

Teaching Surgery Novices and Trainees Advanced Laparoscopic Suturing: A Trial and Tribulations

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The Advanced Laparoscopic Curriculum

Background: There is evidence that a need exists for a standardized curriculum teaching certain advanced laparoscopic suturing tasks. Studies evaluating several of these tasks have demonstrated validity and established proficiency benchmarks.

Tasks: We chose 3 of these advanced laparoscopic suturing tasks to comprise our curriculum. Models were made according to specifications in previously published papers using low cost materials. See Fig. A, B, and C.

- A. Confined Space:** single suture placed without full range of motion
- B. Continuous:** suturing in a running fashion
- C. Under Tension:** placing interrupted sutures to close a large defect

Activities: All participants were trained to Fundamentals of Laparoscopic Surgery (FLS) proficiency (expert times + 2 SD) on 3 FLS tasks. Control group then underwent training to FLS mastery (expert times); Intervention group trained to ALC mastery (expert times). For both groups, 10 reps or 5 hours of practice were used as cut-off points in the event mastery level could not be reached as recommended in learning curve studies.

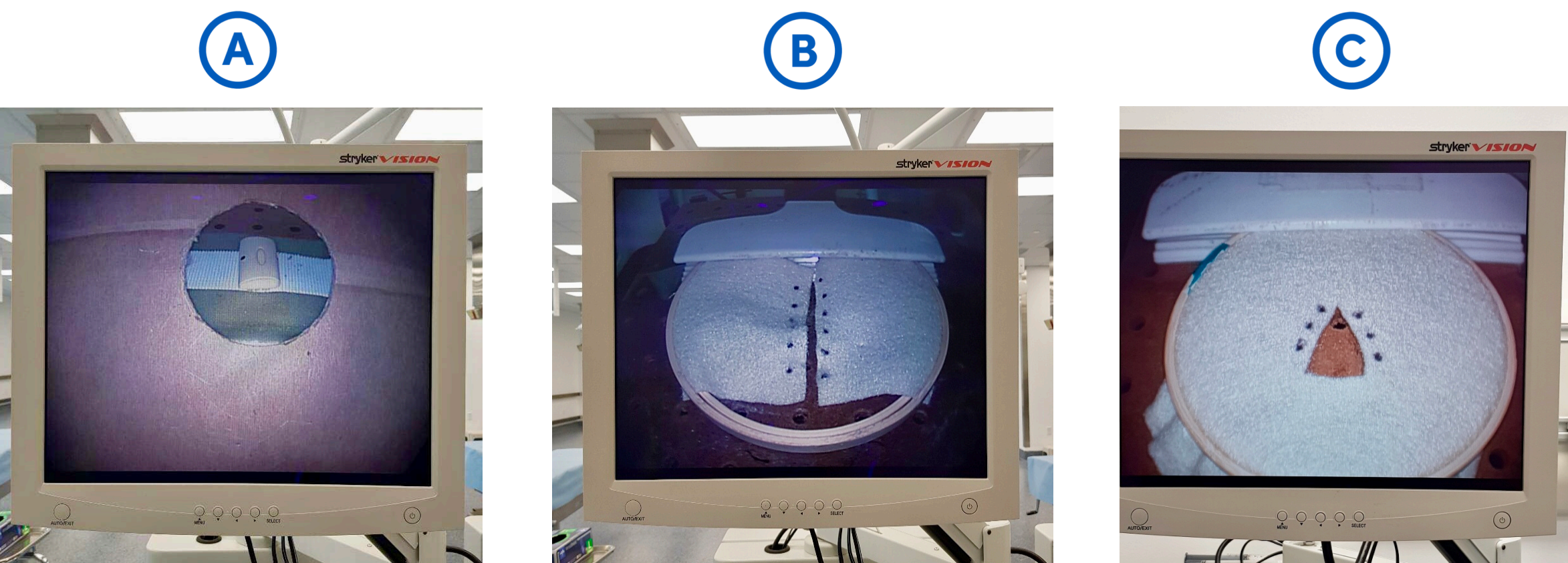
Scoring: Scoring for pre- and post-tests utilized previously established methods taking into account time and accuracy measurements.

$$\text{Cutoff time} - (\text{raw time taken to complete task} + \text{accuracy score}) = \text{Final score}$$
$$(\text{Final score}/\text{high score}) \times 100 = \text{Normalized final score}$$

