Can *ChatGPT* improve communication in hospitals?

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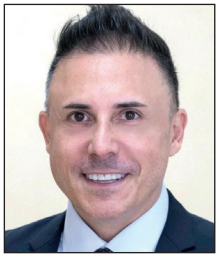

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Abstract

Hospitals' use of communication is a crucial aspect of patient care, yet medical material is often hard to read and understand for patients. Issues related to lack of standardization, use of jargon, reliance on outdated technology, poor coordination between health personnel, and shortage of healthcare workers lead to miscommunication, delays, and errors in patient care. By improving communication, hospitals can improve patient care and outcomes, and perhaps lower costs. This opinion piece compares current communication methods with the use of *ChatGPT* technology to explore whether *ChatGPT* can improve the efficiency and accuracy of communication in healthcare settings and, hence, improve patient care. While natural language processing (NLP) tools such as *ChatGPT* and other artificial-intelligence-generated content (AIGC) have tremendous potential to be very useful in healthcare, they should not be solely used as a substitute for humans and should therefore be used with caution.

Keywords

Healthcare communication; Hospitals; Artificial intelligence; *ChatGPT*; Communication; Patients; Doctors; Education; Training; Upskilling; Costs savings; Efficiency; Efficacy.

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1. Background

1.1. Health communication in hospitals

Health communication refers to strategies that spread health awareness and data with the goal of helping people better understand the major health risks that threaten their communities (**Mheidly**; **Fares**, 2020). Hospitals, public authorities, patients' associations, and pharmaceutical companies are some of the main organizations implementing health communication initiatives (**Medina-Aguerrebere**; **González-Pacanowski**; **Medina**, 2020). In hospitals, external communication is used to reinforce relations with various stakeholders, especially patients, media companies, and public authorities (**Khosravizadeh** *et al.*, 2021). Hospitals implement integrated communication initiatives, such as corporate events or press conferences (**Elrod**; **Fotenberry**, 2020), as well as develop corporate social responsibility activities to change stakeholders' behaviors towards different social issues, such as diseases or prevention measures (**Jiménez-Correa** *et al.*, 2021).

In addition to external communication initiatives, hospitals engage in internal communication activities to help their employees become brand ambassadors and build the hospital's reputation collectively (**Parker** *et al.*, 2021). Internal communication activities aim to

- integrate employees' perceptions from a medical, social, and human perspective (**Li**; **Xu**, 2020);
- consider cultural elements as key factors determining employees' decisions (**Tan** *et al.*, 2020);
- focus on content that helps employees improve their understanding of the hospital's brand (**Lithopoulos** *et al.*, 2021).

Along with the practice of spreading health awareness and health data through external and internal communication initiatives, hospitals implement training sessions with the main objective to reinforce employees' skills in interpersonal communication (**Butow**; **Hoque**, 2020). These sessions are a means to reinforce, for doctors and nurses, dynamic and engaging relationships with patients and promote ideas such as cooperation, leadership, and collective decision-making (**Rodrigues** *et al.*, 2020).

By implementing external, internal, and interpersonal communication initiatives, hospitals promote health education, reinforce patients' skills in health literacy, and advance the organizations' brand (**Ancker**; **Grossman**; **Benda**, 2020). However, such implementation requires hospitals to develop their own patient education materials, directives, and forms (**Rudd**, 2022), as well as establish consistent plans that include research methodologies, objectives, strategies, messages, and evaluation systems (**Zhao**, 2021). To efficiently achieve their health education goals, these organizations assign a budget for such activities (**Mackert** *et al.*, 2021) and recruit experts able to find synergies among patients' needs, hospitals' health education objectives, and public health authorities' requirements (**Finset** *et al.*, 2020). When hospitals manage health education initiatives in this way, they can efficiently promote their brand.

A hospital's brand includes four main dimensions (**Odoom**; **Narteh**; **Odoom**, 2021):

- brand elements;
- tangible assets;
- employees' quality; and
- medical treatments.

Health education initiatives allow hospitals to reinforce these four dimensions and provide stakeholders with meaningful content (**Gómez-Rico** *et al.*, 2022) that determines their perceptions about the hospital, its employees, and its services (**Rahman**; **Langner**; **Temme**, 2021). Building a reputed, credible brand constitutes a challenge, as well as a priority, for hospitals interested in reinforcing their strategic positionings in the health market (**Medina-Aguerrebere**; **González-Pacanowski**; **Medina**, 2020). These challenges are the reasons why these organizations must prioritize stakeholders' needs in terms of information, health education, and emotional support (**Tsai** *et al.*, 2021).

