

Bootcamp to Bedside: Implementation and Evaluation of a Multimodal Robotics Curriculum

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Introduction

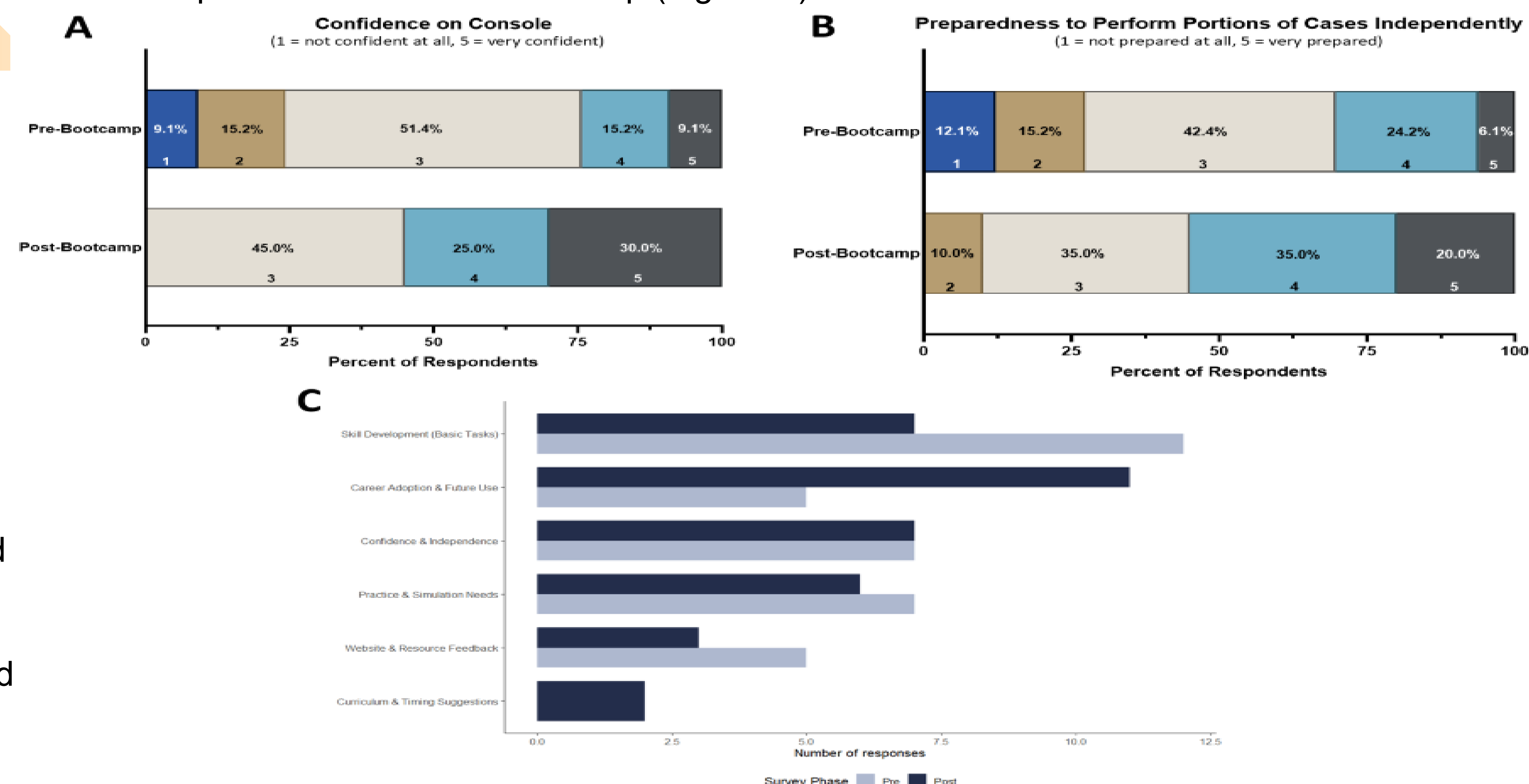
Robotic surgery is increasingly integrated into surgical practice, yet training opportunities remain inconsistent and no standardized curriculum exists. Evidence demonstrates that simulation-based approaches, including virtual reality, bio tissue training, and web-based didactics, enhance technical skills, operative performance, and confidence. The purpose of this study was to evaluate a multimodal curriculum designed to provide consistent, structured exposure to robotic surgery. We hypothesized that this integrated curriculum would improve resident confidence and preparedness for robotic-assisted procedures.

Methods

Our institution implemented a robotics curriculum with three key components: virtual simulations on the robot, a one-week immersive bootcamp with level-based simulation, and an online video platform. Together, these resources were designed to provide residents with progressive and sustained exposure. The bootcamp, developed in collaboration with Intuitive, incorporated level-specific simulation and operative training. PGY 2-3 residents performed gastrojejunal anastomoses using porcine tissue, while PGY 4-5 residents completed cadaver-based operations. All residents practiced robotic suturing, tissue handling, and port placement with faculty providing real-time feedback. To supplement the hands-on training, the video platform provided operative recordings narrated by faculty and fellows. Pre- and post-bootcamp surveys assessed confidence, preparedness, and perceptions of robotics using 5-point Likert scales. Quantitative responses were compared using Wilcoxon rank-sum tests ($p < 0.05$) and open-ended responses were analyzed thematically.

Results

Of 33 residents completing pre-surveys, 20 also completed post-bootcamp surveys. Baseline console confidence was 3 [IQR 3-3] and preparedness to perform cases was 3 [IQR 2-4], with fewer than one-third of residents reporting high scores (≥ 4) in either confidence or preparedness. Following the bootcamp, both confidence (4 [IQR 3-5], $p = 0.005$, Figure A) and preparedness (4 [IQR 3-4], $p = 0.032$, Figure B) improved significantly, with 55% reporting high scores in each domain. Senior residents demonstrated greater post-bootcamp console confidence than juniors (5 [IQR 4-5] vs 3 [IQR 3-4], $p = 0.009$), though preparedness scores were similar ($p = 0.160$). Among the 25 residents who reviewed the online video platform, 80.0% rated it highly helpful (≥ 4). Thematic analysis highlighted skill development and future application as predominant themes, with residents frequently describing increased confidence and independence after the bootcamp (Figure C).



Conclusion

A structured robotics bootcamp with supplemental online video resources measurably improved resident confidence and preparedness for robotic-assisted surgery. These findings support adoption of standardized robotics curricula in residency education. Future efforts should expand specialty-specific faculty engagement and create more opportunities for deliberate practice to further enhance autonomy and skill acquisition.

