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SYSTEMATIC REVIEW

Training in the Field of Artificial Intelligence: Challenges and Opportunities in Health Science Education

Formación docente en el área de la Inteligencia Artificial: Desafíos y oportunidades en la enseñanza en la ciencia de la salud

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ABSTRACT

Introduction: artificial intelligence in higher education teacher training has become an imperative that challenges teachers to update themselves to be able to use this tool to generate knowledge for their students.
Method: a systematic review was conducted in databases such as PUBMED, Cochrane Central Library, CINAHL, and SCIENCE DIRECT, using keywords like “health sciences,” “artificial intelligence,” and “teaching” during the period 2018-2024, following the PRISMA checklist.
Results: studies predominantly originated from Europe, Asia, the Middle East, and the USA, especially involving nursing and medical students. The most notable opportunities of AI include the relationship between ethics and technology, the training of academic tutors, and its contribution to professional education, clinical case management, literature searches, and student learning. However, challenges were identified, such as uncertainty about employability, limited funding for training, and the acquisition of licenses. Additionally, there is a need to promote responsible use of AI to avoid diminishing empathy and humanization in patient care.
Conclusions: AI is a valuable ally in health sciences education, but ethical considerations and teacher training must be taken into account for responsible use, as well as fostering critical and reflective thinking in its implementation.

Keywords: Teachers; Artificial Intelligence; Health Students.

RESUMEN

Introducción: la inteligencia artificial en la formación del docente de educación superior, se ha vuelto un imperativo que desafía al maestro a actualizarse para poder usar dicha herramienta al favor de la generación del conocimiento de sus estudiantes.
Método: se realizó una revisión sistemática en bases de datos como PUBMED, Cochrane Biblioteca Central, CINAHL y SCIENCE DIRECT, utilizando palabras clave como “ciencias de la salud”, “inteligencia artificial” y “enseñanza” durante el periodo 2018-2024, siguiendo la lista de verificación PRISMA.
Resultados: predominaron estudios de Europa, Asia, Medio Oriente y EE. UU., especialmente en estudiantes de enfermería y medicina. Las oportunidades más destacadas de la IA incluyen la relación entre ética y tecnología, la capacitación de tutores académicos y su contribución a la formación profesional, la gestión de casos clínicos, la búsqueda de literatura científica y el aprendizaje del estudiante. Sin embargo, se identificaron desafíos como la incertidumbre sobre la empleabilidad, el escaso financiamiento para capacitación y la adquisición de licencias. Además, se subrayó la necesidad de promover un uso responsable de la IA para evitar la disminución de la empatía y humanización en la atención al paciente.

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Conclusiones: la IA es un aliado valioso en la educación de las ciencias de la salud, pero deben considerarse aspectos éticos y de capacitación docente para su uso responsable, así como fomentar el pensamiento crítico y reflexivo en su implementación.

Palabras clave: Docentes; Inteligencia Artificial; Estudiantes del Área de la Salud (DECS).

INTRODUCTION

Marvin Minski, a pioneer in artificial intelligence, defined it as "the science that allows machines to do things that would require intelligence, in such a way as if they were done by humans".[1] These operations included decision-making, problem-solving, acting like a human, and thinking and acting based on data. Examples of this can be found in personal assistants such as Alexa®, Siri®, Google Home®, and learning applications such as Duolingo®, which are programs that allow interaction with people in a very human-like way. According to a study it is a tool that facilitates many processes, but at the same time creates fear and uncertainty in other situations, such as work.

To complement this idea a little further, AI enables machines to simulate intelligence by giving computers human-like capabilities. Obviously, as artificial intelligence, it lacks characteristics such as reasoning, feelings, or the ability to empathize with other human beings.[2] One of the greatest advantages of AI is that it is a tool that allows external data to be interpreted, generating knowledge-based decisions using computer science and mathematical calculations, which enable the objectives or orders generated by humans to be achieved.[3]

Although AI began more than five decades ago, it is a technology that has grown very quickly and is being included in all sciences, especially in health. One of the world's leading countries in AI is Canada, which has three AI centers in its major cities, Montreal, Toronto, and Edmonton, with deep learning laboratories and funding from companies such as Google and Thomas Reuters, with more than $80 million for implementation.[4]

Moving into the field of education, AI offers significant advantages in supporting the learning and training of university students. However, there is a perception among teachers and other professionals that AI could replace human educators in the next decade.[5] According to Abdellatif et al.[6], AI enables in-depth learning, the storage of large amounts of information, remote teaching, feedback, and innovative assessment methods, among other benefits. Given these benefits, there is a feeling that they could pose a threat to workers who could lose their jobs.

