medical knowledge and literature[4]. As with any machine learning model, ChatGPT

may be influenced by any biases present in the data it was trained on. This could be particularly concerning in medical contexts, where certain demographic groups may be underrepresented or marginalized [4].

<b>Table 1; Conversation with ChatGPT about Diabetes</b>	
<p>1. I have diabetes, should I check my blood sugar levels at home with a glucose monitor? How often should I check them?</p>	<p>As a person with diabetes, monitoring your blood sugar levels at home with a glucose monitor is an essential part of managing your condition. Regular blood sugar checks help you understand how your body responds to various factors like food, exercise, medications, and stress, allowing you to make informed decisions to maintain stable blood sugar levels and prevent complications.</p> <p>The frequency of blood sugar monitoring can vary depending on the type of diabetes you have, your treatment plan, and your healthcare provider's recommendations. Here are some general guidelines:</p> <p>1. Type 1 Diabetes:</p> <ul style="list-style-type: none"><li>● If you have type 1 diabetes and use insulin therapy, you may need to check your blood sugar levels multiple times a day. Your healthcare provider will advise you on how often to monitor, but it is usually recommended before meals, before bedtime, and occasionally during the night.</li><li>● Additionally, if you experience symptoms of low blood sugar (hypoglycemia) or high blood sugar (hyperglycemia), you should check your blood sugar levels promptly.</li></ul> <p>2. Type 2 Diabetes:</p> <ul style="list-style-type: none"><li>● For those with type 2 diabetes, the frequency of blood sugar monitoring can vary. Your healthcare provider will determine how often you should check based on your individual treatment plan, such as whether you are managing diabetes with diet and exercise, oral medications, or insulin therapy.</li><li>● Some individuals with well-controlled type 2 diabetes may only need to check their blood sugar levels a few times a week. Others, especially those on insulin therapy, may need to monitor more frequently, similar to the guidelines for type 1 diabetes.</li></ul> <p>Always follow your healthcare provider's advice regarding the appropriate schedule for checking your blood sugar levels. They</p>

	<p>will consider your specific diabetes management plan, medical history, and any other individual factors to determine the best monitoring frequency for you.</p> <p>Remember that blood sugar monitoring is just one part of diabetes management. Regularly share your blood sugar records with your healthcare provider during your check-ups, as they can help adjust your treatment plan if needed to achieve optimal blood sugar control and overall health. Additionally, if you experience any significant changes in your health or diabetes management, consult your healthcare provider promptly for guidance</p>
<p>2. I have diabetes, what are my goals regarding blood sugar levels?</p>	<p>As an individual with diabetes, your goals regarding blood sugar levels will depend on the type of diabetes you have, your age, overall health, and any other medical conditions you may have. The primary objective of managing diabetes is to achieve and maintain blood sugar levels within a target range that minimizes the risk of complications while promoting overall well-being. The specific targets for blood sugar levels are usually determined in consultation with your healthcare provider. Here are some general goals:</p> <ol style="list-style-type: none"><li>1. Glycemic Targets:<ul style="list-style-type: none"><li>● For most adults with diabetes, the American Diabetes Association (ADA) recommends the following glycemic targets:<ul style="list-style-type: none"><li>● Fasting blood glucose (before meals): 80-130 mg/dL (4.4-7.2 mmol/L)</li><li>● Postprandial blood glucose (1-2 hours after meals): Less than 180 mg/dL (10.0 mmol/L)</li></ul></li><li>● For some individuals, such as older adults or those with a history of severe hypoglycemia, less stringent targets may be recommended.</li></ul></li><li>2. HbA1c (A1c) Level:<ul style="list-style-type: none"><li>● The A1c test measures your average blood sugar levels over the past 2-3 months. The ADA generally recommends an A1c target of less than 7% for most adults with diabetes. However, individualized targets may be set based on your health status and treatment plan.</li></ul></li><li>3. Hypoglycemia (Low Blood Sugar) Avoidance:<ul style="list-style-type: none"><li>● Preventing episodes of low blood sugar (hypoglycemia) is equally important. The ADA recommends aiming to avoid blood sugar levels below 70 mg/dL (3.9 mmol/L) and recognizing and treating hypoglycemia promptly when it occurs.</li></ul></li><li>4. Individualized Goals:<ul style="list-style-type: none"><li>● For children, pregnant individuals with diabetes, and those with specific medical conditions or complications, blood sugar</li></ul></li></ol>

