Integration Of Ai In Medical Education And Training

Damodarrao Thakkalapelli

Vice President Bank Of America ,4808 Loft Ln Plano Tx 75093.

ABSTRACT

The integration of AI into medical education is a significant shift as AI continues to transform various industries. This study explores the changing landscape of AI in healthcare education, focusing on technologies that prioritize learners' needs. AI can replicate human intellect and its growing pervasiveness in the healthcare sector, with a particular emphasis on tailored suggestions and advancements in diagnostics. The current state of medical education often neglects new technologies such as AI, machine learning, and telemedicine.

AI is crucial in equipping future healthcare practitioners for the data science revolution, as machine learning tools like predictive analytics and image identification improve healthcare delivery and provide tailored learning experiences. However, obstacles such as teacher education, financial commitments, and multidisciplinary proficiency are addressed. Technical limitations, concerns about data protection, and ethical factors complicate the integration of AI.

The study also examines the influence of generative AI technologies, such as ChatGPT, on academic honesty, emphasizing the need for teacher education, financial commitments, and multidisciplinary proficiency. The report concludes by proposing strategies for integrating AI principles into medical school curricula, emphasizing the importance of ethical issues, safeguarding data privacy, and establishing explicit rules for AI integration in healthcare.

In conclusion, this study provides valuable information on the advantages, challenges, and moral aspects of AI in medical education, offering a guide for successfully incorporating AI into the medical syllabus and equipping future healthcare practitioners for a progressive and technologically advanced period.

KEYWORDS: AI, Medical Education, Generative AI, Academic Integrity, Ethical AI Use.

INTRODUCTION

AI refers to the replication of human intellect in machines, specifically computer systems. This enables robots to carry out intricate activities that often need human cognitive abilities, such as thinking, decision-making, and problem-solving. Due to the progress in machine learning and deep learning, we anticipate the integration of AI into an increasing number of aspects of our everyday existence. Artificial intelligence (AI) is undeniably becoming more important in healthcare. Particularly in the field of medical imaging, it has the potential to improve medical diagnoses and provide personalized recommendations. Eleven medical institutions across three countries—the US, Canada, and Korea—are now offering AI-based prototype curricula. To keep up with the rapidly changing landscape of medical education and medicine overall, it's possible that all medical schools may need to implement similar changes.[i]

The advent of the AI chatbot ChatGPT in late 2022 has had a significant impact on higher education institutions, affecting their educational landscape. Online education platforms have begun using generative AI technologies, such as Khan Academy's AI chatbot, Khanmingo, to enhance and individualize student instruction. It can function as a personal teacher, providing guidance and instruction. Additionally, it may serve as a writing coach, assisting with the improvement of writing skills. Furthermore, it can generate questions to assess and evaluate understanding. Brick-and-mortar institutions will inevitably have to adapt to the swiftly evolving digital instruments in education. In addition, Clark and Archibald argued that failing to address the influence of generative AI on higher education leads to several negative consequences, including the absence of mechanisms to maintain academic honesty and the lack of progress and relevance in teaching methods for health science education.[ii]

Although AI has been widely embraced in the healthcare field, there remain issues over legal responsibility and accountability, specifically in the context of making clinical choices. Currently, healthcare practitioners are uncertain about the party accountable for mistakes caused by AI in clinical decision support systems. Furthermore, it seems that a significant number of individuals are unwilling to accept responsibility for the outcomes produced by AI. Educators in medical education may cultivate an ethical understanding of AI, enabling future healthcare practitioners to use AI in a responsible and accountable manner.

AI technologies used in medical education might include AI virtual environments, AI-based exams, and adaptive e-learning systems. In a paper by Baker and Smith, three specific applications of AI technologies in education have been identified and are outlined as follows:[iii]

- Learner-oriented AI—AI technology that "students use to receive and understand new information".
- Instructor-oriented AI—AI technology that "can help teachers reduce their workload, gain insights about students and innovate in their classroom".
- Institution-oriented AI—AI technology that "helps make or inform decisions made by those managing and administrating schools or our education system as a whole".

