

LETTER TO THE EDITOR

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# ChatGPT: when the artificial intelligence meets standardized patients in clinical training

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## Letter to the editor:

Standardized patients (SP) were an effective and important program to help medical students develop communication skills [1]. Compared with the low-fidelity manikin, the SP group had significantly higher test scores and communication skills [2]. Artificial intelligence (AI) helps guide medical decisions that benefit individuals and populations and provides insights for optimizing various systems such as public health [3]. Since the release of the chat robot ChatGPT, this artificial intelligence technology has clearly had a significant impact on the way humans work [4]. Due to the importance of SP in clinical training and education, we collected 10 patient histories related to clinical training and education using ChatGPT, and evaluated them by senior physicians to verify

the accuracy of the information generated by ChatGPT simulating SP.

We provided 10 cases (11 to 15 questions for each case) to ChatGPT (ChatGPT-3.5-turbo, mode) and collected the medical histories of these 10 patients through ChatGPT simulating SP. Based on the answers provided by ChatGPT to each question, then we asked 5 senior physicians to evaluate their accuracy. Senior physicians independently evaluated the accuracy score (0–10 points) of each case and summarized them together.

We used the standardized training exam for resident doctors in Jiangxi Province as an example, and drew the flowchart of SP and ChatGPT simulating SP training respectively (Fig. 1A). Compared with real SP, ChatGPT simulating SP could eliminate the need for complex steps 1–6, meaning that ChatGPT simulating SP did not need to prepare medical records or additional training and could be used directly, saving a lot of time, manpower and resources. After evaluation of 5 senior physicians, out of 10 cases, 2 were rated as 10 points and 6 were rated as 9 points, the remaining 2 cases were rated as 8 points (Fig. 1B). ChatGPT simulating SP played a good role in all stages of consultation. For example, case 4 had 13 questions and an evaluation score of 10 (Fig. 2). Firstly, ChatGPT simulating SP was highly intelligent. When ChatGPT met different cases, it could quickly combine the patient's chief complaints and give appropriate and correct answers. Secondly, ChatGPT simulating SP responses were colloquial. When ChatGPT was responding to a doctor's query, it answered the questions in a tone close to that of the patient, such as in questions 2 and 6. Thirdly, ChatGPT simulating SP's responses were vivid and accurate. When ChatGPT described symptoms, it would use vivid words and answer accurately, as

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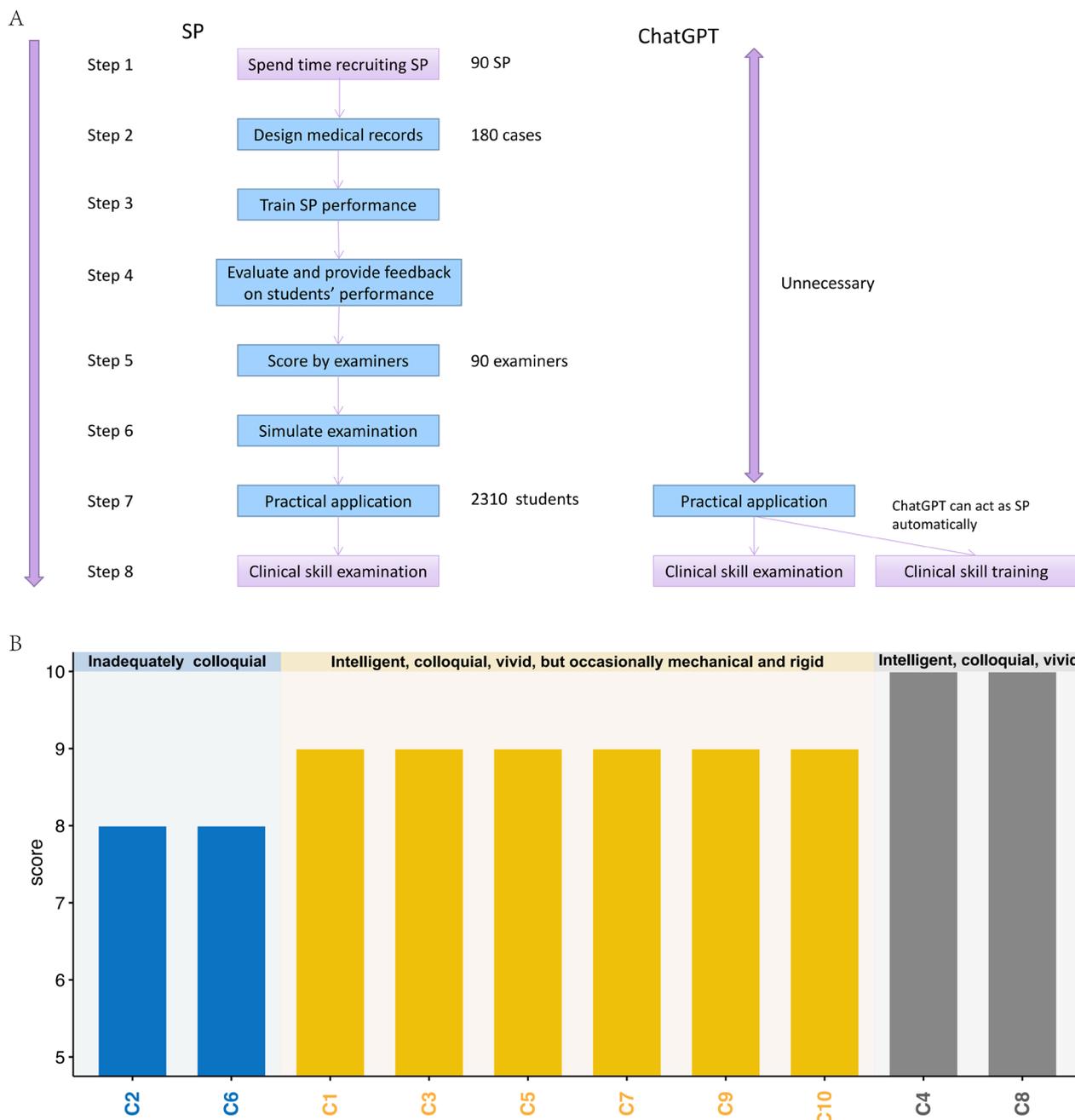
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**Fig. 1** A. Flow chart of SP and ChatGPT simulating SP training. B. Evaluation scores and characteristics of 10 cases

