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ARTIFICIAL INTELLIGENCE MISUSE AND ITS IMPACT ON MEDICAL STUDENTS' KNOWLEDGE QUALITY AND CLINICAL THINKING SKILLS

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Abstract
Abstract. In recent years, artificial intelligence (AI) has become an innovative tool in medical education and practice. However, misuse of AI or its uncritical application may negatively affect medical students' knowledge quality and clinical thinking skills. Research shows that improper AI use weakens active learning and critical thinking among medical students, increases passivity, and raises the risk of making decisions based on inaccurate information. At the same time, proper AI integration can improve educational efficiency, but clear scientific guidelines and ethical standards are required.

Keywords: Artificial intelligence (AI), medical education, knowledge quality, clinical thinking, AI misuse, learning efficiency, academic integrity.

Introduction

Modern medical education is considered a priority field that requires complex clinical knowledge, independent analysis, and deep clinical reasoning. In the traditional education model, the quality of students' knowledge is evaluated not only by memorizing facts, but also by applying them in context and making independent decisions in complex diagnostic situations. However, in recent years, artificial intelligence (AI) technologies have been widely used at various stages of education. AI systems—including generative models, virtual patient simulations, and interactive programs—provide students with fast and prompt answers, repeated practice of complex clinical cases through simulations, and individualized learning pathways. On one hand, this situation is accepted as a tool that increases educational efficiency, while on the other hand serious academic debates exist regarding the possibility that improper or uncritically applied use may decrease knowledge quality and limit broad thinking abilities.

Artificial intelligence has demonstrated great achievements in increasing diagnostic accuracy in the medical field, accelerating big data analysis, and supporting complex clinical decisions. For instance, AI systems can analyze mammography results with up to 95% accuracy, interpret X-rays and other imaging in a short time, thereby easing heavy repetitive tasks on human resources. This, in turn, contributes to making the general diagnostic process efficient and error-free.

In addition, studies on medical education have emphasized the positive impact of AI on the learning process: simulations and virtual patient systems that enhance students' clinical reasoning and communication skills provide opportunities for repeated practice. However, scientific literature also warns about negative consequences arising from improper use of these technologies or from insufficient development of students' critical evaluation skills. For example, students' reliance on AI

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to obtain "ready answers" may reduce their independent analysis and multi-step clinical reasoning skills—thus depriving them of logical decision-making in real complex clinical situations.

Furthermore, along with the increasing role of AI in medical education, academic integrity issues arising from its misuse—such as plagiarism, obtaining grades through ready-made answers, or decision-making influenced by errors—are also being reported. This situation disrupts educational work that deepens students' knowledge quality and clinical reasoning skills, since instead of independent thinking, reliance on AI-generated answers becomes habitual.

Therefore, in the modern context, correct pedagogical guidelines, ethical principles, educational programs developing critical evaluation skills, and clear strategies for understanding AI-related risks are necessary for integrating AI technologies into medical education. The purpose of this article is to systematically analyze, based on scientific literature, the impact of improper artificial intelligence use on medical students' knowledge quality and clinical thinking skills and to provide deep explanation of existing scientific experience, statistical observations, and their implications for the educational process.

Research Objective

The aim of this article is to analyze and summarize scientific literature on how improper use of artificial intelligence negatively affects medical students' knowledge quality and clinical thinking skills.

Materials and Methods

This literature review is based on scientific articles, systematic reviews, and empirical studies in the field of medical education and AI. Publications between 2020–2025 were searched through scientific databases including PubMed, Scopus, and Web of Science. Selected articles analyzed improper AI use, student passivity, critical thinking, and clinical decision-making skills. Peer-reviewed publications were preferred as inclusion criteria.

Results

Medical students' experience and attitude toward AI use. Studies conducted in various countries show that medical students widely use artificial intelligence (AI) tools in the learning process. For example, a study published in *BMC Medical Education* in 2025 analyzed a survey of 702 medical students, and 80.3% of respondents considered AI an effective learning tool. A total of 60.8% stated that AI assistance makes learning more efficient, while 63.1% reported using it as an updated source of information. This result indicates the positive side of the AI usage trend, but there is a lack of clarity regarding users' ability to critically evaluate the technology.

