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Editorial

IJMS's Stance on Ethical Artificial Intelligence Usage for Medical Student Education and Research, and Highlights of IJMS in 2025

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Artificial Intelligence

Artificial intelligence (AI) refers to a technology that mimics human-like thinking through continuous training in perception, reasoning, and learning performance. The rapid development of AI – especially Large Language Models (LLMs) – has far-reaching effects on every facet of life, including medical education. LLM's thought process has been described in studies as a 'Transformer' architecture, a concept which allows models to derive context through simultaneous analysis of different parts of a sentence.1 It is owing to this that LLMs can respond to diverse queries and tasks through computational analysis of statistical relationships between words and phrases across large datasets, producing 'human-like' language often indistinguishable from that made with real human capabilities.[2]

This editorial aims to review (1) current applications of AI use in medical education and medical research alongside its benefits and risks, (2) output validity, ethical concerns, and consequences of AI overreliance, (3) cover IJMS's stance and recommendation of AI use, and (4) highlights IJMS's activity in 2025.

Artificial Intelligence in Medical Education

Given its ability to process vast amounts of complex data, AI is one of the most valuable tools present to address the high information density naturally found during medical training. Studies have reported the use of AI by medical students for computer-assisted teaching and to alleviate the burden of heavy cognitive tasks.[3] While its use has been gaining traction, usage among medical students varies heavily across regions, varying from 46-89%.3–5 In general, AI has received a positive reception, with students viewing it as an effective, credible, and efficient learning tool.[4,5] Zhao et al. (2025) reported that effort expectancy (ease of use) and performance expectancy (usefulness) modified by facilitating conditions (available resources) were direct positive predictors of behavioural intention.[6]

Its direct application ranges from exam preparation to free-form simulated patient interactions.[7] Kung et al. (2023) reported that ChatGPT demonstrated knowledge that surpasses the passing level for the USMLE (United States Medical Licensing Examination) without any prior prompting or AI training. It can also provide easy-to-understand explanations and logical reasoning for each answer.[8] Aside from assisting in problem-solving, recent studies demonstrate that LLMs such as Gemini and ChatGPT can generate high-fidelity clinical vignettes and multiple-choice questions equally compelling for learning compared to those made by faculty members.[9] While this improves conceptual understanding and preparedness, overreliance may reduce independent reasoning due to the taking of a more passive stance towards the problem-solving process.[10] Studies have also reported that factual accuracy is limited to questions testing lower-order cognitive skills, therefore hindering its applicability in areas with a very high degree of specialty.[11,12]

In contrast to structured examination, Skryd et al. (2024) reported that using ChatGPT to generate lists of differential diagnoses enables easy interlinking of materials across multiple modules. Students can then easily ask follow-up questions to help recall and refine their understanding of each diagnosis's underlying pathophysiology.[13] This reinforces clinical reasoning and improves integration of basic science into clinical practice. McDuff et al. (2025) reported a significant 50% increase in differential diagnosis quality generated by clinicians assisted with LLMs.[14] However, another study reported that AI by itself performed worse in pinpointing the correct diagnosis than expert physicians.[15] This reinforces that overreliance and blind-trusting without cross-verification might be a pitfall for students with little clinical experience to accept incorrect or oversimplified outputs.[16] AI operates on the probability of words, not the probability of disease; fundamentally generating differential diagnoses based on which medical terms usually appear together in text, not based on clinical intuition and years of experience behind it.

AI has reportedly been used to simulate clinical case scenarios in which medical students perform tasks such as obtaining a patient's history and interpreting the physical examination.[13] ChatGPT can help students develop doctor-patient communication and initial examination skills while also identifying gaps and aid in decision making through personalized

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feedback.[13,17] Holderried et al. (2024) reported that ChatGPT is able to provide effective and structured feedback on history-taking dialogues.[18] Weisman et al. (2025) also reported that ChatGPT can assist medical students in learning how to break bad news with appropriate timing, mode of communication, and conversation protocol in a simulated telephone call discussing abnormal results of a diagnostic mammogram requiring further biopsy. Virtual patients were reported to be able to ask sensible questions and respond to inquiries with appropriate emotional inflections.[19] While this contributes to the development of doctor-patient communication skills, studies argue that AI-based learning should only supplement and never fully replace human interaction.[20] Diagnoses may also come from reading nuances within silence and the atmosphere, stressing that insensitivity to non-verbal cues might result in incomplete diagnoses.[21]