What is quite certain is that AI has been gaining great popularity, forging divided opinions in the academic sphere regarding its use. There are positive opinions that consider it a valuable tool for the growth of science, providing speed and consistency in its responses, as well as its ability to adapt to the subject and its contexts.[7] However, it has also generated negative opinions regarding the perception that it makes things too easy for students, that using AI is "cheating," and that it sometimes provides inaccurate or inappropriate responses to those who use it.

In addition, it should be noted that university teachers must be prepared to provide up-to-date, relevant education and also be trained in accordance with current technological trends in the health field. These qualities give teachers the necessary skills to professionally train their students, making them more competent and knowledgeable about the current reality. Training refers to learning that is provided to improve job performance, while relevant and up-to-date education provides learning for life, good performance, and professional integrity. In view of this, Pedro et al.[8] emphasize that Artificial Intelligence (AI) is a critical issue of great interest to educational leaders and professionals in the health field who are at the forefront of global health needs.

An interesting point to highlight is the existence of Intelligent Tutoring Systems (ITS), a platform that uses AI and natural language processing to enhance student learning. According to a study ITS is characterized by personalizing the content that students need and adapting to each student's learning pace, offering feedback, evaluation, and readjustment to the difficulty of the content. All of this is done using mathematical models that describe how students generate knowledge.

Above all, in this context of technological advances in artificial intelligence, the most pressing issue is teacher training and updating in these processes. Rapid technological evolution and AI tools are creating a gap between what teachers teach and what is happening in the real world, as well as in the skills required in the workplace. Another limitation is that teachers may refuse to apply AI technology in their daily teaching; some educators may feel overwhelmed by the complexity of AI or simply do not see it as important in their professional fields. In addition to this problem, there is also a lack of resources or institutional support for ongoing teacher training, since AI is not only used for information retrieval, but teachers must also be trained in the pedagogical and ethical aspects of using this technology.

These types of tools allow for the innovative enhancement of the roles of teachers or tutors in clinical practice, who face increasing demands in terms of workload, where medical care is becoming increasingly

severe, scarce, complex, and demanding.[9] AI could therefore support students in this type of adverse scenario. Given the context presented here, the aim of this systematic review is to analyze the current state of teacher training in artificial intelligence, as well as the challenges and opportunities it presents for both teachers and students in the health sciences.

METHOD

This was a systematic review of teacher training in the field of artificial intelligence, including the challenges and opportunities involved in its implementation. To this end, two research questions were initially formulated:

1. What is the teacher training of health science teachers in relation to artificial intelligence?
2. What are the challenges and opportunities of artificial intelligence in the training of health science professionals?

With these two guiding questions, which are the two variables of the study, the inclusion criteria for the search were established using the following keywords:

1. "Artificial Intelligence" "Health Professions Educators" "learning" "formation." However, these words did not yield any results in any of the databases, so the search was only carried out with "Artificial Intelligence" "Health Professions Educators."
2. In PUBMED, COHCRANE, and CINHAL, the terms "health sciences," "artificial intelligence," and "teaching" were used.
3. In SCIENCE DIRECT, the search terms "health sciences," "artificial intelligence," "learning," "medical students," and "nursing students" were used to refine the results, as many articles appeared that were not related to the criteria.
4. In BVS LILACS, the search terms "health sciences," "teachers," and "artificial intelligence" were used "artificial intelligence"

