Artificial Intelligence as a Tool in the Training of Health Professionals: A Bibliographic Review

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Abstract

Introduction: The integration of Artificial Intelligence (AI) in health education is revolutionizing research, data management and learning experiences. Objective: Explore and synthesize knowledge about Artificial Intelligence as a tool in the training of health professionals. Methodology: This review used a qualitative, descriptive methodology with a non-experimental design, focusing on bibliographic analysis. The approach involved a systematic evaluation of the scientific literature relevant to the topic. The process included an extensive examination of scientific articles, theses, and other literature reviews, which served as primary sources. Conclusion: Despite significant benefits in efficiency and healthcare delivery, challenges remain, including limited participation in nursing, ethical concerns, and fears of job displacement. Effective implementation of AI requires addressing data, ethical issues, and maintaining essential human qualities such as empathy. To maximize the potential of AI in health education, it is essential to improve literacy, resources and ensure that AI complements, rather than replaces, human skills. These efforts will help circumvent current limitations and fully integrate AI into healthcare education.

Keywords: Artificial Intelligence, AI, education, health professionals, training.

1. Introduction

Artificial Intelligence (AI) is revolutionizing the field of health education, generating transformative changes in various disciplines. Its capabilities to improve patient management, diagnostic accuracy, and educational processes make it a vital tool for medical education. AI fosters virtual simulations, personalized learning experiences and interactive tools that contribute to more effective training and better preparation of healthcare professionals. However, this integration is not free of challenges. Current applications of AI in education are often in an early stage of development, limited in scope, and inconsistent quality.

Despite its potential, AI in healthcare education faces significant barriers. There is notable heterogeneity in the literature on AI teaching methods, reflecting geographic and linguistic biases

and a limited scope of application in undergraduate medical education. Additionally, concerns about loss of human contact, ethical issues, over-reliance on AI, and the need for algorithmic precision present ongoing challenges.

Healthcare students recognize the importance of AI to future medical practice and cite its benefits in improving quality of care, enhancing interdisciplinary collaboration, and facilitating decision-making. However, they also express fears about its academic and practical impact.

The ability of technology to deliver personalized learning, provide instant feedback, and simulate clinical scenarios offers promising advances, although it also requires attention to consideration of legal, ethical, and operational implications. As AI continues to be integrated into healthcare education, ensuring responsible and effective use while maintaining humanistic qualities remains crucial to its success and acceptance.

2. Methodology

Search strategy

The investigation strategy managed was a comprehensive search, whose objective was to identify relevant literature related to the inclusion of AI as part of health professions education. For this purpose, electronic databases such as PubMed and SciELO were used using “Capacitación”, “Educación”, “Inteligencia Artificial” y “Profesionales de la Salud” as key terms in Spanish language, while “Artificial Intelligence”, “Education”, “Health Personnel” and “Training” were those used in English research. It should be noted that this strategy was adapted to the syntax of each database and Boolean operators were used for a more efficient search.

Inclusion and exclusion criteria

In this work, information search was systematized through the logical establishment of both inclusion and exclusion criteria. The inclusion criteria were: Quantitative, qualitative, cross-sectional articles, meta-analysis; written in English, Spanish or Portuguese; writings focused on careers in the health field; literature published between 2020 and 2024; complete availability of information; Open Access works and paid articles. While to exclude works, it was decided to discard those that did not meet the aforementioned inclusion criteria.

Research systematization

The algorithmic process of choosing the articles is represented in Figure 1.

