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Venezuelan first year medical students' insight on Artificial Intelligence

La visión de los estudiantes venezolanos de primer año de medicina sobre la Inteligencia Artificial

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SUMMARY

Introduction: *A survey addressing first-year Venezuelan medical students' insight on Artificial Intelligence was carried out to analyze their perceptions of the impact of Artificial Intelligence in their medical education and future clinical practice.* **Methods:** *A cross-sectional survey study was conducted using an online Google Forms questionnaire to collect data from students of the JM Vargas Medical School, Faculty of Medicine, Universidad Central de Venezuela, from April to July 2024. The questionnaire consisted of three sections: demographic data, perceptions on Artificial Intelligence, and the impact of Artificial Intelligence on medical education. The data collection was achieved by distributing the link to the questionnaire via email to first-year medical students.* **Results:** *The survey outcome revealed the helpful assessment of first-year medical students towards Artificial Intelligence for its benefits: motivation, acceptance, and knowledge acquisition, among others.* **Conclusion:** *Artificial Intelligence was positively rated by 63 first-year medical students, recognizing its relevance, usefulness, and amelioration of medical learning.*

Keywords: *Artificial Intelligence, emerging technologies, medical education, Venezuela.*

RESUMEN

Introducción: *Se realizó una encuesta sobre la percepción de la Inteligencia Artificial entre estudiantes de medicina venezolanos de primer año para analizar su impacto en su formación médica y su futura práctica clínica.* **Métodos:** *Se realizó un estudio transversal mediante un cuestionario en línea de Formularios de Google para recopilar datos de estudiantes de la Facultad de Medicina JM Vargas, Universidad Central de Venezuela, entre abril y julio de 2024. El cuestionario constó de tres secciones: datos demográficos, percepciones*

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Miembro de la Comisión de Inteligencia Artificial de la ANM

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sobre la Inteligencia Artificial y su impacto en la formación médica. La recopilación de datos se realizó mediante la distribución del enlace del cuestionario por correo electrónico a los estudiantes de medicina de primer año. **Resultados:** *La encuesta reveló la apreciación positiva de los estudiantes de medicina de primer año sobre la Inteligencia Artificial por sus beneficios: motivación, aceptación y adquisición de conocimientos, entre otros.* **Conclusión***: Sesenta y tres estudiantes de medicina de primer año valoraron positivamente la Inteligencia Artificial, reconociendo su relevancia, utilidad y la mejora del aprendizaje médico.*

Palabras clave: *Inteligencia artificial, tecnologías emergentes, educación médica, Venezuela.*

INTRODUCTION

Current first-year medical students belong to Generation Z, born around the early 2000s and 2010 at the same time as the explosive worldwide spread of mobile devices and emerging technologies (1). Generation Z is the first generation to grow up in a world of widespread access to computers, the internet, mobile devices, smartphones, smartwatches, smart bands, smart glasses, smart rings, and social media. As a result, they are hyper-connected. They are confident with traditional technology (2). Although they are adept at finding information, they may not be as good at checking it for validity. Nowadays, Generation Z faces a new development: Medical education through Artificial Intelligence (AI). Artificial intelligence is a rapidly growing phenomenon that will surely instigate large-scale changes in medicine. Emerging innovations in AI will most likely have a substantial impact on medical practice. Interest in training current and future physicians in technology is growing. There is no generally accepted definition of Artificial Intelligence (AI). Numerous are used; for example, International Business Machines (IBM) defines AI as "a field that combines computer science and robust datasets to enable problem-solving". AI can also be defined as the multidisciplinary approach of computer science and linguistics that aspires to create machines capable of performing tasks that normally require human intelligence (3). In its strictest definition, AI is the imitation by computers of the intelligence inherent in humans. However, an ample definition is needed to capture the whole range of applications that are finding their way into practice today and soon. This definition comes from the High-Level Expert Group on Artificial Intelligence, which provides the necessary freedom of scope. Describing AI as "systems that display intelligent behavior by analyzing their environment and taking actions with some degree of autonomy to achieve specific goals" encompasses all of the applications we currently qualify as AI and, at the same time, provides scope for future changes to that qualification (4). AI is reshaping how we work and interact in our daily activities and many scientific fields. New emerging technologies, such as AI, raise numerous questions about the future of medicine and the role of medical doctors. AI has the potential to revolutionize the domain of medicine, particularly in current undergraduate medical training. Despite increasing interest in new technology, medical education has not kept pace with the remarkable breakthroughs made in AI. Taking up AI training in undergraduate medical education has been curbed, perhaps due to the shortage of systematic evidence on the subject. AI applications in healthcare can change how medical doctors practice medicine by increasing diagnostic accuracy and the appropriateness of treatments. Such reforms require medical doctors to have good knowledge and understanding of AI and a willingness to use its applications efficiently (3-6). Thus, attention has to be paid to medical education for the next generation of medical doctors, as they need to be well-equipped with advanced clinical practices that can be performed through AI applications. Recent literature has highlighted the potential of AI in medical education, particularly in helping undergraduate medical students grasp complex medical concepts and improve their clinical reasoning skills. As AI is progressively used in medical sciences, undergraduate medical students must understand its principles and potential applications (7-9). As far as we know, research has not been done to determine Venezuelan medical students' viewpoint on AI value in their training and future clinical practice. This research aims to explore first-year Venezuelan medical students' perceptions of AI on their medical studies and future clinical practice through a survey.