AI may also be used to restructure learning experience by creating personalized schedules and an adaptive learning system. Real-time analysis and personalized learning of prompts inputted into the program can help AI create learning aids tailored to an individual's specific learning style and knowledge gaps.[22] In the absence of AI, medical students largely depend on fixed curricular structures and mentorship/guidance available at their institution. AI offers advantages that address gaps within the conventional settings, such as access to real-time feedback and individualized mentorship.[23] While this increased learning efficiency and shifts learning speed to reflect a more competency-based pace, low discipline might create a study plan that 'overfits' a student's current condition while giving a false sense of security. This creates an illusion of competence, where excessive adaptation fails to force students to engage in progressively complex scenarios, thus encouraging cognitive disengagement and a misleading perception of mastery.[24,25]

Artificial Intelligence in Medical Research

Aside from its use in an educational context, the benefits of using AI can be applied to all steps of the research-writing process. This spans the initial phase (topic selection and research question formulation), the research process (development of research strategies, screening and summarizing sources, and assisting with data interpretation and extraction), and manuscript writing (manuscript outlining, drafting, reference management, and language proofing).[26]

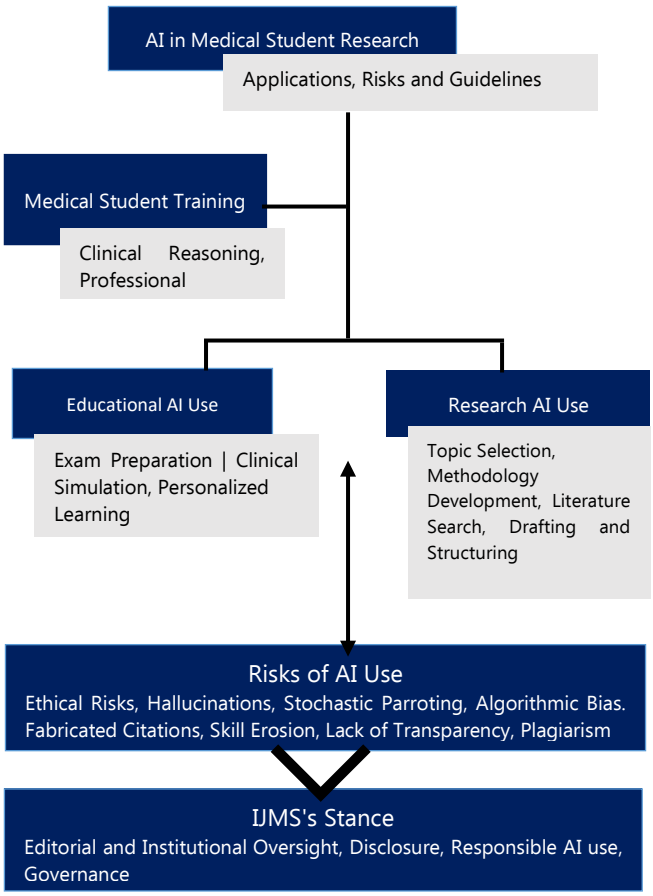
Tangsrivimol et al. (2025) highlighted the use of LLM in hypothesis generation. The paper argues that LLMs' ability to process and synthesize vast amounts of data accelerates research workflow and hypothesis generation.[27] Excellent topic selection and hypothesis generation require an adequate amount of base knowledge. This can be time-consuming for medical students who must juggle their learning capacity between consuming new curriculum-related medical knowledge and off-curriculum knowledge related to their chosen research topic. LLMs aid students in refining research ideas and framing research questions using the limited number of papers medical students consume, thus lowering the entry barrier to research.[27,28] While this lowers the entry barrier to research for early-career researchers, LLMs have been reported to be able to generate superficial or formulaic questions and fail to provide extensive support in topics requiring critical thinking and novelty.[29]

Table 1. Common Applications of Artificial Intelligence for Medical Students in Education and Research.

