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Use of artificial intelligence in the learning process of Medical students

Uso da inteligência artificial no processo de aprendizagem de estudantes de Medicina

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ABSTRACT

Introduction: Artificial Intelligence (AI) has been progressively incorporated into medical education, modifying how knowledge is accessed and utilized.

Objective: To analyze medical students' perceptions regarding the use of Artificial Intelligence in the learning process.

Methods: A descriptive, cross-sectional study with a mixed-methods approach was conducted with 108 medical students. Data were collected through an online structured questionnaire and analyzed using descriptive statistics and thematic content analysis.

Results: Most participants (97.2%) reported using AI tools, with ChatGPT being the most frequently used (95.4%). The main applications included tutoring (84.3%), academic activities (65.7%), and basic disciplines, particularly anatomy/morphofunctional sciences (50.9%) and physiology (41.7%). Reported benefits included improved understanding of complex content (85.2%), time optimization (78.7%), and rapid access to information (63%). Concerns were identified regarding information reliability, algorithmic bias, and technological dependence. Most students (79.6%) showed a preference for hybrid learning methods.

Conclusion: Artificial Intelligence is widely integrated into students' academic routines and is perceived as a complementary tool whose use requires a critical approach.

Keywords: Artificial Intelligence; Medical Education; Learning; Medical Students; Educational Technology.

RESUMO

Introdução: *A inteligência artificial (IA) tem sido progressivamente incorporada à educação médica, modificando as formas de acesso e utilização do conhecimento.*

Objetivo: *Este estudo teve como objetivo analisar a percepção de estudantes de Medicina sobre o uso da IA no processo de aprendizagem.*

Método: *Trata-se de um estudo descritivo, transversal, de abordagem qualiquantitativa, realizado com 108 estudantes de Medicina. Os dados foram coletados por meio de questionário estruturado online e analisados por estatística descritiva e análise de conteúdo temática.*

Resultado: *A maioria dos participantes (97,2%) relatou utilizar ferramentas de IA, com destaque para o ChatGPT (95,4%). As principais aplicações incluíram tutoria (84,3%), atividades acadêmicas (65,7%) e disciplinas básicas, especialmente anatomia/morfofuncional (50,9%) e fisiologia (41,7%). Entre os benefícios, destacaram-se a melhora na compreensão de conteúdos complexos (85,2%), a otimização do tempo de estudo (78,7%) e o acesso rápido à informação (63%). Foram identificadas preocupações relacionadas à confiabilidade das informações, ao viés algorítmico e à dependência tecnológica. A maioria dos estudantes (79,6%) demonstrou preferência por métodos híbridos de aprendizagem.*

Conclusão: *A IA está amplamente integrada à rotina acadêmica dos estudantes, sendo percebida como ferramenta complementar, cujo uso requer abordagem crítica.*

Palavras-chave: *Inteligência Artificial; Educação Médica; Aprendizagem; Estudantes de Medicina; Tecnologia Educacional.*

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INTRODUCTION

The growing integration of Artificial Intelligence (AI) into education has brought about significant changes in the way knowledge is accessed, processed and applied, particularly in medical education[1,2]. AI-based tools, such as virtual assistants and learning support systems, are being widely used to help students understand complex content, optimise study time and quickly access up-to-date information[1,3]. Against this backdrop, the integration of these technologies has helped to transform the learning process, fostering more dynamic, personalised and student-centred approaches[2,4]. However, despite the observed benefits, significant concerns are emerging regarding the reliability of the information generated, algorithmic bias and the risk of technological dependence – factors that may have a direct impact on the development of clinical reasoning[5,6].

Accordingly, it is essential to understand how medical students are using Artificial Intelligence and what their perceptions are regarding its benefits and limitations in the learning process. This study therefore aims to analyse medical students' perceptions of the use of Artificial Intelligence in the learning process, with a focus on its benefits, limitations and implications for the development of clinical reasoning. Despite the increasing adoption of these technologies, there are still gaps in our understanding of the impact of AI on the development of clinical reasoning and on students' autonomy, particularly in the context of Brazilian medical education[1,2,5].

METHODOLOGY

This is a descriptive, cross-sectional and mixed-methods study, carried out with 108 medical students from the Faculty of Medicine at UNIVAG. A non-probability convenience sample was used, consisting of students from different stages of the course, covering the pre-clinical, clinical and internship phases, thereby enabling a comprehensive analysis of perceptions throughout medical training. Data were collected using a structured questionnaire devised by the authors, containing closed and open-ended questions, which had been previously tested for clarity and comprehensibility, and was administered online, covering issues relating to the participants' sociodemographic profile, their level of familiarity with digital technologies, the frequency of their use of Artificial Intelligence tools, and their perceptions regarding the benefits, limitations and impacts of these technologies on the learning process. The quantitative data were analysed using descriptive statistics, with absolute and relative frequencies[7].

