



Comparison of the use of two methods of artificial intelligence and Case Base Learning on clinical decision-making of medical students

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Abstract: Artificial intelligence, especially approaches based on machine learning, deep learning, natural language processing, and decision support systems, can be used as effective strategies in transforming the process of producing and implementing clinical guidelines and solving the challenges in this field. This study aimed to compare the use of two methods, artificial intelligence and patient-centered clinical education, on clinical decision-making of medical students. This is a case-control study conducted on 70 medical students in their medical internship in the internal medicine department of a teaching hospital in 1403. Finally, the results in the areas of data analysis, evidence synthesis, clinical decision-making and reasoning, patient communication, history taking, treatment planning and management were evaluated using the DOPS checklist, and the two groups were compared using t-tests using SPSS software. The results show that in all areas except the area of patient communication skills, the average scores of the case group that used a combination of patient-centered education and AI were significantly higher than the control group ($P \leq 0.05$). Artificial intelligence has the potential to improve the traditional approach to guideline production and implementation. Collaboration between AI experts, healthcare professionals, and policymakers is essential to ensure that the role of AI in clinical guidelines continues to grow and improve as a valuable tool in improving patient outcomes, promoting evidence-based decision-making, and shaping the future of health and care.

Keywords: Artificial Intelligence , Patient-Centered Clinical Education, Clinical Decision Making, Medical Students



1. Introduction

Artificial intelligence can help in various processes from managing patient data to interpreting results and reducing the workload of healthcare workers. In addition, artificial intelligence has emerged as a powerful tool in medical education, and the emergence of artificial intelligence in medical education can create great potential for advancing the healthcare system and empowering future generations of medical professionals(1).

However, there is still uncertainty about the use of this technology among different medical disciplines. Positive and negative attitudes have created contradictions in the use of this technology in different medical specialties. On the other hand, understanding the benefits of AI requires education and acceptance of these technologies by people involved in the healthcare system. AI systems have a structure, components, and capabilities that collectively enhance decision-making capabilities, which is why they have been used in many medical cases(2).

Today, the clinical environment is widely accepted as a key environment for student education, helping students to link theoretical training with clinical practice. Of course, many variables affect clinical education(3).

In the dynamic and advanced world of healthcare, having up-to-date information is essential to providing optimal care to patients. Training a physician to understand and remember all the complexities of modern healthcare, even within their own specialty, is a costly and lengthy process(4).

Advances in artificial intelligence have significantly changed the paradigm of medical education. With the development of artificial intelligence in the past three decades, it seems that this technology can be used to update medical education and improve clinical education (simulated environments, based on multiple potential scenarios to improve decision-making, understanding and predicting treatment outcomes) in the field of diagnosis and decision-making in medical sciences for all professors and students(5,6). Studies have shown that traditional clinical decision support systems are not effective enough and that artificial intelligence should be used to enhance clinical diagnosis training(7).

Considering the various benefits and challenges of applying artificial intelligence in the field of medical education, this study aimed to compare the use of two methods, artificial intelligence and Case Base Learning, on the clinical decision-making of medical students.



2. Methodology

This was a case-control study conducted on 70 medical students in the medical internship program at the hospital's internal medicine department in 1403. The students were randomly divided into two groups of 35. After encountering the patient, the case group advances the process of clinical reasoning and disease management in two conventional ways and using AI. For this purpose, students first participated in a workshop on how to use artificial intelligence in encountering the patient and became familiar with the basics. In the case group, strategies such as Case-based reasoning, Computer-interpretable guidelines, and Guideline-based clinical decision support systems were used. The control group only used the usual clinical training method in this process. Finally, the results in the areas of data analysis, evidence synthesis, clinical decision-making and reasoning, patient communication, taking a history, treatment planning and management were evaluated using the DOPS checklist, and the two groups were compared using t-tests using SPSS software.

3. Results

The mean age of students in the case group was 22.4 ± 1.8 and in the control group was 22.3 ± 2.4 , and there was no significant difference between the two groups ($P \geq 0.05$). 35% of the study samples were boys and 65% were girls. The average scores of the studied domains in the two groups were compared. The results show that in all domains except the domain of patient communication skills, the average scores of the case group that used a combination of patient-centered education and AI were significantly higher than the control group ($P \leq 0.05$) (Table 1).



Table 1- Comparison of clinical decision-making of medical students

in the case and control groups

Field group	Data analysis	Combination of evidence	Clinical reasoning	patient Communicatio n	history taking	Final diagnosis	Treatment planning and managemen t
Case Base Learning+AI	4/8 $\pm$ 0/12	5/25 $\pm$ 1/4	6/3 $\pm$ 0/45	2/5 $\pm$ 0/75	5/5 $\pm$ 0/67	4/25 $\pm$ 0/24	4/04 $\pm$ 0/25
Case Base Learning	3/5 $\pm$ 0/24	2/24 $\pm$ 1/75	3/45 $\pm$ 0/25	4/88 $\pm$ 0/25	4/8 $\pm$ 0/12	3/5 $\pm$ 0/27	2/74 $\pm$ 0/25
P.value	0.001	0.000	0.000	0.054	0.02	0.025	0.000

5. Conclusion

This study compared the use of two methods of artificial intelligence and patient-centered clinical education on clinical decision-making of medical students. Artificial intelligence in this field can be considered as a great help in performing daily clinical tasks and research. Quick and easy access to information, increasing information dissemination, and reducing errors in diagnosing and treating diseases are the main advantages of artificial intelligence in this field(7,8).

The results of the present study are consistent with the results of a study by Kim et al., which examined the impact of artificial intelligence on patient triage. The results of Kim's study showed that artificial intelligence in medicine facilitates the decision-making process. It helps practitioners in this profession to make the best decisions in real time through access to accurate and up-to-date information (9,10)

Artificial intelligence-based decision support systems can help physicians apply clinical guidelines to patient care. These systems can analyze patient information, clinical symptoms, medical records, and clinical guideline recommendations. In addition, by integrating artificial intelligence into patients' electronic health records, physicians can ensure compliance with evidence-based guidelines and reduce errors by using real-time alerts and reminders based on new clinical guidelines(8,10).

In short, artificial intelligence has great potential to improve medical decision-making, but the successful implementation of these types of systems in medicine requires other things, in addition



to paying attention to the principles required for any other information system, including organizational, behavioral, cultural, managerial, economic, educational, and technical factors. Also, artificial intelligence in the clinical education system is not able to establish proper and professional communication with the patient. The presence of many unknown variables means more complexity in decision-making(6). With the help of these systems, more variables can be involved in decision-making. Also, with neural networks, unknown variables, unknown relationships between variables, and variables with unknown effects on the outcome variable can be considered. Thus, by using these systems, greater accuracy in more complex decision-making can be expected. For example, to make decisions about patient referrals, combining AI in data analysis with human intelligence (individual judgment) could empower doctors and nurses to make faster and more accurate diagnoses in the future(11). This combination of education will take medical science beyond the traditional mode; it will also reduce medical error rates and treatment costs, and increase patient satisfaction and patient safety. Artificial intelligence has significant potential to transform medical education and clinical practice. As this technology is considered in clinical practice, it is necessary for educators and planners to make room for it in medical science curricula; in other words, having clear rules for the use of AI is essential for students to use it responsibly. Therefore, given the sensitivities in the medical profession, AI can play a role as a teaching assistant in clinical education(12).

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