Validation of the RobotiX Mentor Robotic Surgery Simulator

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Introduction

With robotic-assisted surgery becoming more common practice in urology, effective training remains a challenge. There is a considerable learning curve associated with robotic training1, though this has been reported as gentler than for laparoscopic training2. Simulation has gained widespread acceptance as a method of reducing the initial phase of the learning curve.

The RobotiX Mentor3,4 is a new virtual reality simulator which mimics the interface of the da Vinci® Surgical System, with integrated training modules including Fundamentals of Robotic Suturing (FRS) and Robotic Suturing. Face, content, and construct validity of the suturing module has been confirmed in a previous study1 though this was performed on a different platform.

This study aims to assess construct, face, and content validity of the RobotiX Mentor virtual reality simulator. It also aims to assess its acceptability as a training tool and feasibility of its use in training.

Methods

This prospective, observational and comparative study recruited novice (n=20), intermediate (n=15), and expert (n=11) robotic surgeons as participants from institutions across the United Kingdom and Europe.

After a familiarisation task, each participant completed nine surgical tasks across two modules on the simulator, followed by a questionnaire to evaluate subjective realism (face validity), task importance (content validity), feasibility, and acceptability. Outcome measures of novice, intermediate, and expert groups were compared using Mann-Whitney U-tests to assess construct validity.

Results

Construct validity was demonstrated in a total of 17/25 performance evaluation metrics (p<0.001). Experts performed better than intermediates in regard to time taken to complete the first (p=0.002) and second (p=0.043) module, number of instrument collisions (p=0.040), path length (p=0.049), number of cuts 2-mm deep (p=0.033), average distance from suture target (p=0.015), and number of suture breaks (p=0.038). Participants determined both the simulator console and psychomotor tasks as highly realistic (mean: 3.7/5) and very important for surgical training (4/5), with simulator pedals (4/5) and knot tying task (4/5) scoring highest respectively. The simulator was also rated as an acceptable (4.3/5) tool for training and its use highly feasible (4.3/5).

Conclusions

Construct, face, and content validity were established for the RobotiX Mentor and feasibility and acceptability of incorporation into surgical training was ascertained. The RobotiX Mentor shows potential as a valuable tool for training and assessment of trainees in robotic skills and may reduce the initial learning curve if utilised as an adjunct to operating-room training.

Investigation of concurrent and predictive validity is necessary to complete validation and evaluation of learning curves would provide insight into its value for training.

References