International Journal of Multidisciplinary Research and Growth Evaluation.

Anesthesia-Techniques Students' Expectations & Attitudes toward Artificial Intelligence in Anesthesia: Sample from Al-Rafidain University College

Sahar A Esa Al Shatari [1*], Mohammed Raad Ali [2], Al-Muntadhar Mushtaq Abbas [3]
[1] M.B.Ch. B / FICMS/ Ass. prophesier-consultant family physician, Baghdad, Iraq.
[2] B. Sc. Anesth., Al-Rafidain college, Baghdad, Iraq.
[3] B. Sc. Anesth., Al-Rafidain college, Baghdad, Iraq.

* Corresponding Author: **Sahar A. Esa Al Shatari**

Article Info

ISSN (Online): 2582-7138
Impact Factor (RSIF): 7.98
Volume: 06
Issue: 06
November - December 2025
Received: 11-09-2025
Accepted: 13-10-2025
Published: 10-11-2025
Page No: 440-450

Abstract

Background: Artificial Intelligence (AI) has rapidly advanced in the medical field, with growing applications in anesthesia, such as patient monitoring, predictive analytics, and automated decision-making. Despite its potential,

Objectives: to assess anesthesia-techniques students' knowledge, expectations, and attitudes toward AI in anesthesia at Al-Rafidain University College and examines the relationship between students' perceptions of AI and some demographic factors and identifying key areas of skepticism and potential for
AI education in anesthesia training.

Method & Participants: A cross-sectional study was conducted among 150 anesthesia students (aged 20-24) from different stages. The survey assessed knowledge, perceptions, and concerns regarding AI in anesthesia. Data Collection: A structured questionnaire covering: Demographics Perceptions of AI in anesthesia, and Ethical and educational considerations. Data analysis was performed using SPSS software, employing descriptive statistics and chi-square tests to identify associations between attitudes and demographic factors.

Results: Students who heard of AI – 96.7%. The main source of AI awareness was social media – 79.3%. Students had limited knowledge of AI – 58%. Students had good knowledge of AI – 33.3%. Neutral attitudes toward AI – 65%. Positive attitudes toward AI – 32.1%. Unsure about AI-assisted anesthesia – 50.1%. Opposed to AI-assisted anesthesia – 32.8%. Acceptance of AI in diagnostics – 72.6%. Acceptance of AI in postoperative monitoring – 63.3%. Concerned about AI's lack of empathy – 36.5%. Concerned about potential communication barriers – 38%. Concerned about AI's inability to detect subtle vital changes – 59.8%.

Conclusion: While anesthesia students recognize AI's potential benefits in anesthesia practice, skepticism remains regarding its ability to ensure patient safety and enhance clinical decision-making.

Keywords: Artificial Intelligence, Machine Learning, Electronic-Health-Record, Artificial-Neural Network, Al-Rafidain-University-College, Baghdad.

1. Introduction

In 1950, Alan Turing proposed that machines could mimic human behavior and thinking, developing the Turing test to distinguish between humans and machines. John McCarthy coined the term "artificial intelligence" in 1956 at a conference on the subject. Since then, computing power has advanced to the point of performing simultaneous calculations and evaluating new data, based on previously evaluated data, in real time [1].

In some books and some authors also write about AI that the term "artificial intelligence" is defined as systems that combine sophisticated hardware and software with elaborate databases and knowledge-based processing models to demonstrate characteristics of effective human decision making [1].

The research team will make three acceptable assumptions, first assumption is the thesis of Church, stating that every calculating device can be modelled by a program, second assumption is that AI is a step device and, on every step, it inputs from outside a

portion of information and outputs a portion of information, the third assumption is that AI is in some environment which gives it a portion of information on every step and which receives the output of AI [2].

Artificial intelligence has been known as the study of algorithms that give machines the ability to reason and perform functions such as problem-solving, object and word recognition, inference of world states, and decision-making [3].

Explain-ability is one of the most heavily debated topics when it comes to the application of artificial intelligence (AI) in healthcare, even though AI-driven systems have been shown to outperform humans in certain analytical tasks, the lack of explainability continues to spark criticism [4].

The importance of AI to the sector of the entire healthcare sector that comprises the hospitals, insurance companies and government agencies also benefit from AI technologies as a whole Since it helps to collect, process, share and store patient data, building on this data AI can provide support towards professional training, and such applications can save time and reduce resource consumption, Extending the application of AI solutions to the field of healthcare brings countless advantages to

this crucial field, it helps minimize resource consumption and reduce treatment expenses, in addition, it accelerates the diagnosis time and thus the decision-making process [5].

Decision-making process has a major impact on treatment strategies and outcomes and might be lifesaving in critical situations, Data sharing in the health sector is important for individual well-being when followed by different doctors in different health institutions [5].

It is also important for scientific research and progress However, accessing medical data is often difficult due to regulatory and privacy challenges, according to Deist et al. (2020), who recommend the personal health train (PHT) system, which provides a privacy-by-design infrastructure connecting data sources while promoting the application of machine learning techniques to distributed data, Paranjape et al. (2019) encourage the use of AI for educational purposes and introduce a framework that includes AI into the medical education curriculum, Holistically speaking, AI can be beneficial across the entire healthcare sector [6].

