ENHANCING SURGICAL SKILL PERFORMANCE THROUGH MACHINE LEARNING-DRIVEN ANALYSIS OF LAPAROSCOPIC AND ROBOTIC SURGICAL VIDEOS

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The objective of the Technology or Device:

The primary objective is to assess and improve surgical competence using automated performance metrics (APMs) derived from two-dimensional (2D) video films of laparoscopic and robotic gastrointestinal surgeries. This technology aims to provide objective, data-driven insights into surgical performance, addressing the need for unbiased and accurate assessment in surgical training.

Description of the Technology and Method of Its Use or Application:

The technology collects and analyzes 2D video films from laparoscopic or robotic gastrointestinal elective procedures. These films are collected from various participating centers both before and after feedback is provided to surgeons. The APMs are calculated using machine learning (ML) techniques, which analyze these videos. The process includes de-identifying data for privacy compliance and then splitting the data into training, validation, and test datasets. Data annotation will be conducted by researchers and volunteers, followed by analysis using various ML modeling.

Preliminary Results, if Available:

The literature contains a few studies that explored the feasibility with good results, albeit with a small sample size and lack of diversity. The study is prospective, with a large sample size and diverse datasets to be collected. The study will focus on improving APMs for the participating surgeons. A secondary outcome is the development of new APMs and measuring the model's performance beyond mere accuracy.

Conclusions / Future Directions:

Using nuanced surgeon performance data, when harnessed effectively, can personalize surgical training in precise, objective, and less time-consuming ways. ML models can identify performance qualities not evident to experienced trainers, improving personalized assessment and training of surgeons. This can lead to enhanced patient safety on a large scale. Furthermore, APMs can be correlated with various post-operative outcomes and used for tasks like quality measures, adverse events recording and analysis, education, statistics, and surgical performance evaluation.

Conclusions / Future Directions:

Future directions include expanding the application of this technology to improve surgical simulators, refine augmented reality applications, and integrate the technology in laparoscopic/robotic cameras to provide surgeons with real-time feedback.

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Conflict of interest

No conflict of interest to declare.

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