

# Trends in the training of female urology residents in Canada

Katherine Anderson, MD<sup>1</sup>; Karthik Tennankore, MD<sup>2</sup>; Ashley Cox, MD<sup>1</sup>

<sup>1</sup>Department of Urology; <sup>2</sup>Department of Nephrology; Dalhousie University, Halifax, NS, Canada

Cite as: *Can Urol Assoc J* 2018;12(3):E105-11. <http://dx.doi.org/10.5489/cuaj.4697>

Published online December 22, 2017

## Abstract

**Introduction:** There is limited research on why women do or do not choose a career in urology. Considering the increasing proportion of female medical students, we assessed for trends in female applicants to urology programs in Canada and their post-residency career choices.

**Methods:** Data from the Canadian Residency Matching Service (CaRMS) was used (1998–2015). Trends in the proportions of females applying and matching to surgical subspecialties, and applying and matching to urology were computed. Surveys were sent to urology program directors to assess female residents' chosen career paths over the last decade.

**Results:** A significant increasing trend in the proportion of females applying to urology as their first choice program was found (0.19 in 1998–99 to 0.27 in 2012–15;  $p=0.04$ ). An increasing trend in the proportion of females successfully matching to urology was found, although it was not statistically significant (0.13 in 1998–99 to 0.24 in 2012–15;  $p=0.07$ ). This was in keeping with the trends found for surgical programs overall. Female graduates choose a variety of career paths, with urogynecology being the most common fellowship (26%).

**Conclusions:** The last two decades has seen an increase in the proportion of female students applying to urology in Canada. Female urology graduates pursue a variety of career paths. It remains imperative that both female and male medical students have early exposure and education about our subspecialty to ensure we continue to recruit the most talented candidates.

## Introduction

In the mid-1970s, the first woman graduated from a Canadian urology residency program.<sup>1</sup> Subsequently, many more females have completed residency and joined the ranks of practicing urologists across Canada. Yet, the majority of practicing urologists are male.

The male predominance is not unique to urology. In the U.S., urology has the third lowest proportion of female resi-

dents across all surgical specialties, higher only than orthopedics and neurosurgery.<sup>2</sup> Canadian data indicate that the only surgical specialty that has enrolled a consistently gender-neutral cohort over the past two decades is general surgery.<sup>3</sup> Many factors have been cited to explain the gender disparity across most surgical training programs. In earlier years, a sheer lack of women entering medical school contributed to the higher number of male surgical residents; however, since the 1970s, the enrolment of women in medical schools across Canada and the U.S. has been increasing such that currently, females occupy approximately half of the seats.<sup>3-5</sup>

There is emerging research that examines why medical students choose to pursue a career in surgery<sup>6,7</sup> and urology in particular.<sup>8</sup> Common themes regarding why women are dissuaded from applying to a surgical residency include: lack of female role models, perceived unattractive lifestyle, negative experiences in surgery, and supposed inability to fit into a masculine career.<sup>7,9,10</sup> To date, there is limited research on why female medical students do or do not choose a career in urology. In addition, information regarding the experiences and outcomes of women in urology is lacking.

Given the changing gender ratio of graduating medical students, our primary objective was to assess the trends in the proportion of female applicants to Canadian urology programs. Our second objective was to explore if there was a propensity for women in urology to pursue particular fellowships, enter community practice, or leave Canada to practice elsewhere. We hypothesized that the proportion of female medical graduates who ranked urology as their first choice and who matched to urology has increased over the last 15 years.

## Methods

This retrospective study used data collected from two sources. First, publically available data from the Canadian Resident Matching Service (CaRMS) website on residency match results for Canadian medical school graduates from 1998–2015 was accessed.<sup>3</sup> We used data starting in 1998, as this is when CaRMS began to report the gender of the matched student online. The data we collected included total number of:

1. CaRMS applicants
2. Surgical discipline residency positions
3. Applicants who ranked a surgical program as first choice
4. Applicants who matched to a surgical program
5. Urology positions
6. Applicants who ranked urology as their first choice
7. Applicants who matched to urology

Although it was not our primary outcome, we collected data on “surgical disciplines” in addition to the data on urology alone. Available CaRMS data for surgical disciplines included: cardiac surgery, general surgery, neurosurgery, ophthalmology, orthopedic surgery, otolaryngology – head & neck surgery, plastic surgery, urology, and vascular surgery. Of note, obstetrics and gynecology was not included in the surgical disciplines grouping by CaRMS. We elected to collect these data to act as a baseline comparison to the trends we assessed in urology programs alone.

