

UroBOT: A national survey of Canadian urology residents and fellows on robot-assisted surgery

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ABSTRACT

Introduction: Robot-assisted surgery (RAS) has a positive impact on the quality of care given to patients. Its increasing adoption in Canadian urology practice also influences the surgical training of residents and fellows. Currently, the lack of clear objectives makes RAS education challenging. The main objective of our study is to highlight how urology trainees perceive the importance of RAS and the standardization of its training.

Methods: In 2021, we conducted a survey of all the residents and fellows enrolled in a Canadian urology program. The questions assessed their opinion on the importance of RAS and on their robotic surgery training.

Results: The response rate was 29%. The majority of participants (67%) wished that they would have a better exposure to RAS during their surgical training. Only 7% of respondents reported that their program had clear criteria to help them progress through the steps of RAS, and most trainees (81%) felt their residency program should provide them with a formal RAS training program. Seventy-six percent of respondents believed that RAS would become a core

KEY MESSAGES

- Most urology residents and fellows in Canadian programs are interested in RAS.
- Although most Canadian urology trainees believe RAS will become a core skill required by the Royal College of Physicians and Surgeons of Canada, RAS training is not standardized.
- The perceived main challenge for the standardization of RAS education is the lack of time due to the already demanding nature of surgical residency programs.

skill required by the Royal College in the future, although 32% feared it would hinder their ability to learn other important techniques, such as open surgery.

Conclusions: Our study revealed that, although most respondents are interested in RAS, their training lacks standardization. Moreover, the potential integration of RAS as a core skill of the Royal College faces some important challenges, mostly due to the perceived lack of time to learn a new surgical technique.

INTRODUCTION

The arrival of new technology has transformed surgery into an ever-evolving field. One example is the development of robot-assisted surgery (RAS). Following Health Canada's approval in 2001, the introduction of the da Vinci robot has influenced several surgical specialties, with urological procedures leading the way.^{1,2} Although it offers many benefits, there are challenges associated with RAS, particularly from a health system and educational perspective. These include the prohibitive cost of the RAS in a universal healthcare system, finding the optimal way to integrate this surgical approach in the residency training, and taking all the measures needed to make it as effective as possible while also limiting complications.^{1,3}

In Canada, considering that RAS is mostly performed in tertiary centers where residents and fellows are trained, its adoption has had a significant impact on surgical education.¹ Even though the exposure to RAS during residency has inevitably increased, practice at the console remains limited.⁴ Currently, surgical education in RAS is difficult because there are no clear criteria that guide urologists on how to train their residents/fellows.⁴⁻⁶ A recent study from the United States has shown that surgical training varied across urology residency programs.⁷ In Canada, RAS has yet to be formally defined as a Royal College entrustable professional activity (EPA) in urology.^{2,8} A universal standardized program in RAS do not currently exist across Canadian urology residency programs even though they have been shown to provide a benefit for the trainees in other surgical fields such as general surgery.⁹

In 2010, Canadian urology residents were asked about their experience with RAS.¹⁰ Although the majority wanted to improve their skills in robotic surgery, there were worries that more exposure to RAS would negatively affect their ability to perform other techniques that are part of surgical training.¹⁰ Due to the already demanding nature of surgical residency, a new question arose: should RAS be reserved to fellows?⁴ However, it is important to note that since 2010, the surgical landscape has changed. Inter alia, more hospitals have access to robots and there are wider indications for its use.⁴ At the present time, there aren't any official recommendations on whether or not a fellowship is required to practice RAS independently in Canada. Each institution has its own accreditation requirements.⁶

For all the above reasons, it is essential to better understand residents' and fellows' opinions on these topics. The objectives of this study were to: (1) Paint a global picture of how Canadian urology trainees perceived the importance of RAS; (2) Compare the beliefs of junior

(R1-R3) and senior (R4-fellows) residents regarding the importance of RAS; and (3) Describe the participants' exposure to RAS during their surgical education.

METHODS

In order to achieve our objectives, we developed a cross-sectional observational study. After the approval of the Centre de recherche de l'Université de Sherbrooke Research Ethics Board, a questionnaire was developed and its quality was tested among 20 urology residents/fellows training at several Canadian institutions. Although not validated, the survey questions were formatted as multiple choice, yes-no, check-all-that-apply, and short answer questions. An online questionnaire, available in both English (*Appendix 1*) and French (*Appendix 2*), was generated on REDcap™. The survey also contained basic demographic questions, followed by questions about RAS and residents' exposure to RAS.