Introduction

The benefits of minimally invasive surgery are numerous, however there is a lack of standardized training for important advanced skills.¹

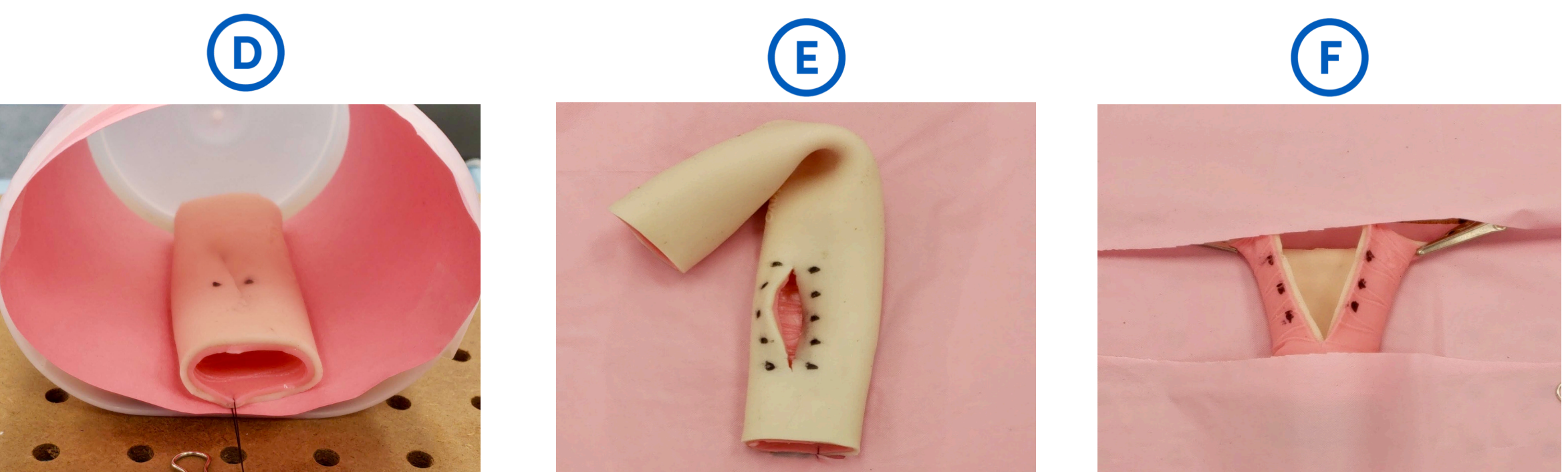
- Laparoscopic suturing has been identified as one of the most difficult skills to master in minimally invasive surgery.**
- Only approximately 56% of incoming fellows are able to suture laparoscopically.²



Figures A, B, C. Confined space, Continuous, and Under tension tasks, respectively

Purpose

To determine whether participation in an ALC results in improved laparoscopic suturing performance vs FLS training alone



Figures D, E, F. Bench models simulating Low pelvic suture, Enterotomy closure, and Crural approximation, respectively

Materials and Methods

Study design was a prospective, single center, randomized controlled trial.

MS1 to PGY4 underwent **baseline FLS training** and **pre-tested on bench models** (Fig. D, E, F). Participants were **stratified by pre-test score** and **randomized** to undergo either:

- (1) **FLS training to mastery level** (Cohort 1)
- (2) **ALC training to mastery level** (Cohort 2)

All were then **post-tested** on the same bench models.

After adjustment, **post-test scores were compared using least squared means.** Multivariable linear regression model identified predictors of post-test score, and Wilcoxon rank sum test assessed for differences in post-training confidence levels between groups.

Results

Twenty-five participants completed the study (16 female, 9 male). There were no significant differences in demographics between groups.

After adjustment, the **ALC group had significantly higher post-test scores** than the FLS group (**mean score 90.50 versus 82.99, p = 0.001**) (Chart 1).

Variables found to predict post-test score include training level and video gaming history.

There was no significant difference in improvement in post-training confidence levels between groups.