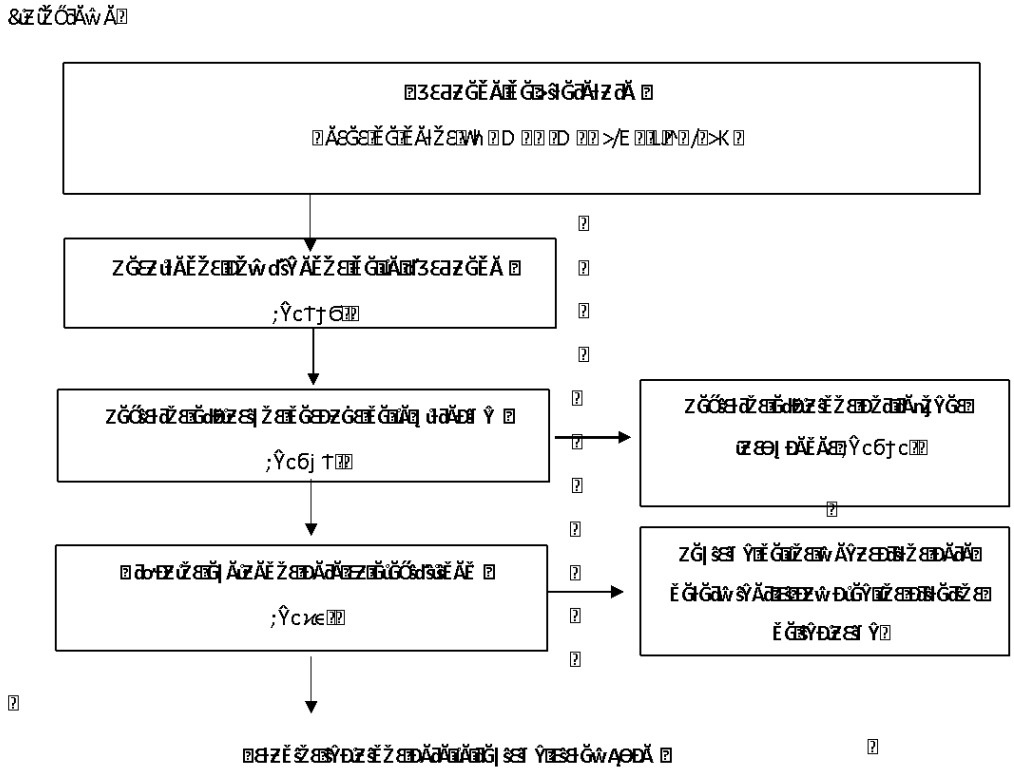

Figure 1. PRISMA

The time period selected was from 2018 to September 2024, and the articles were limited to English and Spanish and available in full text for free.

Another inclusion criterion was that the articles had to address topics related to the training of health science teachers in artificial intelligence, as well as the challenges and opportunities that AI offers for student teaching and learning. Original articles from empirical studies were included regardless of methodology, as well as opinion articles by experts. Scope reviews or meta-analyses, trials, and conference papers were excluded.

Titles and abstracts were examined for an initial assessment of their relevance to the inclusion criteria. Those

that met the criteria were selected for full-text reading, and data were then extracted using a findings matrix consisting of the following parameters: author, year, country, methodology used, challenges, and opportunities of AI. The results were reported using the PRISMA checklist.

RESULTS

The results of the search in the selected databases and the process carried out for this purpose are presented below:

Table 1. Search results

Database	Keywords	Total results	Articles included for analysis	Eligible articles
CINHAL EBSCO	"health sciences" "artificial intelligence" "teaching"	18	6	1
Cochrane Central Library	"health sciences" "artificial intelligence" "teaching"	3	1	1
SCIENCE DIRECT	"health sciences" "artificial intelligence" "learning" "medical students" "nursing students"	29	9	3
PUBMED	"health sciences" "artificial intelligence" "teaching" "educator" "students"	179	32	24
BVS	"teachers" "artificial intelligence" "health sciences"	1	1	1
Total		230	49	30

The quality of these studies has not been questioned, as the scientific journals from which they were obtained are ranked highly in Web of Science and Scopus. The study population consisted mainly of medical and nursing students, and the methodologies used were quantitative in nature.

Table 2. Countries where the studies were conducted

Country	Fr	Country	Fr	Country	Fr
Kuwait	1	Croatia	1	Canada	1
Germany	2	Saudi Arabia	2	Australia	1
Qatar	1	Turkey	3	Cyprus	1
Nepal	1	United States	4	United Kingdom	2
South Africa	1	Argentina	1	China	1
Korea	2	Oman	1	Italy	1
Karachi	1	Palestine	1		

According to the findings of this study, research into artificial intelligence in health sciences education has been conducted mainly in European, Asian, and Middle Eastern countries, as well as in the US.

Quantitative cross-sectional studies predominated in terms of frequency, with 19 studies, followed by qualitative studies using interviews. To a lesser extent, there were articles of reflection, experience reports, historical reviews, participatory action research, and mixed methods.