Anesthesia allows performance of surgical and other interventional procedures by rapidly and safely producing analgesia (pain control), absence of anxiety or absence of awareness with general anesthesia (GA), and adequate muscle relaxation. A critically important aspect of perioperative anesthetic care is maintenance of physiologic homeostasis (e.g., hemodynamic stability, oxygenation, ventilation, temperature) [7].

Anesthesia clinicians (anesthesiologists, Certified Registered Nurse Anesthetists- CRNAs, Anesthesia Assistants-AAs), select and manage intraoperative general, neuraxial, or regional anesthesia (e. g., peripheral nerve blocks), or sedation with monitored anesthesia care (MAC), Anesthesia teams provide care in operating room (OR) and non-OR locations such as endoscopy suites, interventional radiology suites, & interventional cardiology laboratories, Other anesthesia services include preoperative evaluation, postoperative management in the post-anesthesia care unit (PACU) or intensive care unit (ICU), and management of both acute and chronic perioperative pain [8].

Although artificial intelligence is often thought of as relating exclusively to computers or robots, its roots are found across multiple fields, including philosophy, psychology, linguistics, and statistics [9].

Objectives:

- find the Anesthesia-Techniques Students' knowledge about Artificial Intelligence in Anesthesia in Al-Rafidain University College, 2025.
- find the Anesthesia-Techniques Students' Expectations & Attitudes toward Artificial Intelligence in Anesthesia in Al-Rafidain University College, 2025.
- find the association of Expectations & Attitudes toward Artificial Intelligence with some of their demographic variables.

Method & participants

2. Study Design:

This study was a cross-sectional, questionnaire-based study conducted at Al-Rafidain University Collage, between January and February 2025. A total of 150 anesthesia technician student of all stages were enrolled. In our study, the survey consisted of 5- multiple-chose questions and the research team focused on the student segment and asked them questions about the extent of their acceptance of using artificial intelligence in their future work, as they are the youngest group of the medical society and thus the most aware of new methods, especially artificial intelligence.

2.1. Participants:

Eligible participants were aged 20-24 years, they all were studying anesthesia as technicians and from 4 different stages, 103 females and 47 males, and most of them were single.

2.2. Ethical approval:

The study protocol was reviewed and approved by the institutional review board (IRB) of al-Rafidain university collage. Participation in the study was voluntary, and the confidentiality and privacy of the respondents were strictly maintained throughout the data collection and analysis processes. No personal identifiers were collected, and the data was stored securely on password-protected computers accessible only to the researcher.

2.3. study population:

Despite the great progress in the use of AI in medical diagnosis, most studies have focused on technical accuracy without considering the extent to which physicians understand these systems and explain their decisions to patients (Smith et al., 2020). This lack of understanding may affect physicians' adoption of these technologies and reduce patients' trust in them. Therefore, this research seeks to study the impact of the explainability of AI systems on physicians' decisions and patients' trust in them.

2.4. Included criteria:

The research team targeted the students of Al-Rafidain University College, Department of Anesthesia and Intensive Care Techniques

2.4.1. Excluded criteria:

respondents who did not complete the questionnaire were excluded.

2.5. The questionnaire

A structured, self-administered questionnaire was developed to collect data from the participating anesthesia student.
The questionnaire consisted of three main domines:

Demographic characteristics: This section gathered information about the participants' age, gender and the source of information.
Perceptions toward AI in areas of individual patient care
Perception regarding the impact of AI on ethics and medical education.

The questionnaire items were developed based on a comprehensive literature review and refined through consultations with six-experts (2 family medicine, 2 anaesthetics doctors, 2 electronic engineers).

2.5.1. Pillot, Reliability Statistics: -

Pilot study done with 15 students who were not included in the study sample, and reliability calculated as Attitude questions with 16 questions, Cronbach's Alpha was 0.827, and Practice questions with 3 questions, Cronbach's Alpha was 0.755.

The scoring of the Overall attitude

Negative question (first question and second): (Strongly disagreed= 5, disagreed= 4, neutral= 3, agreed= 2, strongly agreed= 1)	negative (5- 30)
	neutral (31- 55)
Positive questions (Remaining 14 questions): (Strongly disagreed= 1, disagreed=2, neutral= 3, agreed= 4, strongly agreed= 5) **Notes:** 13 students have no answer about artificial intelligence	positive (56- 80)

2.6. Sampling technique:

Google Forms was used to create the questionnaire. The Likert system was used to formulate most of the questions in the questionnaire, the data was downloaded and then analyzed using IBM SPSS ver. 26. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were calculated to summarize the demographic characteristics of the participants and their responses to the various domains of the questionnaire.

2.7. Statistical analysis Outcomes and procedures:

The answers were downloaded from the electronic form of the Questionnaire (Google-form) to the computer as an excel file and imported to SPSS ver. 26 to be analyzed. An analysis of the data; frequencies, percentages, and a chi-square test, the data were examined.; P-value is regarded as significant if it's less than 0.05.

2.8. Response rate

One hundred and fifty students studying anesthesia and intensive care techniques out of a total of (one thousand two hundred and sixty-five students) were participated in this study, with a response rate of (11.86%). The largest percentage of participants compared to their numbers were fourth- year students, 24 (28.92%) out of 83 students, and the lowest percentage of participation compared to their numbers were first-year students, 24 (7%) out of 343 students.

