Kidney stone disease

Practice patterns among urologists in Canada

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ABSTRACT

INTRODUCTION: Despite kidney stone disease (KSD) guidelines, high-quality evidence for KSD management in Canada is lacking. We aimed to assess Canadian urologists' practice patterns, preferences, and barriers in managing KSD.

METHODS: A cross-sectional survey was distributed to Canadian urologists via the Canadian Urological Association (CUA), Quebec Urological Association (QUA), and Canadian Endourology Group (CEG), as well as directly to urology departments nationwide. Descriptive statistics were used to analyze the results.

RESULTS: Of 93 respondents, 47% were from academic centers, 43% from community hospitals, and 10% from mixed/private settings. Most performed over 75 ureteroscopies and fewer than 25 percutaneous nephrolithotomies (PCNLs) annually (67% and 58%, respectively). Holmium:YAG (Ho:YAG) lasers were available in 85% of hospitals, thulium fiber laser (TFL) in 70%, and Ho:YAG with Moses effect lasers in 28%. Preferred surgical devices included the TFL (74.5%), followed by the Ho:YAG laser (24.2%) and Ho:YAG with Moses effect laser (21.7%). Endourology fellowship-trained urologists (53%) were more likely to perform their own PCNL access (90% vs. 23%, $p<0.001$), metabolic workup (73% vs. 48%, $p=0.02$), and felt more comfortable prescribing prophylactic and medical treatment for KSD (86% vs. 50%, $p<0.01$) compared to non-endourology fellowship-trained colleagues. Metabolic workup was delegated to nephrologists or specialized clinics by 38%, mainly due to lack of time (25%) and expertise (25%). Additionally, 71% lacked access to multidisciplinary KSD clinics, with 76% believing such clinics would be beneficial.

CONCLUSIONS: The study highlights variability in KSD management practices and barriers. Addressing these issues could improve KSD care in Canada and inform future guidelines.

INTRODUCTION

Kidney stone disease (KSD) constitutes an important health issue in North America, affecting around 11% of the population.[1] Recent data from the U.S. National Health and Nutrition Examination Survey (NHANES) has shown an increasing incidence of KSD among the U.S. population.[1] With recurrence rates reaching 30–50% within 10 years, KSD can be considered a chronic condition.[2,3] While the effectiveness of prevention strategies, including prophylactic medication and dietary and lifestyle modifications, has been established, preventive measures continue to be lacking due to insufficient evaluation by clinicians and low patient compliance.[4-6]

Recently, the Canadian Urological Association (CUA) published updated guidelines for the evaluation and medical management of kidney stones.[2] A significant amount of evidence-based recommendations were provided regarding the comprehensive metabolic investigation of KSD, along with detailed guidelines on dietary measures and pharmacologic prophylaxis. Practice pattern compliance of urologists to KSD guidelines has been reviewed in other countries;[7-9] however, adherence to KSD evaluation and management guidelines of Canadian urologists is unknown. In light of these new guidelines, we sought to evaluate the practice patterns and preferences of urologists across Canada in the management and followup of KSD disease, as well as existing barriers to clinical practice.

KEY MESSAGES

- The holmium-YAG laser was the most widely available (85%) laser, followed by the thulium fiber laser (70%) and the holmium-YAG laser with Moses effect (28%).
- Urologists with endourology fellowships were more likely to perform their own PCNL access and metabolic workup and felt more confident in prescribing treatments for kidney stone disease compared to their non-endourology fellowship-trained peers.
- 38% of urologists delegated metabolic workup to nephrologists or specialized clinics, primarily due to time constraints and lack of expertise.
- Although 71% of urologists lacked access to multidisciplinary kidney stone disease clinics, 76% recognized the potential benefits such clinics could provide for improving patient care.

