

The power of AI chatbots: their role in surgical medical education amongst medical students

El poder de los chatbots de IA: su papel en la educación médica quirúrgica en estudiantes de medicina

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Abstract

Objective: Medical training molds the future of healthcare worldwide. A balance between theoretical, technical, and communication skills is required for a physician to be competent and effective to the community, while preserving healthcare workers' quality of life and mental health. Therefore, a variety of innovative tools whose goals are to aid with medical learning are being implemented constantly. Artificial intelligence (AI) is acquiring mainstream media exposure due to tools such as ChatGPT and other AI chatbots. This may also have its uses in medical education and training. **Method:** A survey was developed to gather information about medical training and AI usage to glimpse how medical students reacted to this new technology. **Results:** Results report online videos were the most utilized tools. Also, AI technology is not yet implemented on a routine basis amongst medical students. Different uses report improving their surgical knowledge and research capabilities. Ignoring these tools existence and not trusting them is a relevant concern for not using AI in medical training. **Conclusions:** AI might become the standard tool soon. Knowing its landscape is important to address opinions and concerns promptly to maximize the output AI provides as a teaching tool.

Keywords: Artificial intelligence. Chatbots. Surgical education.

Resumen

Objetivo: La formación médica determina el futuro de la asistencia sanitaria en todo el mundo. Para que un médico sea competente y eficaz para la comunidad, es necesario un equilibrio entre las habilidades teóricas, técnicas y de comunicación, al tiempo que se preserva la calidad de vida y la salud mental de los profesionales sanitarios. Por ello, se están implementando constantemente diversas herramientas innovadoras cuyo objetivo es facilitar el aprendizaje médico. La inteligencia artificial está adquiriendo gran repercusión en los medios de comunicación gracias a herramientas como ChatGPT y otros chatbots de IA. Esto también podría tener sus aplicaciones en la educación y la formación médicas. **Método:** Se elaboró una encuesta para recabar información sobre la formación médica y el uso de la IA, con el fin de conocer la reacción de los estudiantes de medicina ante esta nueva tecnología. **Resultados:** Los resultados indican que los vídeos en línea fueron las herramientas más utilizadas. Además, la tecnología de IA aún no se ha implementado de forma habitual entre los estudiantes de medicina. Se señalan diferentes usos, como la mejora de sus conocimientos quirúrgicos y sus capacidades de investigación. Ignorar la existencia de estas herramientas y no confiar en ellas es una preocupación relevante que explica la falta de uso de la IA en la formación médica. **Conclusiones:** La IA podría convertirse pronto en la herramienta estándar. Conocer su panorama es importante para abordar las opiniones y preocupaciones con prontitud y maximizar el rendimiento que ofrece la IA como herramienta de enseñanza.

Palabras clave: Inteligencia artificial. Chatbots. Educación quirúrgica.

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Introduction

For years, technological advances have progressed by leaps and bounds, from the smartphone revolution to nowadays, where artificial intelligence (AI) spreads around the world. At present, the biggest exponent of this trend is conversational AI tools or chatbots such as "ChatGPT" that mark a significant breakthrough in various fields, and medicine is no exception.

These easily accessible tools represent a turning point in traditional teaching methodologies. The ability of chatbots to collect information on various topics is crucial to make them one of the most versatile tools for accessing any type of information. In medicine, possibilities are endless, from selecting the next step antidepressant treatment in major depression¹ to assessing performance by solving questions from the United States Medical Licensing Examination Step examinations².

Use of chatbots in medical education carries substantial uncertainty. For years, significant advances have been witnessed in the ability of machines to simulate human behavior and think autonomously, reaching the point of accompanying us in our lives in various ways, such as personal assistants³. In Medicine, AI can be used from the creation of patient's records to robotic assistants for minimally invasive surgery⁴.

Method

An open, anonymous, online survey was performed through Google Forms and diffused by social media. The principal goal of the survey was to measure the percentage of the use of AI applied to the study of surgery topics by medical students from Latin America. The survey had 21 questions, mixed between open and multiple-choice questions, based on the use of AI by medical students in their study methodology. A total of 85 answers were received.

Population selection

Current medical students and residents from Latin America, all medical faculties, and all ages.

Inclusion criteria

Surveyed subjects admit having knowledge of AI and other technological tools for surgery appliance.