	<p>goals may be individualized and set in collaboration with their healthcare team.</p> <p>It is essential to work closely with your healthcare provider to establish personalized blood sugar targets and diabetes management plan.</p> <p>Regularly monitoring your blood sugar levels, following a healthy diet, engaging in regular physical activity, taking prescribed medications as directed, and managing stress are vital components of achieving your blood sugar goals.</p> <p>Remember that diabetes management is a dynamic process, and your blood sugar goals may be adjusted over time based on changes in your health, lifestyle, and treatment plan. Regularly communicate with your healthcare provider, attend diabetes education programs, and stay proactive in managing your condition to optimize your overall health and reduce the risk of diabetes-related complications.</p>
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<p>3.what are the warning signs or symptoms that my blood sugars are too high? What do I do if my blood sugars are too high?</p>	<p>When your blood sugar levels are too high, it indicates hyperglycemia, a condition commonly associated with diabetes. Recognizing the warning signs and symptoms of high blood sugar is crucial as it allows you to take prompt action to bring your blood sugar back within a healthy range. Here are some common warning signs of high blood sugar:</p> <ol style="list-style-type: none"><li>1. Frequent Urination: You may notice an increase in the frequency of urination, and you might need to wake up during the night to use the bathroom.</li><li>2. Excessive Thirst: Hyperglycemia can lead to dehydration, causing you to feel extremely thirsty even after drinking fluids.</li><li>3. Fatigue and Weakness: High blood sugar levels can lead to a lack of energy and persistent tiredness.</li><li>4. Blurred Vision: Hyperglycemia can affect the shape of the lens in your eyes, leading to temporary blurred vision.</li><li>5. Slow Healing of Wounds: Elevated blood sugar levels can impair the body's ability to heal, leading to slow healing of cuts or sores.</li><li>6. Dry Mouth: You may experience a dry or sticky feeling in your mouth due to dehydration.</li><li>7. Headaches: High blood sugar levels can cause headaches and dizziness.</li><li>8. Nausea and Vomiting: In severe cases of hyperglycemia, you may experience nausea and vomiting.</li></ol> <p>If you suspect that your blood sugar levels are too high based on these symptoms, it is essential to take action promptly:</p> <ol style="list-style-type: none"><li>1. Check Your Blood Sugar: Use your glucose monitor to measure your blood sugar levels. If the reading is significantly higher than your target range, it confirms hyperglycemia.</li></ol>
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	<p>2. Drink Water: Hydrate yourself by drinking plenty of water to help flush out excess sugar from your bloodstream and prevent dehydration.</p> <p>3. Avoid High-Carbohydrate Foods: Refrain from consuming high-carbohydrate foods or sugary drinks that can further elevate your blood sugar levels.</p> <p>4. Engage in Physical Activity: Light to moderate exercise, like walking, can help lower blood sugar levels. However, avoid intense workouts when your blood sugar is very high.</p> <p>5. Take Insulin or Diabetes Medication: If you are on insulin or other diabetes medications, follow your healthcare provider's guidance on adjusting your dose to bring your blood sugar down.</p> <p>6. Contact Your Healthcare Provider: If your blood sugar levels remain high despite your efforts, or if you experience symptoms of severe hyperglycemia, contact your healthcare provider for further guidance and potential adjustments to your treatment plan.</p> <p>It is crucial to be proactive in managing hyperglycemia, as uncontrolled high blood sugar levels can lead to diabetic ketoacidosis (DKA) or other serious complications. Consistently monitoring your blood sugar, adhering to your diabetes management plan, and seeking medical advice when needed will help you maintain stable blood sugar levels and promote better overall health.</p>
