

Urologist-perceived barriers and perspectives on the underuse of sacral neuromodulation for overactive bladder in CanadaPeter Gariscsak¹, Gary Gray², Stephen Steele³, Dean Elterman⁴, R. Christopher Doiron³¹School of Medicine, Queen's University, Kingston, ON, Canada; ²Division of Urology, Department of Surgery, University of Alberta, Edmonton, AB, Canada; ³Department of Urology, Queen's University, Kingston, ON, Canada; ⁴Division of Urology, Department of Surgery, University of Toronto, Toronto, ON, Canada**Cite as:** Gariscsak P, Gray G, Steele S, et al. Urologist-perceived barriers and perspectives on the underuse of sacral neuromodulation for overactive bladder in Canada. *Can Urol Assoc J* 2023 March 20; Epub ahead of print. <http://dx.doi.org/10.5489/cuaj.8176>

Published online March 20, 2023

Corresponding author: Dr. R. Christopher Doiron, Department of Urology, Queen's University, Kingston, ON, Canada; chris.doiron@kingstonhsc.ca

ABSTRACT

Introduction: An estimated 18% of Canadians have overactive bladder (OAB), with approximately 24% of those reporting difficulty adhering to pharmacotherapy. To date, there has been no investigation into barriers facing sacral neuromodulation (SNM) as treatment for OAB in Canada.

Methods: Current Canadian Urological Association members were invited to participate in an anonymous survey. Data collected included open-ended and Likert scale responses addressing barriers to referral for SNM. Qualitative analysis used a Theoretical Domains Framework (TDF), while quantitative responses are reported using descriptive statistics.

Results: A response rate of 20.4% (n=142) was obtained. Most respondents believed SNM was underused (n=82, 57.7%) compared to only 6.3% (n=9) who believed it was used adequately. The most commonly cited reasons for not offering SNM were lack of availability (n=85, 59.9%),

KEY MESSAGES

- Despite being a guideline recommended third-line treatment for overactive bladder, more than half of surveyed urologists believe sacral neuromodulation is underutilized.
- Barriers identified include lack of available expertise and resources including operating room time, nursing support, technical staff, and follow-up care post-implantation.
- We recommend improved trainee and continuing education on how and why patients may benefit from SNM, as well as indications for appropriate referral.

expertise (n=49, 34.5%), and funding (n=26, 18.3%). Participants were neutral regarding confidence to appropriately recommend SNM to patients (median 3, interquartile range [IQR] 2–4) and were not confident to manage patient care and issues related to SNM devices (median 2, IQR 1–3). On thematic analysis using the TDF, the most prevalent barriers to SNM care were related to infrastructure and resources. A lack of trained experts and lack of knowledge related to SNM use were also commonly identified barriers.

Conclusions: In this first study exploring urologist-perceived barriers to SNM referral for medically refractory OAB in Canada, urologists acknowledge that SNM implantation is underused but did not feel confident in recommending SNM appropriately. A lack of trained experts and poor funding were also identified as major barriers to SNM referral.

INTRODUCTION

Overactive bladder (OAB) is characterized by urinary urgency, heightened urinary frequency, urinary incontinence and waking to pass urine in the night.¹ In the largest Canadian survey of OAB, 3249 individuals were surveyed, demonstrating an estimated prevalence of 18%, with women being affected more frequently than men (21.2% vs 14.8%).² Notably, dry OAB, which lacks incontinence symptomology, was more prevalent (13.6%) than both wet (2.3%) and mixed OAB (1.2%). Due to OAB's high prevalence there is a substantial economic and psychological burden of the disease.^{3,4}

Current treatment paradigm

The Canadian Urological Association (CUA) treatment guideline has a step-wise algorithm for treating adult OAB. Third-line (medically-refractory) OAB treatments include intradetrusor onabotulinumtoxinA (BTX) injections, percutaneous tibial nerve stimulation (PTNS) and sacral neuromodulation (SNM).⁵ Third-line treatments for OAB do not have a recommended order of use and the decision-making is dependent on the clinical scenario, clinician understanding of the three treatments and their availability.

