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Instant replay: Evaluation of instant video feedback in surgical novices for a laparoscopic gallbladder dissection

Ameer Farooq [a], Artan Reso [a], Adrian Harvey [b,*]

[a] Section of General Surgery, Department of Surgery, University of Calgary, Room 1023, North Tower, 1403 - 29 St, T2N 2T9, Calgary, AB, Canada
[b] Section of General Surgery, Department of Surgery, Room 1005, North Tower, 1403 - 29 St, T2N 2T9, Calgary, AB, Canada

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ABSTRACT

Background: Athletes often use video to improve their technique. We hypothesized that surgical novices given feedback using video-replay would outperform surgical novices given verbal feedback in the performance of a laparoscopic task.

Methods: Our study used a prospective, randomized control design. The surgical task involved the laparoscopic dissection of a pig gallbladder. Our participants performed a dissection, pre- and post-traditional or video feedback. Each recording was independently scored by two staff surgeons using the previously validated rating tools.

Results: There was no significant difference between video feedback or traditional feedback groups in their mean overall or task specific scores. Both traditional and video-feedback groups had a trend towards improved performance post-feedback.

Conclusions: No significant difference in performance by both our global assessment metrics or task-specific metrics was observed. Video feedback requires further study to investigate its impact on surgical training.

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1. Background

Surgical training faces a number of challenges in the modern era. Traditionally, surgical residents would develop their operative skills through sheer volume and exposure. Logbooks documenting case volumes have been used a surrogate for competency. However, in the modern era, this traditional model of training is coming under pressure.[1] Significant attention in the literature has been directed towards mitigating the potential negative effects that work hour restrictions and heightened focus on patients safety might have on educational opportunities for surgical trainees. The move toward a competency based approach to medical education and evaluation is a product of this work.

An emerging focus of research centers around the concept of maximizing every operative experience a surgical resident might encounter. In the sporting world, high performance athletes often use video replays and video analysis to hone their technique and ultimately improved performance.[2,3] The practice patterns and literature are largely supportive of this technique in athletics. As a result, other areas including teaching and workforce development have adapted video-based feedback and coaching as an educational tool.[4,5]

With the publication of Atul Gawande's article "The Coach in the Operating Room" there has been renewed interest in video-based feedback and coaching for improving technical skills, both at the level of trainees and staff surgeons.[6] However, the early surgical literature has been inconclusive as to the effectiveness of these tools. The original work done by Backstein et al., in 2004 and 2005 failed to show an improvement in the performance of simulated surgical skills following video feedback.[7,8] However more recent studies have suggested a benefit and potential role for video feedback in surgical training.[9–13] The ambiguity in the surgical literature is likely a reflection of its heterogeneity. Studies differ in a number of important ways including: 1) extent of exposure to video feedback; 2) task complexity; 3) learner level; 4) additional feedback interventions (e.g. coaching formats); and 5) control group feedback.

Given this ambiguity, we designed our study to specifically look at the impact of video replay on surgical skills performance. Our intent was to standardize any additional factors that might impact

* Corresponding author.
E-mail addresses: Artan.Reso@ahs.ca (A. Reso), adrian.harvey@ahs.ca (A. Harvey).

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outcome between the experimental and control group. This project was intended to guide further research and practice in our simulation surgical skills curriculum.

2. Hypothesis

We hypothesized that surgical novices given feedback using video-feedback will outperform surgical novices given traditional verbal feedback in the performance of a laparoscopic task.

3. Methods

Our study used a prospective, single-blinded randomized control design, comparing the performance of participants given video feedback versus traditional feedback. Ethics approval was obtained through the Conjoint Health Ethics Research Board (CHREB) at the University of Calgary.

Our study population included surgical novices (medical students & first year residents) at the University of Calgary. Surgical novices were defined as those who had no previous laparoscopic skill training and had actively participated in fewer than three laparoscopic cholecystectomies. We excluded any participants who have had previous laparoscopic skill training and who have performed more than three laparoscopic cholecystectomies. In total 16 participants were recruited for the study.

The simulated surgical task used in this study was the laparoscopic dissection of a pig gallbladder off the liver bed. This task has been studied previously as a surrogate for laparoscopic skill and tissue handling.[14] Pig gallbladders were obtained from the Animal Research Centre at the University of Calgary in accordance to ethical standards for animal research. All simulations were performed in the Advanced Technical Skills and Simulation Lab (ATSSL) at the Cumming School of Medicine, University of Calgary. All simulated procedures were recorded using the SDC laparoscopic recorder (Stryker).

