Received: 17 February 2024 | Revised: 27 March 2024 | Accepted: 28 March 2024

DOI: 10.1111/jch.14822

OPINION

WILEY

Enhancing clinical decision-making: Optimizing ChatGPT's performance in hypertension care

Jing Miao MD, PhD[1] | **Charat Thongprayoon MD**[1] | **Tibor Fülöp MD, PhD**[2,3] | **Wisit Cheungpasitporn MD**[1]

[1]Division of Nephrology, Department of Medicine, Mayo Clinic, Rochester, Minnesota, USA

[2]Division of Nephrology, Department of Medicine, Medical University of South Carolina, Charleston, South Carolina, USA

[3]Medicine Service, Ralph H. Johnson VA Medical Center, Charleston, South Carolina, USA

Correspondence
Tibor Fülöp, Department of Medicine, Division of Nephrology, Medical University of South Carolina, Charleston, SC, USA.
Email: tiborfulop.nephro@gmail.com; fulopt@musc.edu

KEYWORDS
artificial intelligence, educational tools, hypertension, machine learning, natural language processing

1 | INTRODUCTION

Artificial intelligence (AI), especially conversational models like ChatGPT developed by OpenAI, has significantly impacted fields globally, including healthcare.[1] ChatGPT, capable of mimicking human conversation based on vast training data and sophisticated natural language processing, has been featured in 2349 PubMed publications as of February 8, 2024, highlighting its growing relevance in medical research and practice.[2] Its application in healthcare promises to revolutionize patient care, offering personalized health monitoring and recommendations.[2,3]

Hypertension, a major risk factor for cardiovascular and chronic kidney diseases,[4] necessitates comprehensive management strategies.[5] Traditional approaches rely on clinical guidelines, physician expertise, and patient outcomes, challenging for nonspecialists.[6] AI, particularly through ChatGPT, introduces a new dimension to clinical decision-making.[7] Studies have demonstrated ChatGPT's efficacy in providing relevant advice for cardiovascular disease prevention and hypertension management,[8–10] indicating its potential to improve clinical outcomes.

This perspective review explores the potential enhancements and optimizations that ChatGPT could contribute to hypertension management, taking into account its existing capabilities and future possibilities.

2 | ENHANCING CLINICAL DECISION-MAKING THROUGH CHATGPT

ChatGPT can quickly process vast information, including medical guidelines and patient data, helping healthcare providers improve diagnostic accuracy, tailor treatments, and enhance patient outcomes.[11] This represents a move towards digital health, with AI like ChatGPT elevating care standards through insightful support (Figure 1).

2.1 | Guideline summarization and updates

ChatGPT can swiftly provide summaries of the latest hypertension management guidelines from leading organizations like the American College of Cardiology, American Heart Association, or European Society of Cardiology, ensuring healthcare professionals stay up-to-date with best practices. It can be set to notify users about new studies, guidelines, or updates in hypertension care, either regularly or on demand. While ChatGPT alone cannot monitor new information in real-time, integrating it with tools like RSS Feeds and Alert Systems (Table 1) can enhance decision-making in hypertension care by keeping professionals informed about new research and innovative treatments.