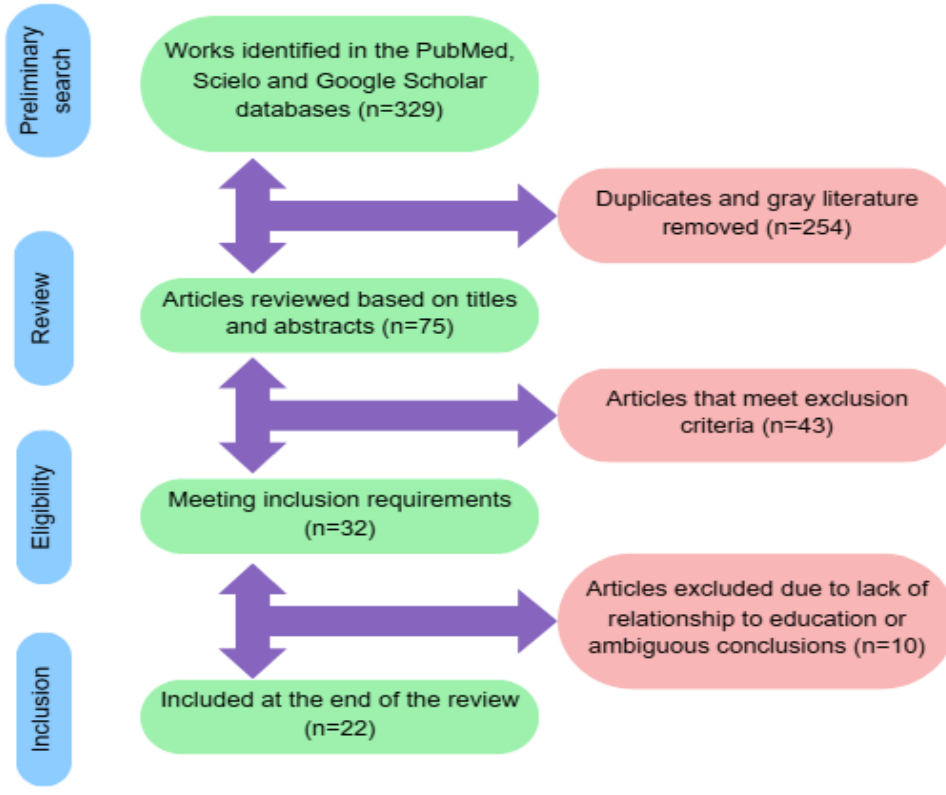

Fig 1. Graphic representation of the systematization algorithm

3. Discussion

Authors	Year	Use of AI in health education	Disadvantages	Database
Ahmed N et al	2021	AI improves research and data management in students.	Development stage, limited scope, inconsistent quality.	PubMed Central
Juehea L et al	2021	AI has a significant impact on medicine, and undergraduate medical education plays a crucial role in early exposure and integration into medical education.	Heterogeneity in the literature on AI teaching, limited scope of undergraduate medical education, geographic and linguistic biases in the reviewed studies.	Journal of the Association of American Medical Colleges
Dave M y Patel N	2023	AI facilitates virtual simulations, personalized learning, and virtual reality experiences in medical and dental education.	Loss of human contact, over-reliance on AI, challenges in ensuring accuracy of algorithms and bias-free operation, concerns about academic integrity.	PubMed Central
Ronquillo CE et al	2021	Knowledge of AI is essential for nursing education. Participation in the development of AI is crucial to align it with nursing practices and contributions to global health.	Limited engagement with AI, gaps in knowledge of AI and health informatics, difficulty incorporating AI-specific knowledge into nursing curricula.	PubMed Central