The structure and organization of the simulation lab session is outlined in Fig. 1. Participants were oriented to the simulation lab and given time to review the consent form and ask questions. Once the consent process was complete participants were shown a live, standardized demonstration of the dissection of the pig gallbladder off the liver bed by one of the study authors. Participants were then given 5 min to briefly familiarize themselves with the setup of the laparoscopic equipment.

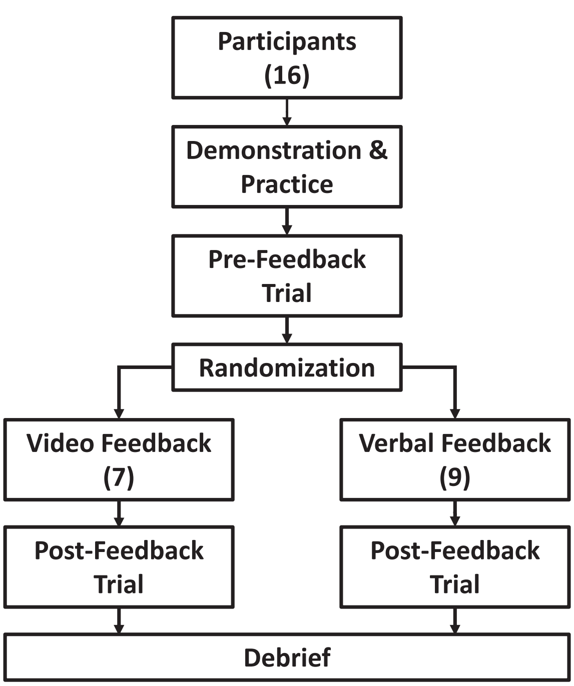

Fig. 1. Prospective, randomized single blinded study design.

Participants were then given ten minutes to perform a laparoscopic gallbladder dissection and were video recorded. After ten minutes the procedure was terminated at whatever stage the participant had completed. A faculty surgeon acted as an assistant for the simulated procedure. The faculty assistants were oriented to respond to instruction from the participants but to not otherwise aid in the performance of the procedure. No concurrent feedback was permitted during the procedure.

Participants were then randomized into two groups using computer-based random number generation. The experimental group were given immediate post-performance feedback on their technical skills using video replay. Preceptors were able to play cases in slow motion and mark up the video to demonstrate areas of potential improvement. Feedback was given using a structured methodology known as the GROW model (Goal - Reality - Options - Wrap Up).[11] Participants were encouraged to ask questions, to rewind or forward their recordings, and to view their video multiple times if requested. The control group were given traditional post-performance verbal feedback without video replay. Feedback was also given in a structured format using the GROW methodology. The duration of feedback was limited to twenty minutes. To prevent cross contamination of participants, feedback was provided in separate areas of the lab, away from participants in the other group.

Immediately following the feedback period, both groups of novices perform a second laparoscopic gallbladder dissection. Participants were again given ten minutes to complete as much of the procedure as they could. Faculty assistance was again provided and no concurrent feedback was provided during the procedure. The post-feedback trials were again recorded for evaluation. The participants were all debriefed at the conclusion of the session and given an opportunity to provide written feedback on the experience. .

Each recording was independently scored by two staff surgeons using previously validated checklists published by Vassiliou and colleagues in 2005.[14] They included two checklists, which provide a score for both overall performance (Objective Structured Assessment of Technical Skills), as well a task-specific rating tool for the dissection of a pig gallbladder off the liver bed. The OSATS and GOALS rating systems have been previously shown to be well correlated with operative performance and assessment (Vassiliou et al., 2005). They were slightly modified for use in our study with our pig model. Assessors were blinded to the randomization of the participant and were shown the video without any identifying features. Each recording received a global and task specific score based on our checklists, and the aggregate scores between each group were compared for statistical significance.

Sample size calculations were done a priori. Based on previous studies looking at a deliberate practice interventions, 30–35% improvement effect in laparoscopic procedures as assessed by a global rating scale was estimated.[9] In order to observe an effect with an α of 0.05 and power of 0.80, a minimum of 8 participants were desired in each group. Results were expressed as mean ± SD. Non parametric statistical analysis (Mann-whitney U test) was used for statistical analysis of the data. Inter-rater reliability was calculated using the Kappa score. All statistical analysis was carried out using SPSS software.

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