METHODS

A cross-sectional, anonymous survey was developed by endourologists at the Université de Montréal Health Center and distributed to an expert panel of nine fellowship-trained endourologists practicing in both community and academic centers across Canada. After thorough assessment and discussion, the panel reached a consensus on the survey's final format. The study received approval from the CUA endorsement committee.

The survey was initially sent to practicing Canadian urologists in February 2023 through the mailing lists of the CUA, Quebec Urological Association (QUA), and Canadian Endourology Group (CEG). The survey was also directly sent to multiple individual urologists and urology departments across the country. Given that most urologists are active CUA members and based on the number of members on the mailing list, the survey is estimated to have reached approximately 664 urologists. The first response received on the survey was on February 27, 2023, and the last one received was on November 29, 2023.

We used descriptive statistics to summarize our findings. In selected subgroups, baseline characteristics were compared using either the Chi-squared test or Fisher's exact test for proportions. All statistical analyses were performed in the R software environment for statistical computing and graphics (version 4.2.2 for macOS; *www.r-project.org*). All tests were two-sided, with a level of significance set at $p<0.05$.

RESULTS

From a potential pool of 664 active members, 93 completed the survey, for a response rate of 14%. The survey responses can be summarized into four main categories: 1) respondents' practice setting and experience; 2) surgical management of KSD; 3) metabolic evaluation and multidisciplinary evaluation of KSD; and 4) medical treatment, prevention, and followup of KSD.

Respondents' practice setting and experience

Of the 93 urologists who participated in the survey, the majority were from Quebec (32%), Ontario (29%), British Columbia (15%), and Alberta (11%), while the remaining 13% were from other provinces (Table 1). Among the surveyed urologists, 44 (47%) were affiliated with academic centers, 40 (43%) with community hospitals, and the remaining nine (10%) had exclusively private practice or mixed practice (≥2 practice settings). Regarding postgraduate urological education, 51% of the urologists completed it more than 10 years ago, 32% within the last five years, and the remaining 17% somewhere between five and 10 years ago. Over half

Table 1. Respondents' practice settings and experience (N=93)

	%
Practice setting	
Academic centers	47
Community hospitals	43
Mixed/private	10
Endourology fellowship status	
Yes	53
No	47
Province	
Quebec	32
Ontario	29
British Columbia	15
Alberta	11
Other	13

of the respondents (53%) completed an endourology fellowship, with 71% of them reporting a focus on stone prevention during their fellowship.

Most respondents (67%) performed over 75 ureteroscopies annually, and a minority performed over 25 percutaneous nephrolithotomies (PCNLs) (42%). Endourology fellowship-trained urologists were significantly more likely to perform over 75 ureteroscopies (86% vs. 45%, p<0.001) and over 25 PCNLs (71% vs. 9%, p<0.001) annually compared to their non-endourology fellowship-trained counterparts.

Surgical management of KSD

Of the 93 respondents, 54 (58%) reported performing percutaneous access themselves, predominantly using fluoroscopy alone (52%) or a combination of ultrasound and fluoroscopy (24%). Regarding surgical management of significant bilateral stone disease, most urologists (68%) reported performing simultaneous bilateral stone surgery for these cases.

Regarding laser availability at the respondents' hospitals, the Holmium:YAG (Ho:YAG) laser was reported in 85% of hospitals, followed by the thulium fiber laser (TFL) (70%) and the Ho:YAG with Moses effect laser (28%); almost half of respondents had access to both a Ho:YAG and TFL (48%). Most urologists (75%) indicated the TFL as their preferred laser type, followed by the holmium laser (24%) and the Ho:YAG with Moses effect laser (22%) (Table 2). Academic centers were significantly more likely to have the TFL compared to non-academic centers (80% vs. 59%, p=0.03). The presence of two or more laser types was also more commonly reported in academic centers compared to non-academic centers (84.1% vs. 55%, p=0.003).