These include online instructional videos, online tutorials, Q&A in online forums, online surgery simulators, and chatbots that use AI like ChatGPT.

Other variables included

Frequency of the use of the AI tools, use of the AI tools for medical research, and the use of the AI to write research articles.

Exclusion criteria

Medical students from other countries, rather than Latin America, were excluded from the study.

Results

The participants who answered the survey varied throughout the academic stage of medical formation, specifically, 21% were in basic stages of medical undergraduate studies, 72% were enrolled in clinical formation that involves hospital rotations, and 7% were identified as postgraduate students.

According to the use of online tools to help assist their studies in surgery, 94.1% of the population have searched for backup help in online tools to make their study in surgery easier, and only 5.9% haven't used them. The most popular tool was instructive online videos (with 97.5%), followed by online tutorials (72.5%), question and answer online tools (41.3%), online surgical simulators (36.3%), and in the last position, chatbots that use AI (23.8%).

Regarding the reasons why people did not use any online tool to help their studies, the most chosen answer was the lack of knowledge about this type of tools (36.4%), also, (40.9%) have not been able to find good quality tools to rely on them and a (54%) of the population prefers another type of help such as printed material and academic books.

Scrutinizing about other tools that use AI, we found that (92.9%) are unaware of any other chatbot platform apart from ChatGPT, suggesting that among the population that answered the survey, there is limited awareness of AI-powered chatbot platforms with the ability to assist in medical surgical education. Among the population (7.1%) who had knowledge of other AI chatbot platforms, they mentioned options like Rayyan, Humata AI, Bard AI, and Bing's IA. Despite this awareness, only a small percentage (28.9%) reported using these platforms to support their surgical studies,

indicating potential adoption barriers. Among those who did utilize AI chatbots for surgical education, ChatGPT, Bing AI, and Bard AI were the most cited platforms. These findings suggest that there is interest in AI chatbot platforms, and that additional efforts may be necessary to enhance awareness and practical application in the context of surgical education.

When asking reasons to not use AI chatbots we found that 34% of the people who do not use the tool do not know it exists, 17% do not trust it and about 48.9% prefer to use other tools to aid their research and learning processes (Fig. 1), although the perceived usefulness of AI chatbot platforms for supporting surgical studies stood out. Regarding AI chatbot general usage and for medical research, approximately 2/3 of the population surveyed almost never uses chatbots, and the other 1/3 uses the tool at least once a month. The most common uses for surgical apprentices are summing up a surgical topping and quick question search. More infrequently, it is used to test knowledge and improvement. For medical research, regarding general uses, around 2/3 do not use the tool to aid for information in medical research. For more specific functions such as writing and referencing in a research paper, 1/10 and 1/5 use AI chatbots to help writing and citing, respectively (Fig. 2).

A significant portion of the people (37.6%) awarded these platforms with the highest rating (5 out of 5), which means extremely useful on a scale of 1-5 (Fig. 3), indicating widespread recognition of their potential to enhance surgical education. However, there remains some uncertainty among respondents, as 35.5% (combined ratings 1 and 2) expressed reservations or doubts about their effectiveness.

Within the context of medical education, distinctive trends in the use of chatbot platforms were identified among two student subgroups. Those who are still in the foundational stages of the medical career utilize these tools to access general information on surgical topics. In contrast, advanced students who are already in their clinical practice semesters use these platforms not only to inquire about specific surgical topics but also to assess their progress and level of surgical knowledge.

When it comes to the willingness to invest in a specialized AI chatbot platform that assists their medical and surgical studies, opinions varied. A considerable majority (40%) remained unsure about investing, while 23.5% showed a probable willingness to pay and only a small percentage (5.9%) firmly expressed their

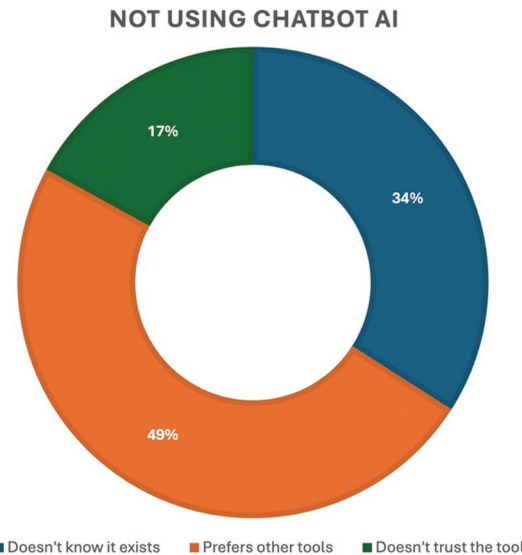


Figure 1. Reasons why people have not used artificial intelligence platforms. Self-elaborated.