MATERIALS AND METHODS

Study Design

A Google Forms survey was conducted among first-year medical students at JM Vargas Medical School, Faculty of Medicine, Universidad Central de Venezuela, from June 1st to July 30th, 2024.

Materials

A structured questionnaire comprising 15 items organized into three sections was distributed to first-year medicine students. In this research, a cross-sectional survey was conducted using a Google Forms online questionnaire to collect data from students at the JM Vargas Medical School, Faculty of Medicine, Universidad Central de Venezuela, from April to July 2024. The questionnaire consisted of three sections: demographic data, perceptions of AI, and the impact of AI on medical education. Data collection was achieved by distributing the link to the questionnaire via email to first-year medical students.

The Inclusion Criteria were all first-year medical students from JM Vargas Medical School, Faculty of Medicine, Universidad Central de Venezuela. The exclusion criteria were students who did not consent to participate in the survey.

Sampling Method

All first-year medical students were invited to participate by answering an anonymous and voluntary Google Forms survey on Venezuelan medical students' insight into Artificial Intelligence. The total student population was 120, and 63 answered the questionnaire.

The questionnaire consisted of three sections. The first part obtained certain demographic information from the participants, the second part focused on perceptions of AI, and the third emphasized the impact of AI on medical education. A 5-point Likert scale was used: (a) Strongly Disagree; (b) Disagree; (c) Neither Agree nor Disagree; (d) Agree; (e) Strongly Agree. The students were informed about the survey through their anatomy lectures from January 15th through March 30th, 2024, and their emails were collected. The survey data was gathered from June 1st to July 30th, 2024.

The survey was administered online after obtaining informed consent. Those first-year medical students who consented to participate in the study were asked to complete the questionnaire. Students were also required to affirm an integrity pledge, mentioning that they would not contact others about the answers to this survey and would not refer to any external sources while completing the study. Each student was contacted via email before the survey, and consent was obtained. The written consent form was designed and sent to the student's email.

The Ethics Review Committee of JM Vargas Medical School, Faculty of Medicine, Universidad Central de Venezuela, granted ethical approval.

RESULTS

One hundred twenty-first-year medical students (their age range is between 18 and 25) were invited to participate in this research, and 63 (52.5 %) accepted and answered the survey. In the demographic data section, the students who answered the questionnaire were 69.9 % (n=44) female and 30.2 % (n=19) male. In this survey, 82.5 % (n=52) of the students have an average age between 18 and 21 years old.

Perceptions of Artificial Intelligence (AI)

50.8 % of medical students who answered this survey have attended lectures or conferences on AI. Nevertheless, 90.3 % (n=59) of the medical students do not have AI programming/coding training. 60.8 % (n=32) strongly agree and 31.7 % (n=20) agree that AI will play an important role in the healthcare system. Concerning whether AI will replace some specialties in the healthcare system in their lifetime, 20 students (14.3 %) strongly agree, and 39.7 % (n=25) agree. Regarding their understanding of the basics of AI principles, 23 medical students (36.5 %) agree. Regarding understanding AI's limitations, 27

medical students (42.9 %) strongly agree, and 24 (38.1 %) agree. 49.2 % (n=31) strongly agree that teaching AI will benefit their career, and 31.7 % (n=20) agree. 60.9 % (n=38) strongly agree that all medical students should receive training in AI, and 27 % (n=17) agree. 23 medical students (36.5 %) agree that they will be using AI tools by the end of their medical degree, and 20 (31.7 %) strongly agree (Figure 1).