Stage	Participants	All students	Response rate
first stage	24	343	7%
second stage	79	583	13.55 %
third stage	23	256	8.98 %
fourth stage	24	83	28.92 %
Total	150	1265	11.86 %

Results:

One hundred and fifty students studying in the Department of Anesthesia and Intensive Care Techniques at Al-Rafidain University College participated in this study, including 24(16.0%) freshmen, 79(52.7%) second-year students, 23(15.3%) third-year students, and 24(16.0%) fourth-year students. The highest percentage of them, 81(54.0%), were less than 20 years old, with a mean age of 20.67 ± 1.917. The majority of the participants were female, 103(68.7%), and most of them were single, 144(96.0%). The percentage of participants who had previously heard about artificial intelligence was 145(96.7%). 87(58.0%) had little knowledge about it, which is the largest percentage. 50(33.3%) of the participants had good knowledge about it, as shown in the table (1).

Table 1: Distribution of the participants students according to their age, sex, stage, Marital status and their hearing about artificial intelligence:

		Frequency N= 150	Percent %
Age Mean= 20.67 Std. Deviation =1.917	≤ 20 years	81	54.0
	21-23 years	58	38.7
	≥ 24 years	11	7.3
Sex	female	103	68.7
	male	47	31.3
Stage	first stage	24	16.0
	second stage	79	52.7
	third stage	23	15.3
	fourth stage	24	16.0
Marital status	single	144	96.0
	married	6	4.0

Did you hear about artificial intelligence	Yes	145	96.7
	No	5	3.3
Your knowledge according your opinion	I don't know	13	8.7
	little knowledge	87	58.0
	good knowledge	50	33.3

According to this study, social media is the primary source, with 79.3% of participants (119 people) relying on it. Internet sites follow, with 24% (36 people) using them. Research and papers, the least used source, are the least influential, with only 3.3% (5 people) mentioning them, as shown in table (2)

Table 2: Distribution of the participants students according to their source of information about artificial intelligent:

	Yes	**%**	**No**	**%**
Social media	119	79.3	31	20.7
Internet sites	36	24.0	114	76.0
College	17	11.3	133	88.7
TV and Radio	14	9.3	136	90.7
Family and friends	12	8.0	138	92.0
Researches & papers	5	3.3	145	96.7
No answer	5	3.3	145	96.7

This study shows that more than half of the participants 77(51.3%) have little knowledge of artificial intelligence. 32(21.3%) of the participants have good knowledge, and 28(18.7%) of the participants have no knowledge about the subject. Regarding the use of artificial intelligence in medical practice, more than half of the students 78(52%) have no knowledge about artificial intelligence applications in the medical field. Only 18(12%) have good knowledge of its medical use, and 41(27.3%) have little knowledge. Regarding its use in daily studies, 58(38.7%) of the students have little knowledge of the use of artificial intelligence in their daily studies, 43(28.7%) have good knowledge of its use, while 36(24.0%) of the students have no knowledge about the use of artificial intelligence in studies. 13(8.7%) of the participants refrained from answering these three questions, as shown in table (3).

Table (3): Distribution of the participants students according to their practicing the artificial intelligent

		Frequency	**Percent**
Total		**150**	**100.0**
Do you have previous or current knowledge in the use of artificial intelligent	No answer	13	8.7
	I don't know	28	18.7
	little knowledge	77	51.3
	good knowledge	32	21.3
Have you previously or currently used artificial intelligent in medical practices	No answer	13	8.7
	I don't know	78	52.0
	little knowledge	41	27.3
	good knowledge	18	12.0
Have you used artificial intelligence in your daily study practice	No answer	13	8.7
	I don't know	36	24.0
	little knowledge	58	38.7
	good knowledge	43	28.7

This table presents the views of 150 participants on the role of artificial intelligence (AI) in anesthesia and medicine in general, 50(36.5%) of participants believe that AI cannot provide empathetic care to patients, 52(38%) are neutral, meaning there is a clear split in opinion. 82(59.8%) believe that AI will not create communication barriers, meaning they see it as a supportive tool rather than a replacement for the doctor. However, 20(14.5%) believe that it may hinder communication, 53(38.6%) believe that AI can enhance safety during anesthesia, while 41(29.9%) do not. The percentage of neutrality is high 43(31.4%), indicating a lack of knowledge or a need for more evidence, 61(44.5%) believe that AI will not be effective in predicting adverse events before they occur, 43(31.4%) are neutral, indicating a general skepticism about its predictive capabilities, 82(59.8%) do not believe that AI is superior to humans in detecting subtle changes in vital signs. 82(59.9%) do not believe that AI is capable of providing reliable general medical advice. 62(45.3%) disagree with the idea that it can provide reliable drug advice for anesthesia. 87(63.5%) do not believe that AI will change the future of anesthesia, reflecting caution or a lack of conviction that technology will soon play a decisive role in this field. 56(40.8%) do not believe that AI can improve patient safety, while 52(38%) are unsure, indicating a split in opinion. 64(46.7%) do not believe that AI can improve the patient experience, reflecting concerns about patient interaction with it. 46(33.5%) believe that AI can assess a patient's condition and refer them to a specialist, while 48(35%) disagree. 91(66.5%) agree that AI can prescribe treatments to patients according to their condition. This exclusion indicates that participants trust its ability to support treatment decisions, perhaps due to its current uses in medicine. 92(67.1%) do not believe it is necessary to add a course on AI to medical curricula, reflecting a belief that its role is not yet essential in medical education, as shown in table (4).

