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AI REVOLUTION: TRANSFORMING STUDENT SUCCESS AT IMF

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Background
Artificial Intelligence(AI) is increasingly integrated into aspects of human life, including health care, with its applications reaching robotic surgery, virtual nursing assistants, image analysis etc. In the light of transformation potential of AI, the World Medical Association has also supported the fact that education related AI training is essential and should be included in the curriculum of all medical degrees in the near future.Hence, the current study was designed to assess perceptions among medical students related to AI in medicine, their perceived needs with respect to structured AI training during medical education and the understanding of ethical dimensions arising from AI in healthcare.

Materials and Methods
The study utilized a cross-sectional survey design, targeting 100 medical students at Osh State University. Data was collected using a semi-structured, self-administered questionnaire with sections on demographic data, prior knowledge of AI, perceptions of AI's role in healthcare, and ethical considerations. A five-point Likert scale measured responses across various themes, including the perceived benefits of AI, potential threats to employment, confidentiality concerns, and the necessity of AI-focused training. Participants' responses were analyzed using descriptive statistics to identify trends and attitudes toward AI in medicine which may include in the medical curricula.

Results & Discussion
More participants (57.2%) considered AI as an assistive technology that could minimize or eliminate errors in medical practice. A considerable percentage (54.2%) perceived that AI could increase the precision of medical decisions, while 48.6% recognized its potential to increase access to medical care by patients. Negative issues cropped up from 37.6% of participants' pertained to reducing the workload on physicians and thus causing unemployment. Furthermore, apprehensions were seen regarding the effect of AI on the humanistic aspects of medicine, as 69.2% feared a loss in the human touch. Also, potential challenges to "trust" (52.9%), and the patient-physician relationship (54.5%). Notably, above half of the participants' were uncertain about professional secrecy maintenance (51.1%), believed that AI may violate confidentiality (53.5%). Only 3.7% felt competent enough to inform patients' about features and risks of AI. Participants' expressed a strong need for structured training in AI applications mainly on the topic of "reducing medical errors"(76.9%), and "Ethical issues" arising from the widespread use of AI in healthcare(79.4%).

Conclusion
This study reveals that medical students are both intrigued by AI's potential and cautious about its ethical implications in healthcare. While they see AI as a promising partner for improving diagnostic accuracy and

reducing errors, they also fear its impact on the human touch that defines the patient-physician relationship. The results highlight a clear call for AI education that balances technical skills with ethical insights, allowing future physicians to integrate AI effectively without compromising the compassionate care at the heart of medicine. As AI becomes an inseparable part of healthcare, preparing students to navigate its benefits and challenges will be key to their success in an evolving medical landscape.

Introduction

The evolution of Artificial Intelligence (AI) has brought profound advancements across numerous sectors, with healthcare emerging as one of the most transformed fields. Today, AI is applied in various aspects of medical care, from enhancing diagnostic imaging and treatment planning to supporting robotic surgeries and patient monitoring. Recognizing the critical role AI will play in the future of healthcare, organizations such as the World Medical Association have called for the incorporation of AI-related education into medical training. This adaptation is seen as essential to equip future healthcare providers with the skills to effectively and ethically engage with AI-driven technologies.

AI as a concept dates back to the 1950s when Alan Turing posed the seminal question, "Can machines think?" This early inquiry laid the foundation for AI development, eventually leading to computational models and neural networks that could mimic aspects of human cognition. In modern times, AI has become ubiquitous, with applications such as Apple's Siri and Google Maps seamlessly integrating AI into everyday life. Within healthcare, AI systems analyze vast quantities of health data, contributing to early diagnosis, risk prediction, and personalized treatment approaches, thus enhancing the quality and efficiency of patient care.

In healthcare, AI's potential to reduce diagnostic errors, improve precision in clinical decisions, and streamline workflows has been widely acknowledged. However, as AI assumes a greater role in clinical settings, ethical challenges related to patient confidentiality, data security, and the physician-patient relationship are increasingly prominent. These complexities underscore the need for an AI-focused curriculum in medical education that encompasses both technical training and a robust understanding of ethical considerations.

This study aims to assess the perceptions and educational needs of medical students at Osh State University regarding AI in medicine, with an emphasis on their views on AI's benefits, ethical challenges, and the relevance of AI training in their education. The insights generated from this study are expected to inform the development of an AI-inclusive curriculum that aligns with the evolving demands of medical practice.

