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Opinion Piece

Artificial Intelligence (AI) in Perioperative Medicine

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The excitement around AI is palpable in the hallways of hospitals everywhere. This is somewhat justified, and recently the availability of this technology, in large language models (LLM's), such as ChatGPT, has heralded a new era in human endeavor. However, it's role may have been overemphasized, leaving many uncertain about the future workplace and their roles in it.

Perioperative medicine is an emerging field, situated within the overlapping realms of surgery, anaesthesia, and critical care. Its exact boundaries are not yet clearly defined, making it difficult to classify it as a stand-alone specialty. The confluence of AI and perioperative medicine offers a unique opportunity to create integrated workflows and innovative tools which may accelerate the novel and perhaps practice enhancing aspects of AI more rapidly in this area. This may be harder to achieve in more established specialties due to ingrained behaviors and practices.(1)

Artificial intellegence's role in the perioperative space includes areas such as data analytics for early warning systems, image analysis, the fascinating field of radiomics, robotic surgery assistance, and large data analysis to aid decision support systems. These can help optimize patient care and improve safety by recognizing inefficient and potentially dangerous patterns, especially in electronic medical record platforms.(2–5)

Artificial intellegence also assists in risk assessment, risk mitigation planning, and patient communication. According to some assessments even outperforming physicians in empathy and effectiveness. It is this relational aspect of care where I feel the perioperative clinician can already see the benefits of the utilization of LLM's. The use of LLM's for generating layperson summaries, motivation letter writing, and protocol design is already in use in many perioperative practices.(6,7)

From anaesthsia to orthopedic surgery to radiological imaging, and numerous other fields, there has been a recent marked escalation in the number of papers and metanalyses on the role and efficacy of AI in the healthcare environment. Currently the research has focused on improved image acquisition and pathology detection, clinical decision-making tools (mainly using limited data sets at present) and interpretation of more complex elements of care such as depth of anaesthesia interpretation. There are mixed results at present with the overall realm currently performing at the level of helpful assistant to practice.

For the future of perioperative care, the goal should be to create a journey on a platform that guides a patient from diagnosis to recovery, applying the latest research but also considering the unique aspects of each case. The correct diagnosis, the best course of action from an operative point of view, risk identification and possible modification, patient communication and assistance with elements such as shared decision making, procedural execution, post-operative care plan and complication identification and management are just a few of the numerous tasks the perioperative clinician must manage. Many factors influence the quality and value of perioperative care, including patient, clinician, infrastructure, and organizational culture factors. Understanding, for example, the complex nature of perioperative complications, involves integrating direct quantitative data from electronic medical records (patient vitals/drug records) from the hospital environment, as well as indirect more qualitative data about organizational culture, safety culture and the like. At present this is extremely difficult because most institutions do not collect a lot of the data and even if they did, would struggle to integrate such a vast dataset into a usable tool. It is in this area where the promise of AI is enticingly promising. Whilst a large amount of technological advancement must still occur to realize this dream, one can now see the proverbial light at the end of the tunnel as advancement in the field ramps up in terms of capability and speed.(8)

Realizing AI's assistant role requires several developments, such as predictive analytics, the use of environmental and patient sensors, the measurement of outcome-impacting institutional factors, and the ability to identify unique

situations for course correction. At present AI uses logical reasoning, has access to vast amounts of text and is unbiased and so doesn't "average" data as one may think. This renders AI excellent at solving the kind of equative problems that occur more frequently in areas of creative endeavor such as engineering and computer science. This "skill" will have real application for assisting with workflow development and assisting with standardization of care. When it comes to the nuanced decision making required by clinicians facing individual complex patients, a characteristic of the best human clinicians, AI in its current format will struggle to provide the high value assistance that many hope will transform practice.(6–9)

In addition, and perhaps a less articulated issue, but one that I am certain plays on the minds of many clinicians and patients, is the question of oversight of effectivity and liability. Who will monitor AI as a whole and the multitude of products that will no doubt arise from generative AI, and how it will perform at a predetermined level of quality and value? These questions are critical. Clinicians will have to play an integral role in defining these metrics in conjunction with AI developers. Design of AI tools should involve clinicians to ensure adoption and oversight. Medical liability issues will also need to be thought about and clear guidance given from clinician professional societies as well as other healthcare regulatory bodies. This is perhaps most important in the perioperative field where there are clearly defined quality metrics and spheres of responsibility and liability.

As I, like many other clinicians, slowly integrate different aspects of AI into my daily practice, I am reminded that, whilst we as humans may someday create a technology so powerful, that it may outperform us in many of our daily tasks, at present it remains a tool and still a rudimentary one at that. A tool not yet able to surpass the wise clinician, educated, sharpened by experience and able to form a relationship with a patient and provide them with appropriate care.

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