Table 3. Research design of the studies included in the review

Type of study	Fr
Cross-sectional quantitative studies	19
Qualitative: interviews	3
Quasi-experimental	1
Mixed methods	1
Randomized controlled trials	1
Reflection article	1
Action research – participation	1
Historical overview	1
Narrative of experience-expert opinion	2
Total	30

Table 4. Population of the studies

Population	Fr
Medical students	12
Nursing students	5
Academic experts	3
Health sciences students	4
Dentistry students	1
Not applicable	5
Total	30

The research was conducted mainly among medical students, followed by nursing students and others, as it was carried out among health science students from different degree programs.

Table 5. Summary of AI challenges and opportunities

Challenges	Opportunities
Drastic changes in a short period of time	Positive perception of the importance of AI
Need for AI instruction and training	Comfort level with AI
Lack of knowledge about AI	Accelerates processes
Inadequate courses and training available	High willingness to use
Risks associated with unverifiable content	Training on AI-based skills
Lack of funding	Generate ideas
Replacement of jobs	Help with academic writing
Education and healthcare systems not prepared for AI	Searching for scientific literature
Lack of reliability	Text translation
Ethical implications	Case simulation for clinical learning
Promotion of responsible use	Methodologies Teaching teaching and learning
Negative sociological impact	Reduces administrative burden

Table 6. Total results matrix

Author	Year	Country	Methods	Challenges IA	Opportunities IA
Buabbas et al.[3]	2021	Kuwait	Transversal Medical Students	AI will drastically change the medical profession.	99,1 % of students perceive AI as important in medical care. 60,1 % understand the basic principles of AI 93,4 % are comfortable with it 83,5 % consider it important for their profession.
Weidener et al.[10]	2024	Germany Austria Switzerland	Cross-sectional survey of medical students in Germany, Austria and Switzerland.	74,9 % believe that there is a need for instruction on AI and AI ethics in medical education, although current offerings were considered inadequate	Formal education on AI or AI ethics in medical curricula was limited, although 38,8 % had prior experience 71,7 % anticipated a positive impact of AI on medicine.
Weidener et al.[11]	2023	Germany and Austria	Qualitative study Interview of 12 academic experts and medical researchers.	Ability to interpret and reflect on the results provided by AI, taking into account the associated risks.	Knowledge and understanding of AI fundamentals, statistics, ethics and privacy and regulation as basic knowledge is necessary in medical education.
Ahmad et al.[12]	2023	Qatar	Cross-sectional study with QU-Health Cluster students using an online survey.	Lack of expert mentoring as a barrier to gaining knowledge about AI, followed by lack of specific courses and funding. artificial intelligence can make better diagnoses than humans also agreed that AI could replace their work.	Most participants had a positive attitude toward AI, considering it useful and reliable. The most popular perceived advantage of artificial intelligence was its ability to speed up work processes.
Jha et al.[13]	2022	Nepal	Cross-sectional study conducted on students doing their internship.	More than 49 % strongly agreed that AI will reduce the number of jobs for doctors. Nepalese healthcare system is not well equipped to meet the challenges of AI.	High perceived willingness among respondents to learn about AI They felt that medical students should be trained in AI competencies.
Lewis et al.[14]	2024	South Africa	Qualitative, exploratory, descriptive research. Data were obtained through five group interviews with undergraduate medical imaging and radiation science students.	Participants expressed concerns about the reliability and ethical implications of AI-generated information. Teachers should encourage the responsible use of artificial intelligence in learning.	AI benefits: Learning Assessment Idea generation Academic writing Literature searching Language translation Becoming more efficient Simulation-based AI supports students' clinical learning Within clinical departments it helps improve patient outcomes.
Shin al et al.[15]	2024	Korea	Quasi-experimental study of 99 nursing students.	Educators should complement AI technology with strategies that enhance critical thinking, careful selection of data, and source verification	The control group (did not use AI) showed strong performance in ethical standards and clinical reasoning when applying the nursing process. In contrast, the experimental group, which used AI, quickly presented multiple problem-solving perspectives.
Lukic et al.[16]	2023	Croatia	The study was conducted in nursing schools of four Croatian universities, and a total of 336 first-year nursing students were surveyed Validated instrument: scale of general attitudes towards artificial intelligence, consisting of 20 Likert-type items.	Practical advantages of artificial intelligence" were somewhat unfavorable.	Students had slightly positive attitudes toward artificial intelligence in nursing. Scores on the subscales "Benefits of artificial intelligence in nursing," "Willingness to use artificial intelligence in nursing practice," and "Dangers of artificial intelligence" were favorable toward artificial intelligence-based solutions.

