Overlearning enhances skill retention in a simulated model of laparoscopic cholecystectomy

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INTRODUCTION: There is an urgent need to determine the optimal method for the acquisition and retention of surgical skills. In this pilot study, we examined the effect of overlearning on laparoscopic skill retention in a simulated cholecystectomy model.

METHODS: Following informed consent, 20 general surgery and emergency medicine (PGY1-3) residents were randomized to control (n=10) and overlearning (n=10) groups and then asked to complete a laparoscopic cholecystectomy on a LapSim® virtual reality (VR) simulator (Surgical Science, Gothenburg, Sweden). The control group practiced on the simulator in a continuous, uninterrupted session until they achieved proficiency, defined as a total simulator score ≥ 80. The overlearning group, after achieving proficiency, performed additional uninterrupted practice equivalent to the number of task repetitions it took to reach a total score of 80 (i.e. 100% overlearning). Performance metrics included global score, total-time, tip trajectory, right/left tissue penetration, and electrocautery injuries. Skill retention in both groups was assessed at 1, 4, and 12 weeks after baseline. We used a two-level linear mixed model to assess individual change in performance across time.

RESULTS: The overlearning group had significantly better retention for global score (↑), total time (↓), tip trajectory (↓) and left instrument tissue penetrations (↓) than the control group. The main effects represent aggregate scores. The retention models fit both linear and quadratic components to explain the variance-covariance.

CONCLUSIONS: Overlearning enhances skill retention on a virtual reality laparoscopic cholecystectomy simulator. These findings have implications for laparoscopic skills curricula.