Creation and Validation of a Novel, Low-cost Dry Lab for Early Resident Training and Assessment of Robotic Prostatectomy Technical Proficiency

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Objective

- Robot-Assisted Laparoscopic Prostatectomy (RALP) is a technically demanding procedure and difficult for novice trainees.
- Current simulation methods are expensive and have yet to achieve widespread adoption. Dry lab simulation is a simple and affordable alternative.
- Our objective was to design and evaluate a novel low-cost, low-fidelity dry lab model for training and assessing proficiency in three specific RALP steps.

Methods

- We created three standardized inanimate tasks to simulate the following radical prostatectomy steps: posterior dissection, neurovascular bundle release, and urethrovesical anastomosis (Fig 1).
- Each task was completed by, medical students (MS, N = 5), junior residents (JR, N = 5), senior residents (SR, N = 5) and urology attendings (N = 7) at a single institution.
- Task completion time was recorded, and task performance was evaluated by blinded graders using the Global Evaluative Assessment of Robotic Skills (GEARS) scores (Fig 2).
- Surveys were distributed following the task to evaluate user experience (Fig 3).

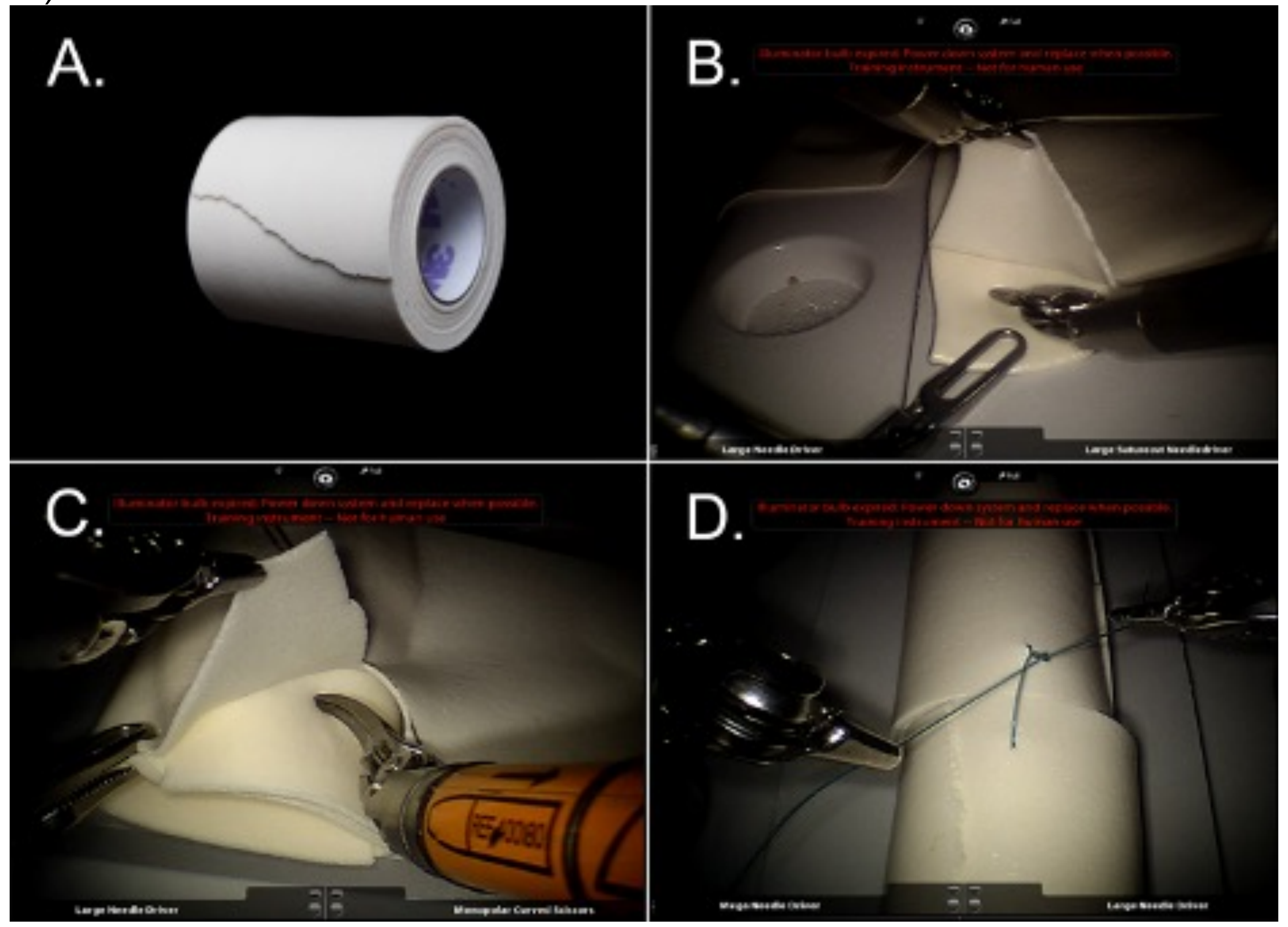

Fig 1. RALP dry lab models (a) 3M™ Microfoam™ tape material used to construct dry lab models. (b) Posterior dissection ("Tape Peel") model. (c). Neurovascular Bundle Release ("Cut and Peel") mode. (d) Urethrovesical Anastomosis ("Tube Anastomosis") model.

Results

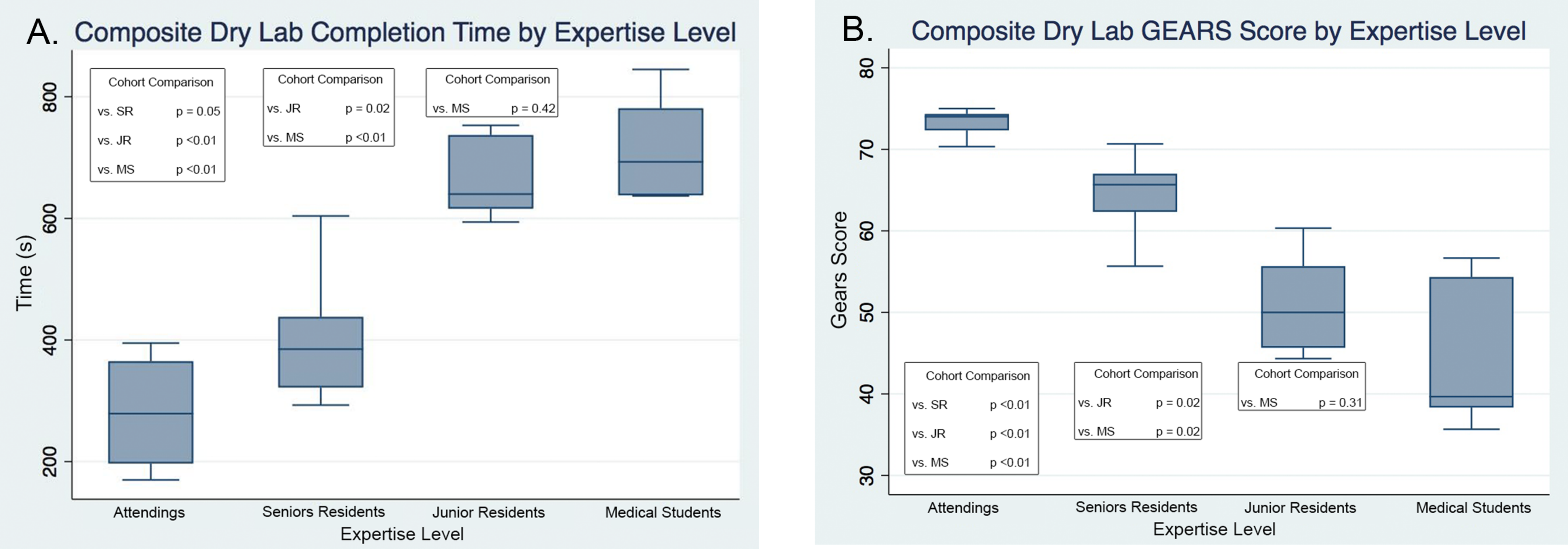

Fig 2. Composite dry lab (a) completion times and (b) GEARS scores by expertise level and differences in performance between cohorts