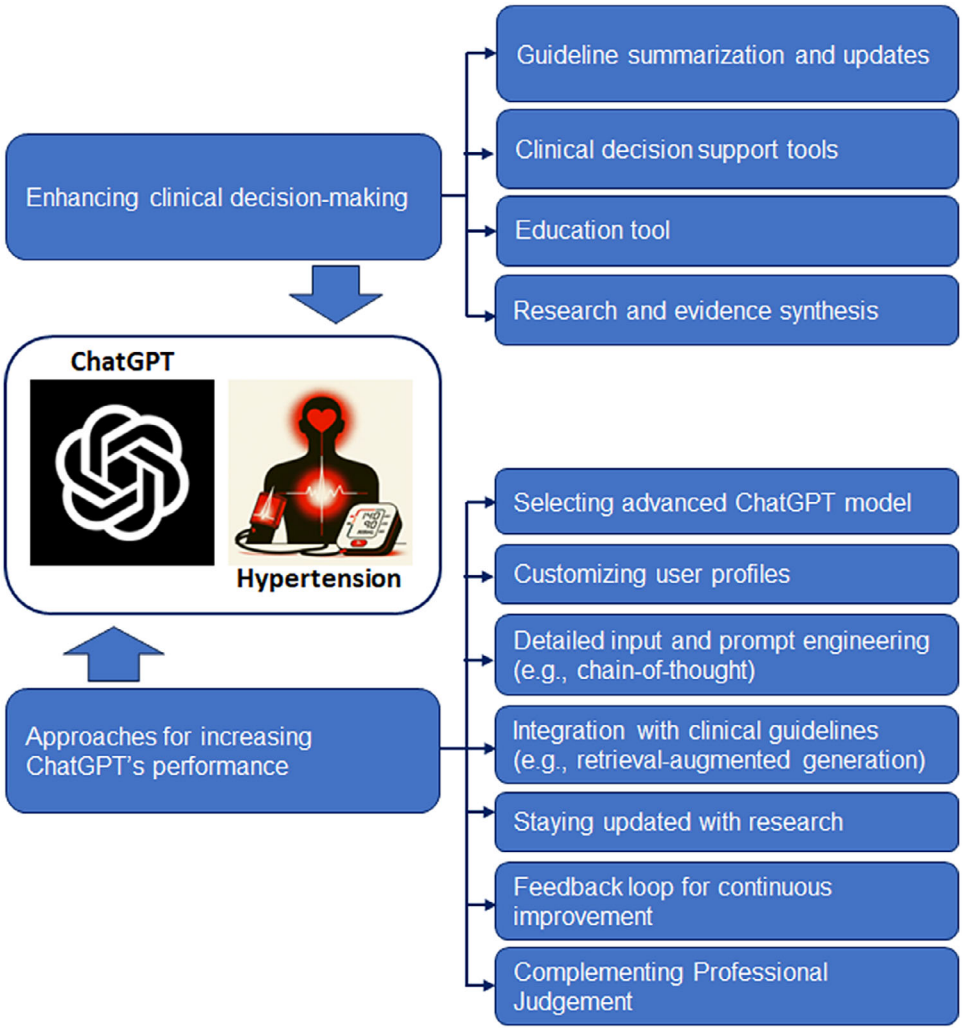

FIGURE 1 Potential enhancements and optimizations of ChatGPT on hypertension management Several strategies are available to enhance the performance of ChatGPT when it is incorporated into the hypertension management aspect of clinical decision-making.

2.2 | Clinical decision support tools

Incorporating ChatGPT into clinical decision support systems can greatly improve their ability to support healthcare providers with evidence-based decisions (Table 2). For instance, It may assist in evaluating patient risk for cardiovascular events to tailor management plans, making systems more responsive to new research.[12] Success requires accurate data, high-quality models, and skilled use.[13] In telemedicine, ChatGPT aids in remote patient monitoring, analyzing data, and highlighting concerns for prompt action.[14]

2.3 | Education tool

ChatGPT acts as a dynamic educational tool for both patients and healthcare professionals, simplifying complex medical topics, highlighting new research, and updating guidelines in an easily understandable way.[15] This ongoing education strengthens clinical reasoning by keeping knowledge up to date.

For patients with hypertension, ChatGPT offers personalized guidance on risk factors, lifestyle modifications, and medication adherence (Figure S1). It aids in developing comprehensive educational resources like FAQs and brochures, making health information more digestible (Figure S2). Its 24/7 availability and interactive learning approach are invaluable, especially for clarifying doubts between medical appointments. ChatGPT adheres to the latest health guidelines, ensuring the advice given is trustworthy. Additionally, it encourages patients to remain engaged with their health management and offers support in multiple languages, broadening access to information across diverse backgrounds.

For healthcare providers, ChatGPT can provide both hypothetical and virtual clinical scenarios for skill enhancement, contributing to improved diagnostic and treatment planning (Figure S3). While it does not replace professional judgment, it can offer diagnostic suggestions, possibly bringing attention to less considered conditions. However, it is crucial to view ChatGPT as a supplement to, not a substitute for, the expertise of healthcare professionals, ensuring a balanced approach to patient education and clinical practice.

TABLE 1 Approaches for setting up ChatGPT for new information alerts.