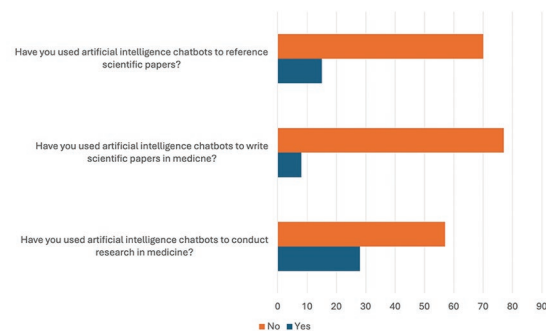


Figure 2. Use of chatbots in medical research. Self-elaborated.

willingness to invest in such a platform (Fig. 4). These findings emphasize the importance of creating more confidence in demonstrating the value of AI chatbot platforms to boost investment willingness and overall adoption for surgical education.

Discussion

The surgical field has been in the forefront of medicine in different technological advances for a long time. These might include procedures, complex and more secure techniques to ensure the patient's good outcome, surgical instruments, robotics for minimally invasive surgery, etc. Many areas have converged to contribute these advances to perform with the most accuracy and precision, while minimizing the risks of

RATING FROM 1 TO 5 UTILITY OF AI CHATBOTS TO SUPPORT SURGICAL AND MEDICAL STUDIES

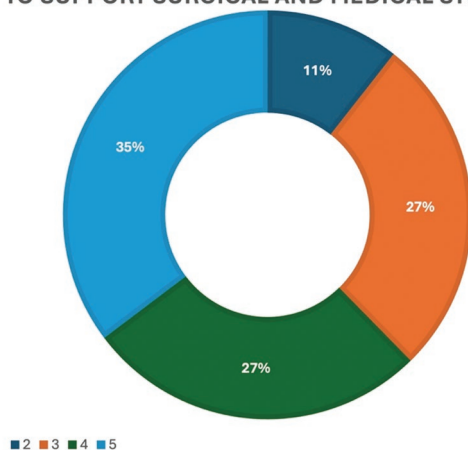


Figure 3. Rating the use of artificial intelligence in medical surgical studies on a scale from 1 to 5. Self-elaborated.

WILLINGNESS TO PAY FOR AN AI CHATBOTS TO SUPPORT SURGICAL AND MEDICAL STUDIES

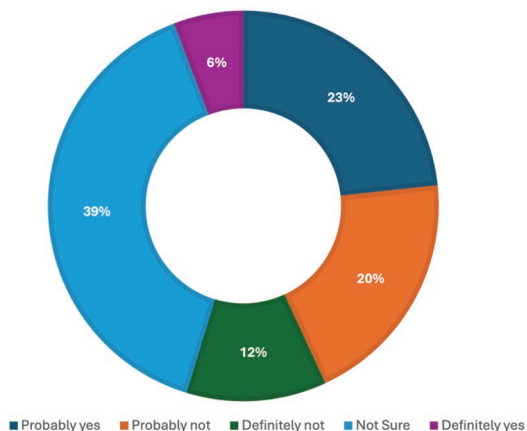


Figure 4. Willingness to spend money on surgical artificial intelligence chatbots. Self-elaborated.

complications pre-operation, during the procedures, and in post-operative care⁵.

As the time passes by, the way technologies are implemented in the medical field has changed too. This is evidenced in the operating system from each healthcare system, the digitalization and processes automation, internet consults/checkups/follow ups, using mobile devices to monitor patients' health, and many other applications for the technology. AI should not be the exception. AI has proved a great potential to revolutionize patient care. With the integration of machine learning and algorithms, it can be useful both for the doctors, administrators, and healthcare operators by simplifying tasks^{6,7}.