Little is currently known about barriers facing SNM utilization in Canada. The objective of this study is to characterize urologist-perceived barriers of care and understanding of SNM patient management. To accomplish this, we outlined three specific aims, to understand the Canadian urologist's: 1) perceived barriers to widespread usage of SNM, 2) clinical experience with SNM; and 3) understanding of SNM as a management of refractory OAB.

METHODS

Recruitment

The survey was distributed to all registered Canadian urologists to the Canadian Urological Association's (CUA) member's-only available database via email. The survey response period was from October 14th to November 3rd, 2021 (21 days).

Survey

In consultation with a urologist specialized in the management of urologic reconstruction (RCD) and a urologist with a high-volume SNM implantation practice (GG), a survey was developed. Utilizing the Theoretical Domains Framework (TDF)⁶, Likert scale questions were generated to corresponding to all relevant domains of the framework to address potential barriers to patients receiving SNM care. The TDF employs a theory-informed approach to exploring clinician behaviour. Survey questions included demographics and practice experience of urologists, knowledge of SNM therapy, and urologist-perceived barriers to referral for SNM implantation as treatment of medically-refractory OAB within Canada. Data collected included a combination of open-ended and Likert scale responses. Finally, urologists were asked to review a clinical vignette of OAB management exploring the themes described. The survey was piloted amongst a convenience sample of urologists and their feedback was iteratively incorporated into subsequent survey versions prior to distribution. Qualitative responses were accepted until saturation in response themes was achieved.

Statistical analysis

Descriptive statistics were used to describe responses to quantitative inquiries. For regression analyses, Likert responses of "Agree" and "Strongly Agree" were grouped, while "Neutral", "Disagree", and "Strongly Disagree" were grouped together. SNM implantation-providing provinces at time of study were grouped as follows: Nova Scotia, New Brunswick, Quebec, Ontario, and Alberta. Demographic information will be presented using descriptive statistics, with categorical data presented as frequency counts and percentages. An a priori univariate binary logistic regression of variables by practice type (community vs academic) and SNM province vs non-SNM province were analyzed for confidence of recommending SNM, provider-perceived distance of SNM referral center, and literature efficacy achievability (Supplemental Figure 1, survey items 2A, 2C, and 3A). Groups were compared with the Pearson chi-square test or Fisher's exact test, where appropriate. Continuous variables are presented as median, and interquartile range. Data entry and all analyses were done using the software program SPSS 26.0 (SPSS Inc., Chicago, IL).

RESULTS

A total of 142 survey responses were obtained from 1104 members registered in the CUA directory (12.9%), which includes non-urologist physicians, residents, allied health members, and researchers. Within our invitation to survey, we allowed only self-identifying urologists to participate. Based upon the CUA annual general meeting census from June 2021, there are an estimated 697 registered urologists within, estimating a 20.4% total response rate.

Demographics

Demographic data is summarized in Table 1. The most represented age decile was <40 (n=66; 46.5%). The mean number of years in practice was 11.69 (SD = 10.90) and the most represented province was Ontario (n=66; 46.5%). Most urologists were based in the community and did not actively provide SNM implantation or patient care (n=62; 43.7%), followed by academic urologists that did not provide SNM implantation or patient care (n=50; 35.2%). The most represented practice size was urologists in a large group with >5 urologists (n=66; 46.5%). Of respondents, the most common previous experiences with SNM were having referred patients for SNM implantation evaluation (n=50; 35.2%) followed by being aware of SNM but have no experience with implantation or patient care (n=47; 33.1%). No urologists reported being unaware of SNM.

Utilization and knowledge of sacral neuromodulation

Most surveyed urologists reported believing SNM is underutilized (n=82; 57.7%), compared to only 6.3% (n=9) who felt it was adequately utilized. Notably, 35.2% (n=50) of surveyed urologists reported that they were unsure whether SNM was appropriately utilized, and none reported that SNM was overutilized.

After being provided a clinical vignette of a patient with medically-refractory OAB, surveyed urologists most commonly reported that they would offer this patient intravesical onabotulinumA Toxin injection (n=125; 88.0%), modification of antimuscarinic therapy (n=9; 6.3%); or sacral neuromodulation (n=7; 4.9%). The most commonly cited reasons for not considering SNM in the case vignette were lack of availability (n=85; 59.9%), lack of expertise (n=49; 34.5%), and lack of funding (n=26; 18.3%).

Urologist perceptions of SNM

When queried about knowledge regarding SNM, urologists were neutral regarding confidence to accurately recommend SNM to patients appropriately (median 3, IQR 2-4), and were not confident to accurately manage patient care and issues related to SNM devices after implantation (median 2, IQR 1-3). On univariable regression, practice setting (academic vs community) (OR 1.176, 95% CI 0.602-2.229, p = 0.635), nor practicing in a SNM-care providing province (OR 0.596, 95% CI 0.270-1.314, p = 0.199), predicted urologists confidence. Surveyed urologists reported believing available literature reported efficacy is achievable in their patients (median 4,

IQR 3-4). On univariable regression, being a urologist in a non-SNM providing province predicted decreased confidence in literature results being achievable in patients (OR 0.438, 95% CI 0.199-0.963, $p = 0.040$), however community compared to academic centers had no effect (OR 0.870, 0.443-1.709, $p = 0.686$). Surveyed urologists were neutral to their patients having a positive experience after SNM implantation (median 3, IQR 3-4), having a good clinical outcome following SNM implantation (median 3, IQR 3-4), and having negative side effects after SNM implantation (median 3, IQR 2-3). Urologists disagreed that SNM was overly invasive for OAB (median 2, IQR 2-3).

Of surveyed urologists, 80.3% ($n=114$) reported that their current practice provides intradetrusor BTX for medically-refractory OAB, and strongly agreed that in their group there are other urologists in their practice that refer patients for intravesical BTX (median 5, IQR 4-5). Urologists agreed that there are other urologists in their practice that refer patients for SNM (median 4, IQR 3-5), and strongly disagreed that they were concerned about loss of income from loss of follow-up with BTX if referring to SNM therapy (median 1, IQR 1-2). Urologists reported that the frequency of offering SNM compared to BTX for medically refractory OAB has remained similar over time (median 3, IQR 2-3), and were neutral when queried about thoughts of increasing offering SNM offering to eligible patients (median 3, IQR 2-4).

Regarding referrals to SNM care, surveyed urologists were neutral regarding 1) being unable to refer patients to SNM therapy when needed (median 3, IQR 1-4), 2) deciding against SNM therapy due to distance from providing centers (median 3, IQR 2-4), 3) deciding against SNM therapy due to waitlist times from providing centers (median 3, IQR 2-4), and 4) inability to offer SNM therapy due to lack of governmental support funding implantation and treatment (median 3, IQR 2-4). On univariable regression, community urologists were more likely to have concerns regarding distance from SNM implanter (OR 2.513, 95% CI 1.254-5.037, $p = 0.009$) compared to academic urologists. Urologists practicing in non-SNM implanting provinces did not have an increased likelihood of being concerned of distance from SNM providing centers (OR 0.715, 95% CI, 0.320-1.597, $p = 0.419$).

Qualitative analysis

On thematic analyses of perceived barriers to SNM referral, multiple themes emerged. These responses spanned the following TDF domains: environmental context and resources, skills, knowledge, and beliefs about consequences (Figure 1). Specifically mentioned barriers within environmental context and resources included: insufficient government funding to support programs, insufficient availability and accessibility to SNM implanters as a result of distance and wait-times, and insufficient resources needed to provide care including nursing support, follow-up logistics, and operating room resources. Barriers identified in the "skills" included perceived lack of training, education, and experience with SNM, and the need for localized expertise within

a centre to champion care. Knowledge barriers mentioned included lack of knowledge regarding SNM, the need for referral awareness and education, and patient perceptions of SNM being overly invasive. Finally, barriers specific to beliefs about consequences included invasiveness of SNM believed to be too high, and discordance between literature and patient outcomes.