demonstrated in question 7. However, ChatGPT simulating SP's responses were mechanical and rigid occasionally when we asked more than one question at a time, such as in cases 9 and 12. The descriptions of symptoms reached the level of our clinical skills training and SP simulation in the test station. In general, ChatGPT can simulate the complete medical record interrogation mode without

disconnection and can be applied to the SP interrogation mode.

In the past few years, ChatGPT has already impacted and made progress in many fields, such as healthcare and education [5]. Nevertheless, ChatGPT has not been reported on simulating SP. In our study, ChatGPT had several advantages in simulating SP. ChatGPT simulating SP was able to combine themes and responded

Part 1.

**Case 4.** A 47-year-old female patient presented to the respiratory clinic due to cough and sputum for 1 month. Please take a history of the patient.

**Question 1:** Hello, I am your management doctor and will inquire about your general situation. May I ask your name, gender, age, occupation, education level, hometown, place of birth, address, ethnicity, and marriage?

**ChatGPT answer 1:** Hello, I am a patient, my name is Zhang Li, female, 47 years old this year, I am an accountant, bachelor degree, I am from Zhengzhou City, Henan Province, my place of birth is Shanghai, I now live in Pudong New Area, Shanghai, I am Han nationality, married.

**Question 2:** What's the matter with you, please?

**ChatGPT answer 2:** I have been coughing and coughing up phlegm for a month now, feeling itchy throat, sometimes accompanied by slight chest tightness. These symptoms made me feel very uncomfortable.

**Question 3:** When did these symptoms first appear? Were they an acute sudden onset or a chronic occurrence? Have there been similar situations before?

**ChatGPT answer 3:** These symptoms began about a month ago, starting with a mild cough and then coughing more frequently, with phlegm when coughing. This is not the first time I've had such symptoms, I've had similar situations before, but never for a month this long.

**Question 4:** Was there a trigger before the onset of the disease? Did you catch a cold, take drugs, vomiting, or allergic?

**ChatGPT answer 4:** I had no obvious colds or allergies and did not vomit. But I recently caught a cold and have been taking cold medicine and may have some effects. Other than that, I have no other obvious triggers.

**Question 5:** Was there a dry cough or sputum, a single cough, or a continuous cough? Was it a paroxysmal cough? Was it accompanied by metallic sounds or hoarse cough?

**ChatGPT answer 5:** I had a cough, and I had phlegm, and the cough was relatively sharp, sometimes several times in a row. My cough was not paroxysmal and had no metallic sounds and no hoarseness.

**Question 6:** Do you get up more obviously in the morning and get worse at night? Do you smell odors such as smoke, oil, and paint aggravate your cough?

**ChatGPT answer 6:** My cough is more pronounced when I wake up in the morning, but it doesn't get worse at night. I have not experienced a worsening of coughing when smelling odors such as cigarette oil or paint, but I feel worse if I am in a smoky environment.

**Question 7:** What kind of sputum? About how much? Is there a peculiar smell?

**ChatGPT answer 7:** My sputum is white, sometimes yellow. The amount of sputum is relatively small, and the amount of sputum coughed out in about a day will not exceed the size of an egg. The sputum does not smell particularly peculiar.

**Question 8:** Under what circumstances does coughing and phlegm increase? Under what circumstances will it alleviate?

**ChatGPT answer 8:** My cough and phlegm increase in smoke inhalation and cloudy air, as well as colds, climate change, etc. When I rest, drink water, and eat throat candy, my cough and phlegm will be relieved.

**Fig. 2** ChatGPT communicated with physicians as SP, and its responses were evaluated by senior physicians. Gray represents the questions we asked, and light yellow indicates the answers responded by ChatGPT

intelligently, colloquially, vividly and accurately, enabling it to play various patient roles. However, there were also some drawbacks, such as ChatGPT simulation of SP's responses being mechanical and rigid occasionally.

