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Integration of Artificial Intelligence into Medical Student Learning: A Cross-Campus Analysis of Student Use and Perceived Educational Impact

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Abstract

Background:

Artificial intelligence (AI) is increasingly used by medical students to support their learning. Despite its growing use, how students incorporate AI into their studies and what educational benefits they perceive remain unclear. This study examined the prevalence, patterns, and perceived educational benefits of AI use among osteopathic medical students across three campuses.

Methods:

Existing data from a cross-sectional survey of first- and second-year osteopathic medical students were analyzed across the Philadelphia, Georgia, and South Georgia campuses of the Philadelphia College of Osteopathic Medicine (PCOM). The questionnaire assessed AI use, frequency, platforms utilized, educational applications, perceived educational benefits, and self-reported understanding of AI. Descriptive statistics were used to characterize responses, with additional inferential analyses examining differences in AI use and associations between frequency of use and perceived educational benefit.

Results:

Among 160 respondents, 145 (90.6%) reported using AI to support medical-school learning. ChatGPT was the most used platform. AI was most frequently used to clarify difficult concepts, generate practice questions, and summarize educational material. Students reported particularly favorable perceptions of AI for conceptual understanding, study efficiency, and overall learning quality, while perceived benefits for retention and clinical reasoning were less pronounced. Greater frequency of AI use was associated with greater perceived educational benefit.

Conclusions:

AI was widely integrated into the learning practices of surveyed preclinical osteopathic medical students. Students primarily used and valued AI for conceptual understanding and learning efficiency, with less emphasis on clinically oriented applications. These findings highlight the need for medical schools to develop educational strategies and guidance supporting responsible, evidence-informed AI use. Longitudinal studies incorporating objective academic and clinical outcomes are needed to determine whether perceived benefits translate into measurable improvements in learning.

Background

Artificial Intelligence (AI) has rapidly transitioned from an emerging technology to widespread adoption across numerous sectors of society. In a 2025 survey, 62% of U.S. adults said they interacted with AI at least several times a week [1]. Among these users, students make up one of the populations with the highest rate of adoption [2]. The emergence of widely accessible generative AI platforms has accelerated this transition, particularly in education, by allowing users to engage with AI models capable of generating individualized explanations and synthesizing complex information into accessible information for the user. As these technologies become increasingly integrated into education, their role is shifting from a novel resource to an integral and routine component of student learning.

This transition may be particularly relevant in medical education, where students are expected to acquire, integrate, and apply a substantial volume of complex medical information. AI offers capabilities that align closely with these demands, including the ability to clarify difficult concepts, summarize educational material, generate practice questions, and provide tailored explanations. As a result, AI use has become increasingly prominent among medical students. A previous study of 702 medical students found that 80% reported using AI at least once per week, demonstrating that AI has already emerged as a prominent tool within medical student learning [3].

Despite widespread adoption, how medical students integrate AI into their learning and where they perceive its greatest educational value is less understood. Although AI can support a broad range of learning activities, its perceived educational impact and usage may vary considerably across educational domains. Students may perceive substantial benefit for knowledge acquisition and study efficiency while finding AI less useful for higher-order skills such as clinical reasoning. Understanding these patterns is increasingly important as medical schools develop guidance and curricula surrounding effective, critical, and responsible AI use.

This study aimed to characterize the integration of AI into medical student learning across three campuses of the Philadelphia College of Osteopathic Medicine. Specifically, we evaluated the prevalence, frequency, perceived educational impact, educational applications, and specific AI platforms utilized by students. We also explored the differences in AI use across campuses and class years, with an emphasis on the relationship between frequency of AI use and perceived educational benefit.

Methods

Study design and setting

We conducted a secondary analysis of data collected in a 2025 cross-sectional survey of first- and second-year osteopathic medical students enrolled at the Philadelphia College of Osteopathic Medicine. Participants were recruited from PCOM's Philadelphia, Georgia, and South Georgia campuses. The eligible population consisted of approximately 957 first- and second-year medical students across the three campuses. The present secondary analysis was conducted in 2026 to characterize students' AI-related learning behaviors and perceptions during their preclinical medical education.

Survey development

A questionnaire was developed specifically for the present study to assess the use of AI as a learning tool among medical students (Additional file 1). Survey development was informed by established principles of web-based questionnaire design, including clarity of wording, relevance to the study objectives, and avoidance of ambiguous or leading questions [4]. The survey underwent review and pilot testing prior to distribution.

The questionnaire assessed whether respondents used AI for medical-school learning, which AI platforms they used, frequency of AI use, specific educational applications, perceived educational benefits, and self-reported understanding of AI functionality.

