Robotic General Surgery Training Curriculum for Residents at an Academic Medical Center

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Background/Introduction

- Robotic-assisted surgery is on the rise across the nation and across specialties
- Across all specialties, general surgery has had the largest volume increase in recent years[1]
- Studies have shown an increase from 1.8% to 15.1% and that number will only increase[2]
- Despite this, there is a paucity of standardized robotic curricula in general surgery training

Purpose/Objectives/Hypothesis

Purpose of this study is to evaluate the effectiveness of a standardized robotics curriculum in the Houston Methodist Hospital general surgery residency program

Methods

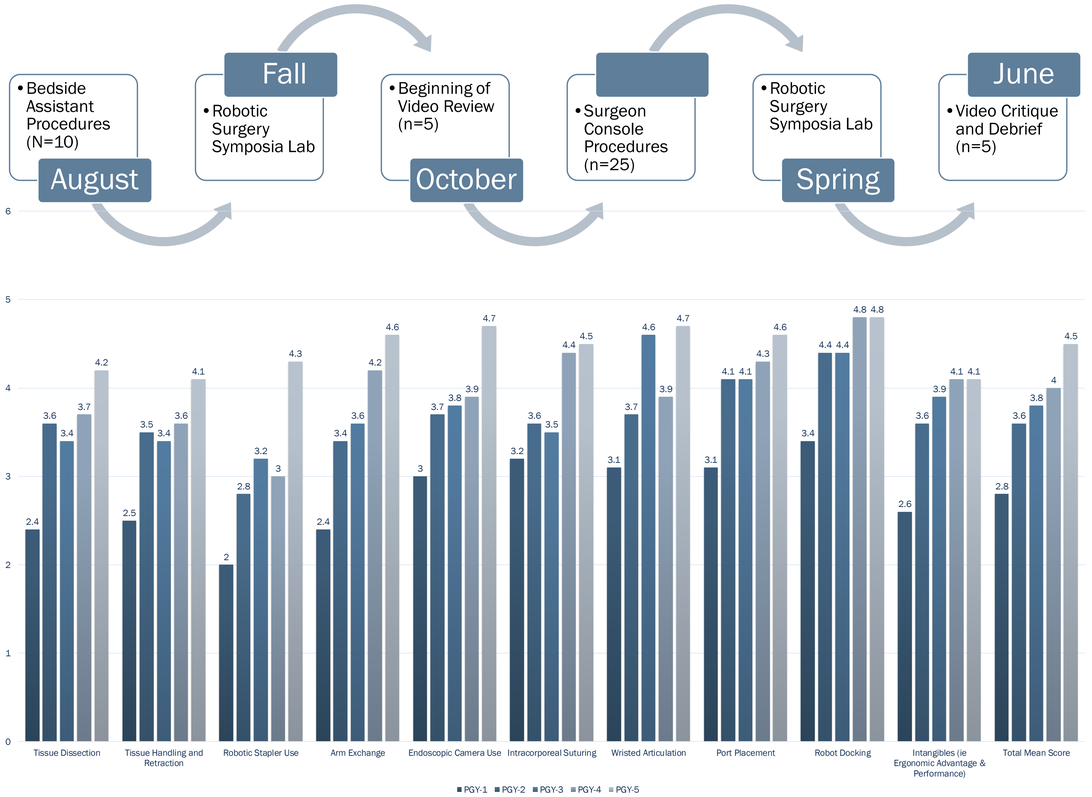
- Single-institution formal education curriculum was developed to evaluate residents PGY-1 to PGY-5
- Included two robotics training symposia
- First- and second-year residents were required to complete 10 bedside assists prior to sitting on the console
- Cases were documented in an online database with de-identified info
- For each robotic case, residents were graded 1-5 (1: poor, 2:fair, 3: good, 4: very good, 5: excellent) on ten metrics using our Competency-Based Assessment of Robotic Surgery Skills curriculum system (CARS): Tissue dissection, tissue handling and retraction, robotic stapler use, arm exchange, endoscopic camera use, intracorporeal suturing, wristed articulation, port placement, robotic docking, intangibles (including ergonomic advantage & performance)