Therefore, our results showed that ChatGPT simulating SP could assist in clinical training and education, thereby more effectively guiding doctors' clinical skills, optimizing the education system, and improving medical skills. Meanwhile, it could alleviate the problem of human resource shortage when training real SP. Of course, the problems and limitations of ChatGPT simulating SP required us to maintain criticism, continuously improve and optimize during the use process.

In the future, we look forward to ChatGPT being applied as an SP in our medical education and training. Of course, to ensure the optimal integration of artificial intelligence-based learning tools in medical education, further research and evaluation are still needed.

Part 2.

**Question 9:** Is it accompanied by symptoms such as fever, sore throat, nasal congestion, runny nose? Is it accompanied by symptoms such as chest pain, asthma, hemoptysis, large amount of purulent sputum, night sweats, fatigue, palpitation, epigastrum, acid reflux?

**ChatGPT answer 9:** I have no symptoms such as fever, sore throat, nasal congestion, runny nose, etc. I also have chest pain, wheezing, hemoptysis, a large amount of purulent sputum, night sweats, fatigue, palpitations, epigastric pain, acid reflux and other symptoms.

**Question 10:** Have you consulted a doctor? What tests have been done? What diseases have been diagnosed? What treatments have been done, including the drugs used, the dosage, the course of treatment, and the efficacy?

**ChatGPT answer 10:** I haven't been to a similar situation before; I haven't done any tests. I have taken some cold medicine, but the effect is not obvious, and my cough and phlegm symptoms have not improved.

**Question 11:** How about the change of diet, sleep, spirit, defecation, physical strength and weight at the beginning of the disease?

**ChatGPT answer 11:** Since the onset of the disease, there have been no significant changes in my diet, sleep, mental state, urine and urine, physical strength, weight, etc. I will maintain a regular diet and sleep every day, and my mental state is relatively stable, I have normal urine and urine, my physical strength has not decreased significantly, and my weight has not changed significantly.

**Question 12:** What kind of disease have you had before? Do you have chronic diseases such as hypertension, diabetes, coronary heart disease, etc? Do you have a history of infectious diseases such as hepatitis B, pulmonary tuberculosis, typhoid fever, etc? Do you have a history of drug or food allergies? Have you had a history of surgery, blood transfusion, or trauma? Do you have similar diseases and vaccination history?

**ChatGPT answer 12:** I do not have chronic diseases such as high blood pressure, diabetes, coronary heart disease, etc. I have no history of infectious diseases such as hepatitis B, tuberculosis, typhoid fever, or drug or food allergies. I have not had surgery, blood transfusions, trauma, etc. There was no similar disease before me. I have a history of vaccinations, but I haven't been vaccinated for a long time.

**Question 13:** What job do you work for? Do you need to sit or stand for a long time? Do you have a history of contact with epidemic water or toxins? Do you have a habit of smoking and drinking? Is there any unclean sexual activity?

**ChatGPT answer 13:** I am an ordinary office worker, the working environment is relatively quiet, and the living environment is relatively comfortable. I have no history of exposure to infected water or poison, and no work or living environment with exposure to poison. I have no habits of alcohol and tobacco, nor a history of unclean sex.

**Score:** 10

**Evaluation:** Cough and expectoration symptoms are relatively common, and this simulation is significantly more realistic. It is also a simulation answer for common diseases. The chief complaint and current medical history based on this answer is relatively complete; The difficulty of training for students is also in the right state.

## Abbreviation

SP Standardized patients

## Acknowledgements

Not applicable.

## Author contributions

WLZ conceived the project. XNL, CLW, HL, YYX analyzed the results, YSL and RL contributed to the interpretation of the data. WLZ and CLW revised the article. All authors read and agreed to the final manuscript.

## Funding

This work was funded by National Natural Science Foundation of China (81800195), Key Clinical Projects of Peking University Third Hospital (BYSYZD2019026, BYSYDL2021006).

## Availability of data and materials

Not applicable.

## Declarations

## Ethics approval and consent to participate

Not applicable.

**Consent for publication**

Not applicable.

**Competing interests**

The authors declared no competing interests.

Received: 7 June 2023 Accepted: 28 June 2023

Published online: 06 July 2023

**References**

1. Kucukkelepce GE, Dinc L, Elcin M. Effects of using standardized patients on nursing students' moral skills. *Nurs Ethics*. 2020;27(7):1587–602.
2. Altun S, Tastan S. Low-fidelity simulation vs. standardized patients in prevention and management of pressure injury education. *J Tissue Viability*. 2022;31(4):643–8.
3. Dorr DA, Adams L, Embi P. Harnessing the promise of artificial intelligence responsibly. *JAMA*. 2023;329(16):1347–8.
4. van Dis EAM, Bollen J, Zuidema W, van Rooij R, Bockting CL. ChatGPT: five priorities for research. *Nature*. 2023;614(7947):224–6.
5. Preiksaitis C, Sinsky CA, Rose C. ChatGPT is not the solution to physicians' documentation burden. *Nat Med*. 2023;29(6):1296–7.

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Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

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