All urology trainees who attended a Canadian training program received an invitation to participate via email (n=184). The survey invitation was either sent directly to them or transferred to them by their program director, according to the preference of each residency program. Following the initial invitation, one program had declined to participate. Initial invitation email was sent on June 12th, 2021 and a reminder was sent again two weeks later. The participants were given a total of 4 weeks to answer the survey. Responses were anonymous and no data allowing the identification of the participants was collected. Respondents who did not complete the survey beyond the demographic questions and trainees in fellowship were excluded from the analysis.

Statistical analyses were conducted using IBM SPSS® software, version 28. Categorical variables were reported using proportions. Continuous variables were reported using medians due to skewed distributions. Chi-squared or Fisher's exact tests were used, where appropriate, to assess differences in the perceptions toward RAS between for junior (PGY 1-3) and senior (PGY 4, 5, fellows) trainees. All statistical tests were two-sided and p-values <0.05 were considered statistically significant.

RESULTS

Demographic data

Out of 184 eligible urology trainees, 53 responded to the survey (29%). Of the participants, two were excluded because they did not complete the survey beyond the demographic questions and the 6 trainees in fellowship were also excluded (Figure 1).

67% (30/45) of participants were men and the median age of the respondents was 28 years old (range 24 to 34). Junior residents (PGY 1-3) represented 64% (29/45) of participants while 36% (16/45) were senior residents (PGY 4-5).

Exposure to RAS and its standardization

Answers on objective and subjective questions regarding exposure to RAS are summarized in *Table 1*. The majority (56%) of respondents reported that their program had one Da Vinci robot

and 79% reported that a dual console was available at one of their institutions. 71% of participants reported that their institution offers fellowship programs that include RAS. Reported yearly RAS cases performed by institution varied, but the majority reported greater than 100 cases/year (all faculty members included).

Of the participants, only 7% reported that their program had clear and objective criteria in their programs to help them progress through the steps of a RAS. 32% of participants reported that a basic learning curriculum for RAS exists in their residency programs. The majority of residents (67%) wished that they would participate to a greater number of RAS cases during their surgical training. Although 88% of trainees reported having access to a RAS simulator, 56% of them reported that they had never practiced on it. The most commonly reported reasons behind this were: lack of specifically dedicated time (61%) and not enough time in general (61%). Also of importance, 32% of trainees felt that RAS training already hinders their ability to learn other common procedures.

Nonetheless, the majority of trainees (81%) believed that it is necessary to establish a basic training program in RAS for Canadian urology residents. 89% of them also believed that the program should be standardized throughout the Canadian urology programs. Most participants felt that the curriculum should include theoretical modules, training on virtual reality simulators, and surgery practice in the operating room. Residents also believed that RAS training should begin as early as R1-R3 on robot simulators (95%) and during R1-R3 (88%) or R4-R6 (12%) on real patients.

Importance of RAS

The perceived importance of RAS during their training and in their future career are reported in *Table 2* and *Table 3*, respectively. 49% of respondents reported being interested in pursuing a fellowship program that contains RAS and 75% wished to practice RAS during their career. 55% of trainees believe that RAS training should be mandatory during residency. When asked to explain why, these trainees stated that this practice-changing technology will become more common and accessible in the future and that RAS is here to stay. They also mentioned that the new skills developed by learning RAS are very good for surgical coordination and even transposable to laparoscopy in many cases. On the other hand, 33% of trainees stated that RAS training should be optional as they did not believe that RAS is a skill that general urologists will use in the near future. They also felt that learning RAS will give them less time to practice other important procedure such as open surgery or conventional laparoscopy. According to these respondents, the goal of residency is to train future community urologists and not necessarily a urologist proficient in RAS. Hence, although 76% of respondents anticipate that RAS will become a core skill required by the Royal College in the future, 52% of participants think that a fellowship should be required to practice RAS independently.

Comparisons regarding their perception of the importance of RAS between junior and senior residents are summarized in *Table 4*. All comparisons were non statistically significant

with the exception of junior residents feeling the need to participate to more RAS during their residency compared to senior residents ($p=0.02$).

DISCUSSION

We conducted a pan-Canadian survey to assess urology residents' and fellows' perception of RAS in 2021. Our study highlights that the majority of respondents are interested in RAS and wished to be more exposed to it during their training. Importantly, even though most participants believed that a uniform RAS training curriculum should be established in Canada, less than half of respondents reported that a basic RAS training program exists at their institution.