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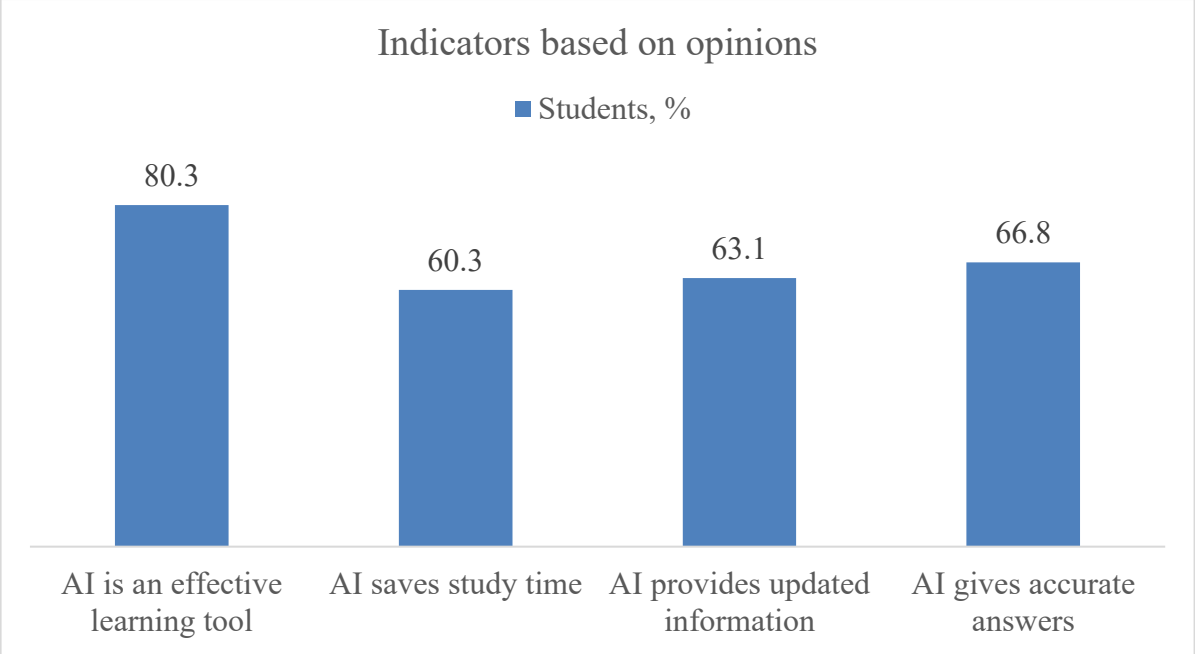

Table 1. Medical students' AI-related opinion statistics (*BMC Medical Education*, 2025)

Source: *BMC Medical Education*, 2025

Misuse and student passivity. In a review published in October 2025 on the improper application of AI in medical education, 42.1% of students believed AI has a negative impact on learning, while 40.8% viewed it as effective. These nearly evenly distributed opinions indicate that although students generally have a positive attitude toward AI, concerns about the negative consequences of misuse remain. In this study, 17.1% of students expressed a neutral opinion, meaning they did not have a clear position regarding AI's impact.

Two major trends were identified in this study:

• Using AI without proper or critical evaluation leads to student passivity and reduced active learning.

• Passivity hinders the development of clinical reasoning, as students become inclined to directly rely on AI-generated answers instead of performing independent analysis while learning.

AI use and academic integrity issues. Another concern associated with improper use of artificial intelligence is the violation of academic integrity. Research shows that many students copy ready-made answers from AI sources, which decreases the objectivity of assessments. For example, monitoring conducted in the United Kingdom revealed that more than 90% of students use AI tools on a weekly basis, yet academic misconduct penalties were issued extremely rarely (at least 1:400). This indicates that improper AI use often goes undetected.

This situation weakens students' independent thinking skills because they rely on ready answers instead of deeply analyzing the knowledge being studied.

AI use and exam performance. There is also a negative correlation between generative AI system use and exam performance. One study found that students who used generative AI tools scored on average 6.71 points lower in examinations. This decline in academic performance was particularly evident among students with high learning capacity.