Methods

Recruitment : A cross-sectional study was conducted among all the undergraduate medical students of Pushpagiri Institute of Medical Sciences and Research Centre during the period of June – August 2023. Those who refused and even those whose questionnaires remained incomplete were excluded from the study. A short online survey was done based on a validated semi structured questionnaire with 3 different sections. Questions developed from a Turkish study entitled "Artificial Intelligence literacy among nurses: an approach towards development".

The first dealt with the demographic details including any previous educational experience about AI and the self. Assessment of their understanding of AI. The second part contained 12 five-point Likert scale questions regarding medical students' perception about AI including five questions on ethical aspects also. The last part was about their opinions

regarding what topics on AI should be covered in medical education. The total number of students in the Institute from 1st year MBBS to the medical students doing their internship. Invitations to fill out the Google form were addressed to all medical students. The Google form remained open for 3

months, and reminder messages were sent once a month. Participation was voluntary, and informed consent was taken through the first part of the Google form. A total number of 100 medical students responded to the survey. After discounting incompletely answered questionnaires, data for 100 participants have been analyzed.

Statistical Analysis: Medical students' perception of the possible influences of AI was rated on Likert scale, from 0 (completely disagree) to 4 completely agree. Data was entered in Microsoft Excel.
The quantitative variables were expressed as mean with standard deviation and categorical variables as percentage.

Results

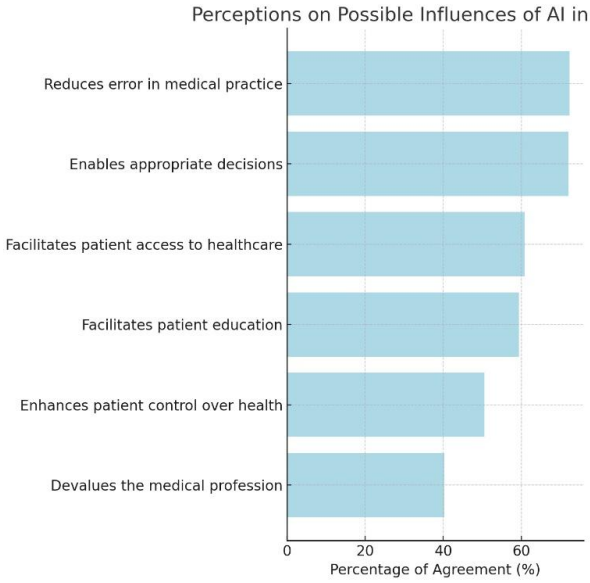
AI in medicine- Prior knowledge and self-evaluation

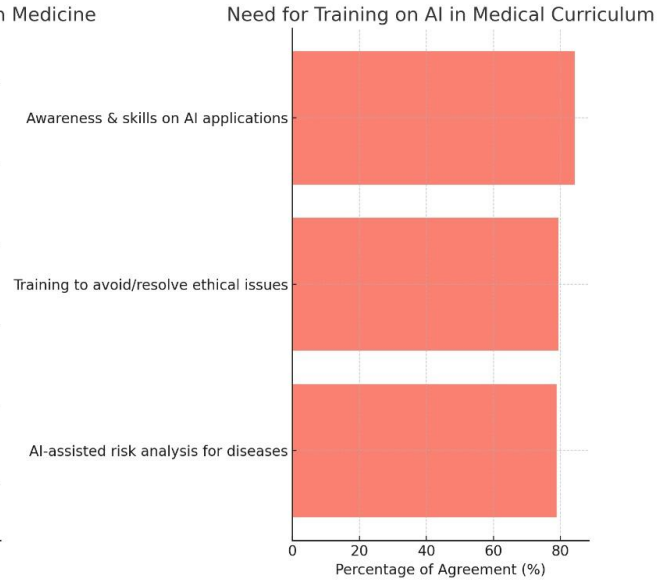
The mean (SD) age of the participants was 21.4 (1.9) -age range 18 to 25 years with 76% females. Almost all - 91.4% of the participants reported that they have not received any form of training in AI while 52% students
have heard about AI but possess no knowledge of it. About 32.6% self-reported to have 'partial knowledge' on AI while none of them reported to be 'very knowledgeable.' Of all the participants only 37.2% did not agree with the opinion that AI could replace physicians; instead, they (85.3%) thought that it could be an assistant or a tool that would help them. About 37.6% of participants agreed the idea that the use of AI would lead to a loss of physicians and, as a result, loss of jobs. More than half of the participants agreed that they would become better physicians with the widespread use of AI applications. A third of the participants (35.1%) stated that their choice of specialization would be influenced by how AI was used in that field. Most students reported, 91.4%, that they had not taken any training on
AI during their medical curriculum while the rest of the students mentioned they had attended seminars and presentations relating to AI. Only 26.8% of the participants reported feeling competent enough to provide information on AI to patients. Over half, 51.1% of the participants, were uncertain on how they could ensure patient confidentiality when using AI.