DISCUSSION

We offer the first investigation of urologist-perceived barriers to SNM care within Canada. Our results indicate more than half of surveyed urologists believe SNM is underutilized. Within the TDF, identified barriers most commonly were described with the domains of “lack of availability,” “expertise,” and “funding”. More specifically, common barriers described within these domains include lack of available trained expertise and care resources, decreased confidence amongst urologist to recommend SNM appropriately for patients, and the urologist-perceived invasiveness of SNM.

A commonly cited barrier within surveyed urologists was lack of available expertise and resources including operating room time, nursing support, technical staff, and follow-up care post-implantation. Furthermore, >70% of surveyed urologists did not feel confident to manage patient care issues related to SNM devices post-implantation. Clearly there is a need to further develop SNM programs amongst Canadian urology groups.

Although initial start-up costs may be deterrent, economic modelling both within Canada and internationally have demonstrated cost-effectiveness for SNM over medical management in refractory-OAB at 5- and 10-year follow-up.⁷⁻⁹ Specifically, cost-effectiveness analyses show that amongst the costs of BTX, SNM and optimized medical therapy at the 2-year mark, SNM is cost-effective compared to optimized medical therapy, and surpasses BTX at the 5- and 10-year marks.⁷ Further, the use of other third-line treatments such as BTX requires the need for close follow-up, repeat injections and possible indwelling or clean-intermittent catheterization.⁵ PTNS treatment requires weekly visits lasting 30 minutes for 12 weeks, high utilization of healthcare resources, and patient adherence.¹⁰⁻¹³

Although the inertia to continue down the path of repeated BTX treatments is strong, it would appear that in Canada our specialty ought to use these and other data to consider how to develop and improve access to SNM programs. This should include improving SNM training opportunities and mentoring of urology trainees with interest in the field. Furthermore, mentoring from existing functional programs and advocating to our provincial ministries for increased support must be considered.

Current literature supports evidence that SNM offers near equivalency, if not some benefit over other third-line treatments. Two separate meta-analyses comparing BTX, PTNS, and SNM, and BTX to SNM demonstrated SNM superiority in urinary frequency and urinary urgency episodes compared to BTX.^{14,15} Additionally, BTX demonstrated significantly higher rates of urinary tract infections and the need for clean intermittent catheterization during

treatment.^{14,15} In the only multicenter randomized trial comparing SNM to BTX for medically refractory OAB, SNM had similar efficacy for reduction of urinary urgency episodes with lower morbidity compared to BTX.^{16,17}

Interestingly, although more than 80% of urologists report having colleagues in their practice that refer out for BTX, comparatively only 54% have the same for SNM. This discrepancy could be attributed to provided-perceived barriers identified in the TDF on thematic analysis including knowledge, and beliefs about consequences. Further, a comparatively higher number of urologists endorsed that they are not confident that the literature-reported efficacy is achievable in their patients, and were neutral to patient outcomes following SNM implantation. These findings, particularly in the context of a reported low confidence level in referring for SNM appropriately, highlights the importance of improved urologist education in the field. We recommend improved trainee and continuing education of established urologists containing clear information on how and why patients may benefit from SNM, as well as indications for referral. There are currently only 6 Canadian centers implanting SNM devices, with an annual implantation rate of approximately 300 patients.¹⁸ Over 24% of OAB patients are medically refractory which could indicate SNM as a treatment option for tens of thousands of Canadians.¹⁹ With MRI compatible rechargeable and long-lived non-rechargeable SNM devices entering the market, SNM is becoming increasingly accessible as a permanent solution to refractory OAB for Canadians.²⁰ Further, there are increasingly expanding indications for SNM including most recently a multicenter randomized trial demonstrating short-term benefit in a cohort with neurogenic lower urinary tract dysfunction with SNM.²¹ With ongoing advances, there is a need to establish infrastructure to roll out SNM programs throughout Canada.

