An Overview of Laparoscopic Surgical Training Modalities – How Does Augmented Reality Simulation Compare?

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Introduction:

Laparoscopic surgery demands rigorous training to attain proficient skills, especially as its popularity surpasses that of open surgery. Consequently, there is a pressing need for innovative and effective training methods.
Augmented Reality (AR) has emerged as a groundbreaking addition to laparoscopic surgical training. Its unique ability to superimpose digital images and physical models offers a compelling advantage: it blends visual realism seamlessly with true-to-life haptic feedback.

Methodology:

A comprehensive evaluation was conducted to compare various laparoscopic training modalities, assessing the effectiveness of Augmented Reality (AR) against the traditional apprenticeship model, alternative methods such as training on patients, human cadavers, box trainers, and Virtual Reality (VR) simulators.

A systematic review of 31 papers was undertaken to compile findings. The assessment encompassed both the available products and the technology's suitability as an educational tool.

Results:

Research findings indicate that augmented reality (AR) technology facilitates accelerated learning, enhanced multitasking capabilities, improved procedural accuracy, refined hand-eye coordination, and more proficient bimanual operation within a condensed timeframe, thereby augmenting success rates in healthcare education. However, AR's effectiveness primarily pertains to technical skill development and may not adequately address the broader spectrum of non-technical skills essential for surgical operations.

In comparison to alternative methods, AR demonstrates superior efficacy in skill acquisition and enjoys widespread preference among learners. Notably, while AR outperforms many modalities, it may fall short when compared to human cadaver models specifically for laparoscopic colorectal skills acquisition. Yet, definitive conclusions are premature due to the limited availability of comprehensive data.

Despite potentially higher initial costs associated with AR implementation, its utilization eliminates the need for expensive specialized facilities or services required for cadavers or animal models. Early data from 150 trusts in the NHS suggests substantial annual savings of £117 million attributed to the adoption of AR technology.

Conclusion:

Augmented Reality (AR) simulation holds promising prospects to emerge as the leading method for laparoscopic surgical training, potentially surpassing existing standards. However, realizing this potential hinges on two critical factors: firstly, the advancement of literature to deepen understanding regarding the technology and its capabilities; and secondly, the continual evolution of technology itself to enhance clinical realism. These dual advancements are imperative to fully harness the transformative potential of AR in surgical education and practice, extending its applications beyond laparoscopy into broader realms of healthcare training.





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We are interns/executives within Inovus Medical, which has provided support but not funding for this study. We have sought to avoid over-mentioning products or pushing sales. Our intention is to increase awarenesss of alternative augmented reality training options to drive surgical training away from the patient's bedside.
We extend gratitude and thanks to SAGES for allowing us to present our findings.
Inovus Medical is an eligible company and is an accredited provider for CPD/CME points for surgical training.