1.2. Inefficiencies in communication in hospitals

Healthcare professionals' skills in communication play a key role in patients' medical outcomes and knowledge (**Koivisto** *et al.*, 2020). These professionals must use medical terminology, which involves using technical concepts and long explanatory sentences (**Szmuda** *et al.*, 2020), while at the same time implementing the hospital's internal protocols, including corporate language, procedures, and approvals (**Hammoud** *et al.*, 2020). Finally, healthcare workers are required to abide by the organization's ethical requirements, which involve privacy, legal frameworks, and ethical principles (**Morsa**, 2021).

These three aspects (medical terminology, internal protocols, and ethical principles) make doctors' communication often cryptic, inaccessible, hard to read and/or understand, for patients. Consequently, patients struggle to grasp basic

concepts related to public health, treatments, and diseases, which can lead to avoiding reading them, as well as limiting their ability to evaluate and use potentially useful medical information (**Van-den-Broucke**, 2020). To minimize this issue, healthcare professionals try to adapt their communication to patients' medical literacy skills (**Hammoud** e*t al.*, 2020). However, this is not always possible as training for doctors in cultural skills and multidisciplinarity in communication is often insufficient (**Frank** *et al.*, 2021; **Civitelli** *et al.*, 2020). This may lead to misunderstandings, problems for, for instance surgery patients that require structured preoperative education and advice in different formats including brochures, reports, or forms (**Koivisto** *et al.*, 2020). Communication problems also represent a threat to patients suffering from noncommunicable diseases:

> "Natural language processing (NLP) tools like *ChatGPT* and other artificial-intelligence-generated content (AIGC) may be very useful in certain healthcare situations by, for example, automating administrative tasks, thus reducing the time that doctors or nurses spend doing non-medical procedures"

- cancer patients need written documents that clearly explain specific concepts such as chemotherapy cycles, side effects, radiation therapy, or surgery (**Tuominen** *et al.*, 2021);
- patients with coronary artery diseases need to receive consistent information about risks, prevention measures and emergency management (**Mentrup** *et al.*, 2020); and
- patients suffering from diabetes need access to documents describing clearly how to control blood sugar or daily frequency of insulin injections (**Soep**; **Agussalim**, 2020).

To improve patient care and reduce issues associated with communication inefficiencies, hospitals have implemented ten initiatives:

1) Help healthcare professionals to adapt their language to patients' needs, and thus improve the readability of educational materials (**Rooney** *et al.*, 2021).

2) Follow evidence-based principles, learning theories, and educational principles in healthcare institutions (**Heng** *et al.*, 2020).

3) Make references to public health authorities' medical guidelines so patients can consult alternative sources of information (**Team** *et al.*, 2020).

4) Implement a human approach that prioritizes patients' needs in terms of information and emotional support (**Tomokawa** *et al.*, 2021).

5) Develop documents that integrate knowledge from other disciplines, such as sociology, anthropology, and education (**Troisoeufs**, 2020).

6) Resort to storytelling techniques to allow healthcare professionals to write more creative texts (**Shruti**; **Govindraju**; **Sriranga**, 2021).

7) Combine written texts with visual elements, such as pictures, figures, or information graphics (**Siregar** *et al.*, 2021).

8) Use videos that complement the written information and help patients to understand some technical concepts (**Lucya**; **Nuryanti**, 2022).

9) Share written documents on different interactive platforms, allowing patients to ask questions to doctors, and upload medical information (**Team** *et al.*, 2020).

10) Integrate written documents, online platforms, and serious games to help some patients, such as children, to understand medical concepts and prevention initiatives (**Sharifzadeh** *et al.*, 2020).

1.3. ICT-mediated communication in hospitals

A significant number of hospitals resort to Information and Communication Technologies (ICT) to improve their relationship with stakeholders. Patient portals, social media platforms, and mobile apps are some of the main technological tools managed by these organizations. According to **Team** *et al.* (2020), hospitals need to improve their dissemination strategies and prioritize patient portals that allow doctors and patients to constantly upskill and share written documents (reports, forms, etc.). Using ICT platforms, healthcare professionals can quickly provide information and monitor patients' medical outcomes (**Shieh** *et al.*, 2020), which positively contributes to reinforcing collective making-decisions processes among patients and doctors (**Adapa** *et al.*, 2020). However, use of these portals introduces challenges to doctors who must write information that adheres to the profession's scientific rigor, allowing patients to make decisions (**Rudd**, 2022), while at the same time, adapting it to different formats available in these portals, such as reports, chats, leaflets, newsletters, or booklets (**Tong** *et al.*, 2021). To efficiently overcome these challenges, hospitals need to train doctors on multidimensional skills (**Farsi**, 2021) and help them to balance medical principles (transparency, ethics, accuracy, patients' rights) and digital health tools (**Barredo-Ibáñez** *et al.*, 2021).

