

Study On Application Of Artificial Intelligence In The Medical Field

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ABSTRACT

The medical education system encompasses a lifetime of study at the undergraduate, graduate, and specialist levels. Its purview also include the medical and associated health professions. We must not forget the enormous influence that AI has had on medical education in this era of rapidly developing technology.

Techniques: The study's aims were met with the inclusion of high-quality data. The literature review also included comprehensive searches of scholarly articles located in reputable databases such as PubMed, Google Scholar, Web of Science, Research Gate, and PubMed central. Reasoning, cognitive modeling, language processing, and planning are just a few of the areas where AI has proven useful in the last ten years of schooling. The field of medicine might benefit from virtual inquiry systems, video recording in medical schools, and medical distant learning and administration. Perhaps this will also help the more empathetic, non-analytical branches of medicine. Aiming precisely at that, this review article aims to showcase the existing and future effects of AI on medical education.

Introduction

Midway through the twentieth century, a new academic discipline emerged: artificial intelligence (AI).

It is a method of creating artificial intelligence that mimics the way a human brain works. AI encompasses a wide range of disciplines, including computer science, languages, philosophy, psychology, mathematics, and more. With the help of social media, business moguls, and healthcare professionals, public expectations have been steadily increasing since artificial intelligence's inception in 1955, and the digital ecology in which it operates is constantly evolving. Language processing, reasoning, planning, and cognitive modeling are just a few of the areas where AI has helped educators in the last ten years (1). More and more people are interested in using AI in medical education, according to the first search for the term on the Web of Science. An increase in both the overall number of articles and the number of citations over the last 20 years suggests

that artificial intelligence has recently seen a spike in its use in medical education research and

development (2). Virtual inquiry systems, medical distant learning and management, and medical school video recording of lectures are some of its potential applications in medical education (1). From first-year medical school all the way through residency and beyond, medical education is an ongoing process of learning. Numerous members of the healthcare industry, including as physicians, nurses, and those working in allied health, are also covered. Consequently, in this era of fast technological advancement, it is essential to acknowledge that new works must be constructed on top of the existing materials to progress the field of artificial intelligence in medical education (2). The humanistic, non-analytical parts of medicine may be made more valuable by AI. A healthcare provider in this era of exponentially increasing medical knowledge must be abstract in order to make sense of the information and make a medical judgment in the face of a multitude of options.

As a result of AI's enhanced diagnostic and problem-solving skills, doctors will spend less time trying to make sense of digital data (3). There has been a generational shift in how students learn in the digital era. They place a premium on social relationships and are maturing in a digital environment. Members of this learning age are more comfortable collaborating in groups and documenting their progress using various online tools. They need intellectual support from an individual and value constructive criticism of their work. In order to capture and maintain their students' interest and participation, teachers need to develop and implement effective teaching strategies. For instance, the US Institute of Medicine convened a multidisciplinary summit to propose a range of strategies for health professional education that would include supervisory procedures, training settings, research, public reporting, and leadership in order to integrate a core set of competences (4). Issues with the educational purpose were highlighted in "Training Tomorrow's Doctors," which also included recommendations for public policy, accreditation bodies, and health institutions (5).

Methods

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The purpose of this article was to provide a synopsis of the twenty years' worth of research on artificial intelligence (AI) and its current state and potential future uses in medical education. Therefore, only high-quality data that fulfilled the criteria for the research were considered. Further, for the literature review, thorough searches were conducted on papers that could be found in credible databases including Google Scholar, Web of Science, Pub Med Central, Research Gate, and Pub Med.

Artificial intelligence (AI), healthcare (AI), medical education (AI), new dimensions in medical education (MDs), postgraduate medical courses (MS), and AI were some of the most important index terms or phrases utilized in the literature search. Scientific literature published in English that addressed the research goals were included. Studies not published in English, literature not addressing the use of AI in medical education, and literature published before 2002 were all considered exclusion criteria.

Applying AI to the current state of medical education

A policy on artificial intelligence was first established by the American Medical Association (AMA) during its 2018 annual meeting. It lent credence to research that emphasized the best way to use AI in medical schools. Collaborating with data professionals, medical students at Duke University's Institute for Health Innovation develop technologies that improve physicians' treatment. In a similar vein, the Centre for AI in Medicine and Imaging at Stanford University actively involves postgraduate and graduate students in healthcare problem-solving using machine learning. University of Florida radiology residents worked with a tech company to create computer-aided detection for mammography.

