Assessing the impact of Augmented Reality training on improving Laparoscopic Vaginal Vault Closure Using Objective Performance Metrics

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Background

Laparoscopic surgery has become a common part of surgical practice.

Advantages[1]	Disadvantages
Decreased length of post-operative ileus	Loss of depth perception and haptic feedback[2]
Decreased post-operative pain and narcotic use	Fulcrum effect[3]
Improved cosmesis	Use of instruments with limited range of motion[3]
Higher patient satisfaction	

- Surgical training has been significantly disrupted by the COVID-19 pandemic
- Trainees have had a 50% reduction in operating as the primary operating surgeon in 2020 in a review of UK surgical trainee logbooks vs 20194
- 12% of senior UK surgeons identified as having their training "delayed due to COVID-19" at annual review of competency progression (ARCP)[5]
- Adverse patient outcomes can occur if surgeons are not given adequate training
- Medicolegal, fiscal and time limitation of teaching operative skills in the clinical setting impacts this further[6]

Acquisition of surgical skills before entering the operating theatre[7]

Review article
Transferability of simulation-based training in laparoscopic surgeries:
A systematic review
Antonios E, Spiliotis[1], Panagiotis M, Spiliotis[1], and Ifaistion M. Palios[1]

Augmented Reality Training

- Low fidelity 'box trainers' vs high fidelity 'virtual reality' simulators – Which is better?[8]
- What is the impact of augmented reality training on improving laparoscopic skills using objective performance metrics?

Methods

Design
- Supervision of surgical trainees (n=6) performing several augmented reality (AR) simulated vaginal vault closures interspersed with LapPass® tasks utilising the LapAR™ by Inovus Medical Ltd (UK)
- Comparator: Benchmark score set by an experienced minimally invasive surgery (MIS) surgeon

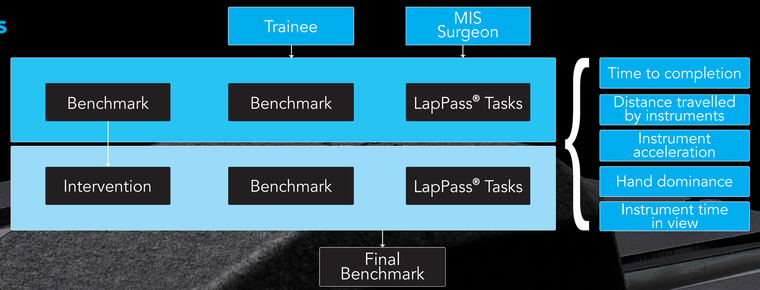
Setting
- A National Health Service (NHS) University Teaching Hospital in South London

Participants
- Surgical trainees (Senior House Officers and Registrars) – qualified doctors of at least 1 year

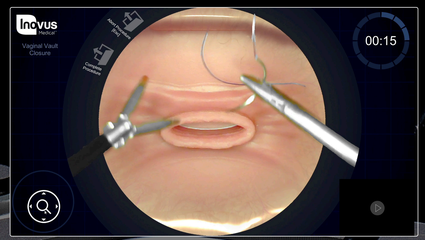
LapPass® Tasks
Passing thread through a hoop
Manipulating hoops between instruments
Positioning hoops on posts
Cutting simulated skin within guidelines
Placing sutures

Objective Metrics	Subjective Metrics
Time to completion	Feedback by experienced surgeons using the work-based assessment (WBA) framework
Distance travelled by instruments	
Instrument acceleration	
Hand dominance	
Instrument time in view	

Interventions



Results



All P values were <0.5 bar two trainees
ANOVA regression performed for significance testing
N = 6 Trainees
achieved an average of:
36.9% improvement in completion time
56.5% improvement in distance travelled

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