Are We Diluting Surgical Training? A Perspective of the Impact of Robotics on Surgical Trainees

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Introduction

- Studies examining the efficacy, utility, and value of the robotic platforms largely conclude that **robotic surgery is non-inferior** to traditional laparoscopy in terms of patient outcomes, but **results in longer operative times** and **is more expensive**, **even when performed by very experienced, well established surgeons.**

- Major studies examining robotic surgery compared with laparoscopic surgery show:

	Clinical Benefit	More Expensive	Longer Op Time
IHR[1-2]	No	Yes	Yes
VHR[3-5]	No	Yes	Yes
Bariatrics[6-9]	No	Yes	Yes
Foregut[10]	Mixed	Yes	Yes
CCY[11]	Harmful	Yes	Yes
Colon[12-13]	No	Yes	Yes
Rectum[14-15]	Yes	Yes	Yes

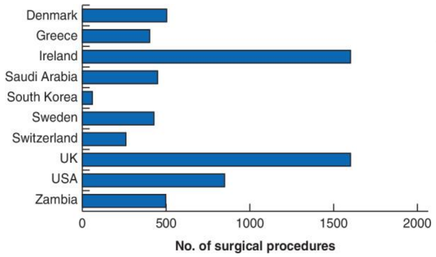
- Despite this, robotic surgery continues to become increasingly ubiquitous in general and minimally invasive surgery and is estimated to represent 22% of all general surgical procedures in the U.S. in 2022.[16]
  - Inguinal hernia repair (28.8%)
  - Reflux surgery (26%)
  - Ventral hernia repair (22.4%)
  - Colectomy (16.3%)
  - Cholecystectomy (7.5%)

- We examine the impact of the growing utilization of robotic platforms in general surgical and bariatric procedures on surgical trainees.

Trainee Thoughts & Experience

- Industry-sponsored study shows trainees want robotic experience:[17]
  - 73.8% of trainees would value greater access to robotic surgery training.
  - 73.4% believed that robotic surgery was important for the future of their desired specialty.
  - 77.2% believed it should be incorporated into formal surgical training.

- In order to perform more robotic cases within the time boundaries of training, **an increase in robotics has been associated with a decrease in traditional laparoscopic minimally invasive surgery during surgical training.**



Competency thresholds for certification of surgical trainees across the globe

- Studies estimate that 50-100 cases are required to achieve robotic proficiency for already very experienced laparoscopic surgeons; may be 3-4 times higher in trainees. This may be difficult to accommodate during training.[18-19]

- Worse, studies demonstrate that **there is negative skill transference from robotics to laparoscopy**, and that learning robotics first can hinder performance of laparoscopic surgery, while there is positive skill transfer from laparoscopy to robotics.[20]

Trainee Thoughts & Experience

- Residents perform meaningful portions of robotic cases much less often than during laparoscopy.[21]

Attending Thoughts

"**The… barrier is having someone at the bedside**. Because now, instead of requiring just one resident in the case as in laparoscopy, now in order to be on the console, I have to find another resident to be at the bedside assisting"

"We're a relatively well-staffed service, so we've always had a resident [at bedside]. **But it's not the best use of that resident.**"

Resident Thoughts

"When it's the robot, the attending is sitting down and doing the case. While it's easy to switch, there has to be somebody bedside assisting, so **the attending has to make a conscious decision to let the resident on the console. It's not like you're already there and doing the case together**. It's more like 'I'll step aside now and let you do it.' So, **it has to be a much more conscious decision to let you do it"**

- Many residents report barriers in their transition from bedside assistant to console surgeon.

- With increased robotic caseloads during surgical training, **surveys show that residents and fellows sacrifice complex laparoscopic cases in order to serve as a bedside assistant** or perform more basic robotic procedures in an attempt to overcome the learning curve of a new operative modality.

Conclusions

- There is not persuasive evidence to support the widespread conversion away from laparoscopy and toward robotics from clinical, financial, or trainee perspectives.

- Trainees may require significantly more operative cases during to achieve appropriate operative autonomy with the addition of robotics. This is due to stunted development in operative skill which owes to performing robotic cases in liue of complex open and laparoscopic cases.

- Surgical training is time-limited and may not allow for mastery of open, laparoscopic, and robotic techniques; these approaches should be treated as discrete entities and their unique learning curves and skill transference should be considered when designing surgical curricula.

- Careful consideration must be given to how best to incorporate robotics in surgical training in order to allow for surgical proficiency within the current construct and confines of surgical training.

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