Students at Carle Illinois College of Medicine get the opportunity to learn about new technologies via a course given by a scientist, clinical scientist, and engineer. Medical students may also enroll in a class on cutting-edge healthcare IT at the Sharon Lund Medical Intelligence and Innovation Institute. Medical students at the University of Virginia's Centre for Engineering in Medicine work with engineering faculty to create ground-breaking medical technologies (8). Instead of spending time reviewing previously covered material or skimming through information that isn't relevant to their work, AI may supply doctors with the information they need when clinical concerns arise. Informatics at Johns Hopkins University School of Medicine is also adapted to the curriculum and pedagogy (9).

Another cutting-edge healthcare system that makes use of artificial intelligence is the "Human Diagnosis Project," or "Human Dx" for short. By combining the knowledge of doctors with AI, "Human Dx" hopes to make medical treatment more accessible, affordable, accurate, and high-quality for everybody. Research into its potential application in clinical decision-making is now underway in partnership with eminent medical institutions throughout the globe, such as Yale, Harvard, and Stanford (10, 11). Likewise, innovations like as MedAware, which was created in partnership with Harvard University, analyze massive amounts of data from EMRs using big data analytics and machine learning algorithms to comprehend how doctors really manage patients in the real world. As soon as a doctor's prescription departs from the usual course of therapy, it is marked as a probable mistake, causing the doctor to check for any other mistakes (12). The goal of the MedEye prototype developed by MIT researchers is to eradicate medication mistakes, according to the researchers. Scanning and identifying additional substances is done using cameras. A combination of image recognition, machine learning, and comparisons to the hospital information system allows MedEye to validate the correctness of medicine (13). A secure and personalized medicine system for nursing homes called MedPass™ was created and tested by Perceptive, a pharmaceutical development business, in conjunction with the University of Missouri. Every tablet is double-checked and prescription mistakes are avoided with our individualized medicine distribution system (14).

Western Michigan University's Homer Stryker School of Medicine has constructed a state-of-the-art simulation facility. The medical school is now evaluating a technology that allows second-year students to practice clinical skills. The tool, built by a UK-based firm called "Resource Medical," uses chat bots with artificial intelligence to replicate patient visits. Furthermore, users may engage in conversation with the robot in a manner similar to a doctor's appointment, learning about the robot's symptoms and medical history and asking why the robot need medical treatment (15). Students may learn about the anatomy of surgical operations using software like Buckingham Virtual Tympanum and Touch Surgery, but there is still no substitute for training with actual individuals (16, 17).

AI in Healthcare Education: Looking Ahead and Overcoming Obstacles

Medical education's potential directions are explored in a comprehensive study by Han et al. (3). Medical

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students, according to the review paper, may learn to be more compassionate by collaborating with other members of the healthcare community. A patient-centered healthcare environment should be provided to students from an early stage, they should study in a setting outside of a hospital, and they should be supported by state-of-the-art technology for learning. Personalized learning, interaction with classmates and teachers, and access to a plethora of knowledge may all be fostered via the use of state-of-the-art technological learning tools for medical students. Medical students may study and engage more successfully in real-life clinical settings with the use of virtual and augmented reality simulations, which put patients in a safe environment. To enhance students' knowledge and encourage peer-to-peer or student-to-faculty contact, readily accessible technology, mobile learning, and online learning may be used (3). Among the several sectors that might be profoundly affected by artificial intelligence (AI) is healthcare. Artificial intelligence (AI) has great promise for shaping the future of healthcare, enhancing diagnostic accuracy, and enhancing medical education. Looking forward, there are a lot of different perspectives and challenges that need to be considered (19).

One of the most important potential prospects in medical education is the capacity of AI to adjust and customize the learning process. The many tastes and learning styles of today's digital learners may be better met with the help of AI. With the use of machine learning algorithms and massive volumes of data, artificial intelligence (AI) can tailor educational materials to each student's specific needs and pace of learning. More people will participate and have a better grasp of complicated medical concepts with this individualized approach (20).

Incorporating AI into medical education has tremendous promise, but there are still challenges that must be solved.

One of these concerns is the moral implementation of AI; as the technology develops, new questions around data privacy, algorithmic bias, and security arise. To ensure that AI algorithms are fair, open, and impartial when making decisions, robust ethical frameworks must be put in place. The need for healthcare and education personnel to further their education and skill sets is another obstacle. Teachers need to be prepared to use AI for both instruction and assessment if medical schools are to reap the benefits of AI in medical education. In order to make good use of AI systems in clinical practice, healthcare

practitioners need also be cognizant of their limits and the potential that these systems hold (21).