STATE OF MEDICAL EDUCATION TODAY

Physicians undergo rigorous and prolonged training before they may ultimately become registered specialists. Despite significant advancements in medicine in recent decades, medical education continues to rely mostly on conventional curriculum. The duration of training varies among nations, but the fundamental skills taught in these programs are comparable worldwide. Following an initial period of preclinical theoretical instruction, the majority of training is focused on experiential learning via practical application. Care for patients, medical knowledge, communication and interpersonal skills, learning and growth via practice, professionalism, and systems-based practice are the six pillars around which medical education is often built. The "Accreditation Council for Graduating Medical Education" (ACGME) established these disciplines. Learning a great deal of material and being an expert at applying it to the treatment of patients is a large chunk of medical school. Memorization is the mainstay of this method. There is a lack of resources to help medical students and residents get familiar with cutting-

edge technologies like telemedicine, mobile health applications, and artificial intelligence. In American medicine, these areas are not covered by the USMLE.[iv]

Nevertheless, change seems to be unavoidable after the 2018 annual meeting of the "American Medical Association" (AMA), when the AMA adopted its first policy on augmented intelligence. This policy encourages more investigation into how AI should be included in medical education. Table 1 displays several projects for integrating AI into medical education, as described by the AMA.[v]

"Table 1. Initiatives for AI in medical education.

Institution	Project
Duke Institute for Health Innovation	Medical students work together with data experts to develop care-enhanced technologies made for physicians.
University of Florida	Radiology residents work with a technology-based company to develop computer-aided detection for mammography.
Carle Illinois College of Medicine	Offers a course by a scientist, clinical scientist, and engineer to learn about new technologies
Sharon Lund Medical Intelligence and Innovation Institute	Organizes a summer course on all new technologies in health care, open to medical students
Stanford University Center for AI in Medicine and Imaging	Involves graduate and postgraduate students in solving healthcare problems with the use of machine learning
University of Virginia Center for Engineering in Medicine	Involves medical students in the engineering labs to create innovative ideas in healthcare"

One sometimes neglected part of medical training is proficiency in handling electronic health records (EHRs). EHR provide several advantages, including enhanced patient safety, while also facilitating the integration of AI in the healthcare sector. The use of AI algorithms relies on data extracted from the EHR, making it crucial to possess the expertise to enter impartial data accurately into the EHR. Alternatively, the AI algorithm is prone to exhibiting prejudice. Currently, the medical curriculum does not often include training for medical students and doctors on the use of EHR.[vi]

As a consequence, medical professionals often utilize EHRs as a substitute for paper-based information collection without fully comprehending the actual capabilities of this technology.

EHR training often comprises impromptu, concise introductory seminars that only focus on imparting fundamental skills for practical use of the hospital's system. The issues surrounding data quality and the potential effects of computers on patient-physician interaction are hardly acknowledged, and these topics are not included in the USMLE examination.[vii]

IMPACT OF AI USE IN AN UNDERGRADUATE MEDICAL PROGRAM

Since the launch of ChatGPT in the latter part of the previous year, endeavours have been made to explore its usefulness in the field of education, along with the usefulness of other generative AI technologies. Nevertheless, due to its extensive functionalities, ChatGPT is prone to abuse, and we provide an observation from our faculty in the following section.

Academic writing is a required component of the research module for undergraduates studying medicine at Universiti Brunei Darussalam's Pengiran Anak Puteri Rashidah Sa'adatul Bolkiah (PAPRBS) Institute of Health Sciences. Students will get the foundational understanding and practical experience in scientific, medical, and health-related research via this subject. Students are expected to demonstrate their understanding of scientific concepts via both written and oral presentations as part of the assessment. The Canvas LMS is used for electronic submission of manuscripts, which are then checked for plagiarism using Turnitin.[viii]

Instances of AI-generated text have been identified in many submissions, exhibiting significant use of ChatGPT material, which has raised substantial concerns over academic misconduct. The presence of citations to non-existent articles, a phenomenon referred to as "hallucination" in the field of AI, was observed. The writing was deemed to be a well-constructed summary in general, but the depth of knowledge was shallow and lacked critical analysis. The oral presentation also revealed a deficiency in the depth of knowledge and critical thinking skills.