Perceptions on the possible influences of AI in medicine

A majority (57.2%) of students viewed AI as a valuable support tool that can minimize or eliminate errors in clinical practice. 54.2% of students believed AI could increase the precision of medical decisions, enhancing diagnostic accuracy and treatment planning. Almost half (48.6%) saw AI as a means to expand healthcare access, facilitating services in under-resourced areas and improving patient outcomes.

However, some students voiced concerns about AI's impact on the workforce. A notable 37.6% feared that AI's efficiency in clinical tasks could reduce the demand for physicians, potentially affecting employment opportunities. Additionally, 35.1% mentioned that their choice of medical specialty might be influenced by the extent to which AI is applied in their field.





Ethical concerns about AI in medicine(Table 1)

In the aspect of disadvantages and risks from using AI in medicine, 69.2% agreed with the statement that AI would reduce the humanistic aspect of the medial profession, 54.5% agreed it could have an adverse effect on the relationship between patient and physician. 52.9% were of the belief that the use of AI-assisted applications can vandal trust in patients while 53.5% thought AI may cause a violation of professional confidentiality.

Table 1
Opinions of medical students on ethical considerations of including AI in medicine

Concerns	Totally agree	Mostly agree	Unsure	Mostly disagree	Totally disagree
Negatively affects patient-physician relationship	73	104	100	45	3
Devalues the medical profession	43	88	126	57	11
Damages trust	76	96	97	46	10
Reduces the humanistic aspect of the medical profession	114	111	62	33	5
Violations of professional confidentiality	49	125	125	20	16

Discussion

Artificial Intelligence is a broad technology in which machines are made to act just like the human brain works. It involves mimicking the human mind with computer science technologies, in the sense that it can be programmed to sense emotions, make decisions, or behave like human beings. Strong and weak AI exist on the basis of levels in which computers are programmed to have intelligence. The most superficial level on which computers can be seen as functioning is when acting on the completion of certain jobs. In this category, robots or computers may store information but cannot perform even a small fraction of what a human brain performs independently. The strong AI forms part of the machines and works as the level does

in the human brain. As of now, this is in the developmental process and hence it has become an area where many qualitative studies focus on developing the weak AI. Its applications in the medical field are:

Education has been studied extensively around the world, especially the perception of medical professionals and their dilemmas about the use of AI in their daily work. Our research focused on the perception of medical students about the use of Artificial Intelligence in medicine. The mean age of the medical students we interviewed was about 21 years, and the majority of the students were studying were females. Most participants in our study (53.3%) agreed that AI could not replace the physical presence of physicians but could help them in their work. This was also substantiated by a study conducted by Bisdas Set al 2021 on medical students of 63 countries, stating AI could work as a "partner" rather than as a "competitor" in their medical practice. A third of our participants (37.6%) felt that use of AI will reduce the need for physicians, which will directly affect their job opportunities. D Pinto Dos Santos published a study in European Radiology in 2019 where a majority of participants 83% were of the opinion that human radiologists would not be replaced by robots or computers [23]. In fact, several studies argue that rather than physicians becoming redundant because of AI, they would change their practice and become "managers" rather than "custodians of information"[24, 25]. Over half of the respondents in our study agreed that with the increasing role of robotics and artificial intelligence, they would become better doctors. In fact, it would appear that medical students knew about the uses and fields in which AI would be applied to medical education. Subjects from other studies felt that the available AI systems today would, in fact enhance physicians' decision making capabilities by synthesizing voluminous amounts of medical literature so as to come up with updated medical protocols and evidence (26–29). Similarly, it therefore means that studies have shown AI systems work by complementing medical practices, instead of competing with the human mind. One-third of the respondents in our study like 35.1% said they would base their decision of choice of specialty on the use of AI in that specialty. Enough has been written regarding how AI will replace specialists in radiology and pathology as seen by medical doctors and students. These are specialties using computers and digital algorithms more than any other specialty in medicine. A Canadian