In addition to patient portals, hospitals manage social media platforms to improve doctor-patient communication relations. Several authors, such as **Bora** *et al.* (2021) and **De-Las-Heras-Pedrosa** (2020) have stated that a greater presence

of reliable organizations on social media is necessary so that patients can access accurate medical information. Hospitals should therefore educate medical teams, including doctors and nurses, on written communication skills specific to social media (**Stellefson** *et al.*, 2020). If implemented, trained professionals can develop ten main initiatives on these platforms (**Chen**; **Wang**, 2021):

- promote infoveillance;
- disseminate health information;
- promote health interventions;
- develop social mobilization;
- facilitate health-related research;
- reinforce professional skills;
- facilitate doctor-patient communication;
- share public health-related information;
- exchange social support in online communities; and
- track patients' medical outcomes.

When doctors use social media professionally, they

- enhance patients' right to access quality information (**Alanazi**, 2021);
- improve their relations with different stakeholders (**Katz**; **Nandi**, 2021); and
- help hospitals tackle public health priorities such as combatting misinformation, promoting medical ethics, and reinforcing patients' skills in health literacy (**Comp**; **Dyer**; **Gottlieb**, 2020).

Finally, hospitals develop mobile apps to improve delivery of healthcare knowledge and improve patient satisfaction (**Mateus-Coelho**; **Cruz-Cunha**; **Avila**, 2021). Mobile applications raise patients' knowledge and provide greater access to more written medical information in more convenient and accessible formats (**Palacios-Gálvez** *et al.*, 2021). However, as is true for patient portals and social media, hospitals need to train health professionals on how to use mobile apps to write medical content that patients can efficiently use to make decisions (**Yu** *et al.*, 2021). When properly trained, doctors can use mobile apps to support clinical diagnosis, improve patients' clinical outcomes, promote digital therapeutics, and implement health education initiatives (**Rowland** *et al.*, 2020). Mobile apps can therefore change the way doctors communicate with patients, especially with those facing serious diseases, by sharing written information and care guidance with patients going through surgery (**Machado**; **Turrini**; **Sousa**, 2020); by providing cancer patients' information needs about treatments, and risks (**Lavdaniti**, 2020); and transferring real-time data to patients with diabetes, providing them with tailored recommendations (**Tassone** *et al.*, 2020).

1.4. AI-mediated health communication

The discussion above indicates that hospitals use of communication is often inefficient, and such inefficiencies may lead to a reduction in the quality of healthcare (**Agarwal**; **Sands**; **Díaz-Schneider**, 2010); that is, patient care and outcomes can be compromised. In addition, suggested remedies, such as training doctors and nurses to improve their written communication skills, are potentially very costly. These costs would multiply as more hospitals communicate across several platforms, ranging from patient portals, social media, and mobile applications. Another concern is patient access to healthcare information, which is greater with the use of multiple platforms but adds cost to hospitals. Given that hospitals have limited resources, it is possible that investments into better communication will reduce resources available for other competing ends.

In fact, when discussing health policy researchers and practitioners often refer to the iron triangle of healthcare (**Ball**, 2021; **Terry**, 2017). This iron triangle has three components: access, cost, and quality, and there is an inherent trade-off between the three corners (vertices) (see Figure 1). The implication is that any policy that makes healthcare cheaper (lowering the cost) will either result in a reduction in access or a reduction in quality. Of course, the corollaries are that an increase in quality will either raise costs or reduce access and an increase in access will come at the expense of either cost or quality. Thus, cost innovations must be carefully considered and implemented.

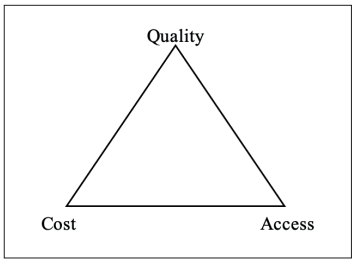

Figure 1. The iron triangle of health care

Another factor is the size of the healthcare industry in almost all countries. In the United States health spending accounted for 18.3 percent of the nation's Gross Domestic Product in 2022; that is, every person in the U.S. spent on average $12,914 on health care annually (*cms.gov*). Although the United States is an outlier, Spain spent 10.7 percent of its GDP on health expenditures in 2020 or €2,538 per inhabitant, which was below average for the European Union (€3,269 per inhabitant in 2020) (*Eurostat*, 2022). In contrast, healthcare expenditure accounts for 8.4 percent of GDP in South Korea (**Kim** *et al.*, 2022). The size and importance of the healthcare industry justifies careful study of the choices that hospitals and governments make to promote the well-being of patients and citizens, respectively.

