

AI in the Preoperative Environment: Evaluating Trust and Reliability among Anesthesia Providers

Muhammad Huzaifa Javaid,
Green International University, Lahore

Imad Ud Din Khan
Green International University, Lahore

Author Details

Keywords: Artificial Intelligence; Preoperative Anesthesia; Medication Optimization; Anesthesia Providers; Clinical Decision Support; Perioperative Care; Technology Adoption

Received on 17 Jan 2026

Accepted on 19 Feb 2026

Published on 26 Feb 2026

Corresponding E-mail & Author*:

Imad Ud Din Khan

Email: imadkhanck@gmail.com

Abstract

Background: Artificial intelligence (AI) is increasingly being explored in anesthesia to support clinical decision-making and enhance patient safety. However, limited data exist regarding anesthesia providers' familiarity with AI and their perceptions of its role in preoperative care.

Objective: This study aimed to assess anesthesia providers' familiarity with AI applications in preoperative care, perceptions of AI-assisted medication optimization, and willingness to adopt AI tools in clinical practice.

Methods: A cross-sectional survey was conducted using a structured questionnaire among 60 anesthesia providers. Data were analyzed descriptively to evaluate levels of familiarity, perceived usefulness, and acceptance of AI in preoperative anesthesia care.

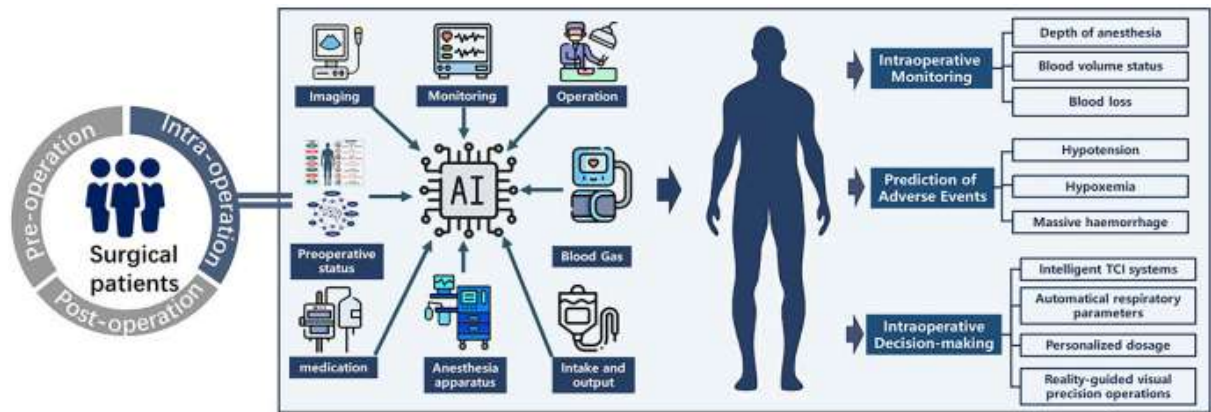
Results: Most participants demonstrated moderate familiarity with AI applications in preoperative care. A majority perceived AI as a useful tool for medication optimization, and more than half expressed willingness to adopt AI-based systems in routine practice. Only a small proportion reported reluctance toward AI use.

Conclusion: Anesthesia providers showed moderate awareness and generally positive perceptions of AI in preoperative care, with favorable acceptance of AI-assisted medication optimization. These findings suggest growing readiness for AI integration in anesthesia

practice, highlighting the need for structured education, clinical validation, and ethical implementation to support safe and effective adoption.

Introduction:

AI encompasses all methods that allow computers to simulate human intellect.(1) It excels in medical diagnosis, treatment, medication manufacture, clinical management, and teaching. (2) Through the use of artificial intelligence, real-time analysis of large patient datasets improves accuracy.(3)Enabling better risk assessment, personalized anesthesia planning, and continuous intraoperative monitoring.(4) Moreover, machine learning reduces anesthesia errors and predicts postoperative risks, with earlier intervention and fewer adverse events. (5) Consequently, this approach provide accuracy in techniques.(6) Integrating AI in anesthesia enables predictive models, automated drug delivery, and vital sign monitoring.(7)Ethical concerns and data privacy must be addressed to ensure it supports patient care safely.(8) Additionally, automated systems can track vital signs during surgery and alert clinicians when intervention is needed.(9) , Integration AI and ML marks the next frontier in anesthesia, with the potential to boost efficiency, lower costs, and enhance patient safety.(10)



(11)

