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Correspondence

Artificial intelligence in surgery: Modern trends

Dear editor

Recent advances in medicine have made it possible to employ artificial intelligence (AI) to aid clinical decision-making, with applications ranging from risk assessment, to genomics and to imaging; and from diagnostics to precision medicine and to drug development [1,2]. Surgeons have recently begun to use AI in their practices, with emphasis on imaging, navigation and early approaches by concentrating on feature identification. In the preoperative planning phase, doctors use patient's medical information and imagings to devise a surgical strategy. Anatomical classification, detection segmentation, and picture registration are all being aided at this step by deep learning, which utilizes image analysis methods and conventional machine learning for classification. The core of minimally invasive surgery (MIS) has always been computer-aided intraoperative guidance. Using a computer vision technique known as radiomics, Swiss researchers have developed methods in rapidly diagnosing COVID-19 patients using CT scans. This discovery was made in less than a year after the pandemic and it demonstrated the critical role artificial intelligence can play in healthcare and public health. By interpreting enormous volumes of imaging data, radiology employs imaging and algorithms to improve diagnostic accuracy. Oncology is where AI is most often used. Adjuvant chemotherapy for early-stage non-small cell lung cancer can be predicted using a radiomics risk score and an accompanying nomogram based on the results of recent studies.

Tissue tracking is one of the many MIS applications that has benefited from AI's learning methodologies. Tracking accuracy of tissue deformation is critical for intraoperative MIS guiding and navigation in MIS. Using creative representations of tissue deformation, scientists have constructed an online learning framework that used algorithms to find the best tracking approach for *in vivo* practice. For example, deep learning algorithms and CT scan data were shown to be able to detect calvarial fractures, cerebral haemorrhages, and midline shifts. These irregularities using deep learning in emergencies can be a key to future triage automation.

Compared to established clinical reference tools, deep learning using recurrent neural networks (RNN) have shown better outcomes in predicting renal failure, death, and postoperative hemorrhage after heart surgery [3,4]. They could enhance critical care by focusing on patients who were at risk of acquiring these problems, accomplished by gathering clinical data alone without any human processing. Artificial intelligence-driven surgical robots have been designed to aid surgeons during operations with manipulation and placement of surgical instruments, allowing them to concentrate on the more intricate components of surgery.

There is a reduction in surgeons' jitteriness, an improvement in patient outcomes, and lower healthcare costs when AI devices are employed during surgery. Robots that use machine learning (ML) to sift through massive amounts of data may assist surgeons in finding the most critical findings and to use the best current practice. Performance-guided laparoscopic AI robot by Asensus Surgical offers doctors with data, such as tissue size, without the need for an actual measuring tape [5]. Robots can be programmed by demonstration and taught by replicating surgeons' procedures, based on human expertise.

The amount of electronic health records have exploded since the Health Information Technology for Economic and Clinical Health Act (HITECH Act) of 2008, which has also increased burnout of clinicains [6]. Though the PCD or the electronic health record may be blaned, the advantages of an electronic health record cannot be overstated. More accurate surgical site infection identification has been made possible by using natural language analysis of electronic health data, rather than just relying on clinical observation alone. Although this technology is automated and portable, it is not presently connected to PCDs and underlines the possible need to control emerging artificial intelligence technologies in the future. As it is currently not attached, this can lead to increased stress, absenteeism, disengagement, and burnout if surgeons are not included in the decision-making process for new AI technologies.

Robots may be "trained" to do new activities independently using learning from demonstration technique (LfD). This step begins by breaking down a challenging surgical procedure into smaller, more manageable actions and gestures. Then, surgical robots are trained to identify, model, and perform the subtasks sequentially, allowing human surgeons to break from repetitious duties. As a surgeon, it is challenging to expand autonomous robots' usage and to allow robots to carry out their jobs, notably in MIS, with an aim to achieve better quality in surgery.

Ethical Approval

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Author contribution

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