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Doğaner, A.[17]	2021	Saudi Arabia.	Cross-sectional research. 550 medical students.	Students mostly think that AI will have negative sociological effects in the future. Students also think that artificial intelligence will cause unemployment in the future.	AI will bring positive contributions to the field of health and medicine. Students think that artificial intelligence will increase the success rate in treatment.
Yalcinka ya et al.[18]	2024	Turkey	General attitudes scale toward artificial intelligence in 291 nursing students.	It can greatly improve the adaptability and efficiency of nursing students in the use of AI in healthcare settings, which is crucial for improving patient care.	The findings reveal a strong correlation between positive attitudes toward AI and willingness to use AI among nursing students.
Akutay et al.[19]	2024	Turkey	Randomized controlled trial 88 third-year nursing students randomly assigned to AI group (n=94) or control group (n=94).	The use of AI in education contributes positively to students' learning abilities.	The use of AI-supported audiovisual materials increases satisfaction and interest in education. AI-supported case studies should be integrated into nursing education. Case management performance scores were significantly higher The results of the study indicated that AI-supported cases improved student performance in case management and were as effective as instructor-led cases.
De Mattei et al.[20]	2024	USA.	Cross-sectional observational study	Positive perception of improved ability to take clinical history and make differential diagnosis.	Students were willing to be exposed to other artificial intelligence simulated virtual patients (AI-VSPs). AI-VSPs are accepted as a complementary learning tool. Students commented that the AI-VSP opportunity increased confidence prior to meeting real patients. Students agree that artificial intelligence-driven virtual patient simulation (AI-VSP) is a complementary learning tool, but not a replacement for human interaction.
Lomis et al.[21]	2021	USA	Reflection article	Teachers must ensure ethics in the use of AI. Teach with greater emphasis to evaluate, interpret, administer and defend the patient's rights, as well as empathy. AI will not supplant anyone, it is only a complement.	AI makes it possible to synthesize the information overload that currently exists. Alleviates administrative burden. AI as a health promoter. Reaches remote locations. Optimization of the use of educational resources for learning.
Magallan et al.[22]	2024	Argenti na	Experience report	Lack of knowledge on how to use these tools effectively	Growing interest in IAGen in the educational community Positive experiences are reported, finding them intuitive and useful for research and teaching.
Alkhaaldi et al.[23]	2023	Oman	Web-based cross-sectional survey of recently graduated medical students 265 students.		The vast majority of respondents denied using ChatGPT. 20,4 % used it to complete written assessments and only 9,4 % used the technology in their clinical work. Prior experience with AI was significantly associated with a positive perception of AI in terms of improved patient care, decreased medical errors and misdiagnoses, and increased diagnostic accuracy