The applications of AI in anesthesia are wide-ranging, covering the entire perioperative continuum.(12) AI has been applied to assess physical status classification, where early rule-based systems improved accuracy through audits and feedback.(13) Anesthesiologists are responsible for maintaining physiological stability, managing pain, and ensuring proper levels of consciousness during surgery.(14) This enables earlier detection of potential issues such as hypotension, arrhythmias, or inadequate pain control, allowing anesthesiologists to intervene proactively.(15) It can predict surgical case duration more accurately, enabling more efficient scheduling and resource management.(16) Moreover, automating routine tasks like record-keeping and pre-anesthetic data collection allows anesthesiologists to focus more on critical decisions and direct patient care.(17) However, it may reduce the essential “human touch” in patient care, which is especially important in anesthesia for patient reassurance and psychological support.(18) AI enhances operating room efficiency through organized scheduling and automated documentation.(19) However, its widespread adoption in anesthesia faces challenges like ethical concerns, clinical skepticism, variability across healthcare systems, and limited in-depth data.(20) One major benefit of AI in anesthesia management is its ability to provide predictive analytics.(21) Recent approaches show that traditional intraoperative pain management risks opioid under- or overdosing due to limited real-time monitoring. AI offers data-driven, personalized strategies that enable real-time adjustments, improving safety, outcomes, and patient-centered care.(22)

The ASA physical status classification is a key tool for preoperative risk assessment. Recent studies show AI can closely match anesthesiologists’ evaluations, highlighting its potential to support accurate, data-driven decision-making in anesthesia management.(23) Precise regulation reduces complications and improves outcomes, while closed-loop systems free anesthesiologists to handle complex or unexpected events.(24) AI optimizes ventilator settings in real time, protecting lungs and reducing injury.(25) AI-driven

solutions in delivering personalized anesthesia care, optimizing both hypnosis and analgesia, and enhancing surgical outcomes.(26)

Material and methods:

The objective of this cross-sectional study was to assess the level of trust, acceptance, and perceived reliability of artificial intelligence (AI) tools in preoperative assessment among anesthesia professionals. The study was conducted over a period of six months following approval of the synopsis at Ali Fatima Hospital, including its affiliated teaching and tertiary care facilities. 60 Participants were selected using convenience sampling and included consultant anesthesiologists, anesthesia residents, and anesthesia technologists or nurse anesthetists who were actively involved in preoperative assessment and perioperative anesthesia care, had at least 6 months to 1 year of clinical experience, participated in clinical decision-making, and had basic awareness or prior exposure to AI-based decision-support tools. Healthcare professionals not involved in anesthesia care, personnel without preoperative responsibilities, interns or students with less than six months of experience, staff working exclusively in postoperative units or pain clinics, individuals with no familiarity with AI applications, developers of AI tools, and respondents with incomplete or duplicate data were excluded. Data were collected using a self-structured questionnaire capturing demographic characteristics, professional role, healthcare setting, exposure to AI, trust, confidence, acceptance, perceived impact on patient safety, workload, and overall satisfaction. Written informed consent was obtained from all participants prior to recruitment. Statistical analysis and ethical approval were ensured in accordance with institutional guidelines.

Results:

Table 4.1: How Familiar are you with the following AI application in Preoperative care

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Familiar	4	6.7	6.7	6.7
	Slightly Familiar	19	31.7	31.7	38.3
	Moderately Familiar	18	30.0	30.0	68.3
	Very Familiar	12	20.0	20.0	88.3
	Extremely Familiar	7	11.7	11.7	100.0
	Total	60	100.0	100.0	

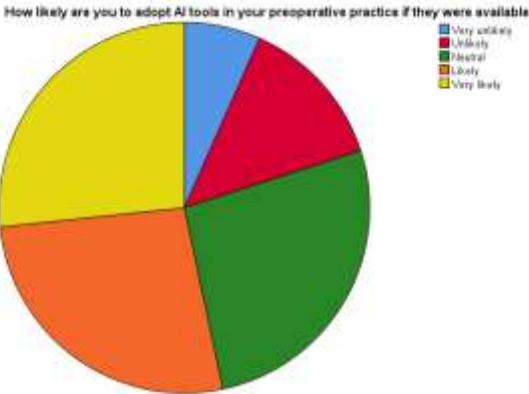
This chart illustrates respondents’ familiarity with AI applications in preoperative care. Most participants reported being slightly to moderately familiar with AI (61.7%), while a smaller proportion indicated very or extremely high familiarity (31.7%). Only a minority of respondents (6.7%) reported no familiarity with AI tools. Overall, the findings suggest moderate awareness of AI technologies among anesthesia providers.

