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Editorial

Power of Artificial Intelligence in Surgery: Transforming Practice, Training and Education

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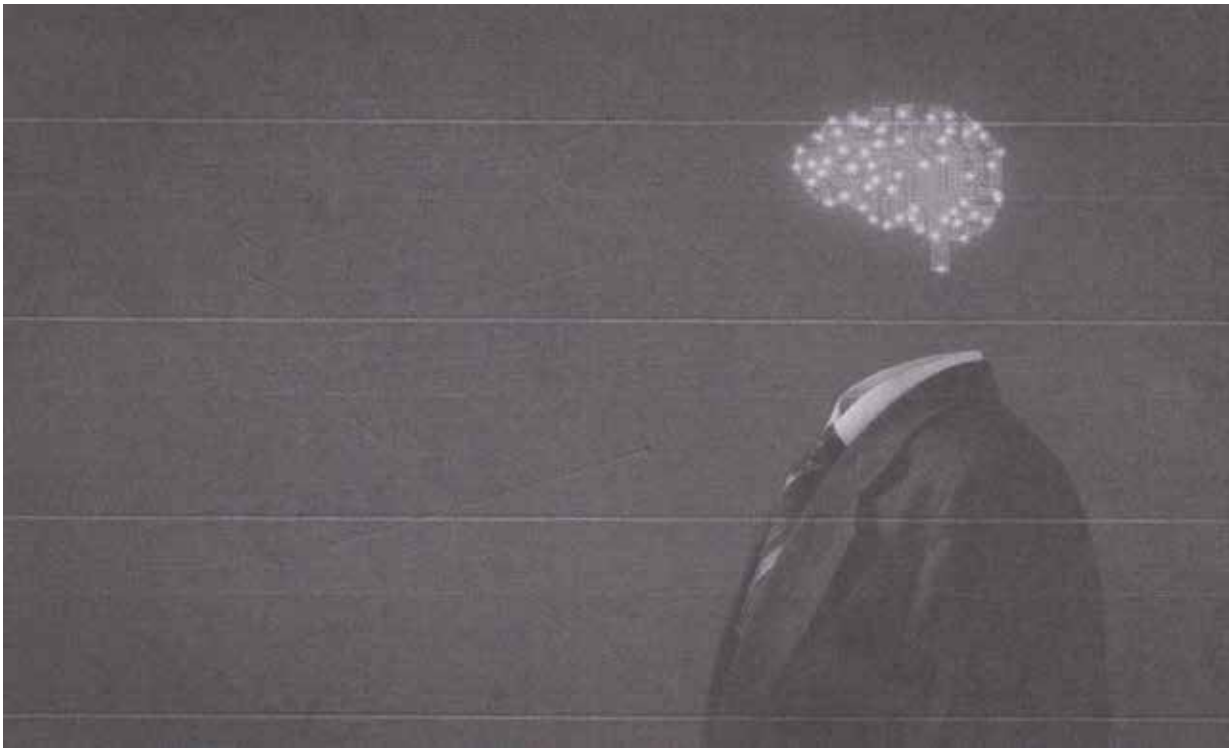

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It is important for the surgeons to have a foundation of knowledge of AI to understand how it may impact healthcare and to consider ways in which they may interact with this technology.

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Artificial intelligence (AI) and machine learning (ML) are comparatively new to the surgical field. Efforts begun to develop applications of these models to surgical practice, training and education[1]. Artificial intelligence can be defined as the application of computer algorithms that mirror or extend human cognitive processes[2]. Thus, the data-driven machine intelligence will be able to help in clinical decision-making and allow surgeons to more accurately assess risk, predict disease progression,

and manage patients with early stages of disease. When it comes to surgery, AI can review large amounts of data from patient records, radiological scans, or surgical videos, and use that information to detect, classify, and predict a diagnosis[1,3].

How AI Works?

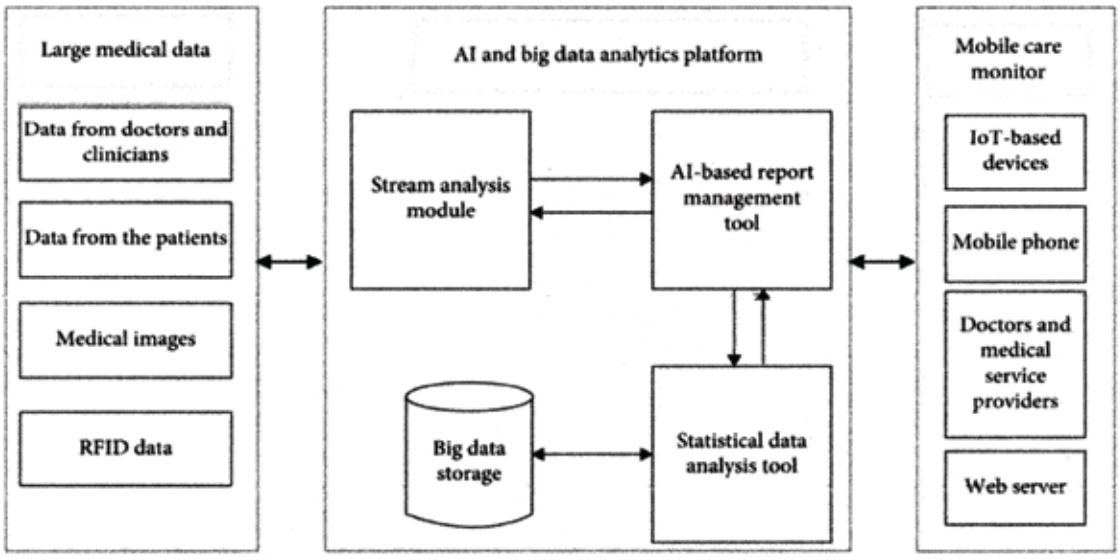
This technology will make hospital and health system operations more efficient, like, by estimating how much time is left in the surgery and more accurately informing the patient's family when the surgery might be completed. AI also could reduce the need to have a surgeon on call by providing a chatbot to answer patient questions before and after surgery. AI is expected to help enhance surgical decision making before, after, and even during a surgical procedure by bringing integrated information from the latest surgical guidelines or research insights directly to the operating theater and bedside. It has the capability to review patient charts and suggest a test or a medication[3,4].