Table 4: Distribution of the participants students according to their attitude toward the artificial intelligent:

		Frequency	Percent
Total		**150**	**100.0**
Do you think AI can provide compassionate care to patients (compassion and compassion towards patients)?	strongly disagreed	16	11.7
	disagreed	34	24.8
	neutral	52	38.0
	agreed	26	19.0
	strongly agreed	9	6.6
Artificial intelligence in medicine will create communication barriers (e.g., doctor-patient communication).	strongly disagreed	37	27.0
	disagreed	45	32.8
	neutral	35	25.5
	agreed	15	10.9
	strongly agreed	5	3.6
How can AI enhance patient safety during anesthesia? Do you think predictive algorithms can identify the risks of adverse events before they occur?	strongly agreed	8	5.8
	agreed	45	32.8
	neutral	43	31.4
	disagreed	33	24.1
	strongly disagreed	8	5.8
Do you think artificial intelligence can improve anesthesia delivery, assess	strongly agreed	6	4.4
	agreed	27	19.7
anesthesia depth, or optimize drug dosages?	neutral	43	31.4
	disagreed	53	38.7
	strongly disagreed	8	5.8
Do you think AI can detect subtle changes in vital signs or other signs faster than humans?	strongly agreed	3	2.2
	agreed	16	11.7
	neutral	36	26.3
	disagreed	61	44.5
	strongly disagreed	21	15.3
Do you think AI is capable of giving general medical advice?	strongly agreed	5	3.6
	agreed	18	13.1
	neutral	32	23.4
	disagreed	66	48.2
	strongly disagreed	16	11.7
Do you think that artificial intelligence is able to give advice regarding the type, course or choice of a specific drug to anesthetize the patient?	strongly agreed	8	5.8
	agreed	26	19.0
	neutral	41	29.9
	disagreed	52	38.0
	strongly disagreed	10	7.3
You believe that the current or future level of artificial intelligence will change the future of anesthesia	strongly agreed	7	5.1
	agreed	12	8.8
	neutral	31	22.6
	disagreed	60	43.8
	strongly disagreed	27	19.7
What do you think about the use of artificial intelligence in anesthesia in the future?	strongly agreed	12	8.8
	agreed	23	16.8
	neutral	39	28.5
	disagreed	47	34.3
	strongly disagreed	16	11.7
Do you think AI can improve patient safety?	strongly agreed	5	3.6
	agreed	24	17.5
	neutral	52	38.0
	disagreed	48	35.0
	strongly disagreed	8	5.8
What do you think about the following sentence: The use of artificial intelligence in medicine can reduce human errors among doctors and their assistants?	strongly agreed	9	6.6
	agreed	17	12.4
	neutral	31	22.6
	disagreed	60	43.8
	strongly disagreed	20	14.6
Would you feel comfortable if artificial intelligence was used in your anesthesia procedure?	strongly agreed	3	2.2
	agreed	11	8.0
	neutral	23	16.8
	disagreed	59	43.1
	strongly disagreed	41	29.9
Do you think that artificial intelligence can contribute to improving the patient experience during anesthesia?	strongly agreed	5	3.6
	agreed	21	15.3
	neutral	47	34.3
	disagreed	53	38.7

	strongly disagreed	11	8.0
Do you think that artificial intelligence can assess the patient's condition and refer him to a specialist doctor?	strongly agreed	11	8.0
	agreed	35	25.5
	neutral	43	31.4
	disagreed	35	25.5
	strongly disagreed	13	9.5
Do you think that artificial intelligence can write a prescription for patients according to their conditions?	strongly agreed	12	8.8
	agreed	79	57.7
	disagreed	40	29.2
	strongly disagreed	6	4.4
Do you think it is necessary to add a scientific subject or materials for students in medical specialties on how to use artificial intelligence? (If their work interferes with artificial intelligence)	strongly agreed	8	5.8
	agreed	13	9.5
	neutral	24	17.5
	disagreed	57	41.6
	strongly disagreed	35	25.5

When participants were asked about their attitude towards artificial intelligence, the majority 89(65%) had a neutral attitude, while 44(32.1%) had a positive attitude, and a few 4(2.9%) had a negative attitude towards artificial intelligence, as shown in fig. (1).

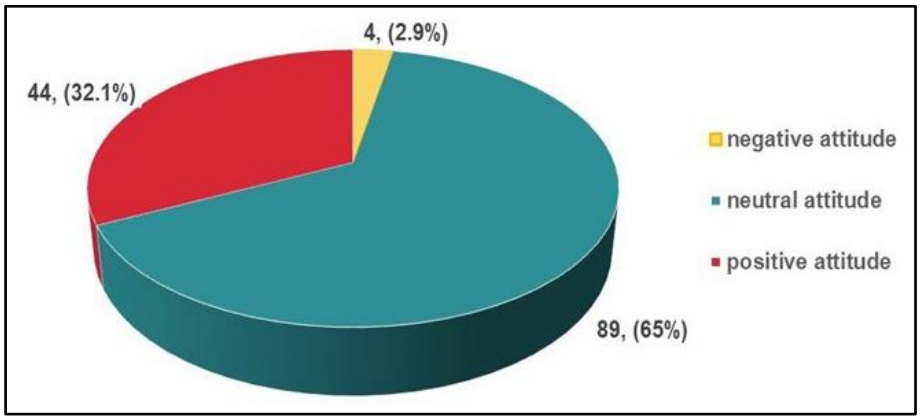

Fig 1: Distribution of student according to their attitude toward the artificial intelligence (N=150)

Regarding students' answers to the question "Would you feel comfortable if artificial intelligence was used in your anesthesia procedure"; the vast majority 70(50.1%) are unsure, about a third of participants 45(32.8%) oppose the idea, and only a small percentage 22(16.1%) support the use of artificial intelligence, as shown in fig. (2).

