

ACS 2025 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

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Challenges in Surgical Education

Standardization of Simulation and Feedback in Surgical Training and Education

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Background: Artificial Intelligence has made an impact on surgery through areas such as surgical simulation, intraoperative feedback, and movement tracking. Through integration of surgical simulation in surgical education, students can improve their skills in near realistic environments. These tools provide an excellent way for surgeons to train and improve their skill, but creates a difficult question in judging proficiency as various tools have been created independently within institutions. Integration of AI based tools within surgery has a range of variation between institutions, resulting in different standards and efficacy of these tools. The absence of standardization of these surgical tools makes it difficult to reliably assess the skill and proficiency of surgeons in training.

Current Challenges: Surgical simulation and training currently face's challenges with standardizing algorithms and the data used for the development of AI models. This disparity leads to a lack of a uniform standard to which trainees across institutions can reliably measure their progress with. Creating such algorithms would involve wide cross institutional collaboration and sharing datasets used to train models. Integrating standardized tools between institutions also encounters the barrier of varying technologies and tools as well as different record systems. Training a model on a biased dataset from one institution can also perpetuate existing biases within data and training.

Need of Innovation: The need for innovation in this area of surgical simulation is within creating technology based on a wide spread of data from numerous institutions. Creating a large dataset will help reduce biases within institutions. Additionally, there is a need for creating a baseline consensus for parameters by which to assess surgical proficiency to better guide simulation tools created. By training simulation tools on wider array of surgical data, we can establish standardized criteria to which to train surgeons.