TRAINING STUDENTS AND FACULTY STAFF FOR ETHICAL USE OF AI

Faculty teaching staff should actively involve themselves with AI to educate medical students and ensure that the curriculum is up-to-date. Students may engage in plagiarism by copying essays created by AI programs, so undermining their ability to think critically and jeopardizing their academic integrity. In order to tackle this issue, colleges should enforce stringent laws and procedures to ensure the ethical use of AI technologies. Educational institutions need to cultivate a culture that promotes academic honesty and provides students with the essential abilities to assess and use AI thoughtfully and responsibly. Educators have the option to provide seminars or training sessions to instruct students on the proficient use of AI technologies while ensuring a harmonious integration of these tools with their distinct thoughts and perspectives. This strategy fosters innovation, critical thinking, and responsibility in conjunction with technological progress while also encouraging the enthusiasm and favourable mindset that faculty members and medical students have towards AI.[ix]

We propose that medical students be guided in the undergraduate research module to develop effective ChatGPT prompts and to use ChatGPT replies to reduce the likelihood of problems like hallucinations and phrase errors. Academic honesty and proper writing style are guaranteed by this method. Presenting medical instructors should emphasize to students at the start of the module the two plagiarism-detecting capabilities of Turnitin: similarity and AI scores. Teachers

and students in the medical field would be well to be aware of the tools available to detect plagiarism and AI-generated content, and to take appropriate measures to avoid it. It might be prudent to require students to disclose the use of AI technologies in their written paper, much as we disclose our use of statistical software for data analysis, in order to promote responsibility.[x]

Additionally, within the curriculum, it is advisable to include lectures on AI for first-year medical students. These lectures should encompass fundamental comprehension, advantages, and potential drawbacks of AI. This approach would enable students to gain familiarity with prevalent terminology associated with AI. Within modules that prioritize the acquisition and retention of biomedical information, as well as those focused on patient care, teaching staff have the option to include advanced language model-driven chatbots. These chatbots may effectively respond to frequently asked medical queries from both students and patients. Students may use chatbots to enhance their proficiency in clinical communication.[xi]

In addition to integrating AI tools into the curriculum, we propose that medical students in their fourth year of the program at PAPRSB Institute of Health Sciences who are following the research project and dissertation track be offered research projects that are based on AI. Our medical school and the university's School of Digital Sciences have been working together, so this proposal has a good chance of succeeding.[xii]

BENEFITS AND CHALLENGES OF AI IN MEDICAL EDUCATION

Benefits

One significant advantage of AI in medical education is that it prepares the next generation of doctors to actively engage in the developing field of data science by equipping them with relevant Machine Learning skills. Several strategies include fundamental technologies like predictive analytics and image identification. Students may first come across Machine Learning in specialized courses focused on population health and evidence-based medicine. Machine Learning functions as an adjunctive instrument for physicians, augmenting their provision of healthcare. Moreover, the deployment of technology creates fresh prospects for specific student demographics, enhancing accessibility and involvement for students who are enrolled part-time and providing customized programs for kids who are brilliant or talented. Emphasizing the revolutionary impact of AI in education, separate research underscores its capacity to provide individualized learning support that is tailored to individual preferences and development.[xiii]

Furthermore, this assessment reinforces the idea that improving healthcare quality may be accomplished by enabling medical personnel to maximize their capabilities. The integration of AI-based apps in medical education and training may enhance the empowerment process for a wide range of medical professionals. Indeed, the use of AI-based training resulted in significant improvements in practical abilities among medical students.