The healthcare sector is, however, different from other markets, not only because of its size, but also due to uncertainty. That is, consumers of healthcare, as well as producers, cannot accurately predict the demand for healthcare

(**Mwachofi**; **Al-Assaf**, 2011). This uncertainty, combined with people being risk averse, explains the ubiquity of health insurance, whether public or private. In addition, the healthcare market is always looking for ways to reduce uncertainty, in addition to exploring ways to reduce costs. Innovations that can achieve both simultaneously are thus desirable. In fact, **Sampathkumar** (2023) indicated that 3,000 funded digital health startups globally were currently developing AI-based solutions for healthcare problems. Platforms like *Qventus* are for instance reducing costs by improving and optimizing operational processes (e.g., automating discharge planning, scheduling or maximizing the usage of operating rooms).
https://qventus.com

> "*ChatGPT* can be used in healthcare in multiple ways: as a virtual assistant, streamlining care, educating patients, and providing mental health support and guidance"

Hence, it is possible that new technologies such as AI chatbots (**Jiang**; **Zhang**; **Pian**, 2022) or Health Recommendation Systems (**Tsai**; **Sandbulte**; **Carroll**, 2022) can in fact break the iron triangle of healthcare by offering better care, better communication, better access, better equity, and even lower costs (**Mahoney**, 2019). Health Recommendation Systems can help patients monitor their health, track their progress, and receive personalized recommendations for their condition. Utilizing AI-mediated health communication could therefore help hospitals save costs by reducing the number of unnecessary consultations, providing more efficient care, and enabling patients to take charge of their health. **Ball** (2021, p. 279) argued that

> "failure to incorporate AI and ML techniques in healthcare may be malpractice".

This study thus explores whether the new *ChatGPT* technology has the potential to achieve these results.

1.5. *ChatGPT*

Today, numerous companies explore and adopt machine learning-based or artificial intelligence-based natural language applications to translate texts, document summaries, or generate abstracts (**Guerrero**; **Liang**; **Alsmadi**, 2022). One of the recent tools launched in this industry is *ChatGPT*, a OpenAI platform designed and trained on a large body of textual data, including newspapers articles, books, and websites, that allows it to answer questions on a wide range of topics and disciplines (*Management and Datascience*, 2023). *ChatGPT* (short for *Chat Generative Pre-Trained Transformer*) is a variant of the *GPT* (*Generative Pre-trained Transformer*) language model that was specifically designed for chatbot applications. With its capabilities in Natural Language Processing (NLP) and its development through large language data sets, *ChatGPT* is said to be able to answer follow-up questions, admit its mistakes, challenge incorrect premises, and reject inappropriate requests (**Jiao** *et al.*, 2023). As such, *ChatGPT* can converse with a human, write codes, compose music, play games, and even write poems and songs. The generative AI quality of *ChatGPT* lends itself to revolutionizing numerous industries and human-computer social interactions (**Gozalo-Brizuela**; **Garrido-Merchan**, 2023). *ChatGPT* acquires its human-like responses through a process of inputs for "reinforcement learning for human feedback," which is said to be developed with human AI trainers (**Gozalo-Brizuela**; **Garrido-Merchan**, 2023, p. 15).

The accuracy of human-like texts of *ChatGPT* not only improves NLP, it also improves natural language understanding (NUL) (**Aljanabi** *et al.*, 2023). This makes it valuable when assisting with social media activities (**Aljanabi** *et al.*, 2023) as it is able to understand language and context (**Gilson** *et al.*, 2022). In addition, its three main advantages are:

- encouraging users' autonomy and improving their learning experiences by offering individualized and interactive help (**Firat**, 2023);
- understanding words in context and making predictions (**Sundar**, 2023); and
- enhancing companies' internal processes (**Fortson**, 2022).

Given the capacities inherent to the *ChatGPT* technology, it can potentially be used in a healthcare in multiple ways, including as a virtual assistant, educating patients and providing clinical support and guidance on medical procedures and protocols. That is, *ChatGPT* can provide written communication material that addresses a variety of patients' needs and questions. In addition, *ChatGPT* answers can be targeted to the level of sophistication of the user.

Based on the *ChatGPT* capabilities, there is real potential for it to lower the cost of healthcare by accomplishing three important goals:

- automating routine tasks (such as appointment scheduling and symptom checker), which would free up healthcare personnel time to focus on more complex tasks (**Baumgartner**, 2023);
- improve efficiency by providing instant access to relevant information to patients across a variety of platforms; and
- reducing errors by providing reliable information at a level that is understandable to the patient. By improving the overall efficiency of healthcare delivery and by freeing up time for healthcare professionals, *ChatGPT* can potentially lower the cost of healthcare.

For similar reasons, *ChatGPT* has the potential to improve the quality of healthcare by providing healthcare providers and patients with accurate, up-to-date information that can reduce the risk of medical errors. In addition, by automating routine tasks, *ChatGPT* can allow healthcare professionals to focus on delivering high-quality care to patients. The

AI platform can also improve the quality of healthcare by improving accessibility to all, but especially to populations that are traditionally underserved due to location. Finally, *ChatGPT* can improve health outcomes and patient care by enhancing communication between patients and healthcare providers, as well as personalizing the provided recommendations and treatment options.

ChatGPT has the potential to break the iron law of healthcare by improving both the quality and efficiency of healthcare delivery; that is, by automating routine tasks, providing accurate, personalized, and up-to-date information, and improving written communication between healthcare providers and patients, *ChatGPT* can reduce the cost of healthcare delivery while also improving the quality of care. Additionally, the use of *ChatGPT* can help reduce the risk of medical errors and improve patient outcomes, which also contribute to lowering healthcare costs. In short, the platform offers a way to simultaneously improve quality, raise access, and reduce costs.

> *ChatGPT* provides obvious benefits to a wide range of industries and offers an opportunity to break the iron law of healthcare by improving access, quality of communication, and patient care at scale and at a reduced cost

The actual impact of *ChatGPT* on the quality of healthcare will depend on various factors, including the quality of its implementation and adoption of best practices in healthcare delivery. Hospitals will need to adopt a multi-faceted approach that includes the use of technology, along with other innovations in healthcare delivery and policy changes. In addition, despite the advantages and potential advances that *ChatGPT* can provide, it has its limitations. *ChatGPT* raises ethical dilemmas (**O'Connor**, 2022). These often revolve around issues such as who owns the intellectual property of texts produced by this platform, how to cite these texts, or how to evaluate them (**Wenzlaff**; **Spaeth**, 2022). Another concern of *ChatGPT* is the "hallucination effect," which is the potential of the platform to provide seemingly credible but inaccurate responses (**Shen** *et al.*, 2023, p. 3). That is, *ChatGPT* responses can provide wrong answers, wrong or invented references and misinformation can be presented as fact (**Lock**, 2022), which may leave users unable to verify the quality of the information (**Rossoni**, 2022). Similarly, *ChatGPT* focuses on what the user wants to receive, which can provide misleading data, as opposed to providing accurate information based on clarification of questions and given circumstances (**Shen** *et al.*, 2023).

2. The use of *ChatGPT* for health communication

The use of *ChatGPT* for health communication personnel in hospitals has the potential to revolutionize the way in which patients and healthcare providers communicate. *ChatGPT* can be used by health communication specialists to assist with a variety of tasks, such as streamlining administrative tasks, as exemplified by the *Doximity/ChatGPT*-powered platform: *https://www.doximity.com/docs-gpt*

Additionally, *ChatGPT* could be used:

- As a virtual assistant, by providing fast and accurate personalized information on social media platforms on a variety of health topics. The launch of *Visual ChatGPT*, which combines visual foundation models (VFMs) will also enable sending and receiving images based on specific prompts. Alternatively, text-to-video technology could also be used. *D-ID* uses real-time face animation and advanced text-to-speech to create an immersive and human-like conversational AI experience.
  https://www.d-id.com
- As medical triage (symptom management), by helping patients identify symptoms, educate them about their conditions, treatments, and medication, as well as direct them to appropriate medical care based on the urgency of their conditions.
- As mental health support (triage, virtual therapy, mental health education and social support), providing guidance on medical procedures and protocols. It could be used to enroll participants in clinical trials (**Moodley**; **Rennie**, 2023).
- As secretary/personal assistant (appointment scheduling).
- As translator, by providing language translation in real-time, which would facilitate communication between patients and healthcare providers, in various countries.

2.1. Social media and personalized information

As *ChatGPT* has been designed for chatbot applications and generates information based on large bodies of textual data and language modeling, it could be used on a hospital's social media account to provide information about common health conditions, medications, or other health-related topics. It could also be used to answer basic questions about the hospital's services and policies, such as its visiting hours or policies for appointment. Additionally, one of the primary benefits of using *ChatGPT* in hospitals is the ability to provide personalized, accurate, and up-to-date free-of-jargon information to patients. Health communication specialists could technically input specific prompts related to a patient's condition or treatment plan, and *ChatGPT* could generate detailed explanations or instructions in a way that is easy for the patient to understand. As an illustrative example, **Jeblick** *et al.* (2022, p. 2) investigated the quality of radiology reports simplified by *ChatGPT*. Their study concluded that

> "the simplified reports were factually correct, complete, and not potentially harmful to the patient".

Applications such as these can be useful for patients with complex medical conditions, or those who may have limited health literacy. An example a recently launched application *MedPaLM* (*Google Research* and *DeepMind*), an open-sourced large language model for medical purposes (**Singhal** *et al.*, 2022). *AnsibleHealth*, a chronic pulmonary disease clinic, also uses *ChatGPT* to simplify radiology reports for patients (**Mathur**, 2023).
https://www.ansiblehealth.com

2.2. Symptom management and post-treatment engagement

ChatGPT can support patients by helping them identify symptoms and direct them to appropriate medical care based on urgency, as well as providing patients up-to-date information on medical conditions, treatments, and medications (medical information retrieval). In addition to educating patient, *ChatGPT* can also assist with symptom management (supportive psychotherapy, manual-based treatment, etc.). For example, if a patient is experiencing a particular symptom and is unsure how to manage it, a health communication specialist can input a prompt related to the symptom and *ChatGPT* can generate suggestions for self-care or recommend seeking medical attention. This can help to alleviate patient anxiety and ensure that symptoms are properly addressed in a timely manner.

2.3. Mental health support

In addition to physical health support, and equally important, *ChatGPT* can provide accessible mental health support to patients due to its ability to converse with humans. With the ability to provide symptomatic support as well as an increase of educational awareness in healthcare, *ChatGPT* can be used in the following four ways for mental health support:

- Mental health triage: *ChatGPT* can be used to create a chatbot that serves as a mental health triage system. The chatbot could be integrated with platforms such as *Cerebral* or *Done ask users questions* about their mental health symptoms and provide appropriate recommendations for treatment, such as seeking help from a mental health professional or accessing self-help resources. It could also help redirect patients to a doctor/psychiatrist /psychologist / specialist and forward the conversation.
  https://cerebral.com/online/online-adhd-test-diagnosis
  https://www.donefirst.com
- Virtual therapy sessions: *ChatGPT* can be used to provide virtual therapy sessions to users, as a virtual psychologist chatbot. The chatbot could ask users about their concerns and provide support and guidance in a therapeutic way. A recent experiment by *Koko*, an online emotional support chat service based in San Francisco, showed that it is feasible.
  https://www.kokocares.org

  It could also be integrated with a conversational app such as *Alan AI* to keep user engagement.
  https://alan.app
- Mental health education: *ChatGPT*, as a chatbot, could provide specific information and education about, for instance, the signs and symptoms of common mental health conditions, treatment options, and self-care strategies.
- Social support: *ChatGPT* can be used to provide social support to users who may be feeling isolated or lonely. *Ginger*, is an example of a mental wellness and emotional support app that uses machine learning to help patients.
  https://www.ginger.com

  With its natural language processing capabilities, *ChatGPT* could allow real-time conversations with patients in various languages, which is especially important in a hospital setting where time is often of the essence, providing them with the information and support they need to make informed decisions about their health. It can also assist with answering frequently asked questions (FAQs) from patients and their families (e.g., exercise or nutrition plans): *ChefGPT.*
  https://www.chefgpt.xyz

2.4. Appointment scheduling

Another potential use for *ChatGPT* in hospitals is to act as a virtual assistant by supporting with appointment scheduling. Health communication specialists can input prompts related to available appointment times and *ChatGPT* can generate responses to patient inquiries, helping to streamline the scheduling process and reduce the burden on healthcare providers. *Voiceoc* is an example of such use.
https://www.voiceoc.com/conversational-ai/?

Iskowitz (2023) reports for instance on a hospital in the U.S. that was able to optimize its OR block scheduler by 30%. *ChatGPT* can also be used to connect with patients and their families in real-time, providing them with the information and support they need to navigate the often-complex healthcare systems, ultimately improving their overall experience at hospitals.

2.5. Internal communication and training

ChatGPT, in partnership with *WebMD*, the *American Journal of Medicine*, could be used for continuing professional development (CPD), upskilling, re-skilling, and training.
https://www.webmd.com
https://www.amjmed.com

ChatGPT can be trained on specific medical topics and used to provide face-to-face and distance training to healthcare professionals, at all levels, at scale. This can be especially helpful in areas or countries where there is a shortage of specialized healthcare professionals. *Qure.ai* provides automated interpretation of X-rays, CTs and Ultrasounds and could be useful to upskill remote personnel, improve and facilitate collaboration and knowledge sharing among healthcare professionals in different departments or locations. Furthermore, integrated with *Discord* or *Trello* and its AI-generated conversation summaries, it could also be used for administrative purposes, to answer common internal administrative questions such as human resources policies, employee benefits, scheduling questions or synthesize/summarize data-rich lengthy meeting minutes.

