18-7341

Video analysis of surgeons performing robot-assisted radical prostatectomy: Is there a relationship between the time taken to complete the urethrovesical anastomosis with technical skill?

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INTRODUCTION AND OBJECTIVES: Identifying robotic skill proficiency and exposing areas for refinement may improve patient outcomes and safety. Previously, we demonstrated a strong correlation with crowdsourced (i.e. lay-person) and peer surgeon video ratings of skill for surgeons performing robot-assisted radical prostatectomy (RARP). However, these evaluations can consume considerable resources. In this project, we evaluated whether the time taken to complete a step for RARP could be used to determine technical skill proficiency.

METHODS: Surgeons in the Michigan Urological Surgery Improvement Collaborative (MUSIC) submitted a representative video of a non-complicated nerve-sparing RARP. Edited video clips (<5 minutes) of the urethrovesical anastomosis (UVA) underwent evaluation for global robotic skill by 285 crowdworkers (C-SATS, Seattle, WA) and 56 peer surgeons using the Global Evaluative Assessment of Robotic Skills (GEARS) (maximum score 25). We fit linear mixed-effects models to estimate mean crowd and peer ratings for each surgeon and sorted surgical times and skill scores into quartiles for comparison.

RESULTS: 28 surgeons provided complete UVA videos for review. Crowd ratings for skill ranged from 16.5 to 18.0 in the lowest quartile (LQ) and from 20.2 to 21.9 in the highest quartile (HQ). Peer ratings for skill ranged from 12.0 to 16.5 in the LQ and from 21.4 to 23.9 in the HQ. The length of time to complete the UVA ranged from 10.3 to 49.0 min with a mean time of 19.8 min for HQ vs 30.0 min for LQ surgeons (with mean peer scores of 22.3 vs 15.0, respectively). Peer ratings of skill showed a greater correlation with the time taken to complete the anastomosis than crowd review (peer $r=-0.54$, $p=0.004$; crowd $r=-0.44$, $p=0.021$; Figure 1).

CONCLUSIONS: Time taken to complete a step for RARP correlated with peer review of robotic skill. Incorporating time for assessing surgeon skill provides an easily obtainable, comparable, and objective measure that can help target surgeon specific areas for improvement and establishment of benchmarks.

Figure 1: Relationship between time to complete urethrovesical anastomosis and crowd and peer ratings of skill (GEARS: Global Evaluative Assessment of Robotic Skills).