<p>4. What are the warning signs and symptoms that my blood sugar is too low? What do I do if my blood sugars are low?</p>	<p>When your blood sugar levels drop too low, it leads to a condition called hypoglycemia. Recognizing the warning signs and symptoms of low blood sugar is essential as it requires prompt action to raise your blood sugar back to a safe level. Here are some common warning signs of low blood sugar:</p> <ol style="list-style-type: none"> <li>1. Shakiness or Trembling: You may feel shaky or experience trembling, especially in your hands.</li> <li>2. Sweating: Hypoglycemia can cause excessive sweating, even if the environment is not warm.</li> <li>3. Rapid Heartbeat: Your heart rate may increase, and you might feel palpitations.</li> <li>4. Hunger: You may suddenly feel very hungry.</li> <li>5. Dizziness or Light-headedness: Hypoglycemia can cause feelings of dizziness or being light-headed.</li> <li>6. Fatigue and Weakness: You might feel extremely tired and weak.</li> <li>7. Irritability: Some individuals may experience mood changes, such as irritability or nervousness.</li> <li>8. Confusion or Difficulty Concentrating: Hypoglycemia can affect cognitive function, leading to confusion or difficulty concentrating.</li> <li>9. Blurred Vision: Your vision may become blurry.</li> </ol>

	<p>If you suspect that your blood sugar levels are too low based on these symptoms, it is crucial to take immediate action:</p> <ol style="list-style-type: none"><li>1. Check Your Blood Sugar: Use your glucose monitor to measure your blood sugar levels. If the reading is lower than your target range, it confirms hypoglycemia.</li><li>2. Treat with Fast-Acting Carbohydrates: Consume fast-acting carbohydrates to raise your blood sugar quickly. Examples include glucose tablets, fruit juice, regular soda, or glucose gel. Aim for about 15 grams of carbohydrates.</li><li>3. Recheck Blood Sugar: Wait for about 15 minutes and then recheck your blood sugar. If it is still low or you continue to experience symptoms, repeat the carbohydrate treatment.</li><li>4. Follow Up with Longer-Acting Carbohydrates: After successfully raising your blood sugar, consume longer-acting carbohydrates to sustain your blood sugar levels. Examples include a small snack containing protein and complex carbohydrates, like a piece of fruit with nuts or cheese.</li><li>5. Inform Others: If you are unable to treat yourself, let someone around you know about your low blood sugar so they can assist you if needed.</li><li>6. Monitor Your Condition: Keep an eye on your blood sugar levels and symptoms. If you experience severe or recurrent hypoglycemia, inform your healthcare provider to adjust your diabetes management plan.</li></ol> <p>Preventing hypoglycemia is crucial in diabetes management. Monitor your blood sugar regularly, follow your meal plan, take medications as prescribed and be mindful of physical activity to maintain stable blood sugar levels. By being proactive and responsive to low blood sugar, you can prevent potential complications and ensure your well-being as you manage your diabetes.</p>
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<p>5. How can I change my life style and diet in a way that will be healthy?</p>	<p>Making positive lifestyle and dietary changes can significantly improve your overall health and well-being. If you are looking to adopt a healthier lifestyle, here are some tips to help you get started:</p> <ol style="list-style-type: none"><li>1. Consult with a Healthcare Provider: Before making any significant changes to your lifestyle or diet, it is essential to consult with a healthcare provider, especially if you have any underlying medical conditions or concerns. They can provide personalized guidance and recommendations based on your health status.</li><li>2. Eat a Balanced Diet: Focus on a balanced diet that includes a variety of nutrient-dense foods. Aim to consume plenty of fruits, vegetables, whole grains, lean proteins, and healthy fats. Minimize your intake of processed foods, sugary drinks, and high-calorie</li></ol>