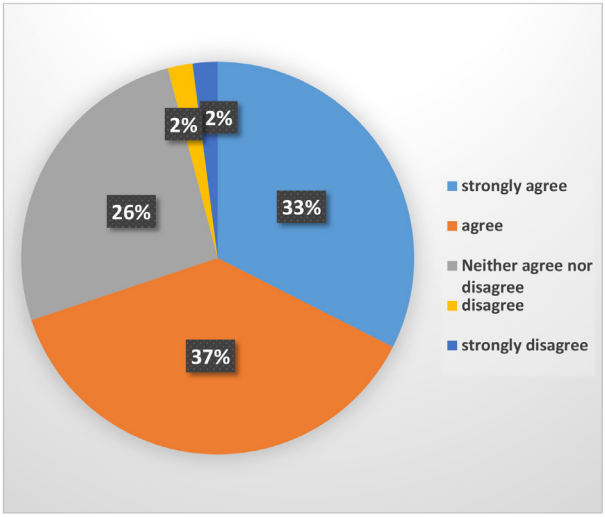

Figure 1. They will be using AI tools by the end of their medical degree.

Impact of Artificial Intelligence (AI) on medical education

On whether AI systems will positively impact medical education, 47.6 % (n=30) agree about this issue, and 39.7 % (n=25) strongly agree. Whether incorporating AI systems into medical education will simplify or help the teaching/learning process, 47.6 % (n=30) strongly agree, and 42.9 % (n=27) agree. 28 medical students (44.4 %) strongly agree that using AI systems in medical education will prepare them for real clinical practice, and 18 (28.6 %) agree with it (Figure 2).

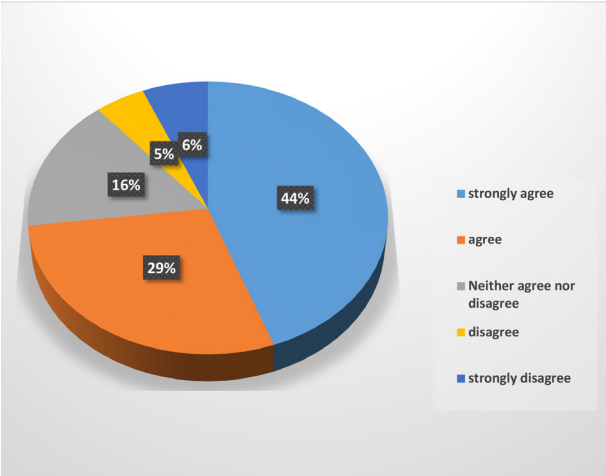

Figure 2. AI systems in medical education will prepare medical students for real clinical practice.

DISCUSSION

The role of AI in the future of medicine will be significant, and AI-based medical training is required. Current results support the use of AI in medical education, especially since most medical students surveyed showed positive perceptions and attitudes toward AI in healthcare and medical education. Based on the findings of this study and others, several important implications should be considered when adopting AI in medical education. Since a significant proportion of medical students believe that learning about AI would benefit their careers, offering AI teaching or training for students would be of principal importance. Most Generation Z medical students thought AI would play an important role in healthcare. Similar findings were reported for medical students in some studies included in the present survey, in which more than 75 % of the medical students believed that AI would have a moderate-to-major effect on medicine during their careers. In our current study, it was not surprising to find that most first-year medical students (83.7 %) thought that receiving AI training would benefit their careers. This finding was consistent with other previous studies (10-13). Moreover, experts have reported that AI and medical professionals complement each other, and although AI will change medical practice, it is unlikely to replace humans anytime soon,

