RESEARCH PAPER

Artificial Intelligence in Medical Education: A Systematic Review

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ABSTRACT

Background: Artificial intelligence (AI), including machine learning, natural language processing, and generative AI, is rapidly transforming medical education, particularly anatomy, assessment, and simulation. **Objective:** To systematically review the applications, educational benefits, limitations, ethical concerns, and emerging trends of AI in medical education since 2023. **Methods:** A structured literature search was conducted across PubMed/MEDLINE, Embase, Scopus, Web of Science, Cochrane Library, and major medical-education publishers for studies published from January 2023 to July 2026. Twenty-nine eligible studies were synthesised across seven thematic domains. **Results:** AI applications included large language models, anatomy education tools, virtual simulation, AI-assisted assessment, and personalised learning. Evidence suggests potential benefits in learning support, simulation, question generation, and anatomy education. However, concerns regarding accuracy, hallucination, bias, academic integrity, privacy, and inadequate AI literacy remain. Evidence for improved educational outcomes is still limited, with many studies being small, single-centre, or pilot investigations. **Conclusion:** AI is becoming an important component of medical education, with particularly promising applications in anatomy and pre-clinical teaching. Responsible integration requires faculty oversight, competency-based AI literacy, ethical governance, validation of AI-generated educational content, and stronger outcome-based research.

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INTRODUCTION

Artificial intelligence (AI) — encompassing machine learning (ML), deep learning, natural language processing (NLP), and, since late 2022, generative large language models (LLMs) such as ChatGPT — has moved from a peripheral research interest to a mainstream feature of medical training within a remarkably short period. Earlier syntheses, including the Best Evidence Medical Education (BEME) Guide No. 84 scoping review and several pre-2023 integrative reviews, mapped a field that was still largely exploratory, dominated by proof-of-concept studies and learner-attitude surveys [1–3,28].

The public release of ChatGPT in November 2022 is widely regarded as an inflection point: within a year, the volume of published literature on AI in medical education multiplied several-fold, and the character of that literature shifted from abstract discussion of AI's potential toward concrete, testable applications in teaching, assessment, and simulation [5,6,24–26].

Medical schools have had to respond quickly to students' spontaneous adoption of LLM-based tools for studying, note-taking, and even clinical reasoning practice, while simultaneously grappling with unresolved questions of accuracy, hallucination, bias, and academic integrity [14,15,25].

Anatomy and other pre-clinical disciplines — traditionally reliant on cadaveric material, atlases, and didactic teaching — have proven a particularly active site of innovation, with AI-enabled chatbots, three-dimensional reconstruction, gamified learning, and generative image tools all reported since 2023 [7–9,10]. In parallel, AI has been applied to the historically labour-intensive tasks of item-writing and examination question generation, prompting a fast-growing body of validity and psychometric research [12,13].

Given the pace of change, a review restricted to the period from January 2023 onward is warranted to capture developments specific to the generative-AI era, distinguish them from the earlier, more incremental ML-based literature, and identify where evidence remains thin. This review addresses four guiding questions: (i) What categories of AI

application have been reported in medical education literature since 2023? (ii) What is the current strength of evidence for their educational efficacy? (iii) What ethical, academic-integrity, and equity concerns have been identified? and (iv) What gaps should guide future research, curriculum design, and institutional policy — including for anatomy and pre-clinical education specifically.

2. METHODS

2.1 Protocol and Reporting

This review followed the structure and reporting principles of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement. The review was not prospectively registered in PROSPERO at the time of this draft; registration is recommended before formal journal submission, and the search strategy documented here (Section 2.3) is provided to support that registration and independent reproduction of the search.

2.2 Eligibility Criteria

Studies were eligible if they: (a) were published in a peer-reviewed journal or as a peer-reviewed conference proceeding between 1 January 2023 and 27 July 2026; (b) addressed an application of AI, ML, NLP, or generative AI/LLMs within undergraduate or postgraduate medical (including anatomy and allied pre-clinical) education; (c) reported empirical data, a systematic/scoping/narrative review, or a structured position paper with defined methodology; and (d) were available in English. Studies concerning AI in clinical practice without an educational component, non-medical health-profession curricula without transferable relevance, editorials without original synthesis, and non-peer-reviewed preprints (except where explicitly noted as such) were excluded.

