



# When the Monitor Starts Predicting: Rethinking the Role of Artificial Intelligence in Anaesthesia

SubhaRaj M<sup>\*1</sup> and Mahata RK<sup>2</sup>

<sup>1</sup>Department of Anaesthesiology and Critical Care, Westbridge University Medical Center, United Kingdom

<sup>2</sup>Department of Biomedical Engineering, Northbridge University, United States

## Research Article

Volume 10 Issue 2

Received Date: July 07, 2025

Published Date: July 30, 2025

**\*Corresponding author:** Mahata SubhaRaj, Department of Anaesthesiology and Critical Care, Westbridge University Medical Center, United Kingdom

## Abstract

Artificial intelligence (AI) is rapidly moving from experimental research into practical applications across anaesthesia and critical care. Machine learning systems are being investigated for preoperative risk assessment, intraoperative hemodynamic prediction, airway assessment, ultrasound interpretation, postoperative risk prediction, and critical-care decision support. Recent reviews demonstrate that AI is increasingly being studied across almost every stage of perioperative medicine. The increasing availability of predictive technologies raises an important clinical question: should AI become another monitor in the operating room, or should it become an active participant in clinical decision-making? This opinion article argues that AI should primarily function as an augmentation technology, supporting clinicians rather than replacing professional judgment. Successful implementation will require prospective validation, transparent algorithms, appropriate human oversight, interoperability, and careful management of alarm fatigue.

**Keywords:** Artificial Intelligence; Anaesthesia; Machine Learning; Critical Care; Clinical Decision Support; Predictive Analytics; Perioperative Medicine

## Introduction

Anaesthesia is already a highly data-dependent specialty. During a single procedure, clinicians continuously interpret blood pressure, electrocardiography, oxygen saturation, capnography, airway pressure, ventilatory parameters, temperature, drug administration, fluid balance, and laboratory information. Traditionally, the anaesthesiologist integrates these data streams using clinical experience and physiological reasoning. AI introduces another possibility: computational systems can examine these variables simultaneously and identify patterns that may precede clinically apparent deterioration. Recent literature suggests

that AI applications now extend from preoperative risk prediction to intraoperative monitoring, airway assessment, regional anaesthesia, imaging, and critical care [1]. The field is therefore moving beyond the question of whether AI is possible toward the more difficult question of how it should be incorporated safely [1,2].

## From Monitoring to Prediction

Conventional monitors primarily describe the patient's current state. A blood pressure monitor reports what is happening now. A pulse oximeter identifies the current oxygen saturation. Capnography describes current

ventilation.

Predictive systems attempt to answer a different question: what is likely to happen next? This distinction could be clinically important. A patient may still have acceptable blood pressure while physiological patterns suggest impending hypotension. Similarly, a patient may have apparently adequate oxygenation while other variables indicate an increasing risk of respiratory deterioration. Predictive analytics could therefore provide clinicians with additional time to prepare an intervention. However, prediction is not equivalent to clinical benefit. A highly accurate algorithm can still be clinically useless if its predictions are poorly timed, difficult to interpret, or associated with excessive false alarms.

### AI Should Augment Rather Than Replace

The most realistic future for AI in anaesthesia is probably collaborative. The clinician remains responsible for understanding the patient, the procedure, the surgical context, the pharmacological effects of treatment, and the uncertainty surrounding any prediction. AI can contribute pattern recognition and quantitative risk estimation. This relationship is particularly important because anaesthesia involves rapidly changing circumstances. A model may predict hypotension, but the reason may be surgical blood loss, vasodilation, medication effect, arrhythmia, or changes in intrathoracic pressure. The appropriate response cannot always be determined by an algorithm. Recent work on AI in anaesthesia similarly emphasizes the gap between predictive performance and practical implementation [2,3].

### The Problem of Trust

Clinicians are unlikely to accept AI simply because a model achieves a high area under the receiver operating characteristic curve. They need to know whether the model has been validated in populations similar to their patients. They need to understand its limitations and know when its prediction may be unreliable.

Explainability is therefore important. An AI system that identifies a patient as high risk should ideally provide information about the variables contributing to that assessment. This does not mean every algorithm must expose every mathematical detail. It means clinicians need enough contextual information to judge whether the prediction is plausible.

### Alarm Fatigue

- An additional concern is the potential multiplication of alerts.

- Operating rooms already contain numerous alarms. Adding predictive alerts without carefully considering their clinical significance could create another source of cognitive overload.
- AI should therefore be designed around actionable information, not simply more information.
- A useful system might generate one high-priority prediction at an appropriate time rather than continuously displaying dozens of probability scores.

### Implementation Requires More Than Technology

The clinical implementation of AI requires more than software development.

Data quality, interoperability, cybersecurity, regulatory oversight, workflow integration, staff education, and liability all influence whether an AI system can be safely deployed. Recent 2026 work specifically identifies data quality, electronic-health-record interoperability, outcome evidence, interpretability, alarm fatigue, and regulatory uncertainty as major barriers to translation [3].

### Clinical Implications

AI could potentially improve anaesthesia by:

- identifying physiological deterioration earlier;
- supporting risk stratification;
- assisting airway assessment;
- improving ultrasound interpretation;
- supporting hemodynamic management;
- predicting postoperative complications;
- reducing documentation and administrative burden.

However, these benefits should be demonstrated through prospective clinical studies rather than assumed from retrospective model performance.

### Future Directions

Future research should prioritize multicenter validation and clinically meaningful outcomes. Rather than asking only whether an AI model predicts hypotension accurately, studies should determine whether its use reduces the duration or severity of hypotension and whether this translates into improved patient outcomes.

Similarly, AI-assisted airway systems should be evaluated according to clinically meaningful endpoints rather than image-recognition accuracy alone. The transition from prediction to intervention will ultimately determine whether AI becomes a meaningful clinical technology.

## Conclusion

Artificial intelligence is likely to become increasingly visible in anaesthesia and critical care. The important issue is not whether clinicians will use AI, but whether they will use it responsibly. The most valuable AI system may not be the one that makes the most decisions. It may be the one that helps the clinician notice important information earlier, understand risk more clearly, and make better decisions at the bedside.

## References

1. Artificial Intelligence in Anaesthesiology (2025) Current Applications, Challenges, and Future Directions. Turkish Journal of Anaesthesiology and Reanimation 53(6): 282-292.
2. Daccache N, Zako J, Morisson L, Laferrière-Langlois P (2025) The applications of ChatGPT and other large language models in anesthesiology and critical care: a systematic review. Canadian Journal of Anesthesia 72(6): 904-922.
3. Baliga J, Seshadri N(2026) From prediction to practice: closing the translation gap in artificial intelligence for anesthesia. Journal of Clinical Monitoring and Computing 40: 933-943.