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Ethical Attitudes Toward Artificial Intelligence in Healthcare Among Medical Students at All Saints University School of Medicine: A Cross-Sectional Study

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ABSTRACT

Background: Artificial intelligence is increasingly entering healthcare through diagnostic support, clinical prediction, image interpretation, workflow automation, and educational tools. Medical students require ethical readiness to use these systems responsibly while protecting patient rights and professional accountability.
Objectives: To assess ethical attitudes toward artificial intelligence in healthcare among medical students at All Saints University School of Medicine and to identify factors associated with favourable ethical attitudes.
Methods: This institution-based cross-sectional study was conducted at All Saints University School of Medicine, Dominica, from April 01, 2026 to April 30, 2026. A total of 110 medical students were included. Data were collected using a structured questionnaire covering demographic variables, previous exposure to artificial intelligence, knowledge, awareness, and ethical attitude statements. Descriptive statistics and chi-square test were used for analysis.
Results: The mean age of participants was 22.6 ± 3.1 years, and females constituted 53.6%. Previous formal exposure to artificial intelligence teaching was reported by 35.5%, and 56.4% had used AI-based learning or healthcare tools. Overall, 68.2% demonstrated favourable ethical attitudes. Most students agreed that AI should support rather than replace clinical judgment, patients should be informed when AI influences decisions, and AI ethics training should be compulsory. Good self-rated AI knowledge showed a statistically significant association with favourable ethical attitude.
Conclusion: Medical students showed favourable but cautious ethical attitudes toward artificial intelligence in healthcare. The findings support structured integration of AI ethics, transparency, privacy protection, accountability, and supervised clinical use into medical education.

Keywords: *Artificial intelligence; Healthcare ethics; Medical students; AI ethics; Medical education.*

INTRODUCTION

Artificial intelligence (AI) has become a major scientific and professional force in modern healthcare. Its applications now extend across diagnostic imaging, clinical decision support, predictive modelling, patient monitoring, drug development, administrative automation, and medical education. The convergence of human expertise and computational systems has created opportunities to improve diagnostic accuracy, personalise treatment, reduce medical error, and support clinicians in complex decision-making [1-3]. At the same time, AI is not a neutral technological tool. Its outputs are shaped by the quality of input data, algorithm design, clinical context, and the ethical controls placed around its use.

In healthcare, ethical concerns related to AI include privacy, confidentiality, informed consent, algorithmic bias, explainability, accountability, patient autonomy, and protection of the patient-physician relationship. Machine-learning systems trained on incomplete or non-representative datasets can reproduce existing inequalities and generate unfair clinical recommendations [4-7]. In addition, opaque algorithms create difficulty for clinicians and patients who expect decisions to be understandable, contestable, and aligned with professional responsibility. These issues are particularly important because clinical AI systems influence high-stakes decisions involving diagnosis, risk prediction, triage, and treatment selection.

Medical students represent a key group in the responsible future adoption of AI. They are entering a professional environment in which AI-assisted tools are likely to become routine components of learning, clinical practice, research, and patient care. Previous studies among medical and healthcare students have reported interest in AI and positive expectations about its role, but have also identified limited formal training, variable knowledge, and concerns about trust, confidentiality, humanistic care, and physician replacement [8-13]. These findings suggest that favourable attitudes alone are insufficient unless accompanied by ethical literacy and structured educational preparation.

The integration of AI ethics into medical curricula is increasingly recommended. Medical students need practical understanding of how AI systems are developed, validated, interpreted, governed, and monitored. They also need clarity regarding patient consent, data stewardship, legal responsibility, bias mitigation, and the boundaries of AI-supported clinical judgment [10,11]. Ethical attitudes among students are therefore useful indicators of their readiness to engage with AI-enabled healthcare in a safe and patient-centred manner.

The present study was conducted to assess ethical attitudes toward artificial intelligence in healthcare among medical students at All Saints University School of Medicine, Dominica. The objectives were to describe students' knowledge and awareness of AI applications, assess their ethical attitudes toward AI in healthcare, and determine demographic and academic factors associated with favourable ethical attitudes.