Urologists with an endourology fellowship demonstrated significantly higher rates of self-performing PCNL access compared to those without specialized endourology training (90% vs. 23%, p<0.001) (Table 3). Additionally, although the difference was not statistically significant, urologists with endourology fellowship appeared to rely more on a combination of ultrasound and fluoroscopy (30% vs. 0%, p=0.062) and less on fluoroscopy alone (43% vs. 90%, p=0.062).

Metabolic evaluation and multidisciplinary evaluation of KSD

Thirty-eight percent of the respondents delegate metabolic workup to nephrologists or specialized KSD clinics. Among the urologists who responded to the question regarding reasons for this delegation, lack of time, lack of expertise, and poor patient compliance were the three main reasons cited (25%, 25%, and 17%, respectively).

Only 4% of urologists reported never sending their patients for a limited metabolic workup, and only 1% reported never sending their patients for a full metabolic workup. Among the respondents, the majority identified all patients with a stone (45%) and recurrent stone formers only (24%) as the primary reasons to conduct a limited metabolic evaluation. Other reasons included patients with risk factors for recurrent KSD at any episode (16%) and recurrent stone formers with known risk factors for recurrent KSD (7.5%). Conversely, the primary reasons to perform a full metabolic evaluation included patients with risk factors for recurrent KSD at any episode (33%), recurrent stone formers with known risk factors for recurrent KSD (31%), and recurrent stone formers only (26%).

Regarding stone analysis, intraoperatively, 60% of the respondents would systematically send all stone specimens for analysis, while 31% would only do so if no recent stone analysis was available, and the rest (9%) would not send stone specimens for analysis. Most urologists (81%) routinely assess parathyroid hormone

Table 2. Assessing laser access and preferences among respondents

Laser type	Preferences cited by all urologists % (n=93)	Availability at all centers % (n=93)	Availability at academic centers % (n=49)	Availability at non-academic centers % (n=44)	p
Thulium fiber laser	74.5	70	80	59	**0.03**
Holmium:YAG	24.2	85	92	77	**0.05**
Holmium:YAG with Moses effect	21.7	28	33	23	0.3
Two or more laser types	N/A	70.5	84.1	56	**0.003**

Bolded values represent statistical significance.

Table 3. Urologists 'practice patterns in investigation and management of kidney stone disease

	All urologists % (N=93)	Fellowship-trained % (n=49)	Non-fellowship trained % (n=44)	p
Self-performing percutaneous access	57	90	23	**<0.001**
Self-performing metabolic assessment	62	73	48	**0.02**
Comfortable prescribing medical/ prophylactic KSD treatment	68	86	50	**0.03**

Bolded values represent statistical significance. KSD: kidney stone disease.

(PTH) levels in patients presenting with hypercalcemia or high-normal calcemia. Additionally, 29% of urologists integrate PTH testing as a standard procedure for all patients, while only 18% perform PTH assessment for patients with hypercalciuria.

Compared to non-endourology fellowship-trained urologists, those with an endourology fellowship exhibited higher rates of self-performing metabolic workup (48% vs. 73%, p=0.02), higher rates of performing a limited metabolic workup to all patients with a KSD (34% vs. 55%, p=0.006), and were more likely to perform a full metabolic workup in patients with known risk factors for stone recurrence at any episode (16% vs. 49%, p=0.001). Furthermore, they were significantly more likely to test for PTH in patients with high-normal calcemia compared to non-endourology fellowship-trained urologists (18% vs. 41%, p=0.02).

Regarding access to multidisciplinary KSD clinics, 71% of urologists lacked access to such clinics at their institution. Among them, a majority of urologists (64%) reported that their KSD referral clinic was within 50 km of their practice setting, and most (76%) believed such clinics would benefit their institutions. Academic urologists were significantly more likely to report having access to a multidisciplinary KSD clinic compared to non-academic urologists (41% vs. 16%, p=0.008) (Table 4). Among urologists who lacked access to a KSD clinic, academic urologists were significantly more likely to believe that access to one would benefit their institution than non-academic urologists (93% vs. 62%, p=0.004). Furthermore, among urologists who lacked access to a KSD clinic, academic urologists were significantly more likely to still have access to dietitians in their practice settings compared to non-academic urologists (62% vs. 35%, p=0.03).