AI in Diagnosis

Surgeons can utilize AI to analyze the patient's unique medical history, including medical records, labs, imaging, and patient-reported outcomes, assisting in the development of customized treatment plans at a more granular level. In fact, most AI healthcare startup funding goes into a diagnostic specialty. The general goal is to identify high-risk cases that radiologists may have missed, such as metastatic nodules in CT scans. One study showed that by using AI, pathologists have decreased their error rate in recognizing cancer-positive lymph nodes from 3.4% to 0.5%[2] It can help reviewing in minutes a stack of x-rays or images that might take hours for clinicians to evaluate. Most research shows that scan interpretation from AI is more robust and more accurate than those from radiologists, often picking up small, rare spots in the images. But, AI is not intended to replace radiologists—it is there to help them find a needle in the haystack[5].

AI in Surgery

By highlighting tools, monitoring operations, and sending alerts, AI-based surgical systems can map out an approach to each patient's surgical needs and guide and streamline surgical procedures. AI is particularly effective in laparoscopic and robotic surgery, where a video screen can display information or guidance from AI during the operation. Based on its review of millions of surgical videos, AI can anticipate the next 1.5 to 30 seconds of an operation and provide additional oversight during the surgery[5]. There's an international project to use AI to make laparoscopic cholecystectomies safer by placing an overlay on the surgeon's video screen during an operation to suggest where it is safer or less safe to operate. The first laparoscopic surgery without human help was done in 2022, which involved reconnecting two ends of a pig intestine, was performed at The Johns Hopkins University in Baltimore, Maryland by the Smart Tissue Autonomous Robot, or STAR[6]. More routinely, AI platforms can be created to communicate or monitor post-operative patients discharged from the hospital by frequently asked questions or minor concerns, with the ability to escalate patient concerns to a provider. These personalized interventions may minimize complications, accelerate patient satisfaction, and enhance the overall patient experience[5].



AI in Education and Training

AI can provide learning tools for surgeons at all stages of their careers, tracking their performance or teaching them new skills. 'ChatGPT' an advanced AI chatbot made available in 2022, interestingly it has passed the US Medical Licensing Exam! It achieved 60% accuracy without specialized input from any clinician trainers. During an operation, AI may display information about similar cases, explain what is happening, and predict what may happen next. In this way, it can serve as a guide for medical students, residents, or other surgeons who are watching the operation[5,6].

Ethical Consideraion

Although AI has enormous potential in surgery, it also poses a variety of ethical, legal, and regulatory issues. Everybody is nervous about new technologies but it's important to note that there are legal, ethical, and regulatory aspects around using data.

Conclusion

Soon, AI is expected to be used to review patient databases and multicenter national registries. AI will revolutionize nearly every area of the surgical profession and ultimately lead to enhanced patient care. After all, AI is intended to augment the surgeon's decision-making and execution skills, not replace them. This technology will have an immense impact in surgical space; however, key ethical considerations should be carefully considered.

References:

1. Loftus TJ, Altieri MS, Balch JA, Abbott KL, et al. Artificial intelligence-enabled decision support in surgery: State-of-the-art and future directions. Ann Surg. March 23, 2023.
2. Wang P. On Defining Artificial Intelligence. Journal of Artificial General Intelligence. 2019;10(2):137.
3. Kavian JA, Wilkey HL, Patel PA, Boyd CJ. Harvesting the Power of Artificial Intelligence for Surgery: Uses, Implications, and Ethical Considerations. The American Surgeon. 2023;0(0). doi:10.1177/00031348231175454.
4. Ting Sim JZ, Fong QW, Huang W, Tan CH. Machine learning in medicine: What clinicians should know. Singapore Med J. 2023;64(2):91-97.
5. Andras I, Mazzone E, van Leeuwen FWB, et al. Artificial intelligence and robotics: A combination that is changing the operating room. World J Urol. 2020;38(10):2359-366.
6. Graham C. Johns Hopkins robot performs first laparoscopic surgery without human help. Scientific American. January 26, 2022. Available at: https://hub.jhu.edu/2022/01/26/star-robot-performsintestinal-surgery/. Accessed October 10, 2023.