Approaches	Methods
RSS feeds and alert systems	• Utilize RSS (Really Simple Syndication) feeds from prominent medical journals and databases such as PubMed, The Lancet, and the Journal of the American College of Cardiology. • Tools like Feedly or Inoreader can aggregate these feeds. • Set up Google Scholar alerts for specific search terms like "hypertension management," "blood pressure control studies," or "antihypertensive drug research."
Scripting automation for regular updates	• Develop a script using a programming language (e.g., Python) that periodically checks these alerts and summarizes the findings. • The script can use APIs from medical databases to fetch new publications, then format this information into a readable summary.
Incorporate ChatGPT for summarization and analysis	• Once the new information is gathered, input it into ChatGPT to generate comprehensive summaries, possible implications, and recommendations based on the latest updates. • This can be done as part of a regular schedule (e.g., weekly, monthly) or upon request.
Integration with communication platforms	• Automate the distribution of these ChatGPT-generated insights through email, Slack, or other communication platforms to ensure you and your team are promptly informed. • Services like Zapier or IFTTT can help automate these workflows.
Custom development	• For a more seamless solution, consider developing a custom application that integrates ChatGPT directly with your information gathering tools. • This application could automatically process new research findings through ChatGPT and send alerts via your preferred method.
Manual prompting upon request	• When immediate updates are required, manually prompt ChatGPT with the latest research findings or updates you have received through your alert systems. ChatGPT can then provide a detailed analysis based on the information provided.
Continuous monitoring and adjustment	• Given the rapidly evolving nature of both AI technology and medical research, continuously review and adjust your configuration to ensure it remains effective and relevant.
Compliance and security	• Ensure that all tools and processes comply with relevant data protection and privacy regulations, especially when handling patient data or sensitive information.

2.4 | Research and evidence synthesis

ChatGPT can quickly gather and summarize literature research on various aspects of hypertension management, providing healthcare professionals with concise overviews of the latest studies, clinical trials, and meta-analyses.[16,17] This tool helps in making informed clinical decisions by offering insights into the efficacy and safety of various antihypertensive medications, lifestyle interventions, and emerging treatments, delivering a comprehensive analysis of the current evidence.

3 | APPROACHES FOR INCREASING CHATGPT'S PERFORMANCE

To optimize ChatGPT's performance on hypertension care from a user's perspective, the following strategies can be considered (Figure 1).

3.1 | Selecting advanced ChatGPT model

It is important to note the shift from GPT-3.5 to GPT-4 marks a substantial improvement in the functionality and efficiency of large language models in various medical subspecialties.[18–22] Our findings show that GPT-4's accuracy in responding to questions related to hypertension has increased by 20%, achieving a 77% success rate.[10] Despite the need for a subscription to access GPT-4, its enhanced performance strongly supports its recommended use.

3.2 | Customizing user profiles

The purpose of providing "custom instructions" when using ChatGPT is to tailor the interaction and responses to better meet the specific needs, preferences, and expectations of the user (Figure S4). These custom instructions help in several ways, like personalization, efficiency, quality control, experience enhancement, content relevance, innovation and speculation, and accessibility and inclusivity. This approach reflects a user-centric design philosophy, aiming to maximize the utility and satisfaction derived from the interaction with AI technologies.

3.3 | Detailed input and prompt engineering

When utilizing ChatGPT, clear and specific queries with detailed information often leads to more accurate and helpful responses. The more specific the input, the more customized and useful the output will be (Figure S5).

When handling complex reasoning tasks, the chain-of-thought prompting approach is designed to improve the model's ability.[23,24] This methodology involves structuring a prompt to guide the AI

TABLE 2 Potential capabilities of ChatGPT in enhancing clinical decision support systems.

Functionalities	Methods
Personalized treatment recommendations	• By analyzing patient data—such as age, medical history, co-existing conditions, and lifestyle factors—ChatGPT can help generate personalized treatment recommendations. • It can assess this data against current guidelines and research to suggest the most suitable treatment plans, including medication, lifestyle modifications, and follow-up schedules.
Risk assessment and stratification	• ChatGPT can assist in evaluating a patient's risk of developing complications from hypertension, such as heart disease, stroke, and kidney damage. • Using predictive modeling and analysis of patient data, it can stratify patients by risk level, guiding the prioritization of interventions.
Interpretation of clinical guidelines	• ChatGPT can provide real-time interpretation and summary of the latest clinical guidelines and research findings. • This includes translating complex guideline documents into actionable insights for healthcare providers, ensuring that patient care aligns with the latest standards.
Patient education and engagement	• It can generate patient-friendly explanations, education materials, and answers to frequently asked questions about hypertension. • This can enhance patient understanding of their condition, treatment plans, and the importance of adherence to prescribed interventions.
Support for diagnostic decisions	• By analyzing clinical data, including lab results and blood pressure readings, ChatGPT can assist in diagnosing hypertension and identifying patterns indicative of secondary hypertension or related complications. • This can support early intervention and tailored treatment strategies.
Medication management	• ChatGPT can offer support in medication management, including suggesting drug combinations based on evidence-based practices, identifying potential drug interactions, and providing recommendations for dose adjustments. • This is particularly valuable in managing patients with complex medication regimens.
Monitoring and follow-up	• It can help in setting up monitoring schedules, alerting healthcare providers to patients who require follow-up based on their risk levels or response to treatment. • This ensures timely adjustments to treatment plans and intervention strategies.
Research and continuous learning	• ChatGPT can facilitate ongoing learning and research by summarizing recent studies, identifying gaps in current knowledge, and suggesting areas for further investigation. • This can help healthcare providers stay at the forefront of hypertension care.
Multidisciplinary collaboration	• By providing a centralized platform for accessing patient information and treatment recommendations, ChatGPT can enhance collaboration among the various healthcare professionals involved in a patient's care, from primary care physicians to specialists.