Educational applications assessed included clarification of difficult concepts, generation of practice questions, summarization of lecture slides or readings, creation of flashcards or mnemonics, review of clinical cases or differential diagnoses, practice of standardized patient encounters, and organization of study plans or schedules.

Seven educational applications were rated using the response options “Never,” “Occasionally,” “Sometimes,” “Often,” “Always,” and “I do not use AI.” Five statements concerning conceptual understanding, retention and recall, clinical reasoning and problem-solving, study efficiency, and overall learning quality were rated “Strongly disagree,” “Disagree,” “Neutral,” “Agree,” “Strongly agree,” or “I do not use AI.” A separate item used the same agreement options to assess self-reported understanding of how AI functions and formulates responses. The five perceived-benefit statements were distinct from the understanding item. The survey asked whether the respondent used AI to support medical-school learning (Yes/No). Respondents selecting “No” were instructed to choose “I do not use AI” on subsequent items. The platform question allowed multiple selections and an “Other” write-in response. Frequency of AI use was a single-choice item with the categories “1–2,” “2–3,” “3–4,” “4–5,” “5–6,” and “6–7 days per week,” plus “I do not use AI.” Adjacent ranges shared an endpoint in the original questionnaire. The platform and self-reported understanding questions were not marked as required on the supplied form.

Participants and recruitment

The original questionnaire was distributed electronically using Google Forms through institutional email. It was restricted to first- and second-year PCOM students using a PCOM email account and allowed one response per participant. Recorded responses were submitted from December 6 through December 29, 2025; the form closed on December 29 at 11:59 p.m. Participation was voluntary. A PCOM email address was required to verify institutional affiliation, prevent duplicate submissions, and administer a randomized drawing for a $50 prepaid gift card, with one recipient selected from each campus. Email addresses were collected alongside survey responses but were subsequently separated and excluded from the de-identified dataset used for statistical analysis.

Ethical approval

The present secondary analysis of existing de-identified survey data was reviewed by the Philadelphia College of Osteopathic Medicine Institutional Review Board and determined to be exempt under 45 CFR 46.104(4) (protocol H26-059X). Only de-identified data were used for the analysis.

Statistical analysis

All 160 responses had campus, class year, and AI-use status recorded. Appropriate descriptive and inferential analyses were used. Analyses of frequency, platforms, educational applications, perceived benefits, and AI understanding were restricted to the 145 respondents who selected “Yes” for AI use. Two respondents who selected “No” supplied substantive answers to some later items; those answers were excluded from AI-user analyses. Categorical responses were summarized as counts and percentages. For educational applications, “Often” and “Always” were combined; for benefit and understanding items, “Agree” and “Strongly agree” were combined. These proportions used 145 AI users as the denominator. The five perceived-benefit items were coded from 1 (strongly disagree) to 5 (strongly agree) and summed to a score of 5–25; all 145 AI users had complete benefit scores. A 95% Wilson confidence interval was calculated for AI-use prevalence. Fisher’s exact test and an odds ratio (M2 relative to M1) with a Wald confidence interval compared AI use by class year. Pearson’s chi-square test and Cramér’s V assessed the campus association. Frequency categories were coded in ascending order from 1 to 6, using the original labels, and analyzed as ordered categories. The Mann–Whitney U test compared frequency by class year; the tie-corrected Kruskal–Wallis test compared frequency across campuses, with eta squared calculated as $(H - k + 1)/(n - k)$. Spearman’s rank correlation assessed frequency against the summed benefit score, using midranks for ties. Its 95% confidence interval was estimated by 5,000 percentile bootstrap resamples with seed 20260923. Internal consistency of the five benefit items was assessed with Cronbach’s alpha. Tests were two-sided, with $p < 0.05$ considered statistically significant. Analyses were reproduced using Python (pandas 2.2.3 and SciPy 1.17.0).

Results

Participant characteristics and prevalence of AI use

A total of 160 osteopathic medical students completed the survey. Respondents included 99 first-year (M1) students (61.9%) and 61 second-year (M2) students (38.1%). Participants represented all three PCOM campuses: Philadelphia (n = 87, 54.4%), South Georgia (n = 42, 26.3%), and Georgia (n = 31, 19.4%).

Overall, 145 of 160 respondents (90.6%; 95% CI, 85.1–94.2%) reported using AI to support their learning in medical school.

AI use was reported by 90 of 99 M1 students (90.9%) and 55 of 61 M2 students (90.2%). There was no significant association between class year and AI use (OR, 0.92; 95% CI, 0.31–2.72; Fisher's exact p = 1.00).