Teng M et al	2022	AI literacy is considered crucial by healthcare students, who believe it can improve the quality of care and improve interdisciplinary collaboration.	Students feel insecure and misinformed about AI, fear job replacement, and find the curriculum overwhelming.	PubMed Central
Woźniacka A, Patrzyk S y Mikołajczyk M	2022	AI can personalize education, provide instant feedback, and use virtual reality simulations to train medical staff without patient involvement.	It requires large data sets, legal and ethical concerns about patient data, and AI cannot replace human qualities such as empathy and intuition.	PubMed Central
Ahmad MN, Abdallah SA, Abbasi SA y Abdallah AM	2023	Students recognize the usefulness of AI in healthcare, especially for decision making and stress relief.	Concerns about job security, lack of empathy, ethical issues, and barriers to learning about AI due to lack of mentorship and funding.	PubMed Central
Alkhaaldi SMI et al	2023	AI tools like ChatGPT enhance learning with personalized feedback, facilitate documentation, and improve clinical decision-making.	Ethical concerns, need for answer verification, possible decline in humanism, and regulatory challenges for responsible use of AI.	PubMed Central
Khadija Farrukh	2024	AI improves student engagement, accessibility, and interactivity; improves teaching, learning processes, curriculum development, evaluation and educational content.	None explicitly discussed	Journal of the Pakistan Medical Association
Ventura J, Gold-von Simson G y Sukhov R	2023	AI can improve the efficiency and speed of healthcare processes and provide personalized tools to improve health outcomes.	Uncertainty and lack of knowledge among healthcare workers, possible exclusion of certain populations, lack of reproducibility and generalization of studies.	PubMed Central
Veras M, Dyer JO y Kairy D	2023	AI delivers personalized learning, enhances clinical simulations, and supports data-driven decision making in PT education.	Digital divide, knowledge gaps, resistance to change.	PubMed Central
Ronquillo CE et al	2022	AI has potential for better representation of SDoH and intersectionality in nursing and allied health datasets, but this potential is underexplored.	Barriers to leveraging data include prioritization issues and EHR infrastructure limitations.	PubMed Central
Park CJ, Yi PH y Siegel EL	2021	It is recognized that AI will play an important future role in medicine, particularly radiology, although it may dampen enthusiasm for radiology as a specialty.	The perceived impact of AI on radiology may lead to a decline in interest in the specialty among students.	PubMed Central
Veras M y Dyer JO	2024	AI chatbots like ChatGPT can improve writing skills, personalize learning, and assist with assignments.	Concerns about accuracy, ethical issues (bias, plagiarism), academic dishonesty, decreased creativity, critical thinking, and data privacy.	PubMed Central
Labrague LJ, Aguilar-Rosales R, Yboa BC y Sabio JB.	2023	Moderate willingness of nursing students to adopt AI, importance of improving technological competence and understanding of AI.	Barriers include lack of computer skills, knowledge of artificial intelligence, and time constraints.	PubMed Central
BJ et al	2021	AI is considered important for the medicine of the future, and AI education needs to be provided during medical school; Hybrid learning is preferred.	Significant knowledge gap in AI concepts; lack of resources for AI learning in medical schools; Media sensationalism hinders learning about AI.	PubMed Central
Ahmer H et al	2023	AI can improve patient care, enhance education, and increase efficiency through personalized treatment, interactive simulations, and streamlined administrative tasks.	Job displacement, lack of human contact, and data security concerns.	Journal of the Pakistan Medical Association
Mousavi Baigi SF et al	2023	Healthcare students have a positive attitude toward AI, which can improve economies, require interdisciplinary collaboration, and save time and resources.	Limited knowledge and skills, concerns about job displacement, ethical issues and more negative attitudes in high-income countries.	PubMed Central

Jha N et al	2022	AI plays an important role in improving decision-making and efficiency, with applications in various specialties; Incorporating AI into curricula is crucial.	Low understanding among students, concerns about job cuts, impact on specialty options, lack of health system preparedness and faculty experience.	PubMed Central
Lanzagorta Ortega D, Carrillo Pérez DL y Carrillo ER	2022	AI offers accurate diagnosis, continuous patient monitoring and reduction of medical errors.	Failures in interpretation, over-reliance on technology, possible lack of human interaction.	SciELO
Stable Rodriguez Y	2023	AI enhances the capabilities of healthcare professionals, aids in digitalization, and supports personalized medicine and predictive diagnosis.	Ethical and legal challenges, risk of replacing human professionals, need for AI to augment rather than replace human skills.	SciELO
Atencio Gonzáles RE	2023	AI in education can save time, provide personalized learning, and improve analysis of student performance.	Job displacement, overreliance on technology, potential bias in artificial intelligence systems.	SciELO

The integration of AI into healthcare education has had a profound impact on research and data management for students.[1] The role of AI in medical education is critical, providing early exposure that integrates seamlessly into undergraduate curricula, thereby laying the foundation for future medical practices.[2] This integration is particularly evident in how AI facilitates virtual simulations and personalized learning experiences, significantly improving educational processes in healthcare fields.[3]

In particular, in nursing education, literacy in these tools is essential, as nursing students must actively participate in its development to ensure alignment with nursing practices and contributions to global health.[4,5]

AI's ability to personalize education is transformative, offering instant feedback and using virtual reality simulations to train medical staff without patient input, thereby enhancing the educational experience.[6] Students widely recognize the usefulness of AI in healthcare for decision-making and stress relief, highlighting its importance in improving clinical practices.[7]

AI tools, such as ChatGPT, have further enhanced learning by providing personalized feedback, facilitating documentation, and improving clinical decision-making processes. The impact of AI extends to improving student engagement, accessibility and interactivity, thereby improving teaching, learning processes, curriculum development and educational content.[8,9]

The efficiency and speed of healthcare processes are significantly improved thanks to AI, which also provides personalized tools to improve health outcomes.[10] In physical therapy education, AI delivers personalized learning experiences, enhances clinical simulations, and supports data-driven decision making, marking a significant advancement in the field.[11] Despite its potential for better representation of social determinants of health and intersectionality in nursing and allied health datasets, this aspect of this technology remains underexplored, suggesting a gap that needs to be addressed.[12]