A lot of systems and resources are needed for medical schools to utilize AI in their curricula. In order to reap the full benefits of AI, healthcare organizations and educational institutions must invest in state-of-the-art computer gear, secure networks, and data storage. To ensure the proper and effective use of AI in medical education, it is imperative that academics, corporations, and regulatory agencies work together to set common standards, frameworks, and guidelines. With AI's improved diagnostic capabilities, more tailored learning experiences, and quicker curriculum creation/implementation, medical education is looking bright. To make AI's promise in medical education a reality, we must address its infrastructural, ethical, and training issues.

To stay up with the ever-changing healthcare industry and equip future doctors, nurses, and other medical professionals to offer excellent patient care, medical schools are incorporating AI into their curricula (22).

Using AI for educational purposes and the constraints it imposes

To better understand their students' behaviors and make course adjustments based on assessment findings, teachers might use virtual inquiry systems like "DxR Clinician" as an effective analytic tool. Students may acquire the necessary abilities to efficiently resolve clinical issues. Engaging with the examples may teach them a lot about diagnosing serious diseases. At the same time as it does deep learning and analysis, the system can also identify when students have made mistakes in the case study and provide them with assistance to fix them. Like DxR Clinician, "Intelligent Tutor Systems" may monitor the student's "psychological processes" while they solve tasks in order to identify faulty assumptions. In addition, it assesses how well the students have grasped the material. In addition to motivating students to engage in self-regulation, self-monitoring, and self-explanation, it may provide them timely help, guidance, and explanations (1).

Digital learning has many practical benefits due to advances in technology, however algorithms for AI and computer-based learning might be programmed to favor some interests over others. This means that moral and ethical concerns need our entire attention. To deal with patients' bio-psychosocial complexity—something that robots struggle to grasp—future physicians should prioritize a humanistic approach. That is why, particularly when studying remotely, it is essential to arrange times that are appropriate for

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all parties. When students experience emotional connection and support from their online tutors, they are able to overcome the geographical distance between themselves and their instructors and classmates.

Robots' potential and limits in the medical field

Despite being mostly operated by humans, surgical robots have already shown encouraging outcomes, despite the technology's early beginnings. Because of their exceptional trajectory, depth, and speed control, surgical robots will have a profoundly beneficial effect on healthcare. Having very stable hands is a prerequisite for surgeons working around sensitive regions like the eyes. Artificial intelligence has shown promising results in trials for the removal of age-related macular degeneration membranes or blood under the retina from patients' eyes. Robotic surgery has shown to be more successful than traditional open surgery in some cases (23). Because they never grow weary, they are perfect for jobs that need them to perform the same things over and over again. Furthermore, robots can go places where traditional tools can't and maintain their posture for long periods of time. One use of AI is in the field of surgery, where it may detect patterns in the field to refine current methods and train surgical robots for pinpoint accuracy. One day, surgeons won't need to employ any humans at all since intelligent robots can be designed with AI software. Schools of medicine that do not include robotic surgery in their curricula may soon find themselves behind the curve when it comes to training future surgeons (24–26). The importance of patients, physicians, and hospital executives' work life is diminished by artificial intelligence. Artificial intelligence systems that are data driven in healthcare, such as Human Dx, MedAware, MedEye, MedPassTM, etc., are more efficient and accurate.

Because machine learning allows AI to learn and improve from experience without being explicitly programmed, it will continue to benefit the healthcare system in a more effective manner.

Best Practices for Incorporating AI into Medical Education Programs:

In order to use AI effectively in healthcare, it must first be taught the right things. Here, medical experts play an essential role. In healthcare, the most prevalent risk is that AI systems may make mistakes from time to time, leading to harm to patients or other complications. For instance, if an AI system makes a mistake and gives a patient the incorrect medication, misses a tumor on a CT scan, or gives one patient a

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hospital bed while another patient doesn't, the patient might suffer damage. An argument could be made that AI errors are theoretically distinct from medical mistakes, even though many injuries happen in medical settings regardless of AI use. This is due to the fact that, as AI systems gain widespread adoption, a single mistake in an AI system could potentially harm thousands of patients, as opposed to the relatively small number of patients affected by a single provider's mistake. In order to supply AI systems with correct patient data, physicians need extensive training. We have previously covered medical AI systems that failed for a variety of unexpected reasons; inadequate training being one of these factors, as demonstrated with IBM's Watson (27). The most effective training programs will maximize the use of AI in medical school curricula. Computer science, medical, education, and ethics are all areas that need to be considered in a collaborative effort (27).

Programs for professional development should have an emphasis on learning data analytics, AI algorithms, and ethical issues related to AI. Proper integration of AI technology into curriculum creation, instructional delivery, and assessment processes requires that educators and healthcare professionals possess the requisite capabilities. Focused "faculty development programs" may help medical schools improve faculty preparation. The ever-evolving field of artificial intelligence (AI) in medical education need ongoing training and cooperation among academic institutions, businesses, and government bodies (8).