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Alhadity et al.[24]	2023	Canada	Validated exploratory questionnaire conducted at the University of Toronto to all clinical year medical students (N=225).	Students also had concerns about the impact of AI on employment prospects and ethical issues,	Most students (n=167, 75,4 %) had no prior exposure to AI in healthcare, with a mean knowledge score of 3,25 out of 5 on AI, and showed no improvement over the years. They had positive perceptions and attitudes toward AI. Perception that AI competencies should be included in medical training.
Lazarus et al.[25]	2024	Australia	Expert opinion		AI is currently not adequate to incorporate the uncertainties intrinsic to anatomy education in the areas of (1) human variation, (2) health care practice, (3) diversity and social justice, (4) student support, and (5) student learning.
Lane et al.[26]	2024	USA	Descriptive case-based study applied to health science educators.	AI poses challenges of transparency, ethical use alphabetization. AI.	AI can serve as a tool, offering opportunities for efficiency and innovation Enables improved teaching methodologies and prepares students for the interprofessional health care workforce Provides innovation for teaching and learning.
Cherrez et al.[27]	2024	Americas	May-June 2023 cross-sectional survey of students of medicine, nursing, dentistry, nutrition, and laboratory science students in the Americas.	42,99 % were unaware of ChatGPT. The mean knowledge score was "minimal". The majority of respondents felt that ChatGPT was neither ethical nor unethical.	Most participants agreed to some extent that ChatGPT benefits healthcare settings, provides reliable data, is a useful tool for accessing clinical and educational medical information, and makes work easier. Overall, 70 % (7/10) of people used it for homework. As perceived knowledge of ChatGPT increased, there was a stronger tendency to have a favorable attitude toward ChatGPT.
Kavadella et al.[28]	2024	Cyprus	Mixed methods study, to evaluate the use of CHATGPT.	One group searched the Internet for scientific resources to perform the task and the other group used ChatGPT for this purpose.	Students using ChatGPT for their assignments performed significantly better on the knowledge test than their peers who used the literature research methodology. Students quickly adapted to the technological environment of the language model recognized its opportunities and limitation and used it creatively and efficiently.
van de Venter et al.[29]	2023	United Kingdom	Action research Participation	Virtuality Barrier	Learning as a module can help AI academics to develop similar AI educational provisions for radiologists and other imaging and radiation science professionals.
Mosleh et al.[30]	2024	United Arab Emirates Emirates United States		Gender and major emerged as significant factors, with female students and health science students using fewer chatbots compared to the other professions cross-sectional approach, using a convenience sample of 529 undergraduate students recruited through online questionnaires	83,6 % of participants regularly used chatbots for learning. A statistically significant positive correlation was found between the frequency of chatbot use Students with more study hours relied less on chatbots.

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Huang et al.[31]	2021	China	Historical overview of AI in education, relevant AI concepts, current applications of AI in healthcare education, dilemmas and recommendations for the future.	Nurse educators must engage in curricular reform and understand the critical concepts and applications of AI to equip nursing students with the information technology skills necessary to meet the needs of the AI era.	
Bonacaro et al.[32]	2024	Italy		A questionnaire created with ChatGPT was administered to nursing students, nurses and educators in total 176 participants.	On the contrary, some of the risks would be: limited opportunities for critical thinking and reduced interaction and collaboration. perceived potential benefits of introducing AI include: improved quality of nursing care, of the diagnostic process and of job satisfaction
Shammin et al.	2024	Karachi	Qualitative, quasi-experimental, cross-sectional study.	Ten short formative essays of final year dental students were manually evaluated and scored. These essays were then scored using ChatGPT version 3.5. L	AI technologies complement human grading in essay evaluation. Medical educators should adopt AI and ML technology to improve the standards and quality of medical education, particularly when assessing long and short essay-type questions.
Champendal et al.[33]	2024	United Kingdom	Cross-sectional survey Participants were Swiss radiologists (clinicians/ educators/researchers/students).	Participants (68 %) did not feel well trained/ prepared to implement AI in their practice, highlighting the lack of availability of specific training (88 %) 19 % considered AI as a threat. Significant threats identified were the reduction of jobs (23 %), the decrease in radiologists' level of experience due to automation bias (16 %).	Forty-three percent of the participants use AI in clinical practice, but 64 % of them were not confident with AI terminology. Participants saw AI as an opportunity (57 %), Opportunities were associated with streamlining repetitive tasks, minimizing errors, increasing time toward patient-centered care, research, and patient safety. Ninety-three percent of participants mentioned that AI education should be included in the undergraduate education program.
Lee et al.[34]	2024	South Korea	An initial Delphi survey conducted in 2022 involving 4 groups of medical AI experts (n = 28) yielded 42 items of competency	The study identified 6 domains encompassing 36 AI competencies essential for medical graduates: (1) understanding of digital health and changes driven by AI; (2) fundamental knowledge and skills in medical AI; (3) ethical and legal aspects in the use of medical AI; (4) application of medical AI in clinical practice; (5) medical data processing, analysis, and evaluation; and (6) medical AI research and development, as well as subcompetencies within each domain.	
Civaner et al. [35]	2022	Turkey	A multicenter cross-sectional study was conducted among medical students across the country, in which 3018 medical students participated. The study instrument was an online survey.	However, half of the participants were concerned about the possible reduction of physicians' services, which could lead to unemployment (44,9 %). As well as devaluing the medical profession (58,6 %), damaging trust (45,5 %) and negatively affecting doctor-patient relationships (42,7 %).	Most medical students perceived artificial intelligence as an assistive technology that could facilitate physicians' access to information (85,8 %) and patients' access to care (76,7 %), and reduce errors (70,5 %).