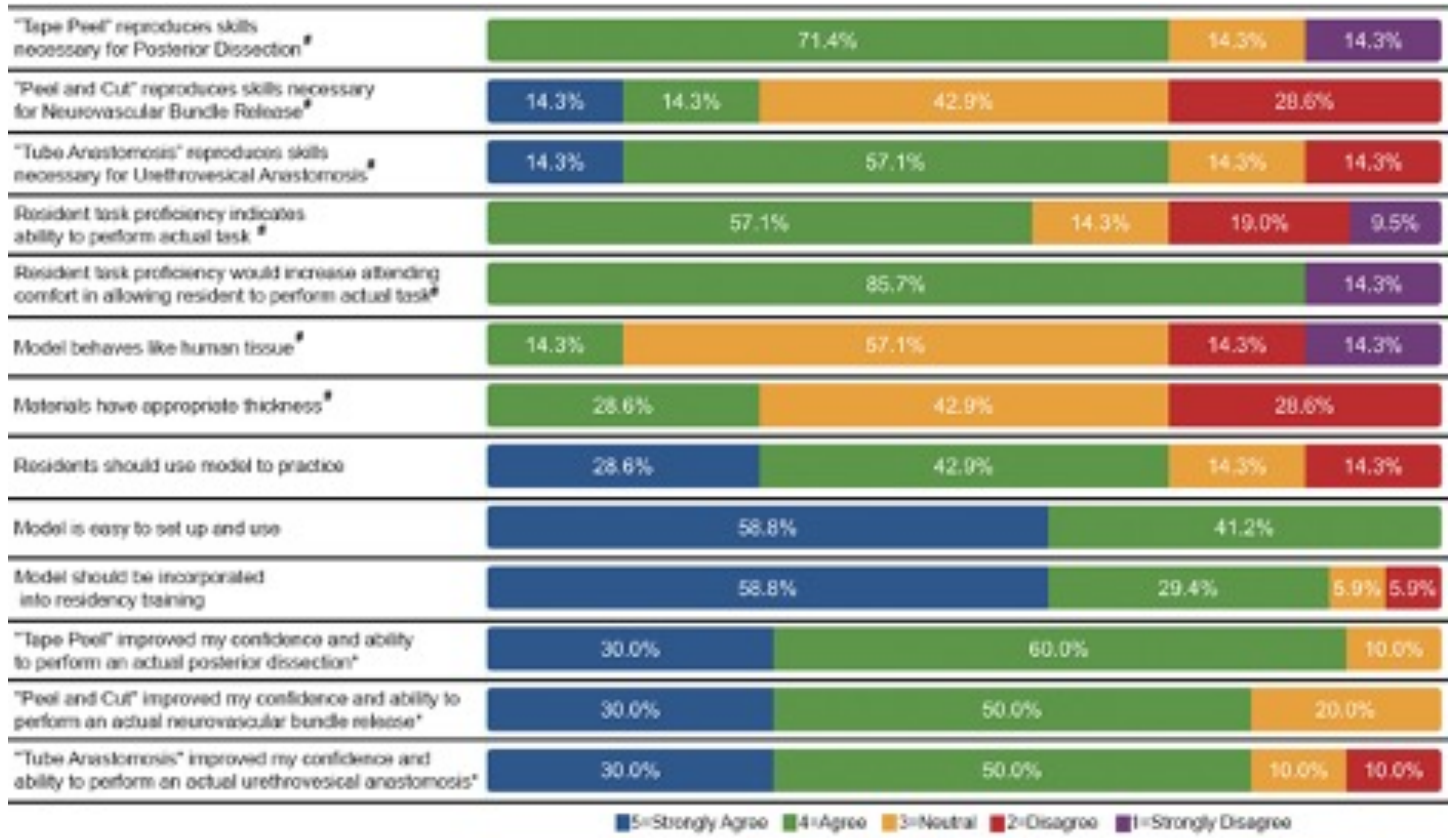

Fig 3. Dry lab content validity, face validity, and acceptability ratings. Content and face validity were assessed only by attendings and indicated by '#' (n=7). Acceptability was assessed by both residents and attendings (n=17). The last three items* were asked only of residents (n=10).

Discussion

- While several high fidelity RALP simulation tools exist, significant barriers, including cost and resident time constraints, limit their use in residency training
- This dry lab cost under US $25 to produce can be easily reproduced using materials that are readily available within the hospital setting.
- There was a significant difference in task completion times and GEARS scores when comparing all participant cohorts.
- Individual cohort differences are presented in Fig 2.
- The model was rated favorably in terms of technique replication and acceptability for use in residency training. However, most felt the model was dissimilar to human tissue (Fig 3).

Conclusion

This low cost, procedure-specific dry lab demonstrated evidence of content validity, construct validity, and acceptability for simulating key robotic prostatectomy technical steps and can be used to augment RALP surgical training.

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