METHODOLOGY

Study design and setting: This institution-based cross-sectional study was conducted at All Saints University School of Medicine, Dominica. The cross-sectional design was selected because it allowed assessment of knowledge, awareness, and ethical attitudes toward artificial intelligence in healthcare at a single point in time without assigning exposure or intervention. The study was structured in accordance with standard reporting principles for observational studies [14].

Study period: The study was conducted from April 01, 2026 to April 30, 2026. During this period, eligible medical students were approached, informed about the study objectives, and invited to participate voluntarily.

Study population and eligibility criteria: The study population included medical students enrolled at All Saints University School of Medicine during the study period. Students from pre-medical, basic science, and clinical science levels were eligible. Students who were willing to provide informed consent and submitted complete responses for the main variables were included. Students who declined consent or submitted questionnaires with missing primary attitude items were excluded from the final analysis.

Sample size and sampling technique: The sample size was calculated using the single proportion formula n = Z^2pq/d^2. Assuming a favourable ethical attitude proportion of 67%, a 95% confidence level, and an absolute precision of 9%, the minimum required sample size was 105. After allowing for incomplete responses, 110 students were included in the final analysis. Participants were recruited using an institution-based sampling approach to represent different academic levels.

Study tool and data collection: Data were collected using a structured questionnaire developed after reviewing published literature on AI in healthcare, medical education, ethical governance, and previous student attitude surveys [5,9-13]. The questionnaire included sections on demographic characteristics, academic level, previous exposure to AI teaching or seminars, previous use of AI-based learning or healthcare tools, self-rated AI knowledge, awareness of AI applications, and ethical attitude statements. Ethical attitude items covered clinical judgment, informed consent, transparency, privacy, algorithmic bias, legal responsibility, empathy, and curriculum-based AI ethics training.

Outcome variable: The primary outcome was favourable ethical attitude toward AI in healthcare. Ethical attitude was assessed using Likert-type statements and classified as favourable or less favourable based on the predefined scoring approach used for analysis. Higher scores indicated stronger ethical acceptance of supervised, transparent, accountable, and patient-centred AI use.

Statistical analysis: Data were entered, cleaned, and analysed using standard statistical procedures. Categorical variables were summarized as frequencies and percentages. Continuous variables were summarized as mean and standard

deviation. Associations between participant characteristics and favourable ethical attitude were assessed using the chi-square test. A p-value of less than 0.05 was considered statistically significant.

Ethical considerations: Ethical approval was obtained from the institutional ethics committee of All Saints University School of Medicine, Dominica. Participation was voluntary, informed consent was obtained, and confidentiality of responses was maintained throughout the study.

RESULTS

A total of 110 medical students from All Saints University School of Medicine were included in the final analysis. The mean age of the participants was 22.6 ± 3.1 years. Most students were aged 21-23 years (49.1%). Females constituted 59 participants (53.6%), while males accounted for 51 participants (46.4%). Basic science students formed the largest academic group (51.8%). Previous formal exposure to artificial intelligence-related teaching or seminars was reported by 39 students (35.5%), and 62 students (56.4%) had previously used AI-based learning or healthcare-related tools (Table 1).

Table 1. Baseline demographic and academic characteristics of study participants (n=110)

Variable	Frequency	Percentage
Age group		
<=20 years	24	21.8
21-23 years	54	49.1
24-26 years	22	20.0
>26 years	10	9.1
Sex		
Male	51	46.4
Female	59	53.6
Academic level		
Pre-medical	20	18.2
Basic science	57	51.8
Clinical science	33	30.0
Previous formal exposure to AI teaching/seminars		
Yes	39	35.5
No	71	64.5
Previous use of AI-based learning/healthcare tools		
Yes	62	56.4
No	48	43.6

Regarding knowledge and awareness of artificial intelligence in healthcare, 53 students (48.2%) rated their knowledge as fair, 31 students (28.2%) as good, and 26 students (23.6%) as poor. Awareness was highest for AI use in medical image interpretation (72.7%), followed by clinical decision-support systems (65.5%) and robotic surgery (60.9%). Comparatively lower awareness was observed for AI applications in drug discovery and hospital workflow automation (Table 2).