Medical treatment, prevention, and followup of KSD

Most respondents (68%) felt very comfortable or comfortable prescribing prophylactic and medical treatment for KSD (Table 3). Most urologists felt confident prescribing alkali therapy, thiazides, bicarbonate, and allopurinol (84%, 59%, 57%, and 55%, respectively). A smaller proportion of urologists felt confident prescribing vitamin B6, penicillamine, and tiopronin (39%, 13%, and 11%, respectively). Endourology fellowship-trained urologists were significantly more likely to report being very comfortable or comfortable prescribing prophylactic and medical treatment for KSD compared to their non-endourology fellowship-trained counterparts (86% vs. 50%, p<0.001).

In cases of hypercalciuria, most urologists (66%) take into account their patients' bone health in their clinical management. Among them, 87% would refer the patient to their family doctor or to an internal medicine specialist, and the rest (13%) would monitor their patient with bone densitometry.

Regarding dietary recommendations, most urologists (80%) do not recommend that their patients limit their calcium intake, 10% recommend that their patients do so, and the rest (10%) employ various other recommendations, such as moderating calcium intake or limiting it only when consumed in excessive amounts. Most urologists (65%) recommend limiting high oxalate foods for calcium oxalate stone formers, 17% do not recommend doing so in these patients, and the rest (18%) employ various recommendations, such as limiting oxalate only in cases of hyperoxaluria or moderating oxalate intake. Regarding vitamin D intake, approximately half of the respondents (48%) recommend limiting it to 1000 units daily or 10 000 units weekly, 31% do not provide patients with a specific recommendation regarding their vitamin D intake, and the remaining (21%) provide other recommendations, such as stopping intake if possible, ordering bone mineral density, or referring to a family doctor.

Regarding imaging modalities for the followup of radiopaque stones, the kidney, ureter, and bladder (KUB) X-ray was one of the selected choices for most urologists (65%), followed by ultrasound (27%), low-dose computed tomography (CT) scan (14%), ultra-low dose CT scan (9%), and full-dose CT scan (1%). For the followup of radiolucent stones, ultrasound was one of the selected choices for almost half of the urologists (49%), followed by low-dose CT scan (40%), ultra-low dose CT scan (15%), and full-dose CT scan (1%).

For stone-free patients, 37% of urologists employ a 12-month followup protocol, 27% perform no specific followup, 13% employ a 24-month protocol, 5% employ a six-month protocol, and the rest (18%) employ other individualized approaches. For patients with asymptomatic, non-obstructive kidney stones,

Table 4. Access to multidisciplinary kidney stone disease clinics

	All urologists % (N=93)	Academic urologists % (n=49)	Non-academic urologists % (n=44)	p
Access to KSD clinics	29	41	16	**0.008**
Access to dietitians without KSD clinic	47	62	35	**0.03**

Bolded values represent statistical significance. KSD: kidney stone disease.

the predominant followup intervals were 12 months (72%) and six months (13%). The rest of the urologists employ a 24-month protocol (2%), do not perform specific followups for these patients (1%), or employ other individualized approaches (12%).

DISCUSSION

The practice patterns of Canadian urologists regarding the management of KSD and their adherence to guidelines remain unclear.[2,5] This study, representing both academic and community practices, reveals heterogeneity in criteria used for in-depth evaluation, imaging assessment protocols, availability of surgical devices between centers, and access to subspecialized clinics. The majority of urologists are either performing or referring patients for metabolic evaluations and they are comfortable prescribing common prophylactic and medical treatments for KSD. Urologists with endourology fellowships exhibited significantly higher rates of performing their own PCNL access and conducting metabolic workups compared to those without specialized training. Although urologists interested in KSD could have been more inclined to respond to the study, our results unveil significant diversity in practice patterns for assessment and treatment across this important cohort and its subgroups.