Application	Example of use	Primary benefit	Key limitations/risks
Medical Education			
Examination preparation	Generation of practice questions and explanations for every answer	Improves conceptual understanding and examination preparedness	Reduction in independent reasoning
Clinical reasoning	Generation of differential diagnoses and clarification of underlying pathophysiology	Reinforces clinical reasoning and integration of basic sciences	Incorrect or oversimplification of outputs
Simulated clinical encounters	Generation of history-taking, diagnostic pathway, and counselling scenarios	Development of doctor-patient communication skills	AI is not able to replace real patient interaction and build empathy
Personalized learning	Generation of customized study plans, flashcards, learning schedules	Increased efficiency and individualized pacing	Low discipline might create an overfitting study plan
Medical Research			
Topic selection and question formulation	Research ideas refinement, research questions framing	Lowers entry barrier to research	Superficial or formulaic questions
Methodology development	Providing suggestion and pointing out common methodological pitfalls	Improves methodological rigor, accurate real-time feedback	Lack of basic understanding and reasoning behind the methodology
Literature search assistance	Source selection, keyword identification, and abstract summarization	Faster orientation to a topic	Inconsistent, hallucinated, or incomplete summaries
Manuscript structuring and drafting	Sections outlining, language clarity improvement	Improve paper delivery and coherence	Potential plagiarism or similarities from papers within learning dataset

LLMs have also been described as a valuable tool during methodology development, providing suggestions and pointing out methodological pitfalls. Biswas et al. (2023) reported that ChatGPT exhibited 'commendable capability in identifying methodological flaws, articulating insightful feedback on theoretical frameworks, and gauging the overall contribution of the articles to their respective fields.[30] Weerasinghe et al. (2025) also reported a high-performance rating of 8.86/10 from researchers who used AI assistance to ensure compliance with ethical and scientific standards during protocol development.[31] AI has been demonstrated to generate multiple perspectives on a single topic, feedback on the most viable research path, while upholding the highest level of methodological rigor through accurate real-time feedback often unavailable when dealing with busy supervisors.[32] While using AI to spot methodological flaws is beneficial, overreliance without cross verification and critical thinking may cause cognitive offloading and automation bias, leading to a lack of basic understanding and reasoning behind the methodology.[33]

Figure 1. Conceptual Framework of Artificial Intelligence Across Medical Students Training and Research.[2,8,16,17,22,26,44,45,51,54,58]



Due to how AI was developed, experts believe that its main advantage lies not in idea generation but in its ability to recall and sort through the vast amounts of information in the datasets it was trained on.[29] While medical students are often limited by the amount of knowledge they have (and time limits to acquire new knowledge), LLMs can act as 'semantic filters' by identifying thematic patterns and relevant studies within the literature. Wang et al. (2025) reported a 63.4% reduction in screening time and a 23.5% improvement in accuracy following human-AI collaboration in clinical evidence synthesis.[34] Proestel et al. (2025) reported that LLMs can correctly identify specific FDA guidance documents and answer questions associated with them, significantly reducing the time required to synthesize information from unfamiliar sources for medical students.[35] While the use of LLMs for practices such as source selection, identification, and summarization may help medical students, studies reported that AI may provide outputs with inconsistencies, hallucinations, or incomplete summaries.[36]

Aside from concerns about the validity of content generated by these LLMs, researchers have reported a high prevalence of fabricated references generated by LLMs. Walters and Wilder (2023) reported fabrication rates of 55% and 18% for references generated by ChatGPT-3.5 and ChatGPT-4, respectively.[37] Bhattacharyya et al. (2023) reported that across 115 references generated by ChatGPT-3.5 on various biomedical topics, 47% were found to be fabricated, 46% were authentic but inaccurate, and only 7% were authentic and accurate.[38] This highlights the critical importance of oversight against AI-generated outputs, from the content itself to the references from which they are derived.

Another example of LLM use by medical students includes manuscript structuring and drafting.[7] Huang et al. (2025) wrote that LLMs can help scientists better organize a logical outline and provide feedback to improve writing style.[39,40] LLMs are able to perform thematic analysis and generate outlines that resemble common patterns found in impactful papers within specific niches of the medical field. D'Agostino et al. (2024) reported that LLMs are very good at organizing thought processes, often producing text that is indistinguishable from that written by humans.[41] It was also described as excelling in 'drafting initial versions of articles and refining grammar and style in existing documents, thus enhancing their clarity and coherence.[40] This 'levels the playing field' for researchers living in non-English speaking resource-limited countries where linguistic mentorship and guidance are scarce by providing high-level feedbacks on linguistic polishing normally only found by using expensive professional editing services.[42]

While LLMs can help outline sections and improve language clarity, because LLMs are trained on vast repositories of existing text, they may inadvertently reproduce/generate similar content from their training datasets without attribution, leading to unintentional plagiarism.[43] This kind of plagiarism extended from the easier-to-detect verbatim plagiarism to the more subtle paraphrase plagiarism, where ideas instead of exact words became reworded without proper attribution from which they are derived within their learning dataset.[43]

The importance of using AI in research lies not so much in what students create with these tools as in how consistent use alters how students approach research during training. While AI can assist with any part of the research process, it may promote formulaic avenues of inquiry, generate work that appears coherent despite knowledge gaps, or reduce thorough engagement with sources.[44]

For medical students whose scientific judgement is still forming, these impacts are especially pertinent. Kobak et al. (2025) reported that LLM influence is detectable across a substantial proportion of recent biomedical abstracts, indicating that AI-assisted writing is becoming commonplace in scientific communication.[45] Notably, this appears to be occurring without disclosure of AI use. These results imply that research training should take into account that medical students are joining research settings where AI-mediated writing is already common.

As AI use becomes increasingly routine in both student work and published writing, it is of utmost importance for the research community to address the ethical and professional consequences

of AI use for researchers themselves. ***Table 1*** describes common AI applications for medical students in education and research. ***Figure 1*** presents a conceptual framework for the use of artificial intelligence across medical student training and research.

Output Validity, Ethical Concerns, and Consequences

In a behaviour known as 'stochastic parroting', LLMs are fundamentally trained to not "understand" but instead statistically mimic human language – hence the term, stochastic parrots – through a string of computational analysis.[16] It acts as a sophisticated predictor of sentence and text formatting patterns, not because of its own internal learning, but by repackaging material learned through its training datasets.

Although seemingly innocuous in daily life, outputs – often missing important technical/scientific nuances – taken as accurate with little-to-no cross-verification in fields such as medical research might propagate misinformation.[16] This creates a phenomenon where AI has been described to fall under 'hallucination,' where it outright makes its own data and presents it as accurate, often with convincing phrasings indistinguishable from human-written language.[46] While in most times content-related hallucinations may pass themselves as seemingly real, incorrectly cited/made-up citations are usually easier to recognize. Recent studies have reported that up to half of AI-generated citations are erroneous, leading to misattribution and significant plagiarism.[47–49]

AI is trained on large, existing datasets provided by its creator companies. The lack of equal representation across all demographics in these datasets led to algorithmic bias, in which AI exacerbates prevalent human biases learned from training models to generate outputs based on social prejudices.[50] Ashwin et al. (2025) reported that the use of Whisper (an AI-based speech-to-text transcription software) during clinical practice resulted in violent and racially inflammatory slurs with potential miss/loss of information.[51] Close sourcing and a lack of transparency regarding the sources of their datasets also raised ethical concerns. Most AI tools were built by private, non-medical entities, not subject to the data protection laws that govern healthcare and health data management systems worldwide.[52] As a result, clinical findings may be lifted off without the knowledge or consent of patients, providers, or researchers, leading to the non-consensual ownership, storage, usage, and transfer of sensitive patient and researcher data across companies and jurisdictions. Elimination of the various biological, ethnic, and social nuances that undergird clinical findings may lead to further misdiagnosis and misrepresentation of scientific conclusions.[53]
Aside from concerns about AI-generated outputs, the research community has raised concerns that overreliance on AI tools can erode human capabilities through skill devaluation, reduced self-determination, and loss of accountability.[54] It is therefore critical that AI usage first be accepted as a tool inseparable from human life in the future. The nuances and potential consequences of AI use should be taught to medical students, rather than feigning ignorance of the suspicious attitude toward AI in the medical field.[55]