Table 2. Knowledge and awareness of AI applications in healthcare (n=110)

Variable	Frequency	Percentage
Self-rated knowledge of AI in healthcare		
Poor	26	23.6
Fair	53	48.2
Good	31	28.2
Awareness of AI applications in healthcare*		
Medical image interpretation	80	72.7
Clinical decision-support systems	72	65.5
Robotic surgery	67	60.9
Patient monitoring and prediction tools	63	57.3
Drug discovery and development	51	46.4
Hospital workflow automation	46	41.8

*Multiple responses were allowed.

The mean overall ethical attitude score toward AI in healthcare was 43.9 ± 6.8. Based on the predefined classification, 75 students (68.2%) demonstrated a favourable ethical attitude, while 35 students (31.8%) had a less favourable attitude. Most students agreed that AI should support but not replace clinical judgment (86.4%). A large proportion also agreed that patients should be informed when AI influences clinical decisions (84.5%) and that medical students should receive

compulsory training in AI ethics (83.6%). Concerns regarding data confidentiality and privacy were reported by 82.7% of participants (Table 3).

Table 3. Ethical attitudes toward AI in healthcare among medical students (n=110)

Ethical attitude variable	Agree / Frequency n (%)	Neutral n (%)	Disagree n (%)
Overall ethical attitude category			
Favourable ethical attitude	75 (68.2)	-	-
Less favourable ethical attitude	35 (31.8)	-	-
Ethical attitude statements			
AI can improve diagnostic accuracy when supervised by clinicians	86 (78.2)	17 (15.5)	7 (6.4)
AI should support, but not replace, clinical judgment	95 (86.4)	11 (10.0)	4 (3.6)
Patients should be informed when AI influences clinical decisions	93 (84.5)	12 (10.9)	5 (4.5)
Informed consent is important before using AI-based clinical tools	88 (80.0)	15 (13.6)	7 (6.4)
Data confidentiality and privacy are major ethical concerns	91 (82.7)	14 (12.7)	5 (4.5)
AI can introduce bias if trained on incomplete or unequal datasets	79 (71.8)	22 (20.0)	9 (8.2)
Legal responsibility for AI-related errors should be clearly defined	85 (77.3)	19 (17.3)	6 (5.5)
Excessive AI dependence can reduce empathy in healthcare	70 (63.6)	25 (22.7)	15 (13.6)
Medical students should receive compulsory training in AI ethics	92 (83.6)	13 (11.8)	5 (4.5)

Favourable ethical attitude was proportionately higher among clinical science students (78.8%) than among basic science students (64.9%) and pre-medical students (60.0%). Students with previous formal exposure to AI teaching also showed a higher favourable attitude than those without exposure (79.5% versus 62.0%). Previous use of AI-based tools was associated with a higher proportion of favourable attitude (75.8% versus 58.3%). However, in the 110-student sample, statistical significance was observed only for self-rated AI knowledge (p=0.003). Students with good self-rated knowledge had the highest favourable ethical attitude (90.3%) (Table 4).

Table 4. Factors associated with favourable ethical attitude toward AI in healthcare (n=110)

Variable	Favourable attitude n (%)	Less favourable attitude n (%)	p-value
Sex			0.601
Male	33 (64.7)	18 (35.3)	
Female	42 (71.2)	17 (28.8)	
Academic level			0.271
Pre-medical	12 (60.0)	8 (40.0)	
Basic science	37 (64.9)	20 (35.1)	
Clinical science	26 (78.8)	7 (21.2)	
Previous formal AI exposure			0.094
No	44 (62.0)	27 (38.0)	
Yes	31 (79.5)	8 (20.5)	
Previous use of AI-based tools			0.081
No	28 (58.3)	20 (41.7)	
Yes	47 (75.8)	15 (24.2)	
Self-rated AI knowledge			0.003
Poor	13 (50.0)	13 (50.0)	
Fair	34 (64.2)	19 (35.8)	
Good	28 (90.3)	3 (9.7)	

Overall, the findings indicate that most medical students had a favourable but cautious ethical attitude toward AI in healthcare. Students supported the role of AI as a clinical assistance tool, while strongly emphasizing transparency, informed consent, data privacy, accountability, and structured AI ethics training in medical education.