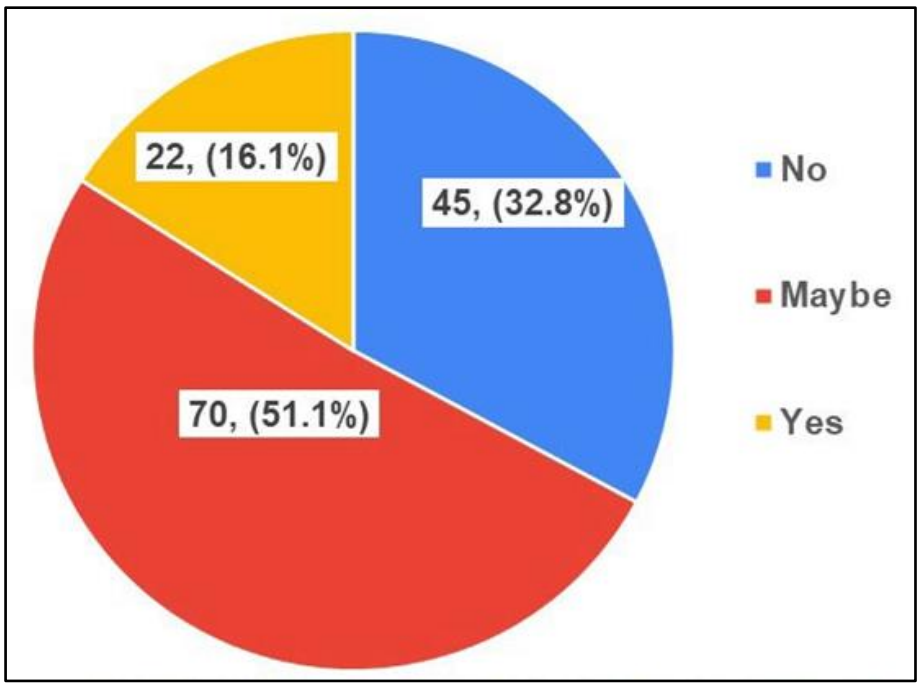

Fig 2: Distribution of students according to their answer "Would you feel comfortable if artificial intelligence was used in your anesthesia procedure" (N=150)

This study found that diagnostic applications received the highest approval rating (109 vs. 41). This indicates students' high confidence in the use of AI in medical diagnosis during anesthesia. Post- operative monitoring received a high approval rating (95 vs. 55). Selecting the type of anesthesia also received high approval rating (94 vs. 56). This, too, is considered relatively high approval rating. This reflects students' confidence in AI's ability to support medical decisions related to anesthesia. While there were mixed opinions about intraoperative monitoring and dose calculation, the monitoring during operation application received 70 vs. 80, indicating a split in opinions regarding the effectiveness of AI at this sensitive stage. Calculating doses during operation was roughly balanced between approval (72) and rejection (78), reflecting concerns about the accuracy and safety of AI in this area, as shown in fig. (3).

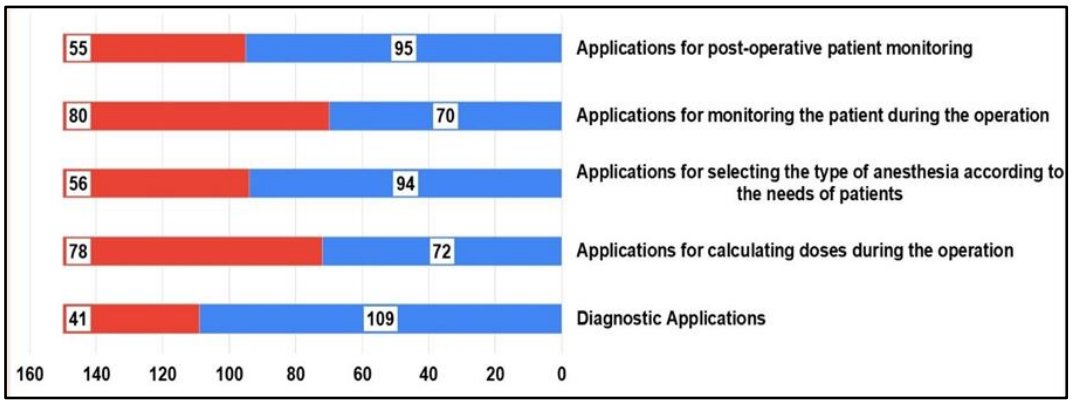

Fig 3: Distribution of students' opinion about potential applications they can see for artificial intelligence in anesthesia

This image shows a statistical analysis of the distribution of ratings, with an average rating of 2.28 out of 5.