I. Tissue dissection, blunt and sharp

- 5 - excellent: The resident treats tissues with finesse and respect, both with gross and fine dissection techniques, both along natural tissue planes and along tissue planes in re-operative fields (when applicable)
- 4 - very good: The resident treats tissues with respect, mostly with gross dissection techniques although not consistently with fine dissection techniques, along natural tissue planes but not consistently along tissue planes in re-operative fields (when applicable)
- 3 - good: The resident treats tissues with care only with gross dissection techniques, without fine dissection techniques, and only along natural tissue planes, never in re-operative fields (when applicable)
- 2 - fair: The resident shows a limited ability to dissect along natural tissue planes and only with basic gross dissection techniques
- 1 - poor: The resident lacks any notion of proper dissection techniques and is not able to define the anatomy with robotic instrumentation

Fig1: Example of one metric in CARS curriculum system provided to evaluators

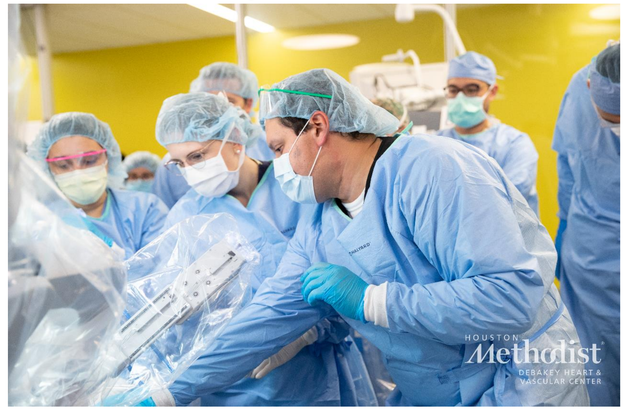
Results



- Total of twenty-nine residents across PGY levels (seven PGY-1, seven PGY-2, six PGY-3, four PGY-4, five PGY-5) were evaluated
- Aggregate average scores increased with PGY level
- Robot docking had the highest mean score
- Robotic stapler use had the lowest mean score
- Largest average score advancements were observed between PGY-1 to PGY-2 and PGY-4 to PGY-5

Robotics Surgery Symposia

- Surgical skills lab held twice in the year for all trainees with multiple procedures on live pigs under general anesthesia at MITIE, including abdominal wall reconstruction, foregut, bariatric, and colorectal operations
- Performances were recorded and evaluated by robotic surgeons from the Houston Methodist system hospitals using the CARS curriculum system in Fig 1



Future Actions

- Robotics certification by the time of graduation
- Continuation of symposia and skills labs including various procedures from all surgical sub-specialties
- Accumulation of competency data to determine trends such as the best procedures that promote improvement, optimal year to progress, year where most deficiencies are seen, etc.
- Phase 2: Video review by independent and blinded reviewers to develop an AI capable of grading surgical proficiency in robotic skills in collaboration with Rice University.

Conclusion

- As trainees gain more robotic surgery experience, the need for a validated robotic general surgery curriculum increases
- Performance scores increased as resident experience and PGY level increase, demonstrating the reproducibility and objectivity of our CARS curriculum system

References

1. Medical Association, A. (2018). *Letters Estimation of the Acquisition and Operating Costs for Robotic Surgery*. https://doi.org/10.1001/jama.2017.7219
2. Sheetz, K. H., Claflin, J., & Dimick, J. B. (2020). Original Investigation | Surgery Trends in the Adoption of Robotic Surgery for Common Surgical Procedures Key Points + Supplemental content. *JAMA Network Open*, 3(1), 1918911. https://doi.org/10.1001/jamanetworkopen.2019.18911