DISCUSSION

This cross-sectional study assessed ethical attitudes toward AI in healthcare among 110 medical students at All Saints University School of Medicine, Dominica. The main finding was that more than two-thirds of students demonstrated favourable ethical attitudes, while retaining clear concerns about privacy, accountability, clinical judgment, and the humanistic dimension of care. This pattern reflects cautious optimism rather than uncritical acceptance. Similar trends have been reported in previous studies and reviews among healthcare students, where positive expectations about AI coexist with gaps in knowledge and concerns regarding ethical safeguards [9,12,13].

The highest agreement in the present study was observed for the statement that AI should support, but not replace, clinical judgment. This is an important professional position because AI systems are most ethically defensible when used as supervised tools that strengthen clinical reasoning rather than substitute physician responsibility. Ethical concerns about machine-learning systems include the risk of hidden bias, lack of transparency, uncertain liability, and over-reliance on automated output [4-7]. The strong agreement regarding patient notification and informed consent also indicates that students recognised patient autonomy as a central ethical requirement in AI-supported care.

Privacy and data protection emerged as prominent concerns. This is expected because healthcare AI depends on large volumes of sensitive clinical, demographic, imaging, and behavioural data. Breaches of confidentiality or secondary data use without adequate consent can weaken patient trust and professional credibility. Trust in medical AI requires not only technical performance, but also transparent governance, explainable outputs, safety monitoring, and clear responsibility for clinical decisions [5,8]. The present findings therefore support the view that AI literacy should include ethical, legal, and social dimensions rather than only computational concepts.

Students with previous formal exposure to AI teaching and previous use of AI-based tools showed higher proportions of favourable ethical attitude, although these associations did not reach statistical significance in this 110-student sample. Good self-rated AI knowledge was significantly associated with favourable ethical attitude. This finding suggests that structured learning and responsible exposure can improve ethical readiness. The comparatively higher favourable attitude among clinical science students also indicates that students with greater clinical context understand both the practical value and the limitations of AI-enabled healthcare. These observations are consistent with literature recommending the integration of AI and AI ethics into medical education [10-12].

The findings have curriculum relevance. Medical schools should introduce AI ethics through case-based teaching, clinical scenarios, data privacy exercises, bias recognition, patient consent discussions, and supervised appraisal of AI outputs. Such training can prepare students to use AI as a transparent, accountable, and patient-centred adjunct. In resource-variable settings, this educational approach is especially important because AI tools are often adopted faster than institutional governance frameworks.

Limitations

This study was conducted in a single medical institution, limiting generalisability to other settings. The cross-sectional design measured attitudes at one point and did not establish temporal relationships. Responses were self-reported, creating potential reporting bias. The ethical attitude score depended on questionnaire-based assessment, and qualitative explanations behind student concerns, decision-making contexts, prior AI experiences, and curriculum exposure were not explored.

CONCLUSION

Medical students at All Saints University School of Medicine demonstrated favourable but cautious ethical attitudes toward artificial intelligence in healthcare. Most participants supported AI as a supervised clinical assistance tool and strongly valued transparency, informed consent, privacy protection, accountability, and structured ethics training. Good self-rated AI knowledge was significantly associated with favourable ethical attitude, while previous formal AI exposure, clinical science level, and prior AI tool use showed positive trends. These findings highlight the need to integrate AI ethics into medical curricula through practical, case-based, and patient-centred teaching. Such training can help future physicians adopt AI responsibly while preserving professional judgment, equity, confidentiality, and the humanistic foundation of clinical care in evolving digital health systems.

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