The second part of our study consisted of a survey of Canadian urology residency program directors (PDs). The current PDs were sent an email with a letter detailing the study intent and requested information. The letter was written in both English and French. The information requested from 2005 until 2015 included (Appendix 1):

1. Number of females entering their residency program
2. Number of female graduates
3. Number of female graduates entering community practice in Canada or the U.S.
4. Number of graduates pursuing fellowship training
5. Type of subspecialty training

To help improve the accuracy of the survey results, the Canadian Urological Association (CUA) provided the individual PDs with anonymous data on the 2008–2015 female graduates from their respective programs. It was sent in a reminder email to PDs as a reference for their survey responses. This was information that had been provided to the CUA by the PDs in past years. The identity of the residents was not requested at any point in time for the purpose of this study.

Local research ethics board approval was obtained prior to the commencement of this study.

## Analysis

We analyzed the proportion of female and male applicants to CaRMS, the proportion of female and male applicants who ranked a surgical program as first choice, the proportion of female and male applicants who matched to a surgical program, the proportion of female and male applicants who ranked urology as first choice, and the proportion of female and male applicants who matched to urology. Proportions were calculated for each of five time periods (1998–1999, 2000–2003, 2004–2007, 2008–2011, and 2012–2015). Changes across time periods were assessed using the chi-square test for trends.

Descriptive statistics were used to report survey data from PDs and visually displayed using histograms.

All statistical analyses were performed using STATA version 13.1 (StataCorp. 2013. College Station, TX, U.S.). A  $p$  value of  $<0.05$  was considered the threshold for statistical significance.

## Results

### CaRMS data

#### 1. CaRMS applicants

Available CaRMS data broken down by gender was complete from 1998–2015 (Supplementary Tables 1, 2). During that timeframe, we found an increasing trend in the proportion of females applying in the CaRMS match (0.47 in 1998–99 to 0.56 in 2012–15;  $p<0.001$ ).

We assessed for trends in female medical students applying to surgical programs overall. First, we assessed the proportion of females applying to surgery as their first choice out of all the females applying in CaRMS. This analysis did not reveal a trend towards an increasing proportion of females applying to surgical programs (0.11 in 1998–99 to 0.10 in 2012–15;  $p=0.99$ ). Conversely, when looking at the proportion of male students applying to surgical programs out of all the males applying to CaRMS, we identified a statistically significant decreasing trend in the proportion of male applicants to surgical programs (0.28 in 1998–99 to 0.19 in 2012–15;  $p<0.001$ ) (Table 1, Fig. 1).

**Table 1. Applicants to CaRMS and surgical specialties based on gender**

Year cohort	Female applicants in CaRMS (%)	Females applying to surgical specialties (%) <sup>a</sup>	Males applying to surgical specialties (%)	Surgical applicants that are female (%) <sup>b</sup>	Matched to surgical programs (female) <sup>c</sup>
2012–2015	56	10	19	40	38
2008–2011	57	12	24	40	38
2004–2007	56	12	27	36	36
2000–2003	47	9	28	22	21
1998–1999	47	11	28	25	25

<sup>a</sup>Proportions of females applying to surgical specialties out of all the females applying to CaRMS. <sup>b</sup>Proportion of females ranking surgical programs first out of all the applicants ranking surgical programs as first choice. <sup>c</sup>Proportion of females who matched to a surgical program out of all the applicants that ranked a surgical program as first choice.

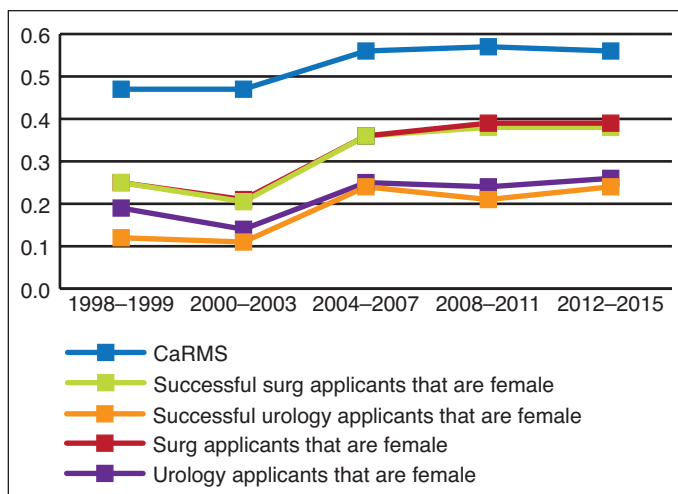


Fig. 1. Comparison of trends in the proportions of female applicants to CaRMS, surgical specialties, and urology (1998–2015).

