**BMES** BIOMEDICAL ENGINEERING SOCIETY

**LETTER TO THE EDITOR**

# Response of ChatGPT for Humanoid Robots Role in Improving Healthcare and Patient Outcomes

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**Abstract**
Humanoid robotics is characterized by constant developments, which are supported by several research facilities across the world. Humanoid robots are used in many different industries. In this setting, this letter, written by people, makes use of ChatGPT answers to examine how humanoid robots might be used in the medical industry, particularly in light of the COVID-19 pandemic and in future. Although humanoid robots can help with certain jobs, it is important to recognize the indispensable importance of human healthcare professionals who have knowledge, empathy, and the capacity for critical judgment. Although humanoid robots can complement healthcare initiatives, they shouldn't be viewed as a full-fledged replacement for human care.

**Keywords** ChatGPT · Humanoid robotics · Medical field · Patient outcomes

Associate Editor Stefan M. Duma oversaw the review of this article.

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## Introduction

Robots that, to varied degrees, mimic and resemble human shape and behavior are known as humanoid robots. They can interact with the physical world similarly to humans because they have a head, torso, arms, and legs. These robots have cutting-edge sensors, artificial intelligence, and mechanical parts that give them the ability to observe their surroundings, make choices, and carry out tasks. Their uses include social and emotional contact, research and development, assistive robots, senior care, entertainment and education, customer service, industrial applications, and disaster response, among others [1].

Humanoid robots have been used in the medical industry for a variety of purposes, particularly during the COVID-19 epidemic. These include of telemedicine and remote care, cleaning and sanitization, patient monitoring and assistance, supply and medication delivery, screening and temperature checks, and public health awareness and education [2]. Hospitals around the world that are well-known for using humanoid robots in their operations include Changi General Hospital in Singapore, Nagoya University Hospital in Japan, Seoul National University Bundang Hospital in South Korea, Hospital of Southern Norway, and University of California, San Francisco (UCSF) Medical Centre in the United States.

The Institute for Human and Machine Cognition (IHMC) in the United States, the Italian Institute of Technology (IIT)

in Italy, the German Aerospace Centre (DLR) in Germany, AIST - National Institute of Advanced Industrial Science and Technology in Japan, the Korea Institute of Science and Technology (KIST) in South Korea, and the Technical University of Munich are a few more research institutions and centres actively engaged in the development of humanoid robots for the medical field.

Boston Dynamics Robots, Hanson Robotics' Sophia, Toyota's T-HR3, Honda's ASIMO, SoftBank Robotics' Pepper and NAO, NASA's Robonaut 2, and SoftBank Robotics' Boston Dynamics Robots are some famous humanoid robots that have been created and are in use today for diverse industrial applications.

Given this context, the goal of this letter is to examine how using humanoid robots in the medical industry could improve patient care. It is written utilizing ChatGPT, an OpenAI-developed AI language model [3].

## Methods and Results

*Authors' Query-1*: What are the challenges and difficulties faced by medical field during COVID–19 pandemic?

*ChatGPT Response*: The COVID–19 pandemic has presented numerous challenges and difficulties for the medical field. Here are some key challenges that healthcare professionals have faced during this time:

- *Overwhelmed Healthcare Systems*: The rapid spread of the virus led to a surge in the number of patients requiring medical care, overwhelming healthcare systems in many regions. Hospitals faced shortages of beds, medical supplies, and healthcare workers, making it challenging to provide adequate care to all patients.
- *Shortage of Personal Protective Equipment (PPE)*: The demand for personal protective equipment, such as masks, gloves, gowns, and face shields, significantly exceeded the available supply. This shortage put healthcare workers at risk and hampered their ability to safely provide care, leading to concerns about their safety and well-being.
- *Increased Workload and Fatigue*: Healthcare professionals faced increased workloads due to the influx of COVID-19 patients. The long hours, high patient volumes, and emotional toll of caring for severely ill patients took a toll on the physical and mental well-being of medical staff, leading to exhaustion and burnout.
- *Lack of Testing and Diagnostic Capacity*: Initially, there were challenges in testing and diagnosing COVID-19 cases. Limited testing capacity and delays in receiving test results made it difficult to identify and isolate infected individuals promptly. This hindered efforts to contain the spread of the virus.

- *Inadequate Medical Infrastructure*: Some regions experienced a strain on medical infrastructure, with a shortage of intensive care unit (ICU) beds, ventilators, and other critical medical equipment. This made it challenging to provide the necessary level of care to severely ill COVID-19 patients.
- *Communication and Information Management*: Effective communication and dissemination of accurate information were critical during the pandemic. However, there were challenges in coordinating communication between healthcare providers, public health agencies, and the general public. Misinformation and rumors further complicated the situation.
- *Mental Health Impact*: The pandemic had a significant impact on the mental health and well-being of both healthcare professionals and the general population. The stress, fear, and grief associated with the pandemic, coupled with the challenges of working under difficult circumstances, contributed to increased levels of anxiety, depression, and psychological distress.
- *Ethical Dilemmas* The pandemic presented ethical dilemmas for healthcare professionals, such as making difficult decisions about resource allocation, prioritizing care for patients, and balancing the needs of COVID-19 patients with those of non-COVID-19 patients.

It's important to recognize the resilience and dedication of healthcare professionals who have been working tirelessly to address these challenges and provide the best possible care in an ever-evolving situation.

*Authors' Query-2*: Do you (ChatGPT) feel humanoid robots can play a key role in facing COVID-19 across the world? What are their limitations with respect to current research status on them?

*ChatGPT Response*: Humanoid robots have the potential to play a role in addressing certain challenges posed by COVID-19; however, it's important to consider their limitations in the current research status. Here's an overview:

(1) Potential Role of Humanoid Robots

- *Reducing Contact and Transmission*: Humanoid robots can be deployed in tasks that require human-to-human interaction, such as patient screening, delivering supplies, or disinfection. By minimizing contact between humans, these robots can help reduce the risk of transmission.
- *Remote Care and Telemedicine*: Humanoid robots can assist in remote care and telemedicine, allowing healthcare providers to interact with patients without being physically present. This can help manage patient monitoring, provide medical advice, and reduce the burden on healthcare facilities.

- *Supportive Functions*: Humanoid robots can provide emotional support and companionship to patients, particularly those in isolation or quarantine. These robots can help alleviate feelings of loneliness and isolation during periods of restricted human interaction.

(2) Limitations of Humanoid Robots

- *Limited Autonomy and Adaptability*: Humanoid robots often require specific environments or modifications to perform tasks. They may face challenges in adapting to diverse and dynamic real-world conditions, particularly in complex healthcare settings that involve unpredictable situations or patient variability.
- *Lack of Versatility*: Humanoid robots are typically designed for specific tasks and may have limitations in their ability to handle diverse medical procedures or respond to complex healthcare scenarios. Adapting them to new tasks or situations may require significant development and customization.
- *Cost and Accessibility*: Humanoid robots can be costly to develop, maintain, and deploy. Their widespread adoption may be limited by the financial constraints of healthcare systems, making them less accessible in certain regions or healthcare settings.
- *Ethical and Legal Considerations* Implementing humanoid robots in healthcare requires careful consideration of ethical and legal frameworks. Issues such as patient privacy, informed consent, liability, and the potential for dehumanization in patient care must be addressed to ensure responsible and ethical use.
- *Human-Machine Collaboration*: While humanoid robots can assist in various tasks, they are not intended to replace human healthcare professionals. Effective integration of robots into healthcare settings requires establishing clear roles and collaboration frameworks between humans and machines.

It's important to note that the field of humanoid robotics is rapidly advancing, and ongoing research and development efforts may address some of these limitations. However, widespread adoption of humanoid robots in healthcare settings will require addressing technical, practical, ethical, and economic challenges. Humanoid robots should be seen as complementary tools that can enhance certain aspects of healthcare but not as complete substitutes for human expertise and care.

## Conclusion

It's crucial to understand that, despite having potential in a number of medical applications, humanoid robots are typically utilized in conjunction with human healthcare personnel. Although they can speed up processes, increase effectiveness, and lessen interaction, they cannot take the place of human medical experts' knowledge and attention to detail. It's important to keep in mind that humanoid robots are still in the early stages of research and those barriers like cost, technological limitations, and societal acceptance may prevent their mainstream use. Humanoid robots could develop and improve their ability to help healthcare professionals as technology and research expand. But it's critical to carefully analyze their function within the larger framework of the intricate healthcare ecosystem. This includes making sure that humanoid robots are properly integrated and used for both the benefit of patients and medical professionals.

## Declarations

**Conflict of interest** The authors declare that they have no conflict of interest.

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