Challenges

The incorporation of AI into medical education poses several problems. Several educators may require more training to use technology and enhance the instructional experience effectively. The advancement of emerging technology, especially when designed for educational use, often involves significant costs and requires a wide array of specialized skills. This skill set encompasses the development of AI algorithms specifically designed for medical content, the analysis of data (including collection, processing, and interpretation) generated by AI in the field of medical education, the seamless integration of AI into existing curricula using educational technology, and the creation of engaging learning experiences through instructional design. Moreover, incorporating AI into education might provide challenges due to its multidisciplinary nature and dependence on technology. Out of the difficulties mentioned, 17 research have shown that six of them have early-stage prototypes that have technological limitations. These limitations need to be improved in order to increase the user experience. These limitations include factors such as improving performance, validating effectiveness, and implementing AI computational procedures. The research highlighted the need to use varied assessment methodologies and large sample sizes to ensure the replicability of AI applications in medical education. This is essential because of the difficulties associated with implementing AI effectively, limitations in available curriculum hours, and a lack of faculty competence.[xiv]

Moreover, the training of AI algorithms is complicated by factors such as restricted sample sizes, data integrity, and privacy concerns. Furthermore, concerns have been raised about the comprehensibility, applicability, and possible overfitting of AI algorithms. Having a thorough grasp of the possibilities and limits of AI is crucial for successfully incorporating technology into medical education since it highlights the need to overcome these obstacles.[xv]
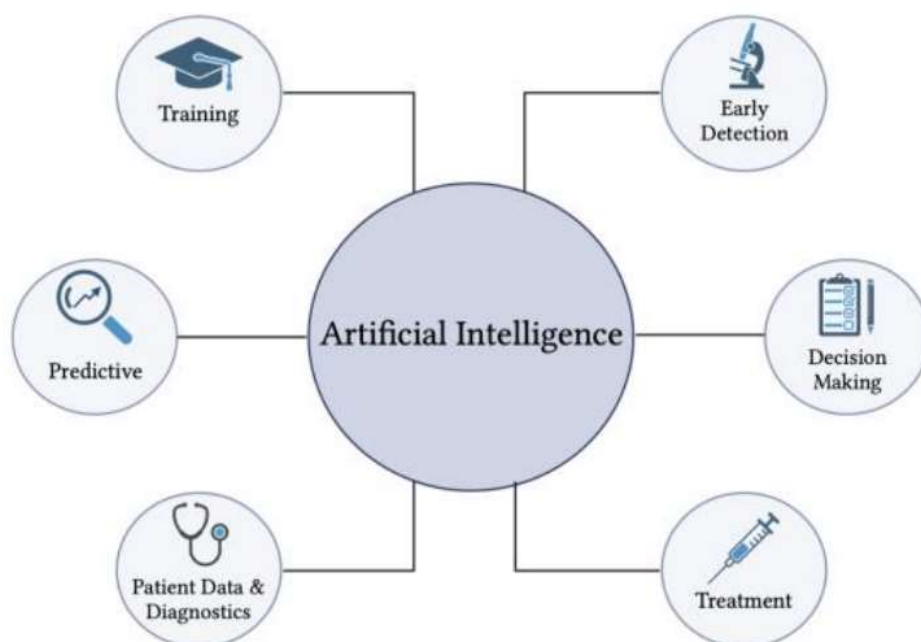

Figure 1 Various applications of Artificial

FUTURE PROSPECTS AND CONSIDERATIONS

The advancement of cutting-edge technology and AI is causing substantial transformations in medical practice. The rapid and innovative development has emphasized the increasing need for a comprehensive educational program that efficiently communicates knowledge to medical students about the potential and capabilities of AI in the healthcare field. When it comes to medical education, it is of utmost importance to give priority to fundamental abilities such as statistical proficiency and empathy. Prospective medical students must equip themselves for a cutting-edge teaching model propelled by AI and Machine Learning. Utilizing cutting-edge technology for student-centred learning entails active involvement via personalization, social interaction, and convenient access to resources. Although technology has the potential to revolutionize medical education, it is crucial to recognize that AI cannot substitute human expertise and judgment. Experienced practitioners' supervision is essential for medical students to develop clinical skills and get a deep understanding of the subject matter.[xvi]