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	<p>snacks.</p> <ol style="list-style-type: none"><li>3. Control Portion Sizes: Be mindful of portion sizes, as overeating can lead to weight gain and other health issues. Consider using smaller plates and bowls to help with portion control.</li><li>4. Stay Hydrated: Drink plenty of water throughout the day to stay hydrated. Avoid excessive consumption of sugary beverages and opt for water as your primary choice.</li><li>5. Limit Added Sugars and Salt: Reduce your intake of added sugars and salt in your diet. Read food labels to identify hidden sugars and choose lower-sodium options.</li><li>6. Engage in Regular Physical Activity: Incorporate regular exercise into your routine. Aim for at least 150 minutes of moderate-intensity aerobic activity or 75 minutes of vigorous-intensity aerobic activity per week, along with muscle-strengthening activities on two or more days a week.</li><li>7. Get Enough Sleep: Prioritize getting enough quality sleep each night. Aim for 7-9 hours of sleep for adults.</li><li>8. Manage Stress: Find healthy ways to manage stress, such as meditation, deep breathing exercises, yoga, or spending time in nature.</li><li>9. Avoid Smoking and Limit Alcohol: If you smoke, seek support to quit smoking. Limit alcohol consumption to moderate levels or avoid it altogether.</li><li>10. Seek Social Support: Surround yourself with supportive friends and family members who encourage and motivate you on your health journey.</li><li>11. Set Realistic Goals: Set achievable and realistic health goals. Celebrate your successes, no matter how small, and be patient with yourself if progress is gradual.</li><li>12. Keep a Food Journal: Consider keeping a food journal to track your eating habits. It can help you identify areas for improvement and make healthier choices.</li></ol> <p>Remember, lifestyle and dietary changes are most effective when they are sustainable and suited to your individual needs and preferences. Gradual and consistent progress is key to building healthier habits for the long term. Seek support from healthcare professionals, registered dietitians, or health coaches if needed to help you achieve your health goals successfully.</p>
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<p>6.What are the side effects of Glyburide ?</p>	<p>Glyburide, also known as glibenclamide, is an oral medication used to treat type 2 diabetes. Like any medication, it can have side effects. Some common side effects of glyburide include:</p> <ol style="list-style-type: none"><li>1. Hypoglycemia: Glyburide lowers blood sugar levels, and one of the most significant risks associated with this medication is hypoglycemia (low blood sugar). Symptoms of hypoglycemia include shakiness, sweating, dizziness, confusion, weakness, and rapid heartbeat.</li><li>2. Nausea and Upset Stomach: Some people may experience nausea, vomiting, or an upset stomach after taking glyburide.</li><li>3. Weight Gain: Glyburide can cause weight gain in some individuals, especially when used in combination with a diet that may lead to increased calorie intake.</li><li>4. Skin Reactions: Rarely, some individuals may experience skin reactions, such as rash or itching, as a side effect of glyburide.</li><li>5. Photosensitivity: Glyburide may increase sensitivity to sunlight, leading to sunburn more easily. It is advisable to wear protective clothing and use sunscreen when outdoors.</li><li>6. Allergic Reactions: In rare cases, glyburide can cause allergic reactions, which may include swelling, itching, rash, and difficulty breathing. If you experience any signs of an allergic reaction, seek immediate medical attention.</li><li>7. Gastrointestinal Issues: Some people may experience diarrhea or constipation while taking glyburide.</li></ol> <p>It is essential to be aware of the potential side effects of any medication you are prescribed. If you experience any side effects while taking glyburide, it is crucial to inform your healthcare provider. They can assess your situation and make any necessary adjustments to your treatment plan to minimize side effects and ensure your safety.</p> <p>It is important to note that not everyone taking glyburide will experience side effects, and many individuals tolerate the medication well. The benefits of diabetes management achieved through proper use of glyburide often outweigh the potential side effects. Always follow your healthcare provider's instructions, take your medication as prescribed, and regularly communicate any concerns or changes in your health to</p>
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	ensure the most effective and safe treatment.
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In conclusion, ChatGPT shows promising potential for enhancing self-management strategies in diabetes care. Its real-time, personalized education and support can boost patient engagement and treatment adherence. While it serves as a valuable educational tool and interactive assistant, precautions must be taken to address its limitations. By doing so, ChatGPT can empower patients and improve health outcomes for individuals living with diabetes.

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