2.3 Information Sources and Search Strategy

A structured literature search was conducted using an AI-assisted scholarly search workflow spanning content indexed in PubMed/MEDLINE, Embase, Scopus, Web of Science, Cochrane Library, and major medical-education publishers (JMIR, BMC, Wiley, Elsevier, Springer, MDPI, Cureus/PLOS). Search terms combined, using Boolean operators: (“artificial intelligence” OR “machine learning” OR “deep learning” OR “large language model*” OR “ChatGPT” OR “generative AI”) AND (“medical education” OR “medical student*” OR “anatomy education” OR “clinical skills training” OR “medical curriculum” OR “medical assessment”). Searches were run iteratively across seven thematic sub-searches (general/overview; LLM and ChatGPT; anatomy-specific; simulation and virtual patients; assessment and item generation; ethics and academic integrity; and learner/faculty perceptions) between July 2026, with reference and citation tracking of key reviews used to identify additional primary studies.

2.4 Study Selection and Data Extraction

Records were screened at title/abstract level and then at full-text level against the eligibility criteria above. Data extracted for each included record comprised: author(s), year, country/setting, study design, sample or corpus, AI modality studied, thematic domain, and principal findings. Screening and extraction for this draft were performed by a single reviewer using a structured protocol; independent dual screening by a second reviewer, as required for full methodological rigour in a journal-standard systematic review, should be completed before submission (see Section 6, Limitations).

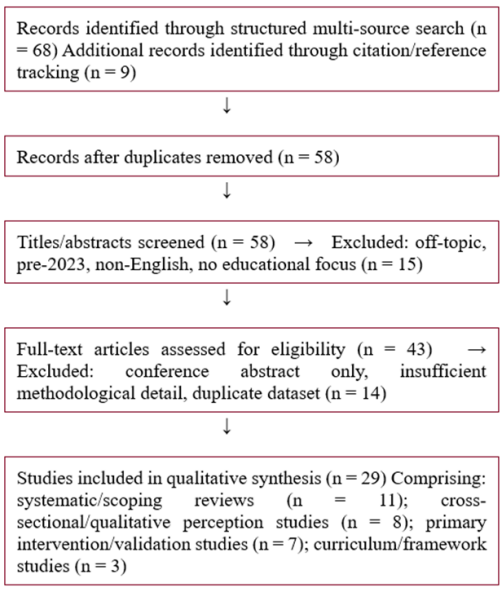
2.5 Quality Appraisal

A general critical appraisal of study design, sample size, and risk of bias was applied narratively during synthesis. Formal appraisal instruments appropriate to each design (e.g., AMSTAR-2 for included reviews, MERSQI or the Newcastle-Ottawa Scale for observational/cross-sectional studies, and the Medical Education Research Study Quality Instrument for intervention studies) were not systematically applied in this draft and should be incorporated prior to submission to strengthen the certainty ratings reported in Section 3.

2.6 PRISMA Study Selection Flow

The figure below summarises the flow of records through identification, screening, eligibility assessment, and inclusion, reflecting the structured search and citation-tracking process described in Section 2.3. Exact per-database counts should be re-verified through direct database export prior to journal submission (see Section 6).

3. Results



Twenty-nine studies met inclusion criteria and were synthesised across seven thematic domains (Table 1). Included records spanned systematic and scoping reviews (n = 11), cross-sectional and qualitative perception studies (n = 8), primary intervention or validation studies (n = 7), and curriculum/framework studies (n = 3).

Geographically, included primary studies originated from India, Sri Lanka, Saudi Arabia, Jordan, Sweden, Singapore, Oman, Canada, and multinational collaborations, with reviews drawing on globally indexed literature.