> "*ChatGPT* could improve access to and democratization of medical advice and mental health support to those in remote areas, medical deserts, or refugee contexts 24/7 and 365 days/year"

https://discord.com
https://trello.com

2.6. *ChatGPT* and cost savings

If *ChatGPT* is implemented in a hospital setting in a way that reduces the need for certain types of labor and supplies, it can potentially lead to cost savings in the form of reduced variable costs. If *ChatGPT* is used to automate certain tasks that are currently performed by hospital staff, it can potentially reduce the need for certain types of labor, such as nurses or receptionists, who are often responsible for facilitating communication, and result in lower payroll costs. Kung *et al.* report on the use of *ChatGPT*

> "to assist with traditionally onerous writing tasks such as composing appeal letters to payors, simplifying radiology reports (and other jargon-dense records) to facilitate patient comprehension, and even to brainstorm and kindle insight when faced with nebulous and diagnostically challenging cases" (**Kung** *et al.*, 2023, p. 10).

Alternatively, it can free up healthcare professionals from routine tasks, both doctors and nurses, and thus allow them to focus on more complex tasks, including more time to engage with patients (*World Health Organization*, 2021). *ChatGPT* can also improve efficiency by providing instant access to relevant information to patients across a variety of platforms, if integrated with *Publer*, which may also reduce costs.
https://publer.io

Finally, *ChatGPT* has the potential to reduce errors by providing reliable information (e.g., potential side effects) at a level that is understandable to the patient. In a hospital setting, effective communication is critical to ensure the safety and quality of patient care. Currently, much of the communication between hospital staff, patients, and other healthcare providers is done in person or over the phone. This can be time-consuming and requires a certain level of staffing and training to support these activities. By improving the overall efficiency of healthcare delivery and by freeing up time for healthcare professionals, *ChatGPT* could thus potentially lower the cost of healthcare.

To this end, the authors of this article propose the following design improvements:

2.7. Potential design improvements

1. Integration with hospital systems: *ChatGPT* could be integrated with hospital electronic medical record systems, allowing it to access patient information and provide more personalized and accurate responses to queries. It could also be used to summarize remote patient monitoring (RPM) data in real time.

2. Customization for healthcare language: *ChatGPT* could be trained on a larger dataset of healthcare-specific language (e.g., *WebMD*), allowing it to better understand and respond to queries related to medical terminology and concepts. It could be combined with the soon-to-be-launched context aware *GrammarlyGo*, which uses organizational, and situational contexts to write professional messages and *Symbl.ai*, which enables live captioning.
https://symbl.ai

3. Support for multiple languages: *ChatGPT* could be designed to better support (and translate in) text-to-speech, speech-to-text, and text-to-images multiple languages, allowing it to be used by a diverse patient population, including those visually/hearing impaired (integrated with the *inSCALE CommCare app* for Malaria detection used in Sub-Saharan Africa for instance), helping reduce language and access barriers in communication, particularly if integrated with *DALL.E2*, *AI Picasso* or *Midjourney* to generate high-resolution medical images.
https://openai.com/product/dall-e-2
https://www.aipicasso.app
https://www.midjourney.com

4. Integration with telemedicine platforms: *ChatGPT* could be integrated with apps or telemedicine platforms such as *Doxy.me*, *Twentyeight Health* or *VSee*, allowing it to assist with virtual consultations and follow-up visits, reducing the need for in-person visits (long/unnecessary commutes) and improving patient access to care.
https://doxy.me/en
https://www.twentyeighthealth.com
https://vsee.com

5. Development of specialized modules: *ChatGPT* could be enhanced with multimodal models (the newly launched *GPT-4*) and specialized modules focused on specific areas of healthcare, such as mental health or chronic disease management, allowing it to provide more targeted and relevant responses to queries.

> There are ethical concerns and risks inherent in the use of *ChatGPT*, around, for instance, confidentiality, the disclosure of private information to third parties, or potential liabilities

6. Natural language processing capabilities: *ChatGPT* could be designed to have improved natural language processing capabilities, allowing it to better understand and respond to queries that are phrased in a more conversational or colloquial style.

7. Integration with other AI tools: *ChatGPT* could be integrated with other AI tools, such as machine learning algorithms, diagnostic apps (such as *Binah.ai*, or natural language generation systems, to provide more sophisticated and personalized responses to queries.
https://www.binah.ai/technology

3. Discussion and conclusions

Overall, the use of *ChatGPT* for health communication personnel in hospitals has the potential to improve patient care and satisfaction by providing personalized (**Haleem**; **Javaid**; **Singh**, 2023), accurate, and up-to-date information and assistance. While there may be some initial investments required to implement *ChatGPT* in hospitals, the long-term benefits are likely to outweigh the costs. That is, *ChatGPT* offers an opportunity to break the iron law of healthcare by improving access and quality of communication and patient care, while at the same time reducing costs of operation. As such, it is worth considering its adoption, possibly in combination with other generative AI tools such as digital human avatars, for instance, or text-to-video creators such as *Synthesia*, *Rephrase Ai*, or *Colossyan* as instruments for health communication personnel in hospitals.
https://www.pantheonlab.ai
https://www.synthesia.io
https://www.rephrase.ai
https://www.colossyan.com