The actual discussion has been revolving around how much precaution should healthcare providers have while using AI. It should be used like a tool and not as a replacement. This field still has a long way to go before being implemented to its full potential, but this might be considered in today's new era of technology⁸⁻¹⁰. The capability of large data analysis and pattern recognition could be useful to make informed decisions and probabilities of events, being used as a leverage to improve the surgeon's work and optimize the planning and intervention with quick decisions on the go or let the physician delegate tasks and use it to analyze imaging, genetics profile or suggesting different therapeutic options, selecting and curing this information, the health provider would have the most knowledge at hand to provide the most accurate care with the information presented¹¹.

Surgical practice had a mentor-student model since its beginning. The apprentice joined the barber before the surgeon was established in the 18th century. At that time, a guild was organized to centralize surgical practice among barbers and conceptualize terminology and procedures¹². When surgery became a branch of medicine, William Halsted, chief surgeon at the Johns Hopkins Hospital noticed the difference between surgeons in terms of dexterity, medical knowledge, and patient skills. He coined the surgical residency as a program whose objective was to level the different surgical apprentices to an approximate skill set and patient exposure. Surgical residency aims to polish dexterity, medical knowledge, patient communication skills, among other crucial tools a competent surgeon need. Grand rounds permit the trainee to express orally and answer about its medical knowledge. Suture, knot practicing, and the skills lab are used to augment dexterity. Direct exposure to surgery also has the resident helping while the lead surgeon narrates the procedure, explains the steps, and actively teaches while performing the procedure. New technologies like videotapes and the internet can aid the training process, and always novelty is searched to help ease the learning curve to perform as a decent surgeon¹³⁻¹⁵.

A key to surgical practice is motivation and a good mentor. An ideal surgical professor is aware that every student learns differently, understands their pupils' skill sets, flaws, and delivers teaching methods to their personal needs. This motivates the student to practice and study harder and improves their capabilities in general¹⁶⁻¹⁸. Although this might prove to be difficult, learning tools and methods empowered by AI might

help the surgical resident to improve based on its individualized needs.

Although AI can be an exemplary tool to optimize and individualize learning, there are some things to take in consideration in general. Ethic concerns relating user privacy and data acquisition to further study or strengthen the training model, biases in the programming and data acquired to discriminate users, inequalities due to technological access and unfair advantages, user surveillance, further education monetization, and loss of autonomy are some general ethical issues to address^{19,20}.

In medical education, AI can also have false positives while it develops higher accuracy. This guides the learning community to use AI as a tool, which is more useful if the student has a developed knowledge and understanding of the subject to doubt the AI response and forge criteria²¹. For the surgical field, conflicts can arise when trying to adapt creativity and surgical decision making, pupil evaluation and grading, adapting senior surgeons to the technology, etc.²².

Conclusions

The survey highlights the widespread use of digital resources among medical students, particularly in the clinical stage, as they actively seek to improve their understanding of surgical concepts. The predominant reliance on educational videos, online tutorials, and question-based tools reflects a strong trend towards using online platforms for educational purposes. However, significant barriers to the adoption of these tools have been identified. Some participants struggle because they are unaware of the online resources available and have difficulty obtaining quality materials. Furthermore, some respondents still prefer traditional learning methods, such as printed materials and academic textbooks.

When it comes to AI-based chatbot platforms, the study showed that participants' knowledge is limited beyond ChatGPT. While some have recognized alternative platforms such as Rayyan, Humata AI, Bard AI, and Bing's AI, their actual use remains limited, suggesting potential obstacles hindering broader integration. Perceptions about the effectiveness of AI chatbots are mixed. Although a significant number of participants recognized its potential to improve surgical training, a considerable percentage expressed reservations or doubts about its actual effectiveness, suggesting an area of uncertainty among users. Creating awareness and properly informing and learning

about AI may increase the use of these kind of platforms to support medical studies, based in surgery.

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Conflicts of interest

The authors declare no conflicts of interest.

Ethical considerations

Protection of human subjects and animals. The authors declare that no experiments on humans or animals were performed for this research.

Confidentiality, informed consent, and ethical approval. This study does not involve personal patient data, medical records, or biological samples, and does not require ethical approval. SAGER guidelines do not apply.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing or creation of the content of this manuscript.