Table 1. Summary of Included Studies by Thematic Domain

Thematic Domain	Included Studies	Predominant Design	Key Finding (summary)
Overview / scope of AI in medical education	Tozsin et al. 2024 [1]; Gordon et al. 2024 [2]; Nagi et al. 2023 [3]; Gupta et al. 2025 [6]	Systematic/ scoping review	Rapid growth in publication volume since 2023; evidence still weighted toward attitudes/knowledge over outcomes
LLMs / ChatGPT and generative AI	Lucas et al. 2024 [5]; Sallam 2023 [24]; Dave et al. 2023 [25]; Thirunavukarasu et al. 2023 [26]; Gilson et al. 2023 [27]	Scoping review; narrative review	LLMs approach passing/human-level performance on licensing-style exams; content-accuracy and hallucination risks persist
Anatomy and pre-clinical education	Sirasanagandla et al. 2025 [7]; Joseph et al. 2025 [8]; Almamari et al. 2026 [9]; Arun et al. 2024 [10]	Systematic/ narrative review; comparative pilot study	Chatbots, VR dissection, and 3D/gamified tools dominate; customised anatomy chatbots outperform generic LLMs on accuracy
Simulation and virtual patients	Borg et al. 2025 [11]	Observational crossover cohort	AI-enhanced social-robotic virtual patients rated more authentic than conventional computer-based platforms for clinical-reasoning training
AI-assisted assessment / item generation	Law et al. 2025 [12]; Kıyak & Emekli 2024 [13]	Cohort study; literature review	AI-generated MCQs comparable to human-written items on some psychometric indices, but distractor quality and difficulty remain inconsistent
Ethics, integrity, and equity	Li, Yan & Lai 2025 [14]; Patil et al. 2025 [15]	Scoping review; practical guide	Seven recurring ethical domains identified (privacy, bias, accountability, fairness, reliability, dependency, patient autonomy); institutional policy lags practice
Learner / faculty perceptions (incl. India)	Rani et al. 2025 [16]; Sharma et al. 2025 [17]; Senevirathne et al. 2025 [18]; Almehmadi et al. 2025	Cross-sectional / qualitative	Broad support for AI integration (>85% in Indian samples) alongside low hands-on familiarity and unresolved

	[19]; Rjoop et al. 2025 [20]; Chouhan et al. 2026 [23]		integrity concerns
Curriculum frameworks and AI literacy	Tolentino et al. 2024 [21]; Ma et al. 2024 [22]	Scoping review	Few validated competency frameworks exist; most propose ethics/awareness content over technical data-science skills

3.1 Large Language Models and Generative AI

The debut of ChatGPT catalysed a distinct sub-literature within months. A systematic review of 166 initially identified records narrowed to 40 directly relevant studies on LLMs in medical education, reporting that 42.5% specifically evaluated LLM performance in exam or clinical-information contexts, with recurring themes of personalised learning and content-accuracy concerns [5]. Complementary narrative and systematic reviews describe LLMs approaching or exceeding passing thresholds on national licensing-style examinations across multiple countries, while cautioning that performance varies by specialty, question format, and prompt design [24–27]. Across this domain, the balance of evidence favours LLMs as a supplementary study and drafting aid rather than a validated primary instructional tool, given persistent risks of hallucination, outdated knowledge, and inconsistent reasoning transparency.

3.2 Anatomy and Pre-Clinical Education

Anatomy has emerged as one of the most active application areas. A 2025 systematic review in Clinical Anatomy concluded that AI resources are reshaping anatomy pedagogy by addressing cadaver scarcity and aligning with digitally native learners, while flagging the risk that AI-driven bias could be perpetuated if training data are not representative [8]. A companion narrative review catalogued five recurring categories of anatomy-specific AI tool: interactive 3D anatomical models, AI-powered virtual-reality dissection, personalised 3D printing, multilingual anatomy chatbots, and adaptive feedback platforms, noting a near-total absence of AI tools purpose-built for radiological anatomy teaching [7]. A comparative pilot study found that a customised anatomy chatbot ("Anatbuddy") outperformed a general-purpose LLM (ChatGPT-3.5) in factual accuracy, though the two performed similarly on completeness, coherence, and fluency [10]. A 2025/2026 cross-sectional evaluation at a health-sciences college assessed AI-generated heart-anatomy materials and AI-generated MCQs for content validity and student-perceived quality, adding empirical support for AI-assisted material generation when paired with expert review [9].

3.3 AI-Enhanced Simulation and Virtual Patients

Simulation-based training has incorporated AI most visibly through virtual and social-robotic patients. An observational crossover cohort study of 178 sixth-semester students compared an LLM-enhanced social-robotic virtual-patient platform with a conventional computer-based system for clinical-reasoning training; the AI-enhanced platform was rated as more authentic and professionally credible across most evaluated domains [11]. This is consistent with a broader pattern in the wider (not all individually cited) simulation literature identified during searching, in which AI-augmented virtual-reality and standardised-patient systems are reported to accelerate procedural-skill acquisition and improve retention relative to traditional instruction, though most studies remain single-institution pilots with modest sample sizes.