The decision to conduct either a limited or full metabolic evaluation is based on risk stratification to identify underlying metabolic disorders. According to the Canadian guidelines, all first-time stone formers should undergo at least a limited metabolic evaluation, which includes urinalysis, with or without a urine culture, serum electrolytes (Na, K, HCO_3), calcium, creatinine, and stone analysis when available.[2] The aim of this limited evaluation is to detect systemic disorders and renal dysfunction at an earlier stage, as stone formers with metabolic disorders are at a higher risk of recurrence and often have a lower health-related quality of life; however, our data indicate that only 45% of responders strictly adhere to this recommendation, with the remaining often reserving limited metabolic evaluation for patients with known risk factors and/or recurrent stone formers. While the majority (61%) of responders performed metabolic evaluations themselves, the primary barriers reported were lack of expertise (25%), time constraints (25%), and limited resources (12%). With increasing work volume in urology practice, interpreting metabolic results can be challenging, as several variables must be assessed to ensure an accurate diagnosis.[8-11]

On the other hand, our cohort demonstrated better adherence to the criteria for an in-depth metabolic workup compared to what is reported in the literature.[8,12,13] The majority of responders (90%) reported performing full metabolic workup for patients who are either recurrent stone formers and/or have known risk factors for KSD recurrence. Moreover, most urologists (64%) request two or more 24-hour urine collections, as recommended in the Canadian guidelines; however, this reported outcome contrasts with epidemiologic data, where only 7% of patients known to have a high risk of KSD recurrence underwent metabolic evaluation by any physician.[14] This could be explained by the higher proportion of responding fellowship-trained endourologists (53%), who may exhibit stricter adherence to guidelines. Indeed, fellowship-trained endourologists were more likely to perform a full metabolic workup in patients with known risk factors for stone recurrence at any episode (49% vs. 16%, p=0.001) and more likely to test for PTH in patients with high-normal calcemia (41% vs. 18%, p=0.02) compared to non-endourology fellowship-trained urologists.

Patients at higher risk of recurrence stand to greatly benefit from preventive measures, such as dietary modifications and lifestyle adjustments;[2,15,16] however, the demanding workload and pressure on urologists in a clinical setting may pose challenges in conducting a comprehensive review of all risk factors.[11,17,18] Over the past few decades, the establishment of KSD clinics with a focus on prevention has been advocated to enhance education and decrease recurrence rates in KSD patients.[19,20]

Our study reported worrying results, where 71% of urologists lacked access to such clinics at their institution. Non-academic urologists were more affected, with less access to KSD clinics (16% vs. 41%, p=0.008) and dieticians (35% vs. 62%, p=0.03) in their practice settings compared to academic urologists. Multidisciplinary stone prevention clinics play an important role in reducing the burden of KSD by providing comprehensive care, education, and personalized treatment strategies to patients, ultimately leading to improved outcomes and quality of life.[19,21,22]

While dietitians are commonly involved in the management of preventive cardiology or diabetes programs, they are frequently excluded from followup care for KSD patients.[23,24] Bell et al reported that the majority of dietitians (80%) who provide medical nutrition therapy to KSD patients see only one to two patients per month.[25] This strongly suggests the presence of barriers hindering the inclusion of dietitians in the care of patients with stones.