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Russell et al.	2023	USA	Interviews with 15 experts in the use of AI-based tools in healthcare settings on clinical competencies.	Clinical competencies AI Core knowledge of AI Social and ethical implications of AI AI Enhanced clinical encounters with AI Healthcare professionals need to work effectively with such tools.	Evidence-based assessment using AI Workflow analysis for AI-based tools AI-based learning and improvement
Jallad et al.	2024	Palestine	Descriptive cross-sectional study. Three models were used: the Technology Acceptance Model (TAM), the Information System Success Model (ISSM) and the Online Learning Self-Efficacy Model (OLSE).	9,80 % of the students used simulation, 5,40 % used virtual reality, 19,10 % used GPT Chat, 42,20 % used mobile applications, and 23,50 % used PowerPoint AI as part of their learning process.	

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DISCUSSION

Artificial intelligence in the training of students enrolled in health science programs is already a reality and is included in their content as a valuable tool in some aspects. Among the findings of this study, certain positive and negative trends in education stand out. Firstly, ethical training for teachers and the promotion of ethics among their students should be mandatory. Students believe that the sources or results of AI applications are not entirely reliable,[15] verifiable, or true,[14] and therefore not very trustworthy in their application.

In light of this, a study believes that the quality of artificial intelligence tools should be evaluated in advance, researching and selecting applications that are backed by evidence, as well as ensuring that the content is supported by scientific evidence and meets certain quality and safety standards.

Despite this initial situation, the perception of AI among health science students was positive.[16] Ahmad et al.[12] perceive it as very important for their training and their profession[3] and are willing to apply it.[13,18] This represents an opportunity for its implementation in higher education. Derakhshanian et al.[36] agree with this, mentioning that medical students have shown a fairly favorable attitude toward AI, but that, counterproductively, it also causes them anxiety due to the uncertainty of whether they will be replaced in their jobs by AI.[17]

Indeed, another challenging finding of this review was precisely the perception that artificial intelligence will replace workers and pose a threat to the employability of healthcare professionals.[12,13] However, AI will inevitably not replace the personalized attention and empathy that goes into patient care.[37] Lomis et al.[21] even assert that teachers in health careers should not think that AI is a threat to these human characteristics, but rather that this situation should be used to teach with greater emphasis on empathy and the defense of patient rights. In short, AI will never replace human intelligence.[20]

Continuing with this theme, another opportunity found in the review was that artificial intelligence is a complementary tool for the training of health professionals, enabling improvements in scientific literature search processes, academic writing, and even text translation.[14] Similarly, Akutay et al.[19] mention that AI contributes to the acquisition of learning skills through the management of clinical cases. In the case of medical students, according to De Mattei et al.[20], it allows them to analyze medical records and make differential diagnoses with the help of virtual reality and virtual patients. This gives them self-confidence, as mistakes do not cause harm to anyone, and improves their critical and reflective thinking. In academia, it has even been shown to contribute significantly to the evaluation of academic essays, serving as a technical complement to provide better input.

One challenge to implementing these benefits is undoubtedly the training of teachers in AI. Ahmad et al.[12] Weidener et al.[10] believe that AI has multiple applications that can be useful in the health sciences, but there is a need for mentoring by experts in the field and specific training courses funded by higher education institutions. Weidener et al.[11] agree that training in these areas is a challenge, as it requires processes of interpretation and reflection on the results provided by AI, knowledge of statistics, medical ethics, and protocols governing medical training.

Something that was widespread in the results was the perception that artificial intelligence reduces the time spent on processes that used to be longer,[12] decreasing both administrative and operational workloads.[21] Artificial intelligence (AI) has the potential to revolutionize the way services are provided. It can help improve outcomes, increase productivity and efficiency in care, and enable healthcare systems to provide higher quality care to more people by facilitating faster care, mainly by reducing the time needed for diagnoses, and helping healthcare systems manage their resources more proactively, directing them to areas where their impact is greatest.[38]

Although AI agents are considered autonomous, fast, and efficient, they are still regarded as unconscious machines that only fulfill special purposes and should be considered as support for humans in specific and complex tasks. Given the explosion of information accessibility today, whether on social media, websites, video tutorials, or elsewhere, the world is finding more and more data available at the click of a button.[39] This accessible information or knowledge also extends to the health sciences, even jeopardizing the trust placed in professionals, as they are now tested on their knowledge according to what patients have already seen or read on the web.