From 2011 to 2014, there number of RAS urology cases in Canada has increased from 1000 to 2200.⁴ The increasing amount of RAS procedures is driving trainees to perceive its importance for their future surgical careers. For example, in 2016, 50% of residents thought that RAS would become the new gold standard for certain surgical procedures in urology.⁴ The increasing importance of RAS can also be seen in our study, as 76% of participants thought that RAS will become a core skill required by the Royal College in the future. It is paramount that surgical training reflects the evolution of surgical technology in urology. In the past decade, several Canadian and American studies have also looked at RAS and residency training via surveys. A study by Bachir et al. mentions that “respondents also believed that they have received the least adequate training in robotic surgery (89.3%)”.¹¹ Moreover, in a survey from 2010 conducted by Robinson et al., residents who had access to a robot in their program and those who didn't both wished to have more experience with RAS.¹⁰ Our study reflects their findings, as 67% of our participants wished to practice more RAS.

In 2015, Sood et al. stated that “although, there have been institutional and surgical-societal level efforts at standardization of these processes, so far these efforts have met with limited success and heterogeneity in certification standards persists”.⁶ A similar Canadian study by Mann et al also mirrored their conclusion.⁵ Unfortunately, almost a decade later, our study showed that the standardization of RAS training remains a challenge: an overwhelming minority of trainees (7%) believe that their program offers clear criteria to help them progress in RAS.

When asked about a standardized RAS training program, 94% of our respondents believed that virtual reality simulators should be part of the program; 95% said that simulation practice should start as early as R1-R3. Surprisingly, although the majority of trainees reported having access to a RAS simulator, more than half of trainees reported that they never practice on it on a monthly basis. The most likely explanation is the lack of time dedicated to learning RAS specifically, because residents also need to master surgical procedures that are required by the Royal College, as well as the lack of a dedicated RAS training program. Indeed, in 2010, a Canadian study by Robinson et al. revealed “68% of residents training in programs with a robot felt that its presence had a detrimental effect on training”.¹⁰ More than 10 years later, this concern is still present for 32% of participants.

Due to the already scarce free time in residency curriculums, studies were already questioning whether reserving RAS training to fellows would be the optimal solution. According to Locke et al. it is “important to either modify residency curricula to address RAS experience or to limit RAS to fellowship training”.⁴ This challenge still exists today. 52% of our participants believed that a fellowship should be required to practice RAS independently, probably because their program does not offer enough RAS training for them to feel confident enough. However, in other specialties, standardized training has been shown to provide benefits.⁹ The results published by Moit et al. suggest that if surgical education is adapted to RAS, general surgery trainees might become competent in RAS without needing a fellowship afterwards.⁹ There is no reason to believe that this can’t be applied to urology residents as well.

Limitations

There were two main limitations in our study. While typical for surveys, the response rate of 29% and small sample size may have caused a selection bias. For example, trainees who are interested in robotic surgery could have been more inclined to participate than those who are indifferent to it. As some questions were subjective, a potential consequence could be the overestimation of the importance of RAS. To the contrary, it is also possible that some answers underestimated the importance of RAS. For example, 75% reported being interested in practicing RAS during their career. However, as we did not exclude trainees that wished to pursue a subspecialty where RAS is seldom being used (i.e. infertility), it is possible that this number represent an underestimation of the true interest. Furthermore, given our small sample size, we were also underpowered to detect a small difference in the perceptions of junior and senior trainees.

CONCLUSIONS

As RAS is becoming more common in urology, our study provides important information about how Canadian residents and fellows perceive its importance and about their surgical training in RAS. Our results show that urology trainees are interested in RAS, but that there is a lack of standardization in training. Although the majority of respondents believe that RAS will become a core skill required by the Royal College, the lack of time to acquire a new skill and the concern that it will hinder their ability to learn other types of common procedures are two important challenges mentioned by the trainees. As most residents and fellows are interested in having a uniform RAS training program, we hope that this study will be a step towards the standardization of RAS training in urology throughout Canada. However, the integration of a new surgical technique in an already busy curriculum remains a challenge.

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FIGURES AND TABLES

Figure 1. Cohort inclusions and exclusions of participants.