### 2. Applicants to surgical programs

The cohort of applicants who ranked surgical programs as their first choice was then assessed. We broke this cohort down by gender. This analysis revealed that there was a significant increasing trend in the proportion of female applicants who ranked a surgical program as their first choice (0.25 in 1998–99 to 0.40 in 2012–15;  $p=0.001$ ).

In order to clarify these findings, we provide this example: Although consistently there are approximately 10% of all female medical students applying to surgical programs, as the overall number of female medical students increases this has resulted in a larger overall number of females in the surgical applicant pool. For example, if there were only 50 female medical students in Year A then five (or 10%) would apply to surgery. However, if there were 100 female medical students in Year B then 10 (or 10%) would apply. If the total number of surgical residency seats is 20, then the proportion of females in the surgical applicant pool has changed from 5/20 (25%) to 10/20 (50%).

We then examined the applicants that matched to any surgical program as their first choice. In this cohort, there was a significant increasing trend in the proportion of successful female applicants (0.25 in 1998–99 to 0.38 in 2012–15;  $p<0.001$ ) (Table 1, Fig. 1).

### 3. Applicants to urology

We assessed for trends in the proportion of urology applicants that were female. We found a significant increasing trend in the proportion of females applying to urology as their first choice program from 1998–2015 (0.19 in 1998–99 to 0.27 in 2012–15;  $p=0.04$ ). We found an increasing trend in the proportion of females successfully matching to urology, although it was not found to be statistically signifi-

cant (0.13 in 1998–99 to 0.24 in 2012–15;  $p=0.07$ ) (Table 2). When represented graphically, these data do suggest a positive trend towards an increasing proportion of successful female applicants to urology since 1998 (Fig. 1).

### Post-residency career paths

A total of 11 responses were obtained from the 13 Canadian urology residency PDs (85% response rate). The proportion of reported females beginning and graduating residency varied significantly by year.

Female graduates choose a variety of career paths following completion of their residency. Community practice, as well as urogynecology/reconstruction and pediatric urology were most prevalent. Urogynecology/reconstruction was the most common fellowship, pursued by 26% of female graduates. There were no reports of female graduates pursuing fellowships in the fields of transplantation, infertility, or male sexual dysfunction (Fig. 2).

### Discussion

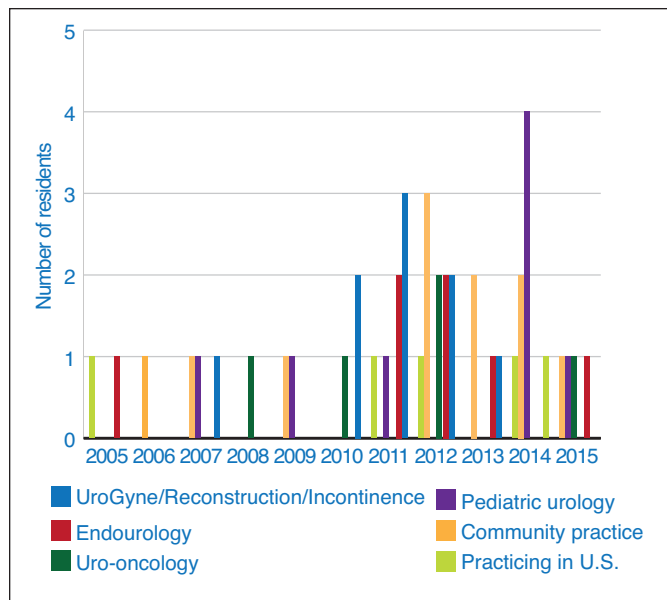
As expected, our study confirms the increasing proportion of females applying in CaRMS from 1998–2015. In terms of surgical disciplines, our study suggests that approximately 10% of female medical students apply to surgical specialties each year and that this has not changed over time. However, of those students who apply to surgery, there has been an increase in the proportion that are female. This is reflected by the fact that there are now more female medical students and the percentage of male medical students who apply to surgery seems to be decreasing (from 28% in 1998–99 to 19% in 2012–15). We have also found an increasing trend in the proportion of females applying to surgery who are successful in matching.

