Gender differences in authorship of Canadian Urological Association guidelines

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ABSTRACT

Introduction: Women are underrepresented in Canadian urology, particularly within academic leadership. This study aimed to analyze gender differences and trends in Canadian Urological Association (CUA) guideline authorship.
Methods: We searched the Canadian Urological Association Journal from March 2007 to August 2024 for all versions of eligible guidelines, best practice reports, and consensus statements. Two independent reviewers extracted data in duplicate. Authors appearing in multiple guidelines were counted more than once. We analyzed author characteristics by gender using the Chi-square test and assessed authorship over time using the Cochran-Armitage test for trend.
Results: There were 1172 non-unique authors across 112 guidelines, of whom 750 (64%) were urologists. Women represented 15.5% of all authors and 7.5% of urologist authors. Focusing only on urologists, women were more likely to be first authors and to be included on functional, pediatric, and endourology guidelines than men. The proportion of women urologist authors, first authors, and last authors did not change significantly over time. Men and women urologists had

KEY MESSAGES

- In CUA guidelines, best practice reports, and consensus statements published from 2007–2024, the representation of women on guideline panels is low relative to the Canadian urology workforce and resident population.
- Men and women authors differ based on author type, specialty, province, guideline topic, and number of guideline panel selections.
- Women CUA guideline authorship has not increased in the past 18 years.
- Incorporating the perspectives of women on CUA guideline panels is fundamental to advance equity and inclusion in the field.

similar rates of repeated authorship (56.7% vs. 51.7%, p=0.61), although men were more likely to appear on ≥5 guideline panels (23.6% vs. 6.9%, p=0.04).
Conclusions: CUA guideline authorship is dominated by men, with limited progress in the participation of women over the past 18 years. CUA guideline panels help establish the standard of urologic care, and guideline authorship represents a significant academic opportunity. Further work to minimize this gender disparity is needed to ensure our guidelines better reflect the diversity of Canadian urologists, urology trainees, and patients.

INTRODUCTION

Women are underrepresented in urology compared to other medical specialties in Canada. In 2023, 14.9% of Canadian urologists were female, compared to 34.1% of all surgical specialists and 45.5% of all physicians.[1] This gender disparity is also reflected within academic and leadership positions in urology. Among 12 Canadian urology programs, women comprised 11.8% of academic urologists and had lower academic ranks and research productivity compared to their male counterparts.[2] In addition, among four leading urology journals, only 7.5% of editorial board members in 2015 were women, increasing to 11.9% in 2020.[3]

Clinical practice guidelines are essential evidence-based resources that inform clinical decision making and shape the standard of care. In Canada, the Canadian Urological Association (CUA) publishes guidelines, best practice reports, and consensus statements with the goal to provide clinical direction to the association's membership and promote high-quality care across the country. These documents are also highly accessed, with the CUA guideline on female stress urinary incontinence being saved over 1,200 times between March and August 2024 alone.[4]

Given the significant reach of CUA guidelines and the resulting implications for patient care, a diverse guideline panel across dimensions such as gender, race, geographic location, specialty, and patient involvement is likely to produce higher-quality guidelines. An analysis of American Urological Association (AUA) guidelines published between 2010 and 2020 found that 17% of all guideline panelists were female and that the proportion of female authorship remained unchanged over time.[5] Whether this disparity extends to authorship of Canadian guidelines, best practice reports, and consensus statements is currently unknown. In this study, we analyze gender differences in authorship of CUA guidelines, best practice reports, and consensus statements, and examine trends in women CUA guideline authorship over time.

METHODS

Study selection

A single reviewer (SS) manually searched all published issues of the Canadian Urological Association Journal (CUAJ) from its inception in March 2007 to August 2024 to identify eligible publications. All articles published in the CUAJ as a "CUA Guideline", "Best Practice Report",

or "Consensus Statement" were eligible for inclusion. We also considered other articles (e.g., practice guidelines, special features, white papers) for inclusion if they were listed on the CUA (https://www.cua.org/guidelines) or CUAJ (https://cuaj.ca/index.php/journal/guidelines) website as a guideline, best practice report, or consensus statement, and/or if they involved CUA participation. Joint guidelines developed by the CUA and other associations were included. Guidelines that were endorsed by the CUA but were primarily developed by other associations were excluded. For guidelines that have been updated, we included all older versions of the guideline published since March 2007. Notably, the CUA reclassified best practice reports and consensus statements as "expert reports" after study selection was completed. We refer to the original terminology in this study.