References

1. Perlis RH. Research Letter: Application of GPT-4 to Select Next-Step Antidepressant Treatment in Major Depression. medRxiv [Preprint]; 2023. Available from: <https://pubmed.ncbi.nlm.nih.gov/37131648> [Last accessed on 2024 Mar 20].
2. Gilson A, Safranek CW, Huang T, Socrates V, Chi L, Taylor RA, et al. How does chatgpt perform on the united states medical licensing examination (USMLE)? The implications of large language models for medical education and knowledge assessment. JMIR Med Educ. 2023;9:e45312.
3. Mintz Y, Brodie R. Introduction to artificial intelligence in medicine. Minim Invasive Ther Allied Technol. 2019;28:73-81.
4. Hamet P, Tremblay J. Artificial intelligence in medicine. Metabolism. 2017;69S: S36-40.
5. Sevgi UT, Erol G, Doğruel Y, Sönmez OF, Tubbs RS, Güngör A. The role of an open artificial intelligence platform in modern neurosurgical education: a preliminary study. Neurosurg Rev. 2023;46:86.
6. Oh N, Choi GS, Lee WY. ChatGPT goes to the operating room: evaluating GPT-4 performance and its potential in surgical education and training in the era of large language models. Ann Surg Treat Res. 2023;104:269-73.
7. Kavian JA, Wilkey HL, Patel PA, Boyd CJ. Harvesting the power of artificial intelligence for surgery: uses, implications, and ethical considerations. Am Surg. 2023;89:5102-4.
8. Waisberg E, Ong J, Masalkhi M, Kamran SA, Zaman N, Sarker P, et al. GPT-4: a new era of artificial intelligence in medicine. Ir J Med Sci. 2023;192:3197-200.
9. Cheng K, Sun Z, He Y, Gu S, Wu H. The potential impact of ChatGPT/GPT-4 on surgery: will it topple the profession of surgeons? Int J Surg. 2023;109:1545-7.
10. Cheng K, Guo Q, He Y, Lu Y, Xie R, Li C, et al. Artificial intelligence in sports medicine: could GPT-4 make human doctors obsolete? Ann Biomed Eng. 2023;51:1658-62.
11. Seth I, Cox A, Xie Y, Bulloch G, Hunter-Smith DJ, Rozen WM, et al. Evaluating Chatbot efficacy for answering frequently asked questions in plastic surgery: a ChatGPT case study focused on breast augmentation. Aesthet Surg J. 2023;43:1126-35.
12. Himmelmann L. From barber to surgeon - the process of professionalization. Sven Med Tidskr. 2007;11:69-87.

13. Chand M, Qureshi T. Evolution in surgical training: what can we learn from professional coaches and elite athletes? *J R Soc Med.* 2014;107:290-2.
14. Jackson HT, Vaziri K, Bass BL. Surgical education and training in the US: a collaborative effort to deliver the next generation of surgeons. *Indian J Surg.* 2022;84 Suppl 1:183-92.
15. Fritz T, Stachel N, Braun BJ. Evidence in surgical training- a review. *Innov Surg Sci.* 2019;4:7-13.
16. Biagioli FE, Chappelle KG. How to be an efficient and effective preceptor: it is possible to do the important work of precepting students and still get home in time for dinner. *Fam Pract Manag.* 2010;17:18.
17. Entezami P, Franzblau LE, Chung KC. Mentorship in surgical training: a systematic review. *Hand (N Y).* 2012;7:30-6.
18. Deptola A. Motivation: an integral component of resident well-being. *J Grad Med Educ.* 2021;13:11-4.
19. Nguyen A, Ngo HN, Hong Y, Dang B, Nguyen BT. Ethical principles for artificial intelligence in education. *Educ Inf Technol (Dordr).* 2023;28:4221-41.
20. Akgun S, Greenhow C. Artificial intelligence in education: addressing ethical challenges in K-12 settings. *AI Ethics.* 2022;2:431-40.
21. Weidener L, Fischer M. Artificial intelligence teaching as part of medical education: qualitative analysis of expert interviews. *JMIR Med Educ.* 2023;9:e46428.
22. Cobianchi L, Verde JM, Loftus TJ, Piccolo D, Dal Mas F, Mascagni P, et al. Artificial intelligence and surgery: ethical dilemmas and open issues. *J Am Coll Surg.* 2022;235:268-75.