There has been some concern in recent years that surgical programs have become less desirable and the reasons behind the decline in interest in surgical specialties has been studied.<sup>6,11,12</sup> One study found that medical students value work-life balance and have a greater interest in having protected time for self and family.<sup>11</sup> This lack of a “controllable

Table 2. Applicants to Canadian urology programs based on gender

Year cohort	Urology applicants that are female (%) <sup>a</sup>	Applicants who matched to urology that are female (%) <sup>b</sup>
2012–2015	27	24
2008–2011	24	22
2004–2007	25	24
2000–2003	14	12
1998–1999	19	13

<sup>a</sup>Proportion of females ranking urology as first choice out of all the applicants ranking urology first choice. <sup>b</sup>Proportion of females who matched to urology out of all the applicants who matched to urology.



**Fig. 2.** Female graduate career paths after urology residency in Canada (2005–2015).

lifestyle” is often cited as an important factor that dissuades students from pursuing a career in surgery and does not seem to be based on gender.<sup>11,13</sup>

One theory about the decreasing interest in surgery is that there are more women in medical school and therefore less people applying to surgical programs.<sup>7</sup> Our data suggest that in Canada, the proportion of surgery applicants that are female is increasing. Perhaps the answer to why there are less applicants to surgery is multifaceted and may include: perceptions regarding the difficulty of residency, lack of knowledge and good role models, and misconceptions about future career satisfaction.<sup>7,11,12</sup> In addition, our data did not report on the number of females applying to obstetrics and gynecology and it is possible that more females are taking on a surgical career in this field.

As with the overall surgical disciplines, we found the proportion of females applying to urology has increased over the past two decades. We also found the proportion of females matching to urology has increase over the past two decades, although this trend was not statistically significant. This is likely due to a small sample size. The most recent cohort for applicants to urology (2012–2015) indicates that nearly one-quarter of PGY-1 urology residents in Canada are female. This is comparable to recent data from the U.S. where 23% of urology residents in 2011 were female.<sup>14</sup>

A survey of medical students applying to urology commonly cited that the mix of medicine and surgery, the diversity of procedures, and clinical exposure to the field as main reasons why they were interested in pursuing a career in urology.<sup>8</sup> There is little data regarding why female students in particular choose a career in urology. One small survey study of female urology residents inquired about the fac-

tors that influenced the residents’ decision to choose urology when they were a medical student.<sup>15</sup> The three most important factors identified were: diversity of procedures, diversity of practice, and lifestyle. It remains imperative that both female and male medical students have early exposure and education about our subspecialty to ensure that we continue to recruit the most talented candidates. As well, access to mentorship seems to play a role in guiding trainees at different levels of training. This may be particularly important for women, as there is the perception that it is more challenging for women to find mentors than their male colleagues.<sup>16</sup> The smaller number of female surgeons may be a hindrance in recruiting future female residents, as they may be discouraged by lack of mentorship availability.

For graduating female residents, fellowships in urogynecology/reconstruction or pediatrics, or starting practice as a community urologist were the most common career paths. Urogynecology/reconstruction was the most commonly pursued fellowship.

A recent study looking at gender differences in publications by academic urologists in the U.S. also found that females were more likely to do a fellowship in female pelvic medicine/reconstructive surgery or pediatric urology.<sup>17</sup> Oberlin et al found that female urologists operated on many more female patients than did their male counterparts (54% vs. 32%, respectively), even when they were performing gender-neutral surgeries or had gender-neutral fellowship training, such as endourology.<sup>18</sup> There are likely several reasons for this finding, including the fact that female urologists frequently have subspecialty training in urogynecology and reconstructive urology. As well, some literature shows that female patients have a gender preference for female physicians.<sup>19</sup>

Other paths that female urology residents chose included fellowships in endourology and oncology, with reportedly no female graduates choosing fellowships in transplantation or infertility in the past decade. As mentioned above, one of the reasons for few residents choosing these subspecialties may be related to a lack of female mentors, such as female urological oncologists, in these areas of subspecialties.<sup>20</sup>

Our study does have some limitations. In regards to the data used from CaRMS, we were only able to use the information available online through their website. Although what was collected was robust, it is reported only for applicants who ranked the specialty as their first choice. It is conceivable that we may have missing data for applicants who matched to a surgical specialty but did not rank it as their first choice program.

A second limitation of our study is that we were evaluating small numbers of applicants and therefore finding statistically significant trends in the data may be difficult due to the large amount of variation from year to year. For this reason, we divided the CaRMS data into four-year cohorts.