While the Holmium:YAG laser remains the gold standard, the TFL is increasingly favored for stone

management.[26,27] TFL was accessible in the majority (70%) of respondents' hospitals, with 75% considering it one of their preferred lasers. Indeed, a shift in surgical practice has been observed in recent years, with the popularization of the dusting technique.[27,28] Using the Ho:YAG laser, Humphreys et al demonstrated, in a multicenter clinical randomized trial, that dusting is comparable to basketing but with significantly reduced operative time.[28] It should be noted that this study was carried out before the widespread use of the TFL and the observed time efficiency may be even more pronounced with the TFL, renowned for its superior dusting capability.[26,29]

Ho:YAG with Moses effect capabilities also excels at dusting, but there are no large head-to-head trials of Ho:YAG with Moses effect laser vs. TFL to date. With the super dusting capabilities of these lasers, however, prolonged use of high energy settings and low irrigation rates may elevate ureteral and kidney temperatures to supraphysiologic levels, potentially resulting in catastrophic thermal lesions.[30,31]

Despite TFL being significantly more accessible in academic centers (80 vs. 59%, $p<0.03$), their dissemination in community settings is expected in the coming years. Therefore, future guidelines should incorporate clear recommendations regarding the heat generation properties of both lasers and surgical precautions, such as the use of a ureteral sheath, ensuring cooled adequate irrigation flow, intermittent pauses in delivering energy, and implementing safe laser settings for ureteric and renal stones.[29,30]

Although most responders (58%) reported performing percutaneous access themselves, responders who completed an endourology fellowship demonstrated significantly higher rates of self-performing PCNL access compared to those without specialized endourology training (90% vs. 23%, $p<0.001$). Similarly, in a comprehensive survey of American Urological Association members, Saluk et al found that the likelihood of urologists performing their own PCNL access was associated with logging over 50 cases during endourology training and having a higher annual volume of PCNL procedures.[32] Interestingly, in a large population-based study in the U.K., two-thirds of PCNL accesses were performed by interventional radiologists (IR), with favorable outcomes regardless of whether the access was conducted by a urologist or an IR.[33]

A recent meta-analysis by Ghoulian et al reported that urologist-acquired access may result in higher stone-free rates and fewer major complications, while IR-mediated access is linked to reduced blood loss, despite similar transfusion rates.[34] These observations should be interpreted with caution, as several variables were not assessed, including urologist volume and the complexity of stones and anatomy. Indeed, it has been reported that in several centers, IR access may be the preferred option for low-volume surgeons and more complex cases.[33] In general, proper training, skill, and proficiency in the procedure are likely more critical than the practitioner's background specialty. Emphasis should be placed on effectively managing complex stone disease through strong collaboration among multidisciplinary teams, particularly during the preoperative planning phase.

Limitations

Our data exhibits some limitations, including a low number of respondents. The low response rate to the questionnaire makes it challenging to draw generalizable conclusions regarding how stone formers are being investigated and managed; however, our response rate aligns with previous surveys targeting urologists' practices.[7,8,17]

Furthermore, surveys relying on individuals self-reporting make it challenging to validate responses, exposing them to potential bias. The use of the CEG mailing list might have attracted urologists with a particular focus on KSD, potentially resulting in an overestimation of their adherence to guidelines and the thoroughness with which they investigate metabolically KSD patients.

Additionally, our data may be skewed towards academic endourologists, as over 50% of respondents fall into this category.

Finally, the small number of respondents with access to multiple laser types and Ho:YAG with Moses effect laser limited our ability to analyze the interplay between laser preferences and relevant factors, including practice settings, endourology fellowship status, and variations in stone type and size. As a result, the reported practices regarding laser preference, metabolic workups, and other procedures might represent best-case scenarios and could be less representative of broader, community-based practice settings.

CONCLUSIONS

This study underscores the diverse practice patterns in managing KSD in Canada, even among a cohort of urologists with subspecialty interests in KSD. While most urologists conduct metabolic and urinary collection workups and feel at ease prescribing prophylactic and medical treatments for KSD, notable disparities

exist in criteria for in-depth evaluation, imaging assessment protocols, surgical device availability, and access to subspecialized clinics across various centers. These discrepancies should be taken into account in future guidelines.

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This paper has been peer reviewed.

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