through a series of intermediate steps or thought processes, rather than directing it to arrive directly at a final answer. The essence of this technique is to mimic human-like reasoning patterns, breaking down a problem into manageable parts and logically navigating through these parts to reach a conclusion (Figure S6). This approach is particularly useful in enhancing the model's performance on tasks that require deep understanding, logical deduction, multistep reasoning, or the integration of disparate pieces of information.

3.4 | Integration with clinical guidelines

Within the scope of managing hypertension, ChatGPT can be tailored to incorporate the newest clinical guidelines through the use of a retrieval-augmented generation method.[25] This process involves initially identifying the most pertinent documents or data snippets from the hypertension corpus (Figure 2). Following this, the system utilizes the gathered information to formulate a response that is consistent with current clinical guidelines (Figure S7).

3.5 | Staying updated with research

While ChatGPT's knowledge is up to date until its last training in April 2023, we can input new information, such as abstracts or summaries of the latest research findings in hypertension, directly to get its analysis based on existing knowledge. For example, "A recent study in JAMA found that dual therapy with ACE inhibitors and calcium channel blockers is more effective in reducing cardiovascular events in elderly hypertensive patients than monotherapy. How could this influence current treatment protocols?"

3.6 | Feedback loop for continuous improvement

Regular evaluation of the accuracy and pertinence of responses from ChatGPT is crucial. While this feedback cannot be directly inputted into the system, it can inform the way questions are posed or the kind of information sought to enhance the response quality. For example, upon reviewing a response, assess its alignment with expectations and adjust