Data extraction

Data were extracted by two independent reviewers (SS and OCM) in duplicate using Microsoft Excel. Discrepancies were resolved by consensus or a third reviewer (AC) as necessary. We analyzed all guideline authors. Authors who appeared in multiple reports were counted more than once. For each author, we extracted the following information: name, gender, author type (first, middle, last), degree(s), specialty, affiliation at the time of guideline publication, and province. If a report only had one author, they were considered as a first author in the analysis. Gender was assessed using a minimum of two resources in the following order: (1) author name, (2) internet search for the author's institutional website biography/picture/pronouns, and (3) the Genderize tool (https://genderize.io) using the author's full name. Despite our efforts to be inclusive in our determination of gender, we were limited to using a binary classification of gender (man, woman) based on the available information. We also extracted the following report information: title, report type, year of publication, topic, author list, total number of authors, total number of women authors, and version number (for updated reports).

Statistical analysis

Report and author characteristics were expressed as count (percentage) for categorical variables and as median (interquartile range [IQR]) for continuous variables. The proportions of men and women authors were compared using the Chi-square test. We assessed the proportion of women authorship, women first authorship, and women last authorship over time using the Cochran-Armitage test for trend. We also determined the number of unique authors and the frequency of repetition for authors who appeared on multiple guidelines ("repeated authors"), overall and by gender. For guidelines that have been updated, we additionally assessed the change in women authorship (overall proportion, first author, last author) across guideline versions. We performed analyses on the total author cohort as well as on the subset of authors who were urologists. We also performed a sensitivity analysis excluding authors of consensus statements, to account for potential differences in panel selection processes in guidelines/best practice reports versus consensus statements. All analyses were conducted using Stata/SE version 17.0 (StataCorp LLC, College Station, TX).

RESULTS

Report characteristics

Between March 2007 and August 2024, 112 eligible reports were published in the CUAJ, including 70 guidelines (62.5%), 13 best practice reports (11.6%), and 29 consensus statements (25.9%). The most common topic was urologic oncology (64/112; 57.1%), followed by pediatric urology (12/112; 10.7%), andrology/infertility/sexual health (11/112; 9.8%), and functional urology (11/112; 9.8%). Supplementary Figure 1 shows the number of publications every year since the inception of the CUAJ. The median (IQR) number of authors per report was 9 (5-15), ranging from 1 to 37 authors. Forty-three (38.4%) guideline panels did not include any women. Of the 43 reports with no women authors, 21 (48.8%) were in urologic oncology and 9 (20.9%) were in andrology/infertility/sexual health. Supplementary Table 1 summarizes the report characteristics.

Author characteristics

There were 1172 non-unique authors across 112 guidelines, of whom 15.5% (182/1172) were women. Supplementary Table 2 shows the breakdown of CUA guideline authorship according to gender and author type. Women authors were less likely to be physicians compared to men (78.6% vs. 98.2%, p<.001). For those authors who were physicians, medical oncology was the most common specialty among women (68/143; 47.6%) and urology was the most common specialty among men (694/972; 71.4%). The majority of authors were from Ontario irrespective of gender, including 50.6% of women and 44.4% of men. Women were more likely to be authors on functional urology and pediatric urology guidelines than men (p<.001) (Supplementary Table 3).

Among 750 urologist authors, 56 (7.5%) were women. There was a higher rate of first authorship (30.4% vs. 11.8%, p<.001) and lower rate of last authorship (5.4% vs. 10.4%, p<.001) among women urologists than among men urologists. There were also higher proportions of women urologists with master's (42.9% vs. 35.7%) or doctorate (10.7% vs. 5.8%) degrees, though this association did not reach statistical significance. Women urologists were more likely to be from Quebec and Manitoba, while men urologists were more likely to be from Ontario and Alberta (p<.001). Women urologists were more likely to appear on functional urology, pediatric urology, and endourology guidelines, while men urologists were more likely to be involved with guidelines in urologic oncology and andrology/infertility/sexual health (p<.001) (Table 1). Comparing the number and percentage of women among urologist authors in each Canadian region, Quebec had the highest percentage of women urologist authors at 11.4% (Figure 1).