Across campuses, AI use was reported by 75 of 87 Philadelphia students (86.2%), 41 of 42 South Georgia students (97.6%), and 29 of 31 Georgia students (93.5%). The overall association between campus and AI use did not reach statistical significance ($\chi^2 = 4.73$, p = 0.094; Cramér's V = 0.17).

Frequency of AI use

Among the 145 students who reported using AI, 55 (37.9%) reported using AI 6–7 days per week, 16 (11.0%) 5–6 days per week, 12 (8.3%) 4–5 days per week, 15 (10.3%) 3–4 days per week, 22 (15.2%) 2–3 days per week, and 25 (17.2%) 1–2 days per week.

Frequency of AI use did not significantly differ between M1 and M2 students (Mann–Whitney U = 2252, p = 0.348; rank-biserial correlation = −0.09), indicating a small difference between class years.

Frequency of use differed across campuses (Kruskal–Wallis H = 6.78, p = 0.034); however, the magnitude of this association was small ($\eta^2 = 0.034$).

AI platforms utilized

ChatGPT was the most frequently reported AI platform, used by 135 of 145 AI users (93.1%). Other commonly reported platforms included AMBOSS AI (n = 32, 22.1%), Google Gemini (n = 28, 19.3%), Google Notebook (n = 21, 14.5%), and Anki AI add-ons (n = 19, 13.1%). Participants could report use of more than one platform.

Educational applications of AI

Clarifying difficult concepts was the most frequently reported educational application of AI, with 116 of 145 students (80.0%) reporting that they used AI for this purpose often or always. This was followed by generating or answering practice questions (n = 72, 49.7%) and summarizing lecture slides or readings (n = 53, 36.6%).

AI was less frequently used for creating flashcards or mnemonics (n = 28, 19.3%), organizing study plans or schedules (n = 27, 18.6%), reviewing clinical cases or differential diagnoses (n = 24, 16.6%), and practicing standardized patient encounters (n = 13, 9.0%).

Perceived educational benefits of AI

Students generally reported favorable perceptions of AI's educational value. Among AI users, 139 of 145 (95.9%) agreed or strongly agreed that AI helped them understand difficult concepts more clearly, 132 (91.0%) agreed or strongly agreed that AI enhanced the overall quality of their learning experience, and 130 (89.7%) agreed or strongly agreed that AI saved time while studying.

Perceived benefits were less pronounced for retention and higher-order learning outcomes. Eighty-seven students (60.0%) agreed or strongly agreed that AI improved their ability to retain and recall information, while 75 (51.7%) agreed or strongly agreed that AI improved their clinical reasoning and problem-solving skills.

The five items assessing perceived educational benefit demonstrated acceptable internal consistency (Cronbach's $\alpha = 0.79$). Greater frequency of AI use was positively associated with perceived educational benefit (Spearman's $\rho = 0.60$; 95% CI, 0.47–0.71; $p < 0.001$).

Understanding of AI

Among AI users, 92 of 145 students (63.4%) agreed or strongly agreed that they had an adequate understanding of how AI functions and formulates responses. Twenty-seven (18.6%) were neutral, while 26 (17.9%) disagreed or strongly disagreed.

Discussion

This multicampus cross-sectional study found that AI was widely used among surveyed preclinical osteopathic medical students with 145 of 160 respondents (90.6%) who reported using it to support their learning. ChatGPT was the most frequently selected platform, and students most often used AI to clarify difficult concepts, generate practice questions, and summarize material. Other surveys provide context for these patterns. Tran et al. reported generative AI use by 78.9% of 167 respondents at six Canadian medical schools, with ChatGPT the most popular model [5]. In a US survey of 415 students from at least 28 schools conducted in 2023, Ganjavi et al. found that asking for explanations of medical concepts was the most common preclinical use [6]. Differences in survey periods, populations, and definitions of AI use prevent direct comparison of prevalence estimates.

ChatGPT predominated over other AI platforms in our sample, although some respondents also selected AI features embedded in established medical education resources. Because the platform question allowed multiple selections, these results describe the range of tools students used; they do not show whether students used the tools together or preferred one over another.

Use was concentrated in activities that support comprehension and knowledge acquisition. Clarification of difficult concepts was the most frequently reported application, followed by practice question generation and summarization. Students less often reported using AI for clinical case review or

standardized patient practice. The survey did not assess the quality of AI-generated explanations or distinguish independent use from faculty-guided use.