if ever (14). The findings of this survey reveal that 90.3 % (n=59) of the medical students don't have AI programming/coding training. AI has gained popularity during the last few years, and its use in medicine is increasing globally. Developing countries like Venezuela are lagging in implementing AI-based solutions in healthcare. In the present survey, 92.5 % of the students agree or strongly agree that AI will play an important role in the healthcare system. Implementing a reform in medical education requires Generation Z students' awareness regarding its importance in modern medical practice. Despite the large volume of literature, there is little consensus on what and how to teach the subject to undergraduate medical students. As AI applications become more widespread in the medical field, it's crucial to understand how undergraduate medical students and future medical doctors perceive and interact with these new technologies. Despite the increasing use of AI in medicine, research on the knowledge and attitudes of undergraduate medical students toward it remains limited. Several factors may influence medical students' perspectives on the issue, including their level of exposure to AI in medical education, their understanding of its advantages and disadvantages, and their own career aspirations (15,16). As AI tools progress toward clinical implementation, there is a lack of educational opportunities in the field. Most first-year Venezuelan medical students surveyed lacked knowledge about AI and its applications (90.3 % in this survey). Still, they had a positive view of AI in medicine and were willing to adopt it. Incorporating AI concepts and applications into the medical curriculum can be advantageous for medical students, as AI systems can play an important role in the education process (17,18). In this survey, 73 % of the students agree or strongly agree that using AI systems in medical education will prepare them for real clinical practice.

CONCLUSION

Undergraduate medical education is experiencing a considerable transformation driven by AI. With emerging innovations in AI poised to impact medical practice substantially, interest in training current and future medical doctors on the technology is growing. Updating should involve equipping future medical doctors with the knowledge and skills to effectively use AI applications and ensure that professional values and rights are protected (19-21). Introducing AI applications into medical education can change how clinicians practice medicine by increasing diagnostic accuracy and the appropriateness of treatments. Such reforms require clinicians to have a good understanding and knowledge of AI and a willingness to use AI applications efficiently (22-24). Thus, attention has to be paid to the medical education we provide for the next generation of medical doctors, as they need to be well-equipped with advanced clinical practices that can be performed via AI applications. Future medical doctors should become educated users to analyze the utilization of AI systems objectively, better understand their concepts, and assess discrepancies between algorithms generated for medical tasks (25,26). Implementing a technological reform in medical education requires students' readiness and awareness regarding the importance of adopting the latest technologies, such as AI concepts, to provide themselves with the knowledge and skills required for future medical practice. Medical students in low and middle-income countries require robust teaching on AI to ensure that they can drive innovation in their healthcare settings. Medical students from all countries should be provided with learning opportunities on AI as part of their curriculum to develop skills and knowledge around it to ensure a patient-centered digital future in medicine. Sound knowledge of the various risks of AI and the ethical and social issues must be inculcated in medical students as part of their medical education before they step into medical practice and harness AI. It is vital to understand that AI is not here to replace medical doctors, but will create new roles and opportunities for them to support their practice. Therefore, avoiding confusion concerning AI in medicine and improving awareness early on is imperative. Overall, medical education should not only teach the foundation of biomedical and clinical sciences but should also cover the broad range of skills that are required for future medical doctors to be effective in their use of AI systems in clinical practices, especially as the adoption of AI continues to grow in healthcare (26-28). On the other hand, misunderstandings about AI can

create fear among users about adopting it in the future. The evolution and advancements of AI will further clarify its potential directions of actual usage in the medical sciences domain, along with its challenges and limitations (29,30). It can be concluded from the findings of this survey that first-year medical students at JM Vargas, Faculty of Medicine in Universidad Central de Venezuela, have positive perceptions towards AI systems, showing optimism towards learning more about AI in their medical education.

Limitations

This study had some limitations. First, it was a single-center study. Second, based on the characteristics of the first-year medical students who were willing to participate in the study, there might have been a possibility of selection bias. Third, due to the lack of research on similar populations in the region, most results were compared with studies on related topics. Still, other populations could have different cultures and learning environments. Finally, measuring the validity and reliability of the questionnaire with a larger sample of medical students is suggested for future studies, as the current study had a limited sample size. Moreover, it is recommended that multiple medical schools be considered in future studies, as this would improve the generalization of the results.

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Notes on Contributors

RRR was involved in the study by conceptualizing the idea, reviewing the literature, formulating the methodological framework, conducting data acquisition, designing formal analysis, and writing the original draft and graphics designs.

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Data Availability Statement. Data supporting this research is available in the original publications cited in the reference section. The author declares that no specific AI applications were used to help or collaborate on the search and writing of this paper.

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