Discussion

Efficient, effective, and cost-conscious simulation methods must be developed and employed as a standard curriculum to meet the need for laparoscopic competence. Initial steps have been implemented; there is evidence of validity for several advanced laparoscopic tasks and proficiency benchmarks.^{3, 4, 5} The current study builds upon this data by showing:

- Superior advanced laparoscopic suturing performance following completion of a designed advanced curriculum.**
- Certain variables may predict laparoscopic suturing performance.**
- The ALC did not result in higher confidence with laparoscopic suturing skills, perhaps owing to task difficulty.**

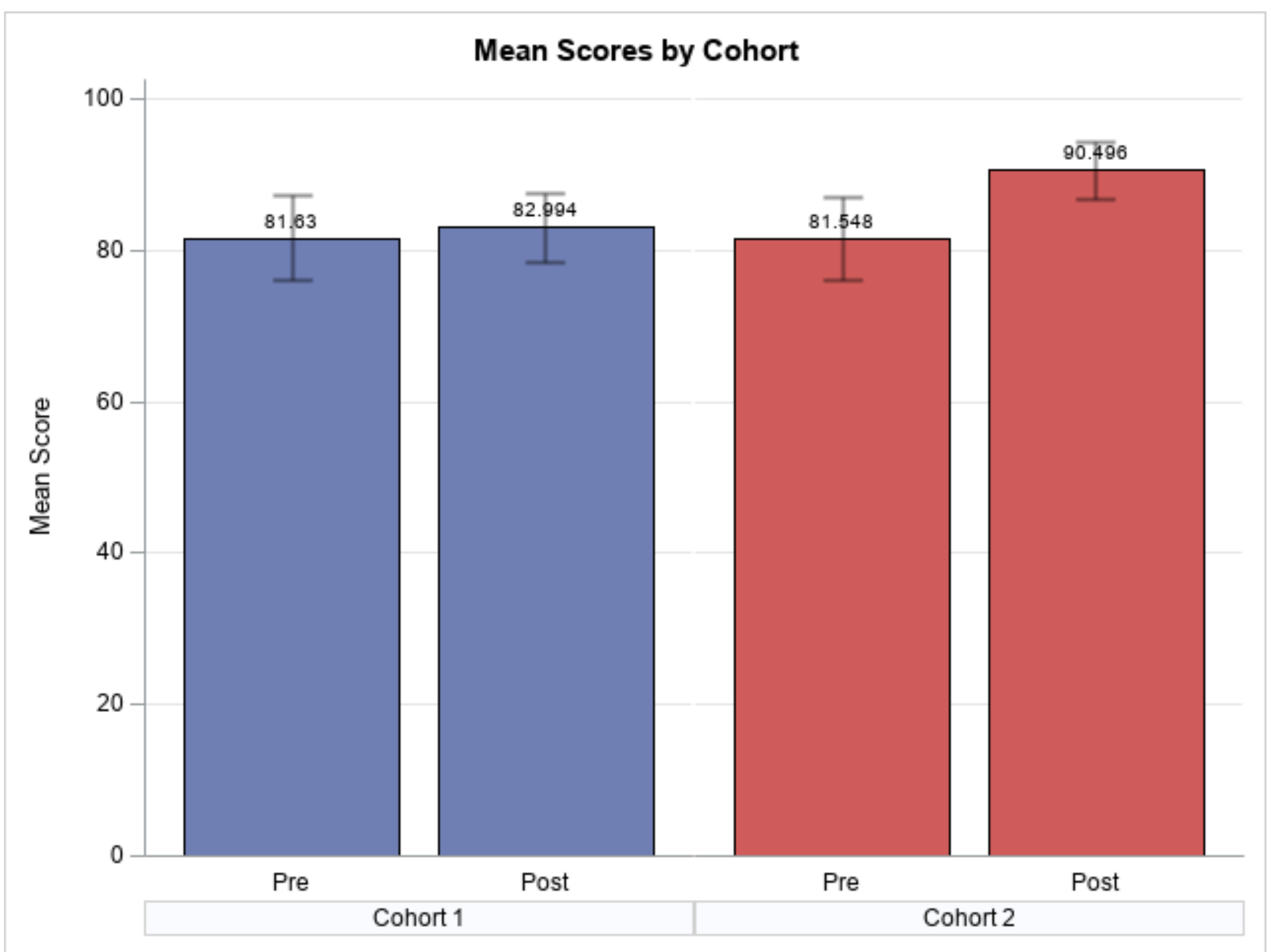


Chart 1. Mean pre- and post-test scores by cohort with 95% confidence intervals

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