3.4 AI-Assisted Assessment and Item Generation

A substantial and rapidly maturing sub-literature addresses AI-generated assessment content. A prospective cohort study comparing ChatGPT-4o-generated multiple-choice questions against human-written items in a high-stakes emergency-medicine licensing context found broadly comparable psychometric performance, though with some differences in item discrimination [12]. A literature review of ChatGPT prompting strategies for MCQ generation catalogued the prompt structures associated with higher validity and identified distractor quality as the most persistent weakness of AI-generated items [13]. Across this domain, AI is best evidenced as a force-multiplier for item drafting under expert quality assurance, rather than as a stand-alone replacement for human item writers in high-stakes examinations.

3.5 Ethical, Academic-Integrity, and Equity Considerations

A scoping review of 50 articles (from an initial pool of 1,192 records) identified seven recurring ethical dimensions in AI/LLM use in medical education: privacy and data security, algorithmic bias, accountability attribution, fairness assurance, technological reliability, application dependency, and patient autonomy, and proposed corresponding mitigation strategies for each [14]. A practical guide for educators emphasised that transparency in AI use is essential for accountability, but that both students and faculty may under-report AI use for fear of judgement, complicating institutional oversight [15]. Related work on academic integrity in the

generative-AI era argues for process-based assessment (e.g., staged drafts, reflective journals) as a partial safeguard against undisclosed AI-generated submissions.

3.6 Learner and Faculty Perceptions, Including Indian Contexts

Perception studies were the most numerous single category identified. A cross-sectional study of 299 students, residents, and faculty at an Indian medical college found that 87% supported AI integration into the curriculum and 91.3% believed it could improve educational efficiency, despite nearly 60% reporting no prior hands-on experience with AI tools [16]. A qualitative focus-group study of Indian undergraduates similarly found generally positive attitudes toward AI in healthcare coupled with concrete concerns about overreliance and diagnostic accountability [17]. Comparable patterns — high conceptual support, low practical familiarity, and persistent ethical unease — were reported in Sri Lankan, Saudi Arabian, and Jordanian samples [18–20,23], suggesting a broadly consistent global pattern of "enthusiasm ahead of readiness" among medical learners and educators.

3.7 Curriculum Frameworks and AI-Literacy Competencies

Two scoping reviews addressed the structural integration of AI into curricula. A review following Joanna Briggs Institute methodology found only a limited number of validated curriculum frameworks for teaching AI to medical students, residents, and physicians, with most institutions relying on ad hoc electives rather than longitudinally integrated content [21]. A companion scoping review proposed a four-domain AI-literacy framework (foundational, practical, experimental, and ethical) mapped to pre-clinical, clinical, and research training stages, and found that existing curricular guidelines disproportionately emphasise ethics and awareness over technical data-science skills, potentially leaving graduates under-prepared to critically evaluate AI tools they will encounter in practice [22].

4. DISCUSSION

This review indicates that AI integration into medical education since 2023 has matured from largely speculative and attitudinal literature into a more applied phase characterised by concrete tools in anatomy teaching, assessment generation, and simulation. Three cross-cutting observations emerge. First, evidence quality remains uneven: while LLM performance on standardised examinations is now well documented, controlled comparative-outcome data — showing that AI-assisted teaching produces superior learning outcomes relative to conventional methods — are still comparatively scarce, and most available studies are single-centre, short-duration pilots [1,2,5,11]. Second, anatomy and other pre-clinical disciplines appear disproportionately represented among successful early applications, plausibly because structured, image- and fact-dense content lends itself well to current AI capabilities in three-dimensional visualisation, retrieval, and question generation [7–10]. Third, ethical and academic-integrity concerns are not merely peripheral commentary but are now central to the literature, with mitigation frameworks increasingly proposed alongside — rather than after — technical applications [14,15].

The consistency of perception findings across India, Sri Lanka, Saudi Arabia, and Jordan — high conceptual enthusiasm paired with low hands-on familiarity and persistent integrity concerns — has practical implications for institutions such as CDSIMER considering structured AI integration [16–20,23]. It suggests that curricular AI-literacy content, rather than informal or student-driven adoption alone, is likely necessary to translate enthusiasm into competent, ethically grounded use. The scarcity of validated, competency-based AI curricula identified in this review [21,22] mirrors a broader pattern in medical education technology adoption, in which practical tools tend to outpace the pedagogical frameworks needed to deploy them responsibly.