In contrast, a 2019 study by Bo Gong et al found that 67% of the study's respondents believed AI would "reduce demand" for radiologists. Many of the interviewed medical students reported the anxiety they felt about being "displaced" by AI technologies in radiology and would discourage them from considering the field for specialization. In fact, one paper published by Yurdasik et al. in 2021 had respondents encouraging practitioners to move away from specializations that used AI. While some studies had results encouraging radiologists to expose themselves to AI technologies as a way of reducing rates of "imaging-related medical errors" and "lessening time spent in reading films," hence having more time with the patients. German medical students also had a positive attitude towards AI and described "not being afraid of being replaced by AI" if they choose radiology as their specialization. The attitude of the specializations' choices to be influenced by AI was dependent on from where one was viewing the problem-as a student or as a specialist-and from the degree of familiarity they were with AI applications. More than half of the participants (53.3%) agreed that with the wide usage of AI applications they will become better physicians. This agrees with the recently published Western Australian study among medical students, which showed about 75% of the participants agreeing that AI would improve their practice. A study by Paranjape et al listed that at the time of writing that paper AI was being tried to assist in "faster and more accurate diagnosis, by computerized interpretation of algorithms in radiology, to cover for medical errors that might be caused by human fatigue, perform repetitive tasks and minimally invasive surgery" etc. The majority of them (91.4 %) reported not having received so far any training on AI in medicine. The

American Medical Association meeting of 2018 on Augmented Intelligence advocated for the training of physicians so that they can understand algorithms and thus work in tandem with the AI systems to arrive at the best clinical care decisions for their patients. Still, Paranjape et al reported that training on the backend of electronic health record systems, such as quality of the data obtained, impact of computer use in front of patients, patient physician relationships and so on have not been addressed through medical education. If used with adequate training and understanding, AI will free up physicians' time/ optimize a physician's work hours, so that they can care and communicate with the patients in the free time thus obtained.

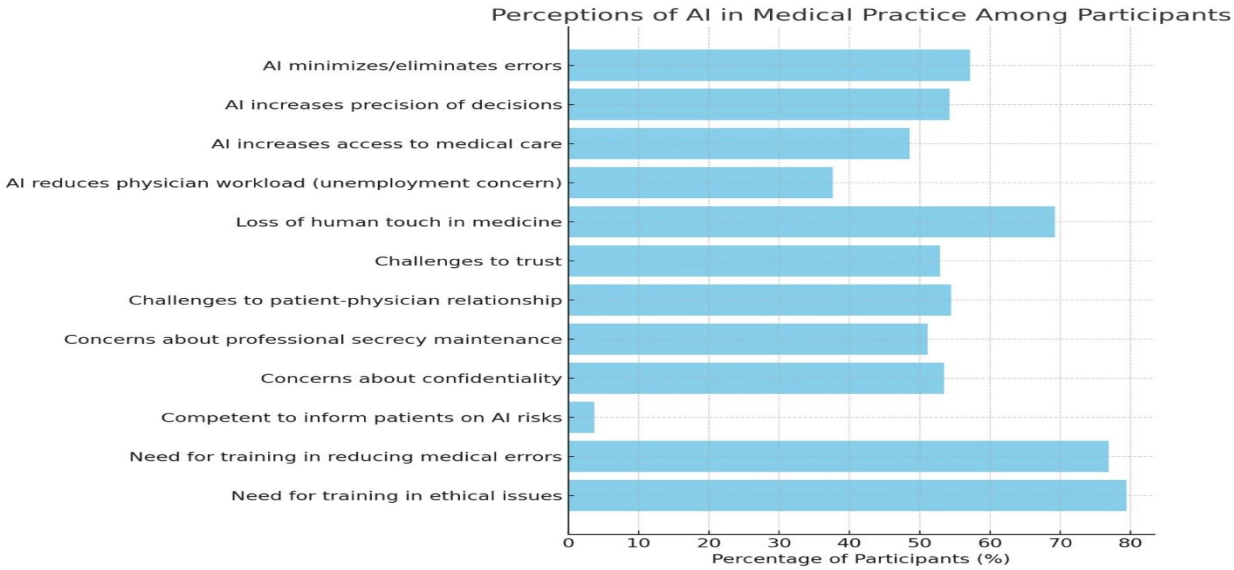
Medical curriculum does not address mathematical concepts (to understand the algorithms), the fundamentals of AI like data science, or the ethical and legal problems that can arise due to the use of AI 27.