Data Analysis: Rating Distribution:
1 Star: 37 people (26.8%)
2 Stars: 44 people (31.9%)
3 Stars: 45 people (32.6%)
4 Stars: 6 people (4.3%)
5 Stars: 6 people (4.3%)

Rating Trend:
The majority of ratings are between 1 and 3 stars, indicating an average or generally unsatisfactory experience.
The lowest percentage were given high ratings (4 and 5 stars), meaning that only a small number were very satisfied with the experience.
The largest percentage (about 32.6%) gave 3 stars, indicating a relatively neutral rating.

Average Rating (2.28):
This figure is low, reflecting poor user satisfaction. Conclusion:
The results regarding the evaluation of the future of artificial intelligence in Iraq appear to be generally unsatisfactory for users, with most ratings ranging from 1 to 3 stars.
This image shows a statistical analysis of the distribution of ratings by 138 people, with an average rating of 3.36 stars.

Data Analysis:
Rating Distribution:
1-star: 7 people (5.1%)
2-star: 19 people (13.8%)
3-star: 50 people (36.2%) (most common category)
4-star: 41 people (29.7%)
5-star: 21 people (15.2%)

Fig 4: this diagram shows a rate for the future of AI locally (in Iraq)

General Trend:
The majority of ratings are between 3 and 4 stars, indicating average to good satisfaction among respondents.
The percentage of low ratings (1 and 2 stars) is 18.9%, significantly lower than the average and high ratings.
The percentage of high ratings (4 and 5 stars) is 44.9%, indicating that a large number of respondents have a positive impression.
Arithmetic mean (3.36):
Indicates that opinions tend toward moderate satisfaction, but not excellent.

Conclusion:
Students seem to see a future for AI in the world. The rating is generally acceptable, but there is room for improvement.
It is useful to analyze the reasons for the 1- and 2-star ratings to identify weaknesses and work toward improving them.

Fig 5: this diagram shows a rate for the future of AI Globally

In concern about the attitudes and opinions of 137 participants regarding artificial intelligence in anesthesia, based on several variables such as age, gender, educational level, knowledge, and comfort with using AI in anesthesia procedures. A detailed analysis of the results is provided below:
General attitude toward AI in anesthesia: 44 participants had a positive attitude, 89 participants were neutral, and 4 participants had a negative attitude. This indicates that the majority are either neutral or positive toward AI in anesthesia, while there is no significant rejection of it.
The effect of age on attitudes toward AI: Age group <20 years: 47 were neutral, 25 were positive, and 4 were negative. Age group 21-23 years: 34 were neutral, 17 were positive, and none were negative. Age group ≥24 years: 8 were neutral, 2 were positive, and none were negative. P-value = 0.381: There is no significant effect of age on attitudes toward AI, as the overall attitude is similar across groups.
Gender effect on attitudes toward AI: Females: 65 neutral, 27 positives, and 2 negative. Males: 24 neutral, 17 positives, and 2 negative. P-value = 0.283: There is no significant difference between genders in attitudes toward AI.

Effect of educational level:
Grade 1: 14 neutral, 6 positives, and no negative.
Grade 2: 45 neutral, 24 positives, and 4 negatives.
Grade 3: 16 neutral, 7 positives, and no negative.
Grade 4: 14 neutral, 7 positive, and no negative.
Grade 4: 14 neutral, 7 positives, and no negative.
P-value = 0.695: There is no significant effect of educational level on attitudes toward AI.
Effect of Marital Status: Single: 86 neutral, 42 positive, and 4 negatives. Married: 3 neutral, 2 positives, and no negative.
P-value = 0.873: Marital status has no effect on attitudes toward AI.
Effect of Prior Knowledge of AI: Those with little knowledge: 64 neutral, 22 positive, and 1 negative. Those with good knowledge: 25 neutral, 22 positive, and 3 negatives. P-value = 0.013: There is a clear effect of prior knowledge on attitudes toward AI, with positive attitudes increasing with increasing knowledge.
Comfort About the Use of AI in Anesthesia: Not comfortable: 38 neutral, 5 positives, and 2 negative. May feel comfortable: 47 neutral, 21 positive, and 2 negative. Feel comfortable: 4 neutral, 18 positives, and none negative. P-value = 0.000: There is a clear significant difference, with those who feel comfortable with AI having a more positive attitude.
Global Assessment of the Future of AI in Anesthesia: Strong agreement: 22 neutral, 11 positive, and 4 negatives. Agreement: 33 neutral, 10 positives, and none negative. Neutral: 29 neutral, 16 positives, and none negative. Disagreement: 3 neutral, 3 positives, and none negative. Strong disagreement: 2 neutral, 4 positives, and none negative. P-value = 0.029: There is a significant difference in the assessment of the future of AI globally, with the majority being neutral or positive.
Evaluation of the Future of Artificial Intelligence in Anesthesia in Iraq: Strong agreement: 3 neutral, 1 positive. Agreement: 14 neutral, 4 positives. Neutral: 35 neutral, 14 positives.
Opposition: 26 neutral, 15 positives. Strong opposition: 11 neutral, 10 positives. P-value = 0.000: There is a significant difference, with greater reservations about the future of artificial intelligence in Iraq compared to the global assessment.