Shin et al.[15] found in their research that nursing students who did not use AI to solve or develop the nursing care process in a clinical case demonstrated better performance in both ethics and clinical reasoning than students who did use AI, and that, although they delivered the solved case more quickly than the others, they did not compare in terms of the quality of the results delivered. On the other hand, in the medical field, Alkhaaldi et al.[23] found that the vast majority of respondents denied having used ChatGPT, 20,4 % used it to complete written assessments, and only 9,4 % used the technology in their clinical work.

Previous experience with AI was significantly associated with a positive perception of AI in terms of improving patient care, reducing medical errors and misdiagnoses[35] and increasing diagnostic accuracy.

In short, AI is changing and will continue to transform medical education.[3] It is even being incorporated into simulation or virtual reality programs where scenarios are configured so that students can perform actions in a metaverse, make clinical decisions, and observe the consequences of those decisions without causing real harm

to anyone.[40,41] Despite all these benefits and the need for health careers to implement them, they must first advocate for new curricula that respond to these challenges, acquire funding for equipment, and, of course, train tutors for this purpose.

According to Wartman et al.[42], these curricula should emphasize four aspects:

- That current education should focus on knowledge acquisition rather than knowledge retention.
- That AI should be a collaborator through the management of existing applications.
- Improve understanding of probabilities and how to apply them in clinical decision-making
- At the same time, empathy and compassion for patients should be cultivated.

Teachers should take advantage of the opportunities offered by this technology, but also learn from the challenges encountered, develop reflective and critical thinking about the results produced by artificial intelligence, making it an ally rather than an enemy. Recommend that students should not completely trust this tool, which, although fast, also provides knowledge based on data that exists on the web, which is not 100 % reliable. Reflect on the fact that human intelligence will not be replaceable and that AI is a complement.

The advantages of AI are not limited to the field of education, but can also be used in other contexts such as disease diagnosis and prevention, as well as health promotion. There are virtual assistants or health promoters managed by artificial intelligence that can be found anywhere in the world, no matter how remote, thus optimizing economic, material, and other resources.[21]

Among the limitations of this study is the bias that may exist due to the use of scientific databases with global impact, which may not always include research results from developing countries. This could mean that the results obtained here are representative of what happens in prestigious universities and cannot be compared with those in poorer countries.[43]

However, the global trend toward the use of artificial intelligence is something that will continue to grow and become more prevalent worldwide in all areas, including health sciences, academia, and process management. Future lines of research could include studies on the state of the art in the use or perception of artificial intelligence in health science academic programs, experimental studies with students to evaluate its use in various academic areas, and the integration of ethics in artificial intelligence in the professional training of health science students.

CONCLUSIONS

The integration of artificial intelligence (AI) in the training of health science students is a reality that is generating transformations and paradigm shifts, but it also poses significant challenges. This study highlights the need for integrated ethical training for teachers and students, given that many consider AI applications to be unreliable or to convey to students the perception that the faster a result is generated, the better and more efficient it is. Despite this, the overall perception among students is positive, recognizing AI as a valuable tool that can enhance their learning and professional preparation. However, there is also anxiety about the potential replacement of jobs by AI, underscoring the importance of maintaining personalized attention and empathy in patient care.

AI not only optimizes administrative processes, but also facilitates practical learning through virtual reality simulations, management, and analysis of clinical cases. However, its effective implementation depends on adequate training for teachers and the development of curricula that effectively integrate AI and have the necessary funding and training. As AI continues to evolve, its role in medical education becomes crucial, promoting training that combines technical knowledge with empathy, humanization, efficiency, but also the reflective and critical thinking that are necessary in clinical practice. In conclusion, AI has the potential to revolutionize health sciences education, but its success will depend on careful and ethical integration into curriculum projects, strategic planning by higher education institutions, and the budget allocated for this purpose.

It is recommended that academic and teaching staff, as well as institutional and government authorities, integrate the professional competencies of artificial intelligence into university funding structures, teacher training, and the acquisition of licenses for existing applications of this technology, which will continue to grow.

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CONFLICT OF INTEREST

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