Thirdly, our survey study of PDs may have been subject to recall bias about the career paths of graduating residents. Finally, we did not collect information from the PDs regarding the career paths of the male graduates so we are unable to draw a direct comparison between female and male career paths.

## Conclusion and clinical implications

Over the last 18 years in Canada, there has been an increasing proportion of females applying and successfully matching to urology. As the proportion of female medical students is increasing, it is encouraging that we are seeing more interest in our specialty through the increasing trend in female applicants.

In Canada, female urology graduates pursue many career paths following residency. It remains important that female residents have early exposure to multiple subspecialty areas in urology and mentorship throughout their residencies, in order to choose a successful career path. Further data regarding the quality of life of females who have chosen a career in urology is needed.

**Competing interests:** Dr. Tennankore has received a research grant from Amgen and has participated in clinical trials supported by Bayer and Pfizer. Dr. Cox has been an advisor for Astellas and Ferring; has received speaker fees from Astellas and Pfizer; and has participated in a clinical trial supported by Aquinox. The remaining author reports no competing personal or financial interests.

This paper has been peer-reviewed.

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**Correspondence:** Dr. Katherine Anderson, Department of Urology, Dalhousie University, Halifax, NS, Canada; [kate.anderson@dal.ca](mailto:kate.anderson@dal.ca)

Year	Total number of females in the match	Total number of males in the match	Female: 1st choice discipline = Surgery	Female: Matched to 1st choice surgical specialty	Male: 1st choice = Surgery	Male: Matched to 1st choice surgical specialty
2015	1574	1288	147	108	211	164
2014	1599	1248	161	120	208	153
2013	1537	1158	153	98	276	202
2012	1536	1136	161	112	244	194
2011	1447	1081	173	124	254	190
2010	1419	1019	186	126	240	188
2009	1317	996	141	104	232	183
2008	1216	918	141	103	240	183
2007	1173	827	151	105	232	166
2006	1136	800	117	90	208	164
2005	786	619	83	66	155	123
2004	644	641	78	58	174	113
2003	610	621	58	39	176	129
2002	506	611	49	33	184	125
2001	520	612	40	28	159	113
2000	526	628	49	28	168	116
1999	565	584	61	34	161	116
1998	532	640	56	41	187	115

Year	Total # of applicants	Quota of positions offered to CMGs	Females who ranked Urology as 1st choice program	Females who matched to Urology as 1st choice	Males who ranked Urology as 1st choice program	Males who matched to Urology as 1st choice
2015	49	33	5	3	27	23
2014	53	31	22	14	21	17
2013	69	33	8	4	38	28
2012	48	33	7	7	28	22
2011	47	31	7	5	35	23
2010	64	30	16	8	34	22
2009	52	31	7	5	25	23
2008	54	30	9	7	30	22
2007	52	28	11	7	27	21
2006	47	26	8	6	27	20
2005	28	18	8	7	14	11
2004	27	17	3	1	24	16
2003	45	17	5	1	23	14
2002	42	15	4	3	26	12
2001	36	15	2	1	17	12
2000	40	15	3	2	17	13
1999	44	17	4	1	19	14
1998	44	18	5	3	19	14

**Appendix 1. Females in urology in Canadian residency programs:**

Please complete this table with as much information as you have available. Spaces should be filled in with a number (no identifying data) except for the columns specifying fellowship types.

University: \_\_\_\_\_

Year	Females matched to PGY1	Total matched positions	Females completed residency	Total residency graduates	Female graduate began a fellowship*	Female graduate began working in community	Female graduate started working in USA
2015							
2014							
2013							
2012							
2011							
2010							
2009							
2008							
2007							
2006							
2005							

\*Please indicate what fellowship the female urology graduate went in to  
Additional comments:

**Example table**

Please complete this table with as much information as you have available. Spaces should be filled in with a number (no identifying data) except for the columns specifying fellowship types.

University: Jon Snow Memorial University

Year	Females matched to PGY1	Total matched positions	Females completed residency	Total residency graduates	Female graduate began a fellowship*	Female graduate began working in community	Female graduate started working in USA
2015	1	5	3	5			
2014	0	5		5			
2013	0	5		4			
2012	0	5		5			1
2011	0	5	2	5	1 - Pediatrics	1	
2010	3	5		4			
2009	0	5		5			
2008	0	5		5			
2007	0	5		5			
2006	2	5	1	5	1 – UroGyne		
2005	0	5		5			

\*Please indicate what fellowship the female urology graduate went in to  
Additional comments: