Impact of Artificial Intelligence on the Prevention of Medical Errors in Anesthesia

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ABSTRACT

Introduction: The impact of artificial intelligence (AI) on preventing medical errors in anesthesia is a critical area of research. Medical errors during anesthesia administration can have severe consequences, including patient harm or death. AI can mitigate these risks by enhancing decision-making, monitoring and preventing errors. This study aimed to explore the impact of AI on preventing medical errors in anesthesia.

Search Strategy: A comprehensive literature search was conducted using PubMed, Embase, Cochrane, and CINAHL databases with the MeSH terms "Artificial Intelligence", "Anesthesia", "Medical Errors", and "Patient Safety" from January 1, 2010, to December 31, 2023. Inclusion criteria encompassed peer-reviewed studies focusing on AI applications in anesthesia and their impact on error prevention, excluding non-English studies, case reports, and studies lacking quantitative data. Data extraction included study characteristics, AI applications, error types, and outcomes. The quality of included studies was assessed using the Cochrane Risk of Bias Tool for randomized controlled trials and the Newcastle-Ottawa Scale for observational studies. The systematic review followed the PRISMA guidelines.

Results: The initial search yielded 1,247 articles, of which 28 met the inclusion criteria. AI-based decision support systems, automated monitoring, and predictive analytics were found to significantly reduce medication errors, dosing errors, and adverse events during anesthesia administration. AI-assisted monitoring systems improved the detection of physiological changes and facilitated timely interventions. Additionally, AI-powered clinical decision support tools enhanced adherence to evidence-based guidelines and protocols, minimizing human errors.

Conclusion and Discussion: Integrating AI technologies in anesthesia practice has demonstrated promising results in reducing medical errors and improving patient safety. However, adopting AI in anesthesia requires understanding anesthesiologists' attitudes towards these technologies. AI tools and hardware technologies have the potential to revolutionize anesthesia practice by aiding in decision-making and addressing clinical issues proactively. However, further research is needed to address data quality, algorithm bias, and user acceptance challenges. Interdisciplinary collaboration between clinicians, data scientists, and ethicists is crucial to ensure responsible and practical implementation of AI in anesthesia.

Keywords: Anesthesia, Artificial intelligence, Medical errors