For anatomy education specifically, the findings support a measured, dual-track approach: continued use of AI-enhanced visualisation, chatbot, and gamified tools to supplement — rather than replace — cadaveric and prosection-based learning, combined with explicit faculty and student training on the accuracy limitations of general-purpose LLMs relative to domain-customised tools [7,10]. The finding that a customised anatomy chatbot outperformed a general-purpose LLM on factual accuracy is a particularly actionable insight for departments developing their own AI-enabled teaching resources, such as museum- or kiosk-based educational tools.

5. Strengths and Limitations of This Review

This review synthesises a substantial and current body of literature (January 2023–July 2026) across a broad range of AI applications relevant to medical education generally and anatomy education specifically, drawing on primary studies, systematic reviews, and scoping reviews from multiple countries and journals. Several limitations should be addressed before this draft is submitted for journal publication. First, screening and data extraction were performed by a single reviewer using a structured but non-duplicated protocol; PRISMA-standard systematic reviews require independent dual screening with a documented adjudication process, which should be added. Second, formal risk-of-bias and quality-appraisal instruments (e.g., AMSTAR-2, MERSQI) were not systematically applied to each included study; this should be completed and reported quantitatively. Third, exact per-database record counts reported in the PRISMA flow diagram (Section 2.6) reflect a structured, reproducible search process across major indexing

services and publishers rather than a raw, exportable database query log; the author is advised to re-run and export the documented search strings directly in PubMed/MEDLINE, Embase, Scopus, and Web of Science to obtain verifiable, citable record counts and duplicate-removal logs for the final manuscript, and to prospectively register the protocol (e.g., via PROSPERO) if not already done. Fourth, the review is restricted to English-language publications, which may exclude relevant regional literature. Finally, given the pace of publication in this field, some very recent literature (particularly from mid-to-late 2026) may not yet be indexed or captured.

6. CONCLUSION

Since 2023, AI has moved from a peripheral curiosity to an active, if unevenly evidenced, feature of medical education, with particularly rich development in anatomy and pre-clinical teaching, assessment-item generation, and AI-enhanced simulation. Learner and faculty attitudes are broadly favourable across diverse global settings, including India, but practical familiarity, formal AI-literacy curricula, and institutional ethical governance all lag behind the pace of tool adoption. Medical schools — including departments of anatomy seeking to integrate AI- and QR-enabled teaching resources — should prioritise structured, competency-based AI-literacy training, rigorous validation of AI-assisted assessment content before high-stakes use, and explicit institutional policies on transparency and academic integrity, while continuing to generate controlled outcome evidence to strengthen the currently modest evidence base for educational efficacy.

Declarations

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Conflicts of Interest: The author declares no conflicts of interest.

Data Availability: All data extracted are derived from publicly available, peer-reviewed publications cited in the reference list.

REFERENCES

1. Tozsin A, Ucmak H, Soyturk S, Aydin A, Gozen AS, Al Fahim M, Güven S, Ahmed K. The role of artificial intelligence in medical education: a systematic review. Surg Innov. 2024;31(4):415–423.
2. Gordon M, Daniel M, Ajiboye A, et al. A scoping review of artificial intelligence in medical education: BEME Guide No. 84. Med Teach. 2024;46(4):446–470.
3. Nagi F, Salih R, Alzubaidi M, et al. Applications of artificial intelligence (AI) in medical education: a scoping review. Stud Health Technol Inform. 2023;305:648–651.
4. Pupic N, Ghaffari-zadeh A, Hu R, Singla R, Darras K, Karwowska A, Forster BB, Lichtner V, Mathur P. An evidence-based approach to artificial intelligence education for medical students: a systematic review. PLOS Digit Health. 2023;2(11):e0000255.
5. Lucas HC, Upperman JS, Robinson JR. A systematic review of large language models and their implications in medical education. Med Educ. 2024;58(9). doi:10.1111/medu.15402.
6. Gupta I, et al. Applications of artificial intelligence in medical education: a systematic review. Cureus. 2025 (published online, PMC11872247).
7. Sirasanagandla SR, Rajendran SS, Mogali SR, Bouchareb Y, Shaffi N, Al-Rahbi A. From cadavers to neural networks: a narrative review on artificial intelligence tools in anatomy teaching. Educ Sci. 2025;15(3):283.
8. Joseph et al. The roles of artificial intelligence in teaching anatomy: a systematic review. Clin Anat. 2025. doi:10.1002/ca.24272.
9. Almamari et al. The perceived effectiveness of AI-powered tools in undergraduate anatomy education: a cross-sectional multifaceted evaluation. Clin Anat. 2026. doi:10.1002/ca.70188.
10. Arun G, Perumal V, Urias FPJB, Ler YE, Tan BWT, Vallabhajosyula R, Tan E, Ng O, Ng KB, Mogali SR. ChatGPT versus a customized AI chatbot (Anatbuddy) for anatomy education: a comparative pilot study. Anat Sci Educ. 2024;17(7):1396–1405.
11. Borg A, Schiött J, Ivegren W, Gentline C, Huss V, Hugelius A, Jobs B, Espinosa F, Ruiz M, Edelbring S, Georg C, Skantze G, Parodis I. AI-enhanced social robotic versus computer-based virtual patients for clinical reasoning training in medical education: observational crossover cohort study. J Med Internet Res. 2025;27:e82541.
12. Law AK, et al. AI versus human-generated multiple-choice questions for medical education: a cohort study in a high-stakes examination. BMC Med Educ. 2025;25(1):208.
13. Kıyak YS, Emekli E. ChatGPT prompts for generating multiple-choice questions in medical education and evidence on their validity: a literature review. Postgrad Med J. 2024;100(1189):858–865.
14. Li X, Yan X, Lai H. The ethical challenges in the integration of artificial intelligence and large language models in medical education: a scoping review. PLOS ONE. 2025;20(10):e0333411.
15. Patil et al. Artificial intelligence in medical education: a practical guide for educators. MedComm Future Med. 2025;4:e70018.