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Impact on clinical reasoning skills. Scientific publications note that improper use of artificial intelligence may lead to a weakening of clinical reasoning skills. As decision-making shifts toward answers generated by AI, students detach from the process of independent thought. This is particularly noticeable when analyzing complex clinical cases, making diagnostic decisions, and systematically studying symptoms. Additionally, the phenomenon of "hallucination" (artificial inaccuracies or fabricated information) in AI systems poses a threat of spreading incorrect data. Studies show that students are not sufficiently aware that AI-generated answers may be inaccurate.

Discussion

The dual-sided effect of integrating artificial intelligence into the educational process. Findings show that medical students widely use artificial intelligence tools, yet such usage does not always result in positive outcomes. On one hand, AI adaptive learning systems and simulations provide opportunities to strengthen clinical reasoning and knowledge, potentially improving educational effectiveness. Michalczak et al. (2025) noted that AI tools enable interactive learning and individualized academic experiences, enhancing student performance. At the same time, when these tools are used improperly or without critical assessment, insufficient or inaccurate information may negatively influence students' cognitive processes.

This two-sided effect reminds us of the necessity of theoretical-methodological guidelines in AI integration. In other words, the use of AI becomes truly effective not merely as a technological tool, but when incorporated harmoniously with educational pedagogy.

Passive learning and decline in clinical reasoning. Findings showed that students' reliance on artificial intelligence leads to passive learning. In studies, 42.1% of students believed AI negatively affects education, which contributes to a shift from being active participants to passive recipients in the learning process.

This condition contributes to decreased critical thinking and clinical decision-making skills, as students tend to rely on AI recommendations rather than independently analyzing complex clinical problems. These conclusions confirm the concept of automation bias: when users accept technological diagnostic recommendations without verification, erroneous decisions are made.

The main risk for medical education here is the reduction of independent decision-making and clinical logical thinking. This leads to perceiving it not only as a technological assistant, but as the main logical tool. This poses a direct risk in solving complex clinical problems.

Academic integrity and ethical aspects. Another problem arising from improper use of AI tools is the violation of academic integrity. Research has shown that students copy AI answers directly to find quick and easy solutions or rely on incorrect information, which reduces the reliability of assessments. This is particularly associated with the so-called hallucination phenomenon — when AI systems generate answers that do not correspond to reality.

Such "hallucinations" not only lead to incorrect acquisition of knowledge, but also decrease students' confidence in human reasoning. This increases the risk of making wrong recommendations in clinical situations and lowers the quality of education being delivered.

The need for pedagogical regulation. Michalczak (2025) and other studies show that the positive effect of AI in education depends on the pedagogical context: without academic supervision, the benefits of AI are limited.

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Another important point expanding this analysis is the need to develop an educational curriculum on AI. Recent analyses show that today's medical students are not sufficiently prepared to work with AI technologies, which reduces their independent clinical reasoning and ability to evaluate information. Thus, merely introducing AI technologies is not enough — it is necessary to implement special courses that prepare students in AI literacy, ethical approaches, and critical thinking.

Conclusion

This analytical literature review showed that the introduction of artificial intelligence into medical education is simultaneously both an opportunity and a risk. When properly integrated, it can be an effective tool that strengthens knowledge, but improper and uncontrolled use may weaken clinical reasoning and reduce education quality. Therefore, properly directing AI as a technological assistant serving the learning process — not as a force replacing students' thinking — is the most important task for medical education.

1. Misuse of artificial intelligence strengthens passive learning models among students and reduces independent analytical thinking processes.
2. Excessive reliance on AI leads to weakened clinical decision-making, logical connection of symptoms, and diagnostic reasoning skills.
3. Risks to academic integrity — copying ready-made answers, uncritically accepting errors, and incorrect AI "hallucinations" — cause a decrease in the quality of knowledge.
4. Introducing AI into medical curricula requires a separate methodological approach, ethical guidelines, and mandatory AI-literacy training modules.
5. In the future, to assess the true effectiveness of AI integration, controlled experimental studies, measurement of educational outcomes through digital indicators, and development of clinical reasoning assessment algorithms are necessary.

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