Authorship over time

The proportion of publications without any women authors decreased over time, from 53.8% (14/26) in 2007-2012 to 20.8% (10/48) in 2019-2024. At the author level, there was no significant change in overall women authorship or women first authorship over the study period (Supplementary Figure 2). However, there was a significant decreasing linear trend in women

last authorship over time (p=.02) (Supplementary Figure 2). The percentage of last authors that were women reached a peak of 57.1% in 2013, and then did not exceed 17% between the years 2014 to 2024. Among urologist authors, the proportion of women authors, women first authors, and women last authors did not change over time (Figure 2).

Repeated authorship

In total, there were 387 unique authors, of whom 210 were single authors and 177 were repeated authors across multiple guidelines. Men were more likely to be repeated authors (50.2% vs. 31.9%, p=.002) and to appear on at least five guideline panels (20.5% vs. 6.4%, p=.002) than women (Supplementary Table 4). Focusing on urologist authors, there were 207 unique authors, including 116 repeated authors. There was no significant difference in the proportion of repeated authors between men and women urologists (56.7% vs. 51.7%, p=.61); however, men were more likely to appear on at least five guidelines compared to women (23.6% vs. 6.9%, p=.04) (Table 2). In addition, 8.4% of men urologists appeared on at least ten guidelines whereas no women urologists achieved ten authorships, though this association did not reach statistical significance (p=.11). Among urologists, two men appeared on a maximum of 31 guidelines, while the highest producing woman authored seven guidelines. Figure 3 shows the frequency of repetition for urologist authors.

Updated guidelines

There were 24 guidelines that were updated over the course of the study period, ranging from one to five updates (Supplementary Table 5). When comparing the earliest version to the most recent version for each of the 24 guideline topics, ten had an increase in the percentage of women authorship, nine had no change in women authorship, and five had a decrease in women authorship. The largest observed increase was for the guidelines on the evaluation and medical management of kidney stones. In 2010, 0/4 authors were women, while in 2022, 4/10 authors were women, representing a 40% absolute increase.

Sensitivity analysis excluding consensus statements

After excluding authors of consensus statements, the proportion of authors who were urologists increased, while the proportion who were medical oncologists decreased (Supplementary Table 6). No significant linear trends were found in overall women authorship (p=.08), women first authorship (p=.38), or women last authorship (p=.96) over time (data not shown). Men were significantly more likely to have two, but not five or ten, authorships compared to women (Supplementary Table 7). Among urologist authors, author characteristics (Supplementary Table 8) and trends over time (data not shown) were consistent with the full cohort. The gender difference for five authorships was no longer significant (14.6% men urologists vs. 6.9% women urologists, p=.26) (Supplementary Table 9).

DISCUSSION

We investigated gender differences and trends in CUA guideline authorship since the inception of the CUAJ. Over the 18-year study period, 15.5% of all authors and 7.5% of urologist authors were women. There was no increase in the proportion of women authors over time. Men were also more likely to be repeated authors compared to women. Our findings highlight a persistent gender gap in CUA guideline panel selection.

The proportion of women among urologist authors in our study is low relative to practicing urologists. The Canadian urology workforce was 14.9% women and 85.1% men in 2023, while urologist authors were 7.5% women and 92.5% men, meaning women urologist authors make up only half (50.3%) of the expected representation, while men are relatively overrepresented at 108.7%.[1] This gap is even more pronounced when compared to trainees, with females comprising 31.4% of Canadian urology residents in 2023-2024.[6] Our results also represent lower rates of women authorship compared to AUA guidelines published between 2010 and 2020, where 17% of all panelists and 13% of all urologists were female.[5] In contrast, our overall proportion of 15.5% women authors is higher than European Association of Urology (12.2%) and National Comprehensive Cancer Network (10.7%) guidelines between 2010 and 2020.[5] This may be explained in part by our inclusion of more recent data, as 42.9% of guidelines included in our study were published between 2019 and 2024, and there were higher numbers of women authors during this time frame compared to previous years. However, this observation makes the lower rate of women authorship compared to the AUA even more surprising. Even if the goal is gender representation proportional to the workforce, rather than gender parity, the current landscape of CUA guideline authorship falls well short of this target.

Several factors may explain the observed gender disparity in CUA guideline panel selection. Urology remains a male-dominated specialty,[1] meaning there are fewer women urologists available to participate as authors. Unstructured selection processes may further perpetuate biases that inadvertently disadvantage the participation of women.[7] Historically, clinical guideline authorship has been determined through informal recommendations by guidelines committees and/or panel chairs. Research has also shown that guidelines where the first or last author is a woman have a greater number of women co-authors, suggesting a pattern of gender-based influence in panel membership.[8] The true cause of low women authorship in CUA guidelines, however, remains unknown.

Women urologists were more likely to author guidelines in functional urology, pediatric urology, and endourology than men. This finding aligns with existing gender differences within urological subspecialties, as women urology residents may feel persuaded into choosing a subspecialty that has less contact with adult male patients.[9] A survey of Canadian urology residency program directors found that urogynecology/reconstruction, pediatric urology, and endourology were the most common fellowships pursued by Canadian female graduates between 2005 and 2015.[10] We can infer that these women, upon attaining academic positions, would be more likely to contribute to guidelines in their area of expertise. It will be interesting to see if the

distribution of guideline topics among women authors changes in the coming years as more women pursue urology and potentially diversify their subspecialty interests.

Women urologists had a higher rate of first authorship and lower rate of last authorship relative to their male colleagues. First authorship typically signifies early career achievement, whereas last authorship is more representative of late career recognition and seniority. The higher proportion of first authors among women than among men suggests that women may need to achieve higher levels of academic accomplishment to be invited as contributors, thereby warranting first authorship. The drastically lower proportion of women as last authors, then, may represent a "leaky pipeline" phenomenon, in which women leave academia or fail to progress to leadership positions at higher rates than men.[11] A study of 12 Canadian urology programs observed a similar phenomenon where the proportion of women decreased as academic rank increased.[2] Alternatively, this may simply reflect a time lag effect, whereby fewer women urologists have attained senior academic roles in Canada due to less time in practice.

There was no progress in the overall proportion of women authors across the study period. Similarly, the proportion of women first and last authors did not increase during the study period. These results are consistent with trends in AUA guidelines which showed no significant variation in the proportion of female panelists by guideline publication year.[5] In fact, the only significant change we observed over time was a decrease in the proportion of women last authors in the overall cohort (but no change among urologists only). Our results contrast positive trends seen in the Canadian urology workforce and other areas of CUA involvement. Female representation among Canadian practicing urologists increased from 6.3% in 2007 to 14.9% in 2023.[1] From the years 2012-2016 to 2017-2022, there was a significant increase in the proportion of women as CUA committee members and plenary invited speakers at the annual meeting, with upward trends also seen for award winners and grant recipients.[12] It remains unclear why we have not observed a similar trend in CUA guideline authorship. Despite the lack of progress in guideline authorship overall, one encouraging shift was the decline in all-male authorship panels or "manels" over the study period. However, without a concurrent rise in first and last authorship among women, this shift alone may not be sufficient to drive true equity.

Greater gender diversity on guideline panels is not only a matter of equity but also about improving patient care. Guideline recommendations are influenced by the composition and opinions of guideline panelists.[13] Therefore, author panels that better reflect the gender makeup of the urology workforce, urology trainees, and patients seeking urological care are essential for producing balanced and broadly applicable guidelines. The AUA has taken steps to address this issue, enacting a process whereby interested individuals can self-nominate for guideline panel membership.[14] A similar public nomination process could be considered within the CUA, with authorship opportunities advertised through email, social media, and the CUA website. As a first step, evaluating current selection processes, including through surveys of prior guideline authors and the broader CUA membership, could help identify perceived barriers to guideline participation. Increased transparency in the selection process may also provide valuable insights

to authors who were not selected. For example, a standardized template for reporting the selection process would provide information on how gender equity was or was not considered, and if and why authors were unable to participate. Beyond improving the selection process, addressing the underrepresentation of women in academic urology, particularly in subspecialties such as andrology and oncology, is likely necessary for long-term change. In addition, regularly collecting and publishing data on the gender of guideline panelists will be key to assessing progress over time.

Importantly, efforts to improve gender representation should avoid tokenism by prioritizing genuine inclusion over filling diversity quotas. The small number of women in urology, and in surgery more broadly, likely face disproportionate demands to mentor and supervise trainees, participate on committees, and speak on panels.[15] While these activities are essential for dismantling gender disparities, they also place an additional burden on a limited pool of women, potentially leading to burnout and reduced opportunities for their own professional growth. Deliberate recruitment and adequate supports are needed to expand the available pool of women urologists and distribute these responsibilities more equitably. The upcoming tenure of the first woman CUA president marks an exciting time ahead for women in urology and a timely opportunity to advance these goals.

Our study is not without limitations. First, we were limited by binary gender information available on institutional websites which may not accurately capture the diversity of our study population. Second, last authorship may not represent the same level of rank or importance across all guidelines, best practice reports, and consensus statements. Third, although there was a steep rise in women authorship in 2024, there was only one guideline published in 2024 and results from this year should therefore be interpreted with caution. Finally, our study was not designed to capture information about individuals who were invited but declined to participate as guideline authors, which could lead to increased or decreased gender disparity depending on which gender was more likely to refuse participation.

CONCLUSIONS

The representation of women on CUA guideline panels between 2007 and 2024 is disproportionately low relative to the urology workforce and trainee population, with limited progress over time. CUA guideline panels play a pivotal role in shaping the standard of urological care, and incorporating diverse perspectives, including those of women urologists, is fundamental to advance equity and inclusion in the field. In addition, guideline authorship represents a significant academic opportunity. Further work to minimize this gender disparity is needed to ensure our guidelines better reflect the diversity of Canadian urologists, urology trainees, and patients.

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FIGURE AND TABLES

Figure 1. Women authorship among urologists by geographic region (p=0.005).

Figure 2. Trends in overall authorship (p=0.09), first authorship (p=0.40), and last authorship (p=0.82) among urologist authors over time.

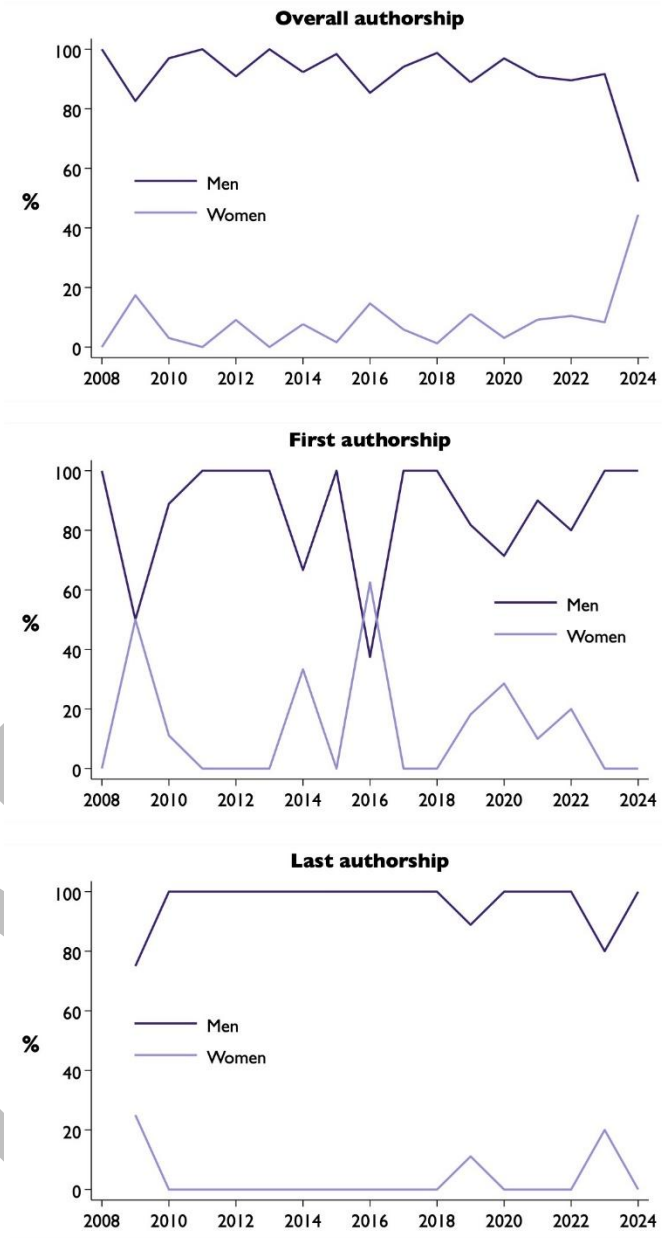

Figure 3. Frequency of repetition for urologist authors.

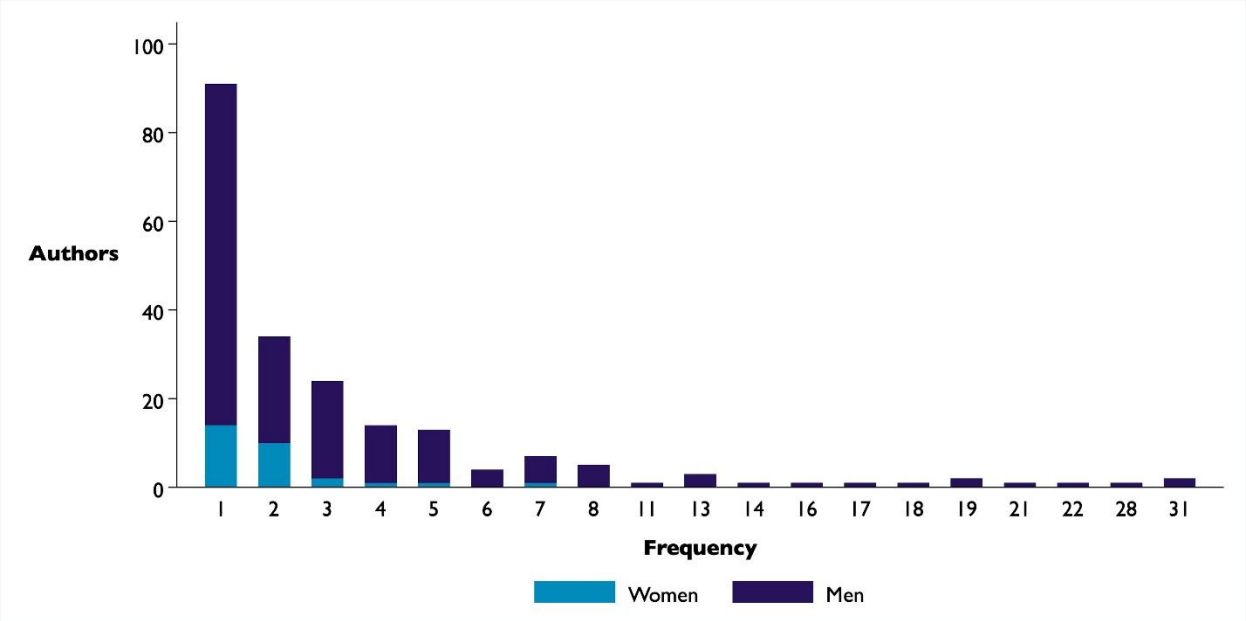

Table 1. Characteristics of urologist authors overall and by gender				
	No. (%)			
Characteristic	**Urologist authors n=750**	**Men urologists n=694**	**Women urologists n=56**	**p**
Author type				<0.001
First	99 (13.2)	82 (11.8)	17 (30.4)	
Middle	576 (76.8)	540 (77.8)	36 (64.3)	
Last	75 (10.0)	72 (10.4)	3 (5.4)	
Academic degree				0.13
MD	432 (57.6)	406 (58.5)	26 (46.4)	
MD + Master's	272 (36.3)	248 (35.7)	24 (42.9)	
MD + PhD	46 (6.1)	40 (5.8)	6 (10.7)	
Province				<0.001
Alberta	54 (7.2)	52 (7.5)	2 (3.6)	
British Columbia	82 (10.9)	76 (11.0)	6 (10.7)	
Manitoba	22 (2.9)	14 (2.0)	8 (14.3)	
New Brunswick	4 (0.5)	4 (0.6)	0 (0)	
Newfoundland and Labrador	4 (0.5)	4 (0.6)	0 (0)	
Nova Scotia	54 (7.2)	49 (7.1)	5 (8.9)	
Ontario	324 (43.2)	313 (45.1)	11 (19.6)	
Quebec	185 (24.7)	164 (23.6)	21 (37.5)	
Saskatchewan	7 (0.9)	6 (0.9)	1 (1.8)	
Outside Canada	14 (1.9)	12 (1.7)	2 (3.6)	
Guideline topic				<0.001
Andrology/infertility/sexual health	79 (10.5)	77 (11.1)	2 (3.6)	
Endourology	43 (5.7)	37 (5.3)	6 (10.7)	
Functional urology	67 (8.9)	45 (6.5)	22 (39.3)	
General urology	36 (4.8)	34 (4.9)	2 (3.6)	
Pediatric urology	37 (4.9)	20 (2.9)	17 (30.4)	
Urologic oncology	488 (65.1)	481 (69.3)	7 (12.5)	

Table 2. Repeated authorship among urologist authors.				
	No. (%)			
Authorship frequency	**Unique urologist authors n=207**	**Unique men urologist authors n=178**	**Unique women urologist authors n=29**	**p**
≥2	116 (56.0)	101 (56.7)	15 (51.7)	0.61
≥5	44 (21.3)	42 (23.6)	2 (6.9)	0.04
≥10	15 (7.3)	15 (8.4)	0 (0)	0.11