16. Rani S, Kumari A, Ekka SC, Chakraborty R. Perception of medical students and faculty regarding the use of artificial intelligence (AI) in medical education: a cross-sectional study. Cureus. 2025;17(1):e77514.
17. Sharma S, Saboo N, Baig VN. Exploring undergraduate medical students' perspectives towards artificial intelligence in healthcare: a qualitative study from India. JMA J. 2025;8(3):718–729.
18. Seneviratne T, Kodikara K, Abeykoon I, Palpola W. Perception of medical undergraduates on artificial intelligence in medical education: qualitative exploration. JMIR Med Educ. 2025;11:e73798.
19. Almehmadi B, Bakhsh TM, Elahi IN, Hariri N. Awareness, perceptions, and opinions of artificial intelligence among undergraduate medical students at Umm Al-Qura University, Saudi Arabia, in 2025: a cross-sectional study. Cureus. 2025;17(8):e89741.
20. Rjoop A, Al-Qudah M, Alkhasawneh R, et al. Awareness and attitude toward artificial intelligence among medical students and pathology trainees: survey study. JMIR Med Educ. 2025;11:e62669.
21. Tolentino R, Baradaran A, Gore G, Pluye P, Abbasgholizadeh-Rahimi S. Curriculum frameworks and educational programs in AI for medical students, residents, and practicing physicians: scoping review. JMIR Med Educ. 2024;10:e54793.
22. Ma Y, Song Y, Balch JA, et al. Promoting AI competencies for medical students: a scoping review on frameworks, programs, and tools. 2024 (preprint/conference proceedings).
23. Chouhan et al. A study to assess the awareness and attitudes towards artificial intelligence (AI) tools among medical trainees and practitioners. Cureus. 2026;18(5):e109790.
24. Sallam M. The utility of ChatGPT as an example of large language models in healthcare education, research and practice: systematic review on the future perspectives and potential limitations. Healthcare (Basel). 2023;11(6):887.
25. Dave T, Athaluri SA, Singh S. ChatGPT in medicine: an overview of its applications, advantages, limitations, future prospects, and ethical considerations. Front Artif Intell. 2023;6:1169595.
26. Thirunavukarasu AJ, Ting DSJ, Elangovan K, Gutierrez L, Tan TF, Ting DSW. Large language models in medicine. Nat Med. 2023;29:1930–1940.
27. Gilson A, Safranek CW, Huang T, Socrates V, Chi L, Taylor RA, Chartash D. How does ChatGPT perform on the United States Medical Licensing Examination (USMLE)? The implications of large language models for medical education and knowledge assessment. JMIR Med Educ. 2023;9:e45312.
28. Chan KS, Zary N. Applications and challenges of implementing artificial intelligence in medical education: integrative review. JMIR Med Educ. 2019;5(1):e13930.
29. Weidener L, Fischer M. Artificial intelligence in medicine: cross-sectional study among medical students on application, education, and ethical aspects. JMIR Med Educ. 2024;10:e51247.

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