Concerns Regarding AI's Ethics

In the real world, AI is already helping with things like robotic prostheses, manual labor assistance, and online medicine via Smartphone apps. Patient choice, safety, and privacy are all at risk with this advanced technology. It brings up fresh ethical dilemmas that need to be resolved (28). The four main ethical concerns raised by Gerke et al. for healthcare AI are detailed below (21). Use with informed consent: Applications of artificial intelligence in healthcare, including imaging, diagnosis, and surgery, will revolutionize the way patients and doctors interact. But there are several obstacles when it comes to professionals' duties to inform patients of the nuances of AI. Due to the AI's reliance on "black-box" methodologies, doctors may struggle to understand and interpret various machine learning techniques, which might result in circumstances where transparency is lacking. Additional effort is required

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in this domain for the results to become increasingly predictable.

Integrity and security:

Safety concerns are a major obstacle for artificial intelligence in healthcare. An example of one of the primary issues with healthcare analytics is the well recognized use of IBM Watson for cancer therapy. Some have claimed that it makes "unsafe and incorrect" recommendations for cancer therapies, which has led to current criticism. This real-life incidence has brought unwanted attention to the profession. Furthermore, it highlights the critical need of AIs being efficient and dependable. To what extent, however, can we rely on AI to keep its promises? To make the most of AI, stakeholders, especially developers, need to make sure two things: that datasets are reliable and trustworthy, and that there is transparency. The reliability, effectiveness, and fairness of the data used to train any Machine Learning (ML) system or algorithm developed by humans are directly correlated to the data's level of algorithmic fairness and bias. Pay close attention to the possibility of biases while deciding on the ML techniques/procedures to train the algorithms and the datasets to utilize for programming, making sure to assess their variety and quality. It's also possible for AI to be biased and discriminatory. Several real-life incidents have shown that algorithms may be prejudiced, leading to gender, race, and ethnicity discrimination.

Patients were not adequately informed about how the test data they submitted with the app "Streams" (which tries to assess and identify acute renal impairment in order to do clinical safety testing) was processed with regards to data privacy. Despite the lack of AI in the «Streams» app, this real-life example has highlighted the danger of privacy invasion while developing technological solutions (21).

Conclusion

A lot of schools have started using AI in their lessons since 2018. New technologies like tailored learning, personalized drug delivery, and prescription mistake detection are the result of partnerships between academic institutions and IT corporations. Nevertheless, progress toward creating AI and ML systems that are completely operational and error-free is still in its infancy. In the future, most medical schools will be operated by AI. This will allow professors to devote more time to understanding students' individual learning styles and fostering

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important character characteristics such as responsibility, empathy, and compassion. Additional study will shed light on the matter of the possibility of bias in these educational systems powered by AI. The development of fully autonomous surgical robots is an ongoing process. Development in this subject is expected to be slow in order to reduce risks to patients' lives while also preserving money. As the price and availability of robotic surgery treatments rise, medical institutions that do not provide this procedure run the danger of lagging behind. If medical schools want to maintain their competitive edge, they must include AI into their curriculum.

It is equally important to teach the "AI Systems" appropriately. Last but not least, we must educate the future medics on the ethical challenges presented by AI if we are to build a healthcare system that is different from the present one.

References

1. Zhao H, Li G, Feng W. *Research on application of artificial intelligence in medical education. Proc- Int Conf Eng Simul Intell Control ESAIC, Hunan, China; 2018 Nov 9; pp. 340–2.*
2. Chan KS, Zary N. *Applications and Challenges of Implementing Artificial Intelligence in Medical Education: Integrative Review. JMIR Med Educ. 2019;5(1):e13930.*
3. Han ER, Yeo S, Kim MJ, Lee YH, Park KH, Roh H. *Medical education trends for future physicians in the era of advanced technology and artificial intelligence: An integrative review. BMC Med Educ. 2019;19(1):1–15.*
4. Greiner AC, Knebel E. *Health Professions Education: A Bridge to Quality. Washington (DC): National Academies Press (US); 2003.*
5. Blumenthal D. *Training tomorrow's doctors: the medical education mission of academic health centers: a report of the Commonwealth Fund Task Force on Academic Health Centers. New York: Commonwealth Fund; 2002.*
6. Garg T. *Artificial Intelligence in Medical Education. Am J Med. 2020;133(2):e68.*
7. Wartman SA, Combs CD. *Medical education must move from the information age to the age of artificial intelligence. Acad Med. 2018;93(8):1107–9.*
8. Paranjape K, Schinkel M, Panday RN, Car J, Nanayakkara P. *Introducing artificial intelligence*