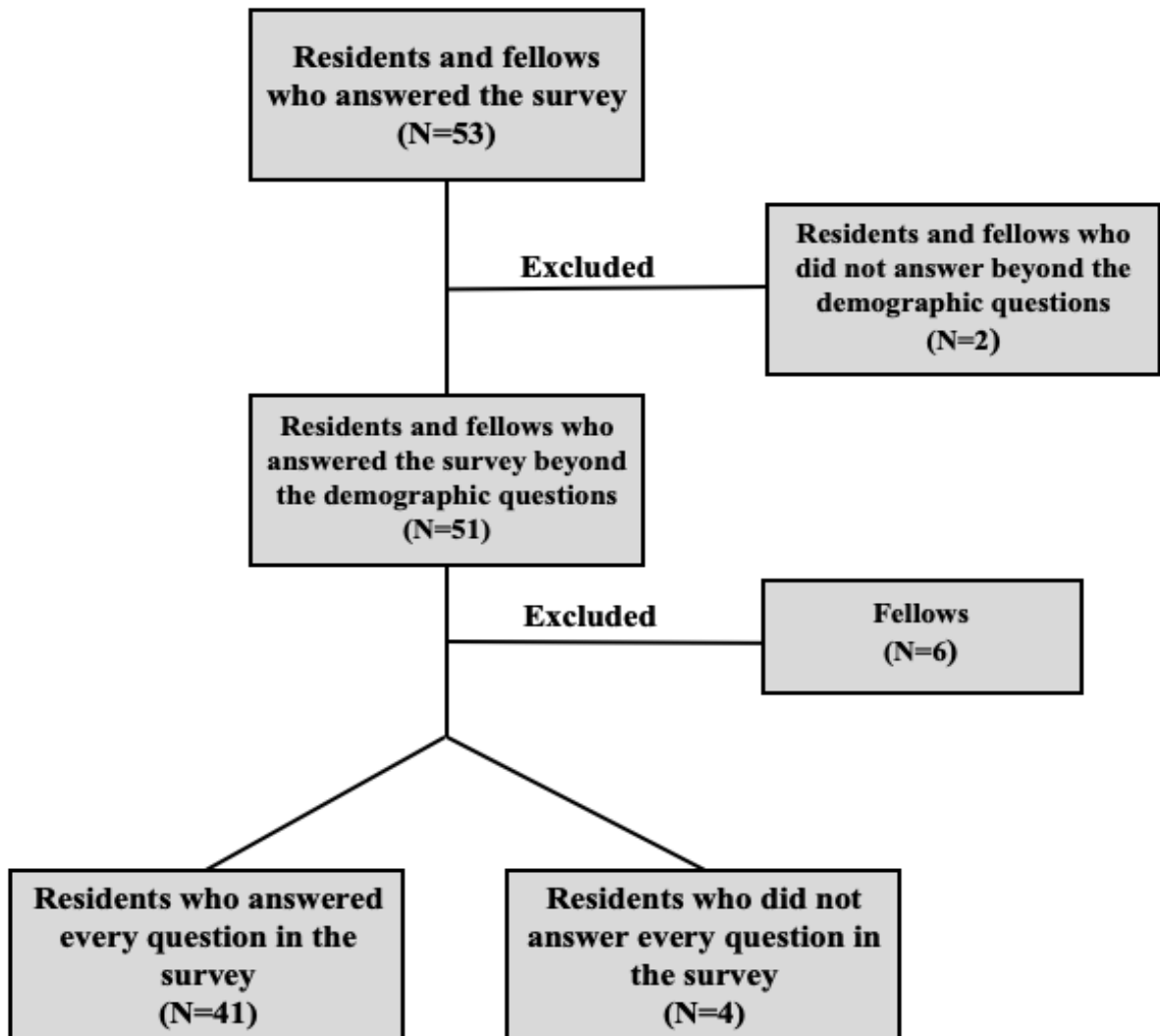


Table 1. Objective and subjective questions about exposure to RAS (N=45)	
Statements	n (%)
My residency program has the Da Vinci robot	
Yes	43 (100)
No	0
N/A	2
Number of robot(s) available	
1	24 (56)
2	15 (35)
≥3	4 (9)
N/A	2
The dual console is available in my residency program	
Yes	34 (79)
No	9 (21)
N/A	2
The robotic surgery simulator is available in my residency program	
Yes	36 (88)
No	5 (12)
N/A	4
On average, how many hours a month do you practice on the robot simulator?	
Never (0 hours)	20/36 (56)
1–2 hours	11/36 (31)
3–4 hours	3/36 (8)
5–6 hours	1/36 (2.5)
>6 hours	1/36 (2.5)
What is/are the main barriers preventing you from practicing more often on the simulator (check all that apply)?	
Lack of dedicated time	22/36 (61)
Lack of time	22/36 (61)
Inaccessibility	6/36 (17)
No structured program	12/36 (33)
Other	3/36 (8)
My institution offers fellowships that include training in RAS	
Yes	29 (71)
No	12 (24)
N/A	4
The number of robot-assisted cases each year at my institution is (including all urology faculty members):	
<50	0
50–100	9 (20)
101–200	17 (40)
>200	17 (40)
None	0
N/A	2

