REMOTE MENTORING ON LAPAROSCOPY USING AUGMENTED REALITY TECHNOLOGY: BANGLADESH EXPERIENCE

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Background

- Surgical training in LMICs is heavily limited by financial and logistic barriers to expert-mentor surgical training.
- Laparoscopic surgical skills are a critical part of many surgeons' armamentarium; however, compared to open surgery, the acquisition of laparoscopic skills presents a specific and protracted learning curve.
- Open surgical techniques can be taught using available resources; however, young surgeons have limited or no exposure to laparoscopy, let alone pediatric laparoscopy.
- To assess whether a new augmented reality (AR) remote laparoscopic training program launched in Bangladesh could help facilitate lasting knowledge acquisition, the authors conducted a quasi-experimental study that evaluated the outcome of a training program and compared real-time training sessions with recorded video training sessions.

Objectives

- Evaluate efficacy of remote surgical training of pediatric laparoscopic technique
- Evaluate whether differences in efficacy exist between synchronous and asynchronous learning in the context of augmented reality remote laparoscopic training.



FIGURE 1. Expert/mentors conduct surgery while demonstrating key techniques through equipped AR technology. The system is hands free, and the operative field and vision are unobstructed.

Methods

- This study was conducted at a private hospital that provides pediatric laparoscopic training. It included all trainees who participated in the training program at different slots over a one-year period.
- These trainees were either trained by viewing the laparoscopy sessions in real-time or as recorded videos. The program was based on optical see-through head-mounted displays (OST-HMDs) provided by the nonprofit Ohana One.
- Each trainee was expected to enroll for 12 weeks and participate in one session per week. The trainees in the real-time (17) and video (25) groups were primarily from Bangladesh and other countries.

Results

- The study included 17 trainees in the real-time group and 25 in the video recording group. Most of the participants in both groups were from Bangladesh, with no significant difference in region (p = 0.179).
- The time since graduation was slightly longer in the real-time group (median: 5 vs. 3; p = 0. 795). In addition, the rate of attending training programs before the current one, whether similar training or hands-on training, was slightly higher among the real-time group. However, none of these differences were statistically significant (p: 0.695, and 0.174).
- In addition, subjective assessment of self-laparoscopy skills, such as the level of eye-hand coordination, intracorporeal knot-tying, and intracorporeal suturing skills, were similar in both groups, with no significant differences (p = 0.09, 0.056, 0.163).
- Most of the trainees worked with senior surgeons (15 trainees (88.2%) vs. 24 trainees (96%]) for the real-time and recorded video groups, respectively; p = 0.920). Nine trainees (53%) in the real-time group and 10 trainees (40%) in the other group practiced laparoscopy independently, without any significant differences.
- Trainees in both groups rated the quality of the video sessions and immersive experiences (median score: 8, 10, (p = 0.282 and 0.326, respectively).

Results

- The objective assessment of knowledge revealed that the knowledge score was significantly higher in the real-time group [median (min–max): 21 (9-24) vs. 16 (5-24), p = 0.004]. Both groups reported improvement in self-efficacy in laparoscopic practicing without any significant differences (p = 0.641). Overall satisfaction was very high, with no significant difference between groups (p = 0.299).
- All participants in both groups reported that the course would help improve their job, and their overall satisfaction was very high [median (min-max): 9 (6-10) for the real-time group and 9 (1-10) for the recorded-video group] without a significant difference between the groups (p = 0.299).



Figure 2. Remote users join from anywhere using personal devices

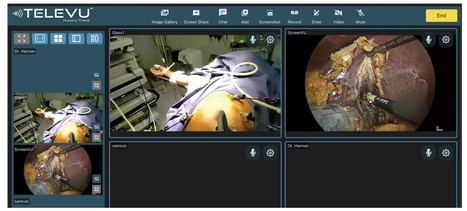


FIGURE 3. Mentees observe the operation through multiple screens and can communicate with mentor in real-time

Conclusions

- The study appears to show that OST-HMD technology can create a rich and engaging environment, making it a promising tool for laparoscopic training in low-resource settings.
- This study demonstrates that remote learning can be a powerful tool for surgical training and underlines the importance of real-time interaction as opposed to passive pre-recorded viewing for lasting knowledge acquisition.

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