RECOMMENDATIONS FOR EFFECTIVE AI INTEGRATION

Despite the fast advancement of AI, there is a lack of easily accessible literature to aid medical students in understanding its ideas. Current AI materials often presuppose technical proficiency, depriving medical students of crucial foundational understanding. Hence, in order to ensure the smooth incorporation of AI in the medical domain, it is crucial to use tactics that integrate AI into the curriculum of medical schools. This proactive measure will provide medical practitioners with a fundamental comprehension of AI algorithms, empowering them to enhance the utilization of this revolutionary technology. Machine Learning-related topics may be smoothly included in a complete curriculum to enhance patient care via the skilful use of information technology. This strategic approach guarantees a comprehensive framework that prioritizes the development of competence and expertise. Furthermore, it is essential to emphasize that while AI provides several benefits, its incorporation into healthcare presents ethical concerns about the confidentiality of data, automation, and telemedicine. The absence of clearly defined standards might lead to difficulties throughout the implementation process, underscoring the need to develop a prescribed set of norms to adhere to.[xvii]

CONCLUSION

The incorporation of AI into medical education offers both advantages and obstacles that need thoughtful examination. The profound impact of AI on medical education is clear, as it can improve learning experiences, provide tailored support, and equip the next generation of medical professionals for the advancing data science revolution. Nevertheless, these technological progressions include ethical deliberations and need proactive actions to guarantee the proper utilization of AI.

The present condition of medical education is characterized by a conventional curriculum that places significant emphasis on didactic learning and memory. Despite the advancements in health and technology worldwide, the incorporation of AI tools, such as virtual environments and adaptive e-learning systems, is still restricted. Medical personnel sometimes lack sufficient training in using electronic health records (EHRs), a critical component of AI algorithms in the healthcare field. The American Medical Association (AMA) presents initiatives that aim to

bridge this gap by enrolling medical students in projects that investigate the convergence of technology and healthcare.

The influence of AI on medical education is not devoid of problems. Faculty members are responsible for instructing both students and themselves in the ethical use of AI. The occurrence of AI-generated material causing plagiarism problems emphasizes the need to set explicit standards and regulations for the use of AI. It is essential to find a middle ground between using AI technologies to improve learning and upholding academic honesty. By actively involving faculty in AI and providing seminars and training sessions, students may acquire the necessary abilities to analyze AI applications in a discerning manner and use them responsibly.

The problems highlighted include not just ethical issues but also the technological and economic elements of integrating AI. Additional training may be necessary for instructors, and experience in algorithm development, data analytics, educational technology integration, and instructional design is essential for the creation of AI tools for educational purposes. These problems highlight the multidisciplinary aspect of AI in education and emphasize the need to have a thorough grasp of its capabilities and constraints.

Notwithstanding these difficulties, the advantages of AI in medical education are significant. AI equips medical personnel with advanced technologies such as predictive analytics and image identification, which significantly improve the delivery of healthcare. It provides new opportunities for making information and resources more easily accessible and engaging, specifically targeting a wide range of student populations. The function of AI in customized learning is to cater to individual preferences and track progress, resulting in significant enhancements in practical abilities among medical students.

In the future, the advancement of AI in medical education requires a thorough educational program that teaches crucial qualities, such as statistical proficiency and empathy. Although technology, such as AI and machine learning, has the potential to revolutionize medical education, it is incapable of substituting human expertise and judgment. The mentorship of seasoned professionals is essential for developing clinical expertise and deep topic understanding.

Suggestions for successful AI integration include integrating AI principles into the medical school curriculum and ensuring that materials are readily available and customized for medical students. Well-defined norms should be set to negotiate ethical issues, including data privacy and automation. The collaboration between technology advancements and human knowledge will play a vital role in creating the medical education environment, equipping students with the necessary skills to navigate the future healthcare ecosystem.

To summarize, the process of incorporating AI into medical education requires a careful and deliberate strategy that tackles ethical considerations, technological obstacles, and the need for complete training methodologies. Through the responsible use of AI, medical education may effectively leverage its revolutionary capacity to enhance the preparation of future healthcare professionals.