Students reported particularly favorable perceptions of conceptual understanding, study efficiency, and overall learning quality, with less favorable perceptions of retention and clinical reasoning. These are perceived benefits, not measured gains in knowledge or skills. In a small randomized study involving 33 first-year medical students, Kalam et al. observed higher immediate quiz scores with ChatGPT than with institutional materials, but found no statistically significant difference in scores on a resource-free quiz one week later across the study groups [7]. That experiment addressed a different question from our survey, yet illustrates why favorable student perceptions should be assessed alongside objective performance and retention outcomes.

The observed association between frequency of AI use and perceived educational benefit is also noteworthy. Students who used AI more frequently tended to report greater perceived benefit. Several interpretations are possible. Repeated interaction with AI may allow learners to develop more effective strategies for incorporating it into their studying. Conversely, students who perceive substantial benefit from AI may simply choose to use it more frequently.

These findings support practical guidance for AI use in medical education. Students may benefit from instruction in checking generated claims against reliable sources, protecting patient information, and using AI appropriately in assessed work. In a US survey of 177 medical students, Xu et al. found that respondents reporting greater baseline understanding of AI were more likely to report cross-checking and editing ChatGPT output [8]. This association does not establish that teaching AI literacy changes behavior, but it identifies verification habits as a relevant target for future curricular evaluation.

Strengths and limitations

This study has several strengths. It included students from three geographically distinct campuses within an osteopathic medical school and evaluated AI use beyond simple prevalence by examining frequency, platforms, specific educational applications, and perceived benefits. This study also contributes to the limited literature examining AI use among preclinical osteopathic medical students.

Several limitations should also be considered. First, the cross-sectional design prevents determination of temporal or causal relationships between AI use and perceived educational benefit. Second, all measures were self-reported and are therefore susceptible to recall, response, and social-desirability biases. Third, respondents were drawn from a single osteopathic medical institution, limiting generalizability to other medical schools, educational models, geographic regions, and student populations.

Participation was voluntary, creating the possibility of selection bias if students with greater interest in or stronger opinions about AI were more likely to respond. The original frequency categories shared

endpoints (for example, 5–6 and 6–7 days per week), limiting precise interpretation of days of use; respondents selected one category. The form required a PCOM email address to restrict participation to eligible students and limit multiple submissions. Although identifiers were separated from the analysis dataset, this requirement may have affected willingness to respond. The study measured perceived educational benefits rather than objective academic or clinical outcomes. Finally, AI technologies and their adoption are evolving rapidly; consequently, patterns of use observed during the survey period may change as new platforms and AI-enabled educational resources become available.

Conclusion

AI use was highly prevalent among surveyed first- and second-year osteopathic medical students across three campuses, with many students incorporating AI into their routine learning practices. Students primarily used AI to clarify difficult concepts, generate practice questions, and summarize educational material and perceived particularly strong benefits related to conceptual understanding and learning efficiency.

AI was less commonly used for clinically oriented or interactive educational activities, and students perceived comparatively less benefit for clinical reasoning than for conceptual understanding and study efficiency. These findings suggest that AI currently functions primarily as a supplemental learning resource rather than a replacement for experiential and clinically grounded medical education.

Medical schools should consider students' existing patterns of AI use when developing institutional guidance and educational curricula surrounding responsible, critical, and evidence-informed use of AI. Longitudinal and interventional studies incorporating objective academic and clinical outcomes are needed to determine whether the perceived benefits of AI-assisted learning translate into measurable educational improvements.

Abbreviations

AI
Artificial intelligence
PCOM
Philadelphia College of Osteopathic Medicine

Declarations

Ethics approval and consent to participate

The Philadelphia College of Osteopathic Medicine Institutional Review Board approved this secondary analysis of deidentified existing survey data (protocol H26-059X; letter dated September 20, 2026). The IRB determined that the research was exempt from informed consent requirements under 45 CFR 46.104(4). All procedures involving human participants were conducted in accordance with relevant

institutional and national ethical guidelines and regulations, including the principles in the Declaration of Helsinki.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and analyzed during the current study are not publicly available due to considerations regarding participant confidentiality and the potential for identification of respondents from a relatively small institutional sample. Deidentified data are available from the corresponding author upon reasonable request, subject to applicable institutional and ethical requirements.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

CV: Conceptualization, methodology, survey development, investigation, data collection, data curation, formal analysis, visualization, interpretation of results, and writing- original draft.
JO: Principal investigator, supervision, methodology, project administration, funding acquisition, and writing - review and editing.

JS: Project administration, funding acquisition, and writing - review and editing.

All authors read and approved the final manuscript.

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Supplementary Files

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