The qualitative responses were analysed using content analysis, in accordance with Bardin's[8] approach, enabling the identification of thematic categories relating to students' perceptions of the use of artificial intelligence in medical education. Prior to taking part, all students were provided with the Informed Consent Form; participation was voluntary and subject to their agreement to the terms set out therein. Anonymity and confidentiality of the information collected were guaranteed. The study was conducted in accordance with the ethical principles governing research involving human subjects and was approved by the Research Ethics Committee of Centro Universitário de Várzea Grande under opinion No. 7.825.745.

RESULTS

A total of 108 medical students took part in the study, the majority of whom were young and very familiar with digital technologies. A distribution was observed across the different stages of the course, with the highest concentration in the mid to late semesters. The use of AI tools proved widespread (Table 1), with 97.2% of participants reporting its use, particularly ChatGPT (95.4%). The main areas of application included tutoring (84.3%), academic activities, core subjects and support for study organisation, highlighting the cross-cutting integration of AI into the educational process. The perceived benefits included an improved understanding of complex content (85.2%), more efficient use of study time (78.7%) and quick access to information (63%).

In addition, the students reported that they found it helpful in summarising content and that their academic performance had improved. With regard to limitations, concerns were identified regarding the reliability of the information, algorithmic bias, the risk of technological dependence and possible impacts on the autonomy of clinical judgement. It was observed that the majority of students adopt a critical approach, highlighting the need to verify information against other sources. A preference for hybrid learning methods was observed among 79.6% of participants, indicating that AI is

Table 1. Use and perception of Artificial Intelligence among medical students (n=108).

Variable	n (%)
Use of AI	105 (97.2)
Use of ChatGPT	103 (95.4)
Application in tutoring	91 (84.3)
Application in academic activities	71 (65.7)
Improved understanding	92 (85.2)
Time optimisation	85 (78.7)
Quick access to information	68 (63.0)
Preference for a hybrid approach	86 (79.6)

Source: Prepared by the authors.

seen as a tool that complements traditional teaching. There was also a call for these technologies to be formally integrated into the curriculum and for specific training in their proper use.

DISCUSSION

The results of this study highlight the widespread use of artificial intelligence tools by medical students, indicating their prevalence in the academic context. This finding is consistent with recent literature, which points to a significant increase in the use of these technologies in health education, particularly following the expansion of access to natural language processing systems[9,10].

The predominant use of tools such as ChatGPT, combined with their application in various academic activities, suggests that Artificial Intelligence is seen as a versatile resource in the learning process. Recent studies highlight that AI-based tools have the potential to support self-directed learning, facilitate the understanding of complex content and broaden access to information, particularly in dynamic educational settings[5,9].

The benefits reported by students – such as improved understanding of course content, more efficient use of time and rapid access to information – are consistent with recent findings in the literature, which suggest that AI is a resource capable of supporting cognitive processes and study strategies[5,10]. However, it is important to note that these results reflect the participants' perceptions; it is not possible to infer any direct impact on academic performance or the acquisition of clinical skills.

The high frequency of use can be explained by the perceived usefulness and ease of access of these tools, factors widely described as key determinants of the adoption of digital technologies in an educational context[11].

Despite these positive perceptions, the students reported significant concerns, particularly regarding the reliability of information, algorithmic bias and the risk of technological dependence. These findings are consistent with recent studies that highlight significant limitations in the use of AI in health education, including the potential for inaccurate information to be generated and the need for critical validation of the content[5,6].

The adoption of strategies such as checking information against other sources suggests a cautious approach on the part of students. However, this study did not assess the effectiveness of these strategies, which limits the inferences that can be drawn regarding their suitability for the learning process.

The preference for hybrid methods observed amongst participants suggests that Artificial Intelligence is perceived as a complementary resource to the learning process, in line with evidence pointing to the integration of digital technologies to support existing educational practices[1,2].

This study has limitations, including the use of a convenience sample and self-reported data, which may introduce perceptual biases[7,12]. Furthermore, the cross-sectional design does not support the establishment of causal relationships between the use of Artificial Intelligence and educational outcomes[12].

CONCLUSION

Artificial Intelligence is an important tool in the learning process of medical students, particularly in contexts based on active learning methodologies, as it promotes self-directed learning and access to information. It also represents a promising tool in medical education; however, its effectiveness depends on the development of critical skills that ensure its ethical, safe and reflective use, particularly when assessing the reliability of information and preserving the autonomy of clinical reasoning. In this context, it should be seen as a complementary resource to the training process.

CONTRIBUTION OF THE AUTHORS

Isabel Mitsu Brito Kanashiro, Naudia da Silva Dias, Ana Cecília Perotes Albuquerque, Pamela Pang Martins Oliveira, Octávio Caetano Simão Neto, and Eduardo Ferreira Holanda participated in the study conceptualization, data curation and formal analysis, investigation, methodology, project administration, resources, software, supervision, validation, visualization, and manuscript writing, review, and editing.

CONFLICT OF INTEREST

We declare no conflict of interest.

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We declare that there is no funding.

STATEMENT OF DATA AVAILABILITY

Research data is only available upon request.

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