IJMS's Stance & Recommendation on AI Use

The development of an AI screening tool and measures to flag AI-generated content will be a never-ending race. Therefore, IJMS believes that in the future, AI should not become an enemy of the scientific community, but an assistant towards improving research quality. IJMS urges student-authors to be accountable in their use of AI, both when taking their first steps and throughout their research careers. IJMS agrees with ICMJE (International Committee of Medical Journal Editors) and COPE (Committee on Publication Ethics) that AI is ineligible for authorship due to a lack of accountability, and the authors must disclose any use of AI-assisted technologies in the production of submitted work.[56,57] In the end, it is the author's ultimate responsibility to ensure that all information in the manuscript is factually correct and that no ethical concerns are present. IJMS supports the integration of AI learning into the medical curriculum. We believe that medical students are the future backbone of medical research. Therefore, ethical and rational use of AI must be taught as early as possible.

Highlights of IJMS in 2025

The year 2025 marked a period of consolidation and strategic growth for the International Journal of Medical Students (IJMS), strengthening its role as a global platform for high-quality medical student research, editorial training, and scientific communication.

One of the year's major academic milestones was the 2025 World Conference of Medical Student Research (WCMSR). The conference recognized outstanding student scholarship across original research, case reports, posters, and oral presentations, as well as public engagement through audience-voted awards. Rather than listing all distinctions here, readers are encouraged to explore the full list of awardees, presentations, and recordings at: https://ijms.info/IJMS/Conference/editions/2025

The success of WCMSR 2025 was made possible by strong student leadership, led by Chloe Carrington (University of Queensland–Ochsner, second-year medical student), alongside a dedicated organizing team. Editorial rigor during the abstract evaluation process was reinforced by the exceptional contribution of student editors, with Aditi Saini, Atroba Zaheer, Dhvanit Rajdeep, Lessa Alessandra Méndez Lara, Shrideavi Murugan, and Tyler Hepler standing out for completing the highest number of abstract reviews.

Beyond the conference, IJMS demonstrated significant growth in its digital presence. In 2025, the journal website recorded 156,500 new users and 401,557 page views, reflecting increasing global reach and readership. Additionally, IJMS successfully re-established and strengthened its Social Media and Communications strategy, led by Mihai-Gabriel Zaiț and his team, improving dissemination, visibility, and engagement across platforms.

Finally, IJMS continued to recognize excellence within its editorial structure, with Drs. Ahmed Nahian and Hamrish Kumar Rajakumar as Student Editor and Associate Editor of the Year, respectively, reaffirming the journal's mission to train the next generation of medical editors and academic leaders. Together, these achievements reflect a focused, impactful year for IJMS—defined by academic quality, editorial development, and sustained global engagement.

This issue of the International Journal of Medical Students features a broad range of original research, reviews, short communications, case reports, and experiential scholarship addressing priority topics in medical education, mental health, workforce well-being, health systems, and emerging technologies. The original articles examine clinical audits in medical training,[59] sleep disorders,[60] empathy in physician–patient interactions,[61] the impact of psychiatric comorbidities on HIV care,[62] pandemic-related educational disruptions,[63] and resident burnout.[64] Complementary short communications and reviews focus on educational interventions,[65] resilience training,[66] women in medicine initiatives,[67] and the expanding role of artificial intelligence in clinical practice.[68,69] The issue is further enriched by clinically relevant case reports,[70,71] and reflective experiences[72] that emphasize complex decision-making and trauma-informed care, reinforcing IJMS's commitment to globally relevant, practice-informed, and student-led medical scholarship.

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