There are however a few potential drawbacks to using *ChatGPT* or NLP tools for health communication in hospitals:

1. Accuracy and accountability: NLP tools rely on patterns in existing text data to generate responses, so they may not always generate accurate or appropriate responses (drug dosages, intolerances, etc.). **Andreou** (2023, p. 13) argued that *ChatGPT*

> "may not be as sensitive nor perceptive to communication signals by patients (i.e., tone, inflection, prosody, fluency, and non-verbal)."

This can lead to misunderstandings, miscommunication, or "catastrophic outcomes" (**Andreou**, 2023, p. 13), which can have serious consequences in a healthcare setting (**Adams**, 2023; **Zhavonrokov**, 2023). **Hegde** *et al.* (2023) and **Doshi** and **Bajaj** (2023) report on experiments to use *ChatGPT* to generate a report on a central nervous system tumor (**Hegde**; **Srinivasan**; **Menon**, 2023) and an authorization letter regarding a transesophageal echocardiogram, not covered by the insurance provider (**Doshi**; **Bajaj**, 2023). Both concluded that, while *ChatGPT* did a "reasonable job" of summarizing content and providing a workable template, referencing of crucial medical literature was lacking.

2. Limited ability to handle complex medical and pharmaceutical terminology: Medical/ pharmaceutical terminology can be complex and challenging to comprehend. While NLP tools can recognize and analyze medical and/or pharmaceutical terminology, they may not be able, yet, to paraphrase, explain, or provide patients with clarifications.

3. Lack of context: NLP tools may not have access to the same contextual information that a human healthcare provider would have, such as a patient's medical history, context, or current condition. This can result in responses that are not tailored to the specific needs or concerns of the patient or inaccuracies in the summary of a clinical consultation.

4. Lack of human interaction (s): While NLP tools can provide patients with information quickly and efficiently, they lack the human interaction, patience, and empathy that are often necessary in healthcare. Patients may feel more comfortable and reassured when they are able to speak with a healthcare professional directly.

5. Ethical concerns:

> "Confidentiality of patient information forms the basis of trust in the doctor-patient relationship. *ChatGPT* threatens this privacy –a risk that vulnerable patients may not fully understand" (**Moodley**; **Rennie**, 2023, p. 10).

There may be ethical concerns about using NLP tools for health communication, around consent issues and confidentiality, particularly if patients are not aware that they are interacting with a machine rather than a human healthcare provider (as in the case of the *Koko* experiment).

6. Bias: NLP tools rely on human input and training and may be susceptible to unintended biases, such as ethnicity, age, creed, gender, and race, therefore providing health advice that is irrelevant or inaccurate.

In conclusion, this opinion piece has argued that, while NLP tools like *ChatGPT* and other AI-generated content (AIGC) may be very useful in certain healthcare situations (**George**; **George**; **Martin**, 2023), by, for example, automating administrative tasks, thus reducing doctors or nurses' time spent doing non-medical procedures (**Baumgartner**, 2023; **Doshi**; **Bajaj**, 2023), as a virtual assistant, streamlining care (**Corder**, 2018), and the potential to assist with medical education and clinical decision-making (**Shahriar**; **Hayawi**, 2023; **Kung** *et al.*, 2023), they should not be solely used as a substitute for human healthcare providers and should be used with caution in a healthcare setting. Considering the risks with *ChatGPT* around, for instance, the disclosure of private information to third parties or potential liabilities (**Adams**, 2023), health organizations should tread carefully when using it. To minimize these concerns, the *National Health Service* (*NHS* England) is currently working with *OpenAI* and universities to generate synthetic contextual doctor's notes, reducing re-identification to improve privacy:
https://nhsx.github.io/skunkworks/synthetic-data-pipeline

> "Proposed design improvements include integration with telemedicine diagnostic apps, medical databases, and text-to-speech, speech-to-text, and text-to-images artificial intelligence (AI) generators/creators"

Although generative AI (GenAI) provides obvious benefits to a wide range of industries (**Vallance**, 2022), allows patients to improve their medical outcomes (**Firth-Butterfield**, 2023), could help disseminate information to patients faster at scale and at a reduced cost, could improve access to and democratization of medical advice and mental health support 24/7 to those in remote areas, medical deserts, or refugee contexts (**Shah**; **Santandreu-Calonge**, 2019) 365 days/year, we argue that this tool cannot, as of yet, entirely replace trained healthcare professionals.

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