Rethinking Surgical Training in the AI Era

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Artificial Intelligence (AI) is rapidly transforming surgical practice and the way surgeons will work in the near future. Therefore, it emerges a strong call to reflect on which technical and non-technical competencies will remain, which ones will become obsolete, and which ones will need to be strengthened or rethought. This reflection leads to the issue of training our students to possess the competencies that future surgeons will need to exhibit. Traditional models of surgical training, centered on deep clinical expertise, must now evolve to incorporate broader competencies. The proposed "T-shaped" model of competencies envisions future surgeons as professionals with both vertical depth—clinical skills and knowledge—and horizontal breadth, encompassing digital literacy, leadership, ethics, systems-based thinking, and the ability to interact effectively with AI technologies. As AI becomes embedded in preoperative planning, intraoperative assistance, and postoperative care, surgeons must be equipped to understand, evaluate, and apply AI tools critically and responsibly. The integration of AI into surgical education demands not only the development of new curricula but also the training of educators to adapt to these changes. AI-powered tools such as simulation, virtual reality, and adaptive learning platforms can personalize education, provide objective feedback, and enhance skill acquisition, especially when direct clinical exposure is limited.

Surgical competence in the AI era requires not just mastering technical procedures but also embracing continuous learning, critical thinking, and ethical oversight. By fostering "T-shaped" competencies in both trainees and trainers, surgical education can meet the demands of a future where human-AI collaboration is central to clinical excellence.