Table 5: overall attitude and opinions of the students

		Overall attitude			Total	P value
		negative	neutral	positive		
Total (without students with no answers)		4	89	44	137	
Age	≤ 20 years	4	47	25	76	0.381
	21-23 years	0	34	17	51	
	≥ 24 years	0	8	2	10	
Sex	Female	2	65	27	94	0.283
	Male	2	24	17	43	
Stage	first stage	0	14	6	20	0.695
	second stage	4	45	24	73	
	third stage	0	16	7	23	
	fourth stage	0	14	7	21	
Marital status	Single	4	86	42	132	0.873
	Married	0	3	2	5	
your knowledge according to your opinion	Little	1	64	22	87	0.013
	Good	3	25	22	50	
Would you feel comfortable if artificial intelligence was used in your anesthesia procedure?	No	2	38	5	45	0.000
	Maybe	2	47	21	70	
	Yes	0	4	18	22	
Globally How to assess the future of AI in anesthesia	strongly agreed	4	22	11	37	0.029
	Agreed	0	33	10	43	
	Neutral	0	29	16	45	
	Disagreed	0	3	3	6	
	strongly disagreed	0	2	4	6	
Inside Iraq How to Assess the Future of Artificial Intelligence	strongly agreed	3	3	1	7	0.000
	Agreed	0	14	4	18	
	Neutral	1	35	14	50	
	Disagreed	0	26	15	41	
	strongly disagreed	0	11	10	21	

4. Discussion

This study's findings were shed light on anesthesia techniques students' expectations and attitudes toward artificial intelligence in anesthesia. AI is increasingly shaping modern anesthetic practices, with applications ranging from patient monitoring and decision support to drug administration, and perioperative management. However, its adoption is met with varying degrees of acceptance among students, highlighting key areas for further education, integration, and ethical considerations.

4.1. Students' Awareness and Knowledge of AI in Anesthesia:

The majority of students had heard about AI in anesthesia, primarily through social media and internet sources, rather than formal education. This indicates a gap in structured AI education within medical and anesthesia training programs. While a significant proportion of students had some knowledge of AI, relatively few reported hands-on experiences in using AI-based tools. This suggests that exposure to AI applications in anesthesia is still in its early stages and requires a more structured academic approach.

4.1.1. Perceptions of AI's Role in Patient Safety and Anesthetic Care:

Despite the advancements AI has brought to medicine, a considerable number of students expressed skepticism about AI's ability to enhance patient safety during anesthesia. Many students remained neutral or disagreed with statements suggesting that AI could reduce human error, detect subtle changes in vital signs, or predict adverse events before they occur. These findings may stem from a lack of direct exposure to AI in clinical settings or concerns about the reliability of AI-driven decision-making in high-risk environments like anesthesia. As shown in similar research: Attitudes of Anesthesiologists toward Artificial Intelligence in Anesthesia: A Multicenter, Mixed Qualitative-Quantitative Study (2023). Journal of clinical medicine, 12(6), 2096.Switzerland and Germany [10].

Interestingly, while some students acknowledged AI's ability to process large datasets and provide predictive analytics, many remained doubtful about its capability to offer compassionate patient care. The human element in anesthesia—such as empathy, intuition, and adaptability—was perceived as a crucial factor that AI could not replace. This aligns with previous literature suggesting that AI should serve as a supportive tool rather than a replacement for anesthesiologists.

4.1.2. Expectations for AI in the Future of Anesthesia:

A notable proportion of students believed that AI would play a significant role in shaping the future of anesthesia, although many were uncertain or hesitant about its direct implementation. While some saw AI as a means to enhance efficiency and decision-making, others were concerned about potential communication barriers between patients and healthcare providers. The results suggest that while AI's technological potential is acknowledged, its real-world implications raise concerns that need to be addressed through proper training and awareness. As shown in similar research: Artificial intelligence and anesthesia: A narrative review. Saudi Journal of Anaesthesia 16(1):p 86-93, Jan–Mar 2022.India [11].

4.1.3. Ethical and Educational Considerations:

One of the key challenges identified in the study is the ethical dilemma surrounding AI in anesthesia. Questions about patient privacy, informed consent, and legal responsibility in

the event of AI-related errors were significant concerns among students. Additionally, the concept of AI as a "black box" system—where decision- making processes are not entirely explainable—further contributed to skepticism. These concerns highlight the need for clearer regulatory frameworks and ethical guidelines to ensure responsible AI implementation.

Furthermore, most students did not strongly support the integration of AI-related subjects into their curriculum, indicating potential resistance to change or a lack of understanding of AI's importance in their field. This suggests that any effort to introduce AI training into medical education should be carefully structured to highlight its practical benefits and address misconceptions. As shown in similar research: Exploring Artificial Intelligence in Anesthesia: A Primer on Ethics, and Clinical Applications. (2023) Surgeries, 4(2), 264-274. Italy [12].

4.1.4. Implications for Future Research and Practice:

The study underscores the need for further research on how AI can be effectively integrated into anesthesia training programs. Hands-on exposure to AI applications, case-based learning, and interactive simulations may help students gain confidence in AI-assisted anesthesia. Additionally, interdisciplinary collaboration between anesthesiologists, computer scientists, and medical educators can facilitate the development of AI tools that are more user-friendly and aligned with the needs of anesthetic practice.

Overall, while AI holds significant promise for the future of anesthesia, its acceptance among anesthesia students remains mixed. Addressing concerns through education, ethical frameworks, and practical training will be essential in ensuring that AI becomes a valuable asset in anesthetic practice rather than a source of uncertainty. As shown in similar research: Artificial Intelligence in Anesthesiology: Current Techniques, Clinical Applications, and Limitations. Anesthesiology, (2020) 132(2), 379–394. United states of America (13).