REFERENCES

[i] Paranjape, K., Schinkel, M., Panday, R. N., Car, J., & Nanayakkara, P. (2019). Introducing artificial intelligence training in medical education. JMIR medical education, 5(2), e16048.

[ii] Pizzolla, I., Aro, R., Duez, P., De Lièvre, B., & Briganti, G. (2023). Integrating artificial intelligence into medical education: Lessons learned from a Belgian initiative. Journal of Interactive Learning Research, 34(2), 401-424.

[iii] Jamal, A., Solaiman, M., Alhasan, K., Temsah, M. H., & Sayed, G. (2023). Integrating ChatGPT in medical education: adapting curricula to cultivate competent physicians for the AI era. Cureus, 15(8).

[iv] Busch, F., Adams, L. C., & Bressem, K. K. (2023). Spotlight on the biomedical ethical integration of AI in medical education–Response to:'An explorative assessment of ChatGPT as an aid in medical education: Use it with caution'. Medical Teacher, 1-1.

[v] Rainey, C., O'Regan, T., Matthew, J., Skelton, E., Woznitza, N., Chu, K. Y., ... & Malamateniou, C. (2021). Beauty is in the AI of the beholder: are we ready for the clinical integration of artificial intelligence in radiography? An exploratory analysis of perceived AI knowledge, skills, confidence, and education perspectives of UK radiographers. Frontiers in Digital Health, 3, 739327.

[vi] Kung, T. H., Cheatham, M., Medenilla, A., Sillos, C., De Leon, L., Elepaño, C., ... & Tseng, V. (2023). Performance of ChatGPT on USMLE: Potential for AI-assisted medical education using large language models. PLoS digital health, 2(2), e0000198.

[vii] Castonguay, A., Farthing, P., Davies, S., Vogelsang, L., Kleib, M., Risling, T., & Green, N. (2023). Revolutionizing nursing education through Ai integration: A reflection on the disruptive impact of ChatGPT. Nurse Education Today, 129, 105916.

[viii] Recht, M. P., Dewey, M., Dreyer, K., Langlotz, C., Niessen, W., Prainsack, B., & Smith, J. J. (2020). Integrating artificial intelligence into the clinical practice of radiology: challenges and recommendations. European radiology, 30, 3576-3584.

[ix] Najjar, R. (2023). Redefining radiology: a review of artificial intelligence integration in medical imaging. Diagnostics, 13(17), 2760.

[x] Goh, P. S., & Sandars, J. (2020). A vision of the use of technology in medical education after the COVID-19 pandemic. MedEdPublish, 9(49), 49.

[xi] Aggarwal, D. (2023). Integration of innovative technological developments and AI with education for an adaptive learning pedagogy. China Petroleum Processing and Petrochemical Technology, 23(2).

[xii] Hanna, K. (2023). Exploring the applications of ChatGPT in family medicine education: five innovative ways for faculty integration. PRiMER, 7.

[xiii] Cross, J., Robinson, R., Devaraju, S., Vaughans, A., Hood, R., Kayalackakom, T., ... & Robinson, R. E. (2023). Transforming Medical Education: Assessing the Integration of ChatGPT Into Faculty Workflows at a Caribbean Medical School. Cureus, 15(7).

[xiv] Brauer, D. G., & Ferguson, K. J. (2015). The integrated curriculum in medical education: AMEE Guide No. 96. Medical teacher, 37(4), 312-322.

[xv] Liu, M., & Bu, J. (2021). Deep integration of physical health education based on intelligent communication technology. Journal of Healthcare Engineering, 2021.

[xvi] Mergen, M., Meyerheim, M., & Graf, N. (2023). Reviewing the current state of virtual reality integration in medical education–a scoping review protocol. Systematic Reviews, 12(1), 1-6.

[xvii] Solchanyk, D., Ekeh, O., Saffran, L., Burnett-Zeigler, I. E., & Doobay-Persaud, A. (2021). Integrating cultural humility into the medical education curriculum: strategies for educators. Teaching and Learning in Medicine, 33(5), 554-560.