



Guest Editorial:
Machine Learning and Artificial Intelligence in Anesthesia

Embracing the Power of AI and Machine Learning: A Transformative Journey*

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I view it [AI] as the most profound technology humanity will ever work on If you think about fire, electricity or the internet, it's like that but I think even more profound.

Sundar Pichai, Alphabet/Google CEO (asamonitor.pub/48e0p9v)

Unbeknownst to many, the pervasive influence of artificial intelligence (AI) surrounds us in our everyday lives. Ever since the term AI was coined in 1955 by McCarthy and colleagues, it has made remarkable strides, leaving a profound im-

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act on various aspects of our existence (asamonitor.pub/3PIVP03). Forecasts from the past envisioned computers’ substantial advancement by the turn of the millennium, anticipating their invaluable contribution to patient care (*N Engl J Med* 2023;388:2398-9). The evolution of technology, automation, and AI has led to a paradigm shift, revolutionizing

how we interact with machines and the world.

From manual typewriters to AI-assisted word processors, our methods of documentation have undergone a monumental transformation. Today, we can effortlessly produce and store vast amounts of information in various formats with built-in autocorrection for spelling and grammar. Electronic health records equipped with programmed algorithms have become invaluable tools, notifying us of potential errors, including drug interactions, in patient care. Anesthesiologists are aware of the role of AI, and sophisticated ORs and intensive care units now boast AI integration, providing controllable alarms and alerts for improved precision and patient safety (*J Clin Med* 2023;12:2096; *Br J Anaesth* 2023;131:397-406). Indeed, AI’s applications are boundless, with endless possibilities to explore (*Saudi J Anaesth* 2022;16:86-93).

In essence, AI focuses on crafting machines and systems capable of performing tasks that traditionally require human intelligence, heralding a new era in computer science and technology (*Pediatr Res* 2023;93:281-3). ChatGPT, an advanced generative large language model developed by OpenAI (San Francisco, California), encapsulates AI’s functionalities, simulating human cognitive abilities such as learning, reasoning, problem-solving, and understanding natural language. Most AI systems are based on machine learning (ML). In 1959, Arthur Samuel defined ML as the “field of study that gives computers the ability to learn

without being explicitly programmed” (*IBM Journal of Research and Development* 1959;3:210-29). ML commonly uses multiple layer neural networks to identify connections within massive amounts of data, allowing ML to provide information for description, prediction, or recommendations.

A defining moment occurred when the Prime Minister of India, Narendra Modi, addressed the U.S. Congress during his June 2023 visit and characterized AI as a symbol of collaboration between America and India (asamonitor.pub/3PIVP03). This partnership, fueled by the combined intelligence of two nations, promises to drive AI’s progress even further.

Despite AI’s immense potential, trepidation persists regarding its capacity to replace human roles due to its access to vast datasets. It can swiftly analyze big data, exhibit roles in specialized medical fields such as regional anesthesia, and even project the aging process of a pediatric face into adulthood. AI has applications throughout the entire spectrum of anesthesiology, including preoperative, intraoperative, and postoperative care, practice management, and critical care medicine (*Anatomical Sciences Education* 2023;1-7). The role of AI is being increasingly recognized by anesthesiologists who have a reasonable understanding of AI and ML (*J Clin Med* 2023;12:2096). In critical care medicine, AI can use the vast amount of individual patient data to predict outcomes, to recommend and even provide therapy, and to be continuously



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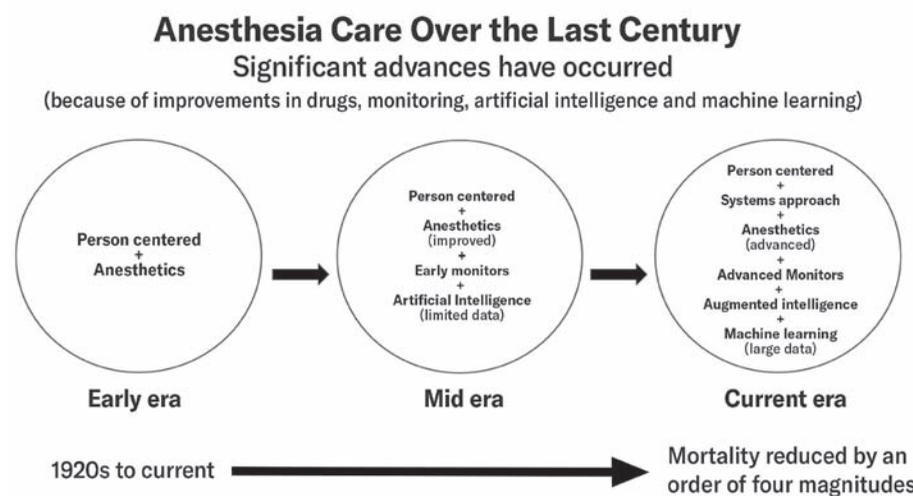
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vigilant (*Front Med* 2023;10:1176192). However, the accuracy, reproducibility, and generalizability of all AI applications must undergo thorough scrutiny and validation before they can be fully trusted.

While AI is undoubtedly here to stay and can serve as a valuable resource, a degree of caution is prudent. Cross-checking for accuracy remains essential, recognizing that AI, like any tool, has limitations. Because of limitations in training data that can restrict its performance, AI is not free of bias. Currently, and in the near future, anesthesiologists will still be needed to plan and oversee anesthesia delivery to ensure patient safety (*Br J Anaesth* 2023;131:397-406). In this issue of the *ASA Monitor*, contributors delve into the relevance of AI and ML to anesthesiology, providing valuable insights into its present and potential impact.

As we embark on this transformative journey, embracing the power of AI with responsible optimism will undoubtedly shape the future of human-machine collaboration and innovation. With continued exploration and critical evaluation, AI’s boundless capabilities will pave the way for a brighter, more efficient tomorrow. Anesthesia has transitioned from a solely patient-focused approach to a holistic model that integrates both individual care and systemic strategies, resulting in remarkable advancements in patient outcomes (see Figure) (*Br J Anaesth* 2023;131:397-406). ■

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*Self-declaration: AI was used in the preparation of this manuscript.