4.2. Conclusion

1. AI's Growing Role in Anesthesia:
2. AI is becoming increasingly significant in anesthesia, with applications in patient monitoring, decision support, drug administration, and perioperative management. Despite this, there are mixed perceptions regarding its reliability and acceptance among students.
3. Student Awareness and Knowledge: Most students have heard about AI in anesthesia but primarily through informal sources such as social media and the internet, rather than structured academic programs.
4. Hands-on experience with AI tools remains limited, highlighting the need for more structured AI education in anesthesia training.
5. Skepticism and Ethical Concerns: Many students doubt AI's ability to enhance patient safety and prevent human error in anesthesia. There is a strong belief that AI cannot replace the human elements of anesthesia, such as empathy, intuition, and adaptability.
6. Ethical concerns about data privacy, liability, and AI replacing human jobs remain significant.
7. Future Expectations and Implementation Challenges: While some students are optimistic about AI's future in anesthesia, many remain uncertain or hesitant about its direct implementation.
8. AI's potential is recognized in data analysis, decision-making support, and diagnostics, but there is resistance to AI managing critical intraoperative tasks.
9. The acceptance of AI is higher globally than in Iraq, where skepticism is more pronounced due to uncertainty and lack of awareness.
10. **Final Takeaway:** AI in anesthesia has promising applications but faces challenges in acceptance, trust, and education. Addressing knowledge gaps, ethical concerns, and hands-on exposure will be critical for AI's successful integration into anesthesia practice. AI should be seen as a supportive tool rather than a replacement for anesthesiologists, ensuring patient safety and ethical integrity in its implementation

4.3. Recommendations

1. To ensure successful AI adoption in anesthesia, education, ethical considerations, and interdisciplinary research must be prioritized. By addressing students' concerns and providing proper training, AI can become a valuable enhancement to anesthetic practice rather than a source of uncertainty.
2. Conduct Further Research on AI in Anesthesia.

5. References:

1. Mintz Y, Brodie R. Introduction to artificial intelligence in medicine. Minim Invasive Ther Allied Technol. 2019;28(2):73–81. Available from: https://doi.org/10.1080/13645706.2019.1575882
2. Dobrev D. A definition of artificial intelligence. Math Balk. 2005;19(1–2):67–74. Available from: https://arxiv.org/abs/1210.1568
3. Witkowski E, Ward T. Artificial intelligence assisted surgery. In: Bohr A, Memarzadeh K, editors. Artificial Intelligence in Healthcare. Academic Press; 2020. p. 179–202. Available from: https://doi.org/10.1016/B978-0-12-818438-7.00008-3
4. Amann J, Blasimme A, Vayena E, et al. Explainability for artificial intelligence in healthcare: a multidisciplinary perspective. BMC Med Inform Decis Mak. 2020;20:310. Available from: https://doi.org/10.1186/s12911-020-01332-6
5. Ali O, Abdelbaki W, Shrestha A, Elbasi E, Alryalat MAA, Dwivedi YK. A systematic literature review of artificial intelligence in the healthcare sector: benefits, challenges, methodologies, and functionalities. J Innov Knowl. 2023;8(1):100333. Available from: https://doi.org/10.1016/j.jik.2023.100333
6. Varnosfaderani SM, Forouzanfar M. The role of AI in hospitals and clinics: transforming healthcare in the 21st century. Bioengineering. 2024;11(4):337. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC11047988/
7. Falk SA. Overview of anesthesia. UpToDate. Available from: https://www.uptodate.com/contents/overview-of-anesthesia
8. Sohn HM, Ryu JH. Monitored anesthesia care in and outside the operating room. Korean J Anesthesiol. 2016;69(4):319–26. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC4967625/
9. Hashimoto DA, Witkowski E, Gao L, Meireles O, Rosman G. Artificial intelligence in anesthesiology: current techniques, clinical applications, and limitations. Anesthesiology. 2020;132(2):379–94. Available from:

https://pubmed.ncbi.nlm.nih.gov/31939856/
10. Henckert D, Malorgio A, Schweiger G, Raimann FJ, Piekarski F, Zacharowski K, et al. Attitudes of anesthesiologists toward artificial intelligence in anesthesia: a multicenter, mixed qualitative–quantitative study. J Clin Med. 2023;12(6):2096. Available from: https://doi.org/10.3390/jcm12062096
11. Singh M, Nath G. Artificial intelligence and anesthesia: a narrative review. Saudi J Anaesth. 2022;16(1):40–54. Available from: https://doi.org/10.4103/sja.sja_669_21
12. Cascella M, Tracey MC, Petrucci E, Bignami EG. Exploring artificial intelligence in anesthesia: a primer on ethics and clinical applications. Surgeries. 2023;4(2):264–74. Available from: https://doi.org/10.3390/surgeries4020027

How to Cite This Article

Al Shatari SAE, Ali MR, Abbas AM. Anesthesia-Techniques Students' Expectations & Attitudes toward Artificial Intelligence in Anesthesia: Sample from Al-Rafidain University College. Int J Multidiscip Res Growth Eval. 2025;6(6):440-450.

Creative Commons (CC) License