This study has several strengths and limitations. Understanding the barriers to SNM was sought in order to inform future strategies to address underutilization of SNM. Delivery of SNM requires referral from urologists to specialized SNM care providers. Notably, the referring urologist is often the “gatekeeper”, in that they can control the referral to specialized care for SNM implantation decision-making upstream. Inclusion of both community and academic urologists as well as varying practice sizes is a strength of this study, as it allowed us to capture each practice type’s unique beliefs and practice patterns. Finally, we are not aware of any studies that have explored urologist-perceived SNM barriers within Canada or otherwise. A combined qualitative approach using a theory-informed TDF while gathering some quantitative data allowed for a practical and accessible description of the problem while leaving the opportunity for urologists to express themselves openly.

Limitations include the survey-based nature of the study from response bias. Additionally, there is concern for social desirability bias through survey responses due to the nature of quantitative and open-ended responses. Our results support the need for physician champions of care as well as institutional and governmental support through increased funding and resources to increase SNM uptake.

Despite our study's shortcomings, our survey represents the initial step in understanding the practice patterns of Canadian urologists, and their perceived barriers to SNM utilization within Canada. Canadian urologists believe that SNM is underutilized with barriers including lack of trained expertise and care resources, poor confidence to recommend SNM appropriately, and urologist-perceived invasiveness of SNM. We believe addressing these barriers through continuing education on SNM referral indications and engaging resource stakeholders for access-to-care will serve to increase access to care within Canada.

DRAFT

REFERENCES

1. Nitti VW. Clinical impact of overactive bladder. *Rev Urol.* 2002;4 Suppl 4:S2-6. <http://www.ncbi.nlm.nih.gov/pubmed/16986018><http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC1476019>
2. Corcos J, Schick E. Prevalence of overactive bladder and incontinence in Canada. *Can J Urol.* 2004;11(3):2278-2284. <http://www.ncbi.nlm.nih.gov/pubmed/15287994>
3. Coyne KS, Wein A, Nicholson S, Kvasz M, Chen CI, Milsom I. Comorbidities and personal burden of urgency urinary incontinence: A systematic review. *Int J Clin Pract.* 2013;67(10):1015-1033. doi:10.1111/ijcp.12164
4. Milsom I, Coyne KS, Nicholson S, Kvasz M, Chen CI, Wein AJ. Global prevalence and economic burden of urgency urinary incontinence: A systematic review. *Eur Urol.* 2014;65(1):79-95. doi:10.1016/j.eururo.2013.08.031
5. Corcos J, Przydacz M, Campeau L, et al. CUA guideline on adult overactive bladder. *Can Urol Assoc J.* 2017;11(5):E142-E173. doi:10.5489/cuaj.4586
6. Cane J, O'Connor D, Michie S. Validation of the theoretical framework. *Implement Sci.* 2012;7:37.
7. Hassouna MM, Sadri H. Economic evaluation of sacral neuromodulation in overactive bladder: A Canadian perspective. *J Can Urol Assoc.* 2015;9(7-8 August):242-247. doi:10.5489/cuaj.2711
8. Arlandis S, Castro D, Errando C, et al. Cost-Effectiveness of Sacral Neuromodulation Compared to Botulinum Neurotoxin A or Continued Medical Management in Refractory Overactive Bladder. *Value Heal.* 2011;14(2):219-228. doi:10.1016/j.jval.2010.08.006
9. Leong RK, de Wachter SGG, Joore MA, van Kerrebroeck PEV. Cost-effectiveness analysis of sacral neuromodulation and botulinum toxin A treatment for patients with idiopathic overactive bladder. *BJU Int.* 2011;108(4):558-564. doi:10.1111/j.1464-410X.2010.09905.x
10. Staskin DR, Peters KM, MacDiarmid S, Shore N, De Groat WC. Percutaneous tibial nerve stimulation: A clinically and cost effective addition to the overactive bladder algorithm of care. *Curr Urol Rep.* 2012;13(5):327-334. doi:10.1007/s11934-012-0274-9
11. Peters KM, Carrico DJ, Perez-Marrero RA, et al. Randomized Trial of Percutaneous Tibial Nerve Stimulation Versus Sham Efficacy in the Treatment of Overactive Bladder Syndrome