Table 4.2: AI for medication optimization

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	37	61.7	61.7	61.7
	No	23	38.3	38.3	100.0
	Total	60	100.0	100.0	

This chart shows participants’ perceptions of AI use for medication optimization in preoperative care. A majority of respondents (61.7%) believed that AI can be effectively used for medication optimization, while 38.3% did not support its use for this purpose. These findings indicate a generally positive attitude toward AI-assisted medication management among anesthesia providers.

This chart shows participants’ willingness to adopt AI tools in preoperative practice. Over half of respondents (53.4%) reported being likely or very likely to adopt AI, while 26.7% were neutral. Only a minority (20.0%) expressed reluctance, indicating overall positive acceptance of AI tools.



Discussion:

The present study demonstrated moderate familiarity with AI applications in preoperative care among anesthesia providers, with most respondents reporting slight to moderate awareness and only a minority indicating no familiarity. This finding is consistent with reports from *Anesthesia & Analgesia* (2024) and *npj Digital Medicine* (2023), which describe increasing awareness of AI but limited routine clinical use due to gradual integration into perioperative workflows.

A majority of participants believed that AI can be effectively used for medication optimization, reflecting a positive perception of AI-assisted pharmacological support. Similar conclusions have been reported in the *Journal of Clinical Medicine* (MDPI, 2024) and PMC-based reviews, which highlight AI’s potential to improve individualized drug dosing and enhance medication safety.

More than half of respondents expressed willingness to adopt AI tools in preoperative practice, with only a small proportion showing reluctance. This aligns with findings from the *Saudi Journal of Anesthesia* (2022) and *Current Opinion in Anesthesiology* (2024), indicating growing acceptance of AI as a supportive adjunct in anesthesia care. Overall, these results support the expanding role of AI in preoperative anesthesia while emphasizing the need for continued education and clinical integration.

Conclusion:

The study demonstrates moderate familiarity and generally positive perceptions of AI among anesthesia providers, with a majority recognizing its potential in medication optimization and

expressing willingness to adopt AI tools in preoperative care. These findings are consistent with recent literature highlighting AI's supportive role in enhancing decision-making, safety, and efficiency in anesthesia practice. While acceptance is growing, targeted education, robust clinical validation, and ethical safeguards are essential to ensure effective and responsible integration of AI into routine preoperative anesthesia care.

Limitations:

This study was conducted at a single center with a relatively small sample size, which may limit the generalizability of the findings. Convenience sampling may have introduced selection bias, as participants with prior interest or exposure to AI could be overrepresented. The use of a self-structured questionnaire relies on self-reported perceptions rather than objective measures of AI use, which may be influenced by response bias. Additionally, the cross-sectional design captures perceptions at one point in time and does not assess changes in attitudes with increasing exposure or training.

Recommendations:

Future studies should include multicenter designs with larger and more diverse samples to improve external validity. Longitudinal research is recommended to evaluate how familiarity, trust, and acceptance of AI evolve with increased clinical implementation. Incorporating objective indicators of AI utilization and performance alongside perception-based measures would strengthen evidence. Structured training programs and guidelines on ethical use, data security, and clinical validation of AI tools should be developed to enhance confidence and safe adoption among anesthesia professional

References:

- Bellini V, Rafano Carnà E, Russo M, Di Vincenzo F, Berghenti M, Baciarello M, et al. Artificial intelligence and anesthesia: a narrative review. *Ann Transl Med.* 2022;10(9):528.
- Liu PR, Lu L, Zhang JY, Huo TT, Liu SX, Ye ZW. Application of Artificial Intelligence in Medicine: An Overview. *Curr Med Sci.* 2021;41(6):1105-15.
- Bellini V, Valente M, Gaddi AV, Pelosi P, Bignami E. Artificial intelligence and telemedicine in anesthesia: potential and problems. *Minerva anesthesiologica.* 2022;88(9):729-34.
- Fritz BA, King CR, Abdelhack M, Chen Y, Kronzer A, Abraham J, et al. Effect of machine learning models on clinician prediction of postoperative complications: the Perioperative ORACLE randomised clinical trial. *British journal of anaesthesia.* 2024;133(5):1042-50.
- Miyaguchi N, Takeuchi K, Kashima H, Morita M, Morimatsu H. Predicting anesthetic infusion events using machine learning. *Scientific reports.* 2021;11(1):23648.
- Tu Z, Zhang Y, Lv X, Wang Y, Zhang T, Wang J, et al. Accurate Machine Learning-based Monitoring of Anesthesia Depth with EEG Recording. *Neuroscience Bulletin.* 2025;41(3):449-60.
- Petermann H, Böhler H, Witte W. Von der Äthernarkose zur „grünen“ Anästhesie: Herausforderungen in der Anästhesiologie der letzten 175 Jahre. *Anaesthesist.* 2021;70(10).
- Ridhoka ER, Nurdiansyah E. Impact of Artificial Intelligence on Anesthesia Decision-Making: A Comprehensive Systematic Review. *The International Journal of Medical Science and Health Research.* 2025;15(7):1-16.
- Lee H-C, Ryu H-G, Chung E-J, Jung C-W. Prediction of bispectral index during target-controlled infusion of propofol and remifentanyl. *Anesthesiology.* 2018;128(3):492-501.
- Bihorac A, Ozrazgat-Baslanti T, Ebadi A, Motaei A, Madkour M, Pardalos PM, et al. MySurgeryRisk: development and validation of a machine-learning risk algorithm for major complications and death after surgery. *Annals of surgery.* 2019;269(4):652-62.
- Shu X, Zhu Y, Liu X, Li Y, Yi B, Wang Y. Applications of artificial intelligence in anesthesiology. *Anesthesiology and Perioperative Science.* 2025;3(4):48.
- Lengston V, Falkner S. The Dawn of Intelligent Anesthesia: AI's Role in Surgical Care. *Journal of Surgery & Anesthesia Research SRC/JSAR-281 DOI: doi.org/1047363/JSAR/2025 (6).* 2025;239:2-6.
- Joosten K. The attitude of anesthesia assistants towards Artificial Intelligence-assisted patient monitoring in the Operating Room.
- Duarte-Medrano G, Nuño-Lámbarri N, Paternò DS, La Via L, Tutino S, Dominguez-Cherit G, et al., editors. Advancing a Hybrid Decision-Making Model in Anesthesiology: Applications of Artificial Intelligence in the Perioperative Setting. *Healthcare*; 2025: MDPI.
- Ye J, Bronstein S. Artificial intelligence and digital health in Anesthesiology. *The Digital Doctor: Elsevier*; 2025. p. 291-307.
- Pardo E, Le Cam E, Verdonk F. Artificial intelligence and nonoperating room anesthesia. *Current Opinion in Anesthesiology.* 2024;37(4):413-20.

- Raposo S, Mascarenhas M, Correia Bezerra R, Ferreira JC, editors. Specialised competencies and artificial intelligence in perioperative care: Contributions toward safer practice. Healthcare; 2025: MDPI.
- Han L, Char DS, Aghaeepour N, Group SAAW. Artificial intelligence in perioperative care: opportunities and challenges. *Anesthesiology*. 2024;141(2):379.
- Dost A, Alaraj R, Mayet R, Agrawal DK. Reshaping Anesthesia with Artificial Intelligence: From Concept to Reality. *Anesth Crit Care*. 2025;7(3):77-90.
- Gao Z, Winhusen TJ, Gorenflo M, Ghitza UE, Davis PB, Kaelber DC, et al. Repurposing ketamine to treat cocaine use disorder: integration of artificial intelligence-based prediction, expert evaluation, clinical corroboration and mechanism of action analyses. *Addiction*. 2023;118(7):1307-19.
- Pan X, Lin X, Cao D, Zeng X, Yu PS, He L, et al. Deep learning for drug repurposing: Methods, databases, and applications. *Wiley interdisciplinary reviews: Computational molecular science*. 2022;12(4):e1597.
- BArch J, MGeo R, Diaz D. Utilization of Artificial Intelligence Algorithms in the Perioperative Management and Reduction of Pain: An Evidence-Based Educational Module. 2024.
- Dost B, Turan E, Aydın ME, Ahiskaloğlu A, Narayanan M, Yılmaz R, et al. Artificial Intelligence in Anaesthesiology: Current Applications, Challenges, and Future Directions. *Turk J Anaesthesiol Reanim*. 2025;53(6):282-92.
- Cai X, Wang X, Zhu Y, Yao Y, Chen J. Advances in automated anesthesia: a comprehensive review. *Anesthesiology and Perioperative Science*. 2025;3(1):3.
- Morton SE, Knopp JL, Chase JG, Docherty P, Howe SL, Möller K, et al. Optimising mechanical ventilation through model-based methods and automation. *Annual Reviews in Control*. 2019;48:369-82.
- Ghita M, Neckebroek M, Muresan C, Copot D. Closed-loop control of anesthesia: Survey on actual trends, challenges and perspectives. *Ieee Access*. 2020;8:206264-79.