AI is recognized as a critical component of future medicine, particularly in specialties such as radiology, although its influence can sometimes dampen enthusiasm for certain fields due to perceived job threats. AI chatbots, including ChatGPT, improve writing skills, personalize learning, and help with academic assignments, proving their usefulness in the educational context.[13,14]

However, nursing students' moderate to low willingness to adopt AI underscores the need to improve their technological competency and understanding of the tool.[15] The importance of this technological tool to the future of medicine is clear, and incorporating training in it throughout the medical school journey is crucial, with students preferring hybrid learning formats.[16]

The contribution of AI to improving patient care, education, and efficiency is profound. It provides personalized treatment plans, facilitates interactive simulations, and streamlines administrative tasks, significantly improving healthcare delivery.[17]

Healthcare students generally have a positive attitude toward AI, recognizing its potential to improve economies, require interdisciplinary collaboration, and save time and resources.[18] The role of AI in improving decision-making and efficiency in various medical specialties highlights the need to incorporate AI into medical curricula to adequately prepare future healthcare professionals.[19]

AI's capabilities to deliver accurate diagnoses, continuous patient monitoring, and reduce medical errors underscore its critical role in modern healthcare.[20] It also enhances the capabilities of healthcare professionals, supports digitalization efforts and aids in personalized medicine and predictive diagnosis, contributing to more effective healthcare systems.[21] In education, AI saves educators time, provides personalized learning experiences, and improves analysis of student performance, showing its comprehensive benefits in both healthcare and education.[22]

AI in healthcare education, although promising, is currently hampered by several practical and developmental limitations. The technology is still in its early stages, with limited scope and inconsistent quality across various applications. Furthermore, the literature on AI in education reflects significant heterogeneity, geographic and linguistic biases, and a limited focus on undergraduate medical education.[1,2]

Challenges such as loss of human contact, over-reliance on AI, and concerns about the accuracy and bias of algorithms, as well as issues of academic integrity, are prevalent.[3] Furthermore, nursing education shows limited engagement with AI, with notable gaps in knowledge and health informatics, and difficulties integrating specific content into existing curricula.[4] Healthcare students also experience insecurity and misinformation about AI, with fears of job displacement and an overwhelming curriculum.[5] These factors collectively highlight the need for stronger frameworks and strategies to address limitations and maximize benefits in health education.

The adoption of AI in healthcare faces additional obstacles related to data, ethics, and educational infrastructure. Effective implementation requires large data sets and must navigate complex legal and ethical concerns related to patient data, while maintaining irreplaceable human qualities such as empathy and intuition.[6] Barriers such as digital divides, knowledge gaps, resistance to change, and prioritization issues further complicate the integration of AI in education.[11,12]

Ethical and regulatory challenges, the risk of overreliance on AI, potential job displacement, and the exclusion of certain populations from the benefits of AI raise additional concerns.[8,10,14,17] The perceived impact of these tools on specialties such as radiology may also affect student interest

in these fields.[13] To overcome these obstacles, it is essential to improve literacy among students and healthcare workers, improve educational resources, and ensure that AI serves as a complementary tool to, and not a substitute for, human skills rather than a replacement.[21,22]

4. Conclusions

AI in healthcare education holds great promise, but faces notable practical and development limitations. The technology is still in its early stages, with limited scope and inconsistent quality. Writings on AI teaching reveal diversity and the presence of bias, and tend to focus strictly on undergraduate medical education. Key challenges include the loss of human contact, over-reliance on AI, and concerns about the accuracy and bias of algorithms. Nursing education faces limited engagement in AI and gaps in knowledge, making it difficult to integrate AI-specific content into curricula. Healthcare students often feel insecure and misinformed about AI, fear job displacement, and find the curriculum overwhelming.

Additionally, effective AI implementation requires extensive data sets while addressing complex legal and ethical issues, including patient data privacy and maintaining essential human qualities such as empathy. Barriers such as digital divides, knowledge gaps, resistance to change, and prioritization issues complicate the integration of AI in education. Ethical and regulatory challenges, risks of overreliance on AI, potential job displacement, and concerns about exclusion of certain populations highlight additional obstacles. Addressing these issues requires improving AI literacy, improving educational resources, and ensuring that AI complements, rather than replaces, human skills.

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