Only 25% of the
respondents said they felt competent enough to provide knowledge on AI to patients. Unless medical physicians have a basic understanding of the methods of AI, or the ways in which to critically analyze AI, they will be at a loss when called to train medical students in using AI tools for medical decision making. For that reason, the medical students will lack the competencies in AI. Liaw et al. also propose Quintuple Competencies in using AI in primary health care, one of these is to understand how to communicate with patients the why and how of the use of AI tools, privacy, and confidentiality questions that may be raised by patients during patient-physician interactions, and identify emotional, trust, or patient satisfaction issues that may arise as a result of AI use in health care. More than half of the participants, 51.1%, are not sure how to protect patient confidentiality during use of AI technologies. In this respect, direct providers of health care need to be well informed of precautions in taking the sharing of data with third parties that are not being the direct providers to the patients, 16. Artificial intelligence algorithms are derived from large data sets from human participants, and at times they may use data differently at different points in time. Patients will lose control of information they had consented to share, especially where the impact on their privacy has not been taken into consideration. However much regulations might be made towards protecting patient confidentiality and privacy of data, they will always lag behind AI advances, which by implication means that human brain thus needs to work incessantly in order to stay ahead of the artificial intelligence it developed.

Perceptions about potential impacts of AI on medicine

Medical students hold diverse views on AI's role in shaping healthcare. The majority (72.3%) believe AI could greatly reduce medical errors, improving patient safety and clinical accuracy. Students also expressed optimism about AI's ability to support decision-making (72%) and to expand patient access to healthcare services (60.9%). Additionally, over half (59.4%) see AI as a tool for enhancing patient education, empowering individuals to take a more active role in their health.

Despite these positive views, ethical concerns emerged. Many students (69.2%) worry that AI could lessen the personal, human touch in medicine, and 54.5% fear it may weaken the patient-physician relationship. Trust in AI technologies is another area of hesitation, with 52.9% expressing concern that AI could erode patient trust and 53.5% noting potential threats to confidentiality. These perspectives reflect a balance between excitement for AI's clinical potential and caution about its impact on core values in healthcare.



Limitations:

This research, one of the first conducted in Kerala, covered about 65% of the medical students in the

institution, which is higher than in similar studies. However, several limitations were identified. The use of an online survey via Google Forms led to voluntary participation, which may have introduced self-selection and non-response biases. Since the study focused solely on students from one institution, its findings may not be widely generalizable. Additionally, the literature review revealed no alternative measurement tools, indicating a need for further studies with similar populations. A gender bias was noted, with three-fourths of respondents being female, reflecting the gender distribution in Kerala's medical colleges. The questionnaire did not explore students' understanding of AI terms or their proficiency with AI, potentially missing relevant concepts. The quantitative nature of the data may also have limited insights into students' depth of understanding or perceptions. Many participants had no prior exposure to computer science or AI, which could have influenced their responses. Future research should replicate and expand the study to larger, more diverse populations to assess regional variations in knowledge, attitudes, and perceptions among medical students. Additionally, the questionnaire, adapted from Civaner MM's study, received little enthusiasm for the final question regarding additional topics.

Conclusion

The current study on medical students' perceptions regarding the introduction of AI into medical education reflects varied and complex insights. Most participants in this study are aware of the collaborative potential of AI, considering it not as a replacement for physicians but as an important collaborator in healthcare. Oddly enough, speculations about job displacement go hand in glove with optimism over improved decision-making.

Improved medical practice in this context involves the knowledge deficit in incompetent communication of information related to AI to the patients and the imperative need for taking a holistic approach to medical education. The finding underpins the perceived need for a proactive approach in preparing medical students for the future when AI will no doubt be playing a significant role in healthcare, hence ensuring that they embrace, yet are capable of functioning competently with, technological advancement would also uphold the humanistic values associated with the practice of medicine.

Abbreviations

AI : Artificial Intelligence

IIT : Indian Institute of Technology

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