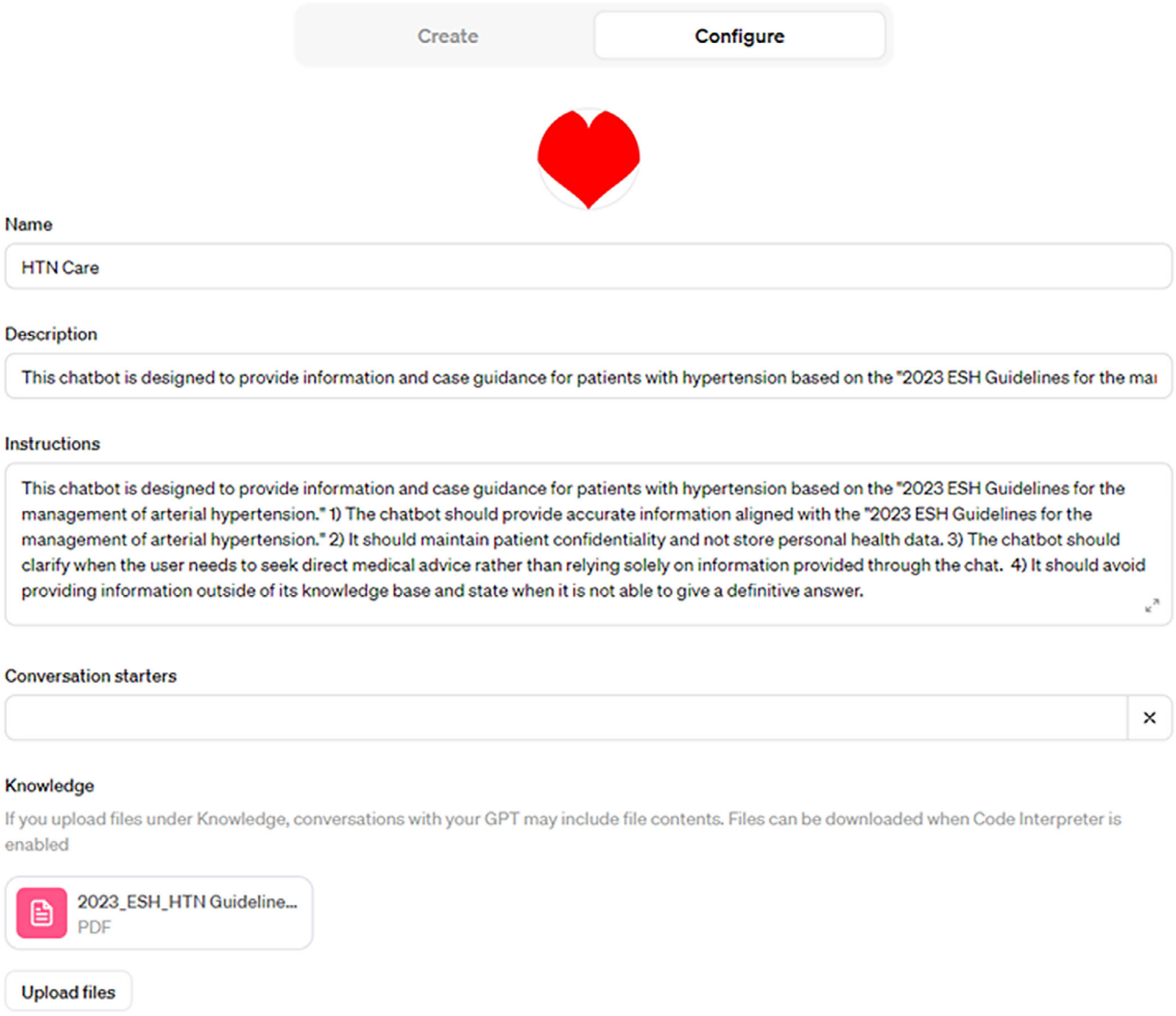

FIGURE 2 Creation of a customized ChatGPT model through the retrieval-augmented generation approach. In the creation of our GPT models, we have the ability to tailor and configure them by specifying a Name, Description, Instructions, and by integrating Knowledge bases of our choosing into the model. For example, a specialized ChatGPT can be developed to include the 2023 European Society of Hypertension guidelines for arterial hypertension management, ensuring that its outputs align strictly with these guidelines.

the subsequent inquiry to improve precision, possibly by clarifying the context or specifying the nature of the advice desired.

3.7 | Complementing professional judgement

Keep in mind that ChatGPT serves to enhance, not substitute, professional medical judgment. It is essential to leverage our expertise to assess the suggestions provided, taking into account the most recent clinical evidence and guidelines. Treat the responses from ChatGPT as initial guidance for deeper investigation or for sparking discussions with peers, rather than as conclusive medical counsel. For instance, should ChatGPT propose a modification in medication, consider this a prompt for more thorough review of current clinical research or for seeking advice from a specialist prior to making any treatment adjustments.

4 | ETHICS AND LIMITATIONS

Current ChatGPT utilization in hypertension management faces challenges including the reliance on outdated information, lack of personalization in treatment recommendations, absence of clinical judgment, and inadequate communication skills for patient interactions. These limitations necessitate careful consideration and mitigation strategies. When using ChatGPT in clinical settings, prioritizing ethical and

privacy considerations is crucial for safeguarding patient confidentiality and data security. It is imperative to refrain from disclosing sensitive information and to comply strictly with regulatory standards governing AI utilization in healthcare decision-making.

5 | CONCLUSIONS

To effectively use ChatGPT in hypertension management, a comprehensive strategy encompassing patient education, engagement, clinical support, and data analysis is crucial. Customizing interactions to meet individual patient needs, integrating with existing healthcare frameworks, and prioritizing privacy and security can significantly improve hypertension care, leading to enhanced patient outcomes and more streamlined healthcare services. Staying updated on AI advancements and exploring their incorporation into clinical practice can further optimize patient care. A collaborative effort among technology developers, healthcare professionals, and patients is essential to tailor ChatGPT to meet the needs of all stakeholders.

ACKNOWLEDGEMENT

The authors have nothing to report.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

All data that support this study have been provided and are also available on request from the corresponding author.

ORCID

Tibor Fülöp MD, PhD https://orcid.org/0000-0002-3346-7040

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Miao J, Thongprayoon C, Fülöp T, Cheungpasitporn W. Enhancing clinical decision-making: Optimizing ChatGPT's performance in hypertension care. *J Clin Hypertens*. 2024;26588-593. https://doi.org/10.1111/jch.14822