Are there clear and objective criteria in your program for residents to progress through the steps of a RAS?	
Yes	3 (7)
No	30 (73)
I don't know	8 (20)
If so, what are they (check all that apply)?	
Have successfully completed the previous steps	3/3 (100)
Have the attending physician's approval	3/3 (100)
Perform a step in a certain amount of time	2/3 (67)
Does a basic training curriculum for learning RAS exist for residents in your program?	
Yes	13 (32)
No	28 (68)
Do you feel the need to participate in more RAS during your resident training?	
Yes	26 (67)
No	13 (33)
N/A	4
Do you feel that training in robotic surgery at your institution hinders your ability to learn common open or traditional laparoscopic urologic procedures?	
Yes	13 (32)
No	12 (29)
Maybe	16 (39)
N/A	4

RAS: robot-assisted surgery.

Table 2. Questions about the importance of RAS during training (N=45)	
Questions	n (%)
Do you think robotic training should be optional during residency based on resident interest?	
Yes	14 (33)
No	23 (55)
Maybe	5 (12)
N/A	3
Do you believe that a basic learning curriculum in RAS should be established for urology residents in Canada?	
Yes	35 (81)
No	8 (19)
N/A	2
If so, should it be uniform throughout all urology residency programs in Canada?	
Yes	31/35 (89)
No	4/35 (11)
If so, the robotic training program should include (check all that apply):	
Online theory modules	27/35 (77)

Training on virtual reality simulators	33/35 (94)
Surgeries in the operating room	34/35 (97)
At what level of residency should robotic training begin (with a simulator)?	
PGY 1–3	39 (95)
PGY 4–6	2 (5)
N/A	4
At what level of residency should robotic training begin (on a real patient)?	
PGY 1–3	36 (88)
PGY 4–6	5 (12)
N/A	4

PGY: postgraduate year; RAS: robot-assisted surgery.

Table 3. Questions about the importance of RAS in their future career (N=45)	
Question	n (%)
In the future, I would like to practice in this setting	
University	24 (53)
Community	21 (47)
Do you believe that RAS will become a core skill required by the Royal College in the future?	
Yes	32 (76)
No	10 (24)
N/A	3
I hope that my future practice will involve RAS:	
Yes	33 (75)
No	11 (25)
N/A	1
Are you interested in pursuing a fellowship which include training in RAS?	
Yes	20 (49)
No	10 (24)
Maybe	11 (27)
N/A	4
Do you believe that a fellowship should be required in order to perform RAS in independent practice in Canada?	
Yes	23 (52)
No	7 (16)
Maybe	14 (32)
N/A	1

RAS: robot-assisted surgery.

Table 4. Comparison between junior and senior residents regarding the importance of RAS				
Questions	Yes n (%)	No n (%)	Maybe n (%)	p
I hope that my future practice will involve robot-assisted surgery (RAS):				
Junior	23 (82)	5 (18)		0.15
Senior	10 (63)	6 (37)		
Are you interested in pursuing a fellowship which include training in RAS?				
Junior	14 (52)	5 (19)	8 (29)	0.21
Senior	6 (43)	6 (43)	2 (14)	
Do you feel the need to participate in more RAS during your residency training?				
Junior	21 (81)	5 (19)		0.02
Senior	7 (47)	8 (53)		
Do you think robotic training should be optional during residency based on resident interest?				
Junior	11 (39)	14 (50)	3 (11)	0.25
Senior	3 (19)	9 (56)	4 (25)	
Do you believe that a basic learning curriculum in RAS should be established for urology residents in Canada?				
Junior	24 (89)	3 (11)		0.1
Senior	11 (69)	5 (31)		
If so, should it be uniform throughout all urology residency programs in Canada?				
Junior	22 (92)	2 (8)		0.4
Senior	9 (82)	2 (18)		
Do you believe that RAS will become a core skill required by the Royal College in the future?				
Junior	21 (55)	7 (25)		0.65
Senior	11 (69)	5 (31)		
Do you feel that training in robotic surgery at your institution hinders your ability to learn common open or traditional laparoscopic urologic procedures?				
Junior	6 (23)	10 (38.5)	10 (38.5)	0.15
Senior	7 (47)	2 (13)	6 (40)	

RAS: robot-assisted surgery.