

Bridging the gap: assessing the integration of robotic-assisted surgery into Canadian surgical training programs

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SUMMARY

The adoption of robotic surgery has surged globally across multiple surgical specialties, but uptake in Canada has unfolded at a slower pace. Surgical educators and trainees in Canada face potential challenges related to sufficient exposure, experience, and competence in robotic surgical procedures. We conducted a cross-sectional national survey to gain insight into the perspectives of program directors overseeing general surgery residency and fellowship programs on the integration of robotic surgery into Canadian surgical training programs. Despite the presence of robotic surgery platforms at most academic and academic-affiliated hospitals, few trainees have exposure to any robotic surgery. Furthermore, a gap exists between the training provided in robotic surgery and its anticipated relevance to trainees upon graduation. Increased focus on the integration of robotic surgery within general surgical training in Canada is required to equip trainees for their careers.

The increasing proportion of surgical procedures performed robotically is reshaping the landscape of surgical training, particularly in the United States. In Canada, this shift is occurring to a lesser degree, owing to distinct regulatory, reimbursement, and health system drivers.^{1,2} Surgical educators must consider the impact of robotic surgery on trainees, including residents and fellows. In Canada, the precise role of robotic surgery in general surgery and its associated fellowships remains unclear, with no structured training program.

Just as with laparoscopy, surgical trainees' exposure and experience with robotic surgery in Canada may be occurring at varying rates across different training programs.² In 2022, 24 of 83 general surgery residency or fellowship program directors participated in a cross-sectional survey focused on understanding Canadian program directors' perspectives on the role of robotic surgery within general surgery residency and subspecialty fellowship training programs. Among the respondents, 18 (75%) program directors confirmed that trainees have access to a robotic surgical system. However, only 8 (33%) stated that surgical trainees are given the opportunity to use the robot platform in a clinical setting, and robotic surgery constituted less than 5% of their clinical case volume. None of the program directors felt their trainees would gain competence in performing robotic surgery independently by the completion of their training. Nonetheless, it is worth noting that 13 (54%) program directors indicated that training in robotic surgery would be relevant to the practice setting in which their graduates will eventually work. This highlights the existence of a conspicuous gap between surgical training in Canada and the independent practice environment that program directors envision for their trainees.

The minimal exposure of general surgery trainees in Canada to robotic surgery echoes the comparatively slower adoption of this surgical platform in Canada, especially when compared with other jurisdictions, such as the US.¹ Program directors indicated that barriers to training in robotic surgery included limited access to robotic platforms and consumables (66.7%), limited evidence supporting improved patient outcomes (42.9%), and high

consumable costs (38.1%). The landscape may change in the years to come, as more competitors enter the market, improving access and cost-efficiency.

Several programs participating in this survey have either initiated or plan to introduce a formal robotic training curriculum. Within a resource-constrained system, it is crucial to equip trainees with the ability to critically evaluate technology and evidence pertaining to the use of robotic and minimally invasive approaches. This includes judicious patient selection, given that existing evidence does not universally support the adoption of robotic approaches in all patient populations and procedures.³ Trainees may be taught to leverage the potential advantages of the technology in facilitating minimally invasive surgery for some patients who otherwise would have required an open approach.³

The landscape of robotic surgery training among general surgery trainees in Canada differs tremendously to that in the US. This is relevant given that the 2 countries have reciprocal training and licensing arrangements in place for general surgery and subspecialty disciplines. Although most programs in the US include formal robotic surgery training and exposure for surgical residents,⁴ only 4 (17%) Canadian programs in this survey offer formal training. It is important to highlight that in the US, although robotic surgery training is more common, there is not yet a requirement for residents or fellows to demonstrate a minimum case volume or competency level for graduation or board certification. With the rapid proliferation of robotic surgery globally, acquiring these skills may become an expectation, similar to laparoscopic surgery. Minimal exposure to robotic approaches may be perceived as a limitation by international trainees considering Canadian centres for residency or fellowship training, and in the recruitment of international faculty. Conversely, the skills acquired by trainees, whether open or laparoscopic, are translatable to robotic surgery. Moreover, the learning curve for robotic surgery is reported to be shorter than that for laparoscopic surgery.⁵ Hence, trainees should be reassured that completing surgical or fellowship training without the use of robotic-assisted surgery may not hinder their prospects.

As robotic surgery continues to expand internationally, educators must plan for the evolving landscape of surgical approaches. It is important to acknowledge that the perspectives of the program directors who responded to our survey are subject to differential sampling (28.9% response rate). Consequently, these findings may not comprehensively represent the national perspective of all program directors. Respondents may have a particular interest in further expanding training in robotic surgery or hold the belief that robotic surgery does not have a place in the Canadian health care system. Additionally, this survey captures the program directors' perspective and not the viewpoints of trainees or other faculty, who may have different interests, experiences, and motivations for considering the role of robotic surgery in training.

Current exposure to robotic surgery during general surgery residency and subspecialty training in Canada is modest or absent. Nevertheless, most participating program directors in Canada foresee that robotic surgery will be relevant to the future practice setting of their residents and fellows. Formal and informal training in robotic surgery is not well established, and there seems to be little consensus in Canada on whether, when, or how to train residents and fellows. Opportunities exist to enhance exposure to and formal training in robotic surgery within Canada. Considering the current high costs of robotic surgical approaches and the evolving evidence, trainee education should also consider when and how to responsibly employ this surgical technology in the Canadian context. Trainees should be taught to balance innovation in minimally invasive approaches and the imperatives of patient safety and health system stewardship.

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References

- Muaddi H, Hafid ME, Choi WJ, et al. Clinical outcomes of robotic surgery compared to conventional surgical approaches (laparoscopic or open): a systematic overview of reviews. *Ann Surg* 2021;273:467-73.
- Locke J, Robinson M, MacNeily A, et al. Evolving attitudes toward robotic surgery among Canadian urology residents. *Can Urol Assoc J* 2017;11:E266-70.
- Muaddi H, Stukel TA, De Mestral C, et al. Adverse events following robotic surgery: population-based analysis. *Br J Surg* 2022;109:763-71.
- George LC, O'Neill R, Merchant AM. residency training in robotic general surgery: a survey of program directors. *Minim Invasive Surg* 2018;2018:1-7.
- Leijte E, De Blaauw I, Van Workum F, et al. Robot assisted versus laparoscopic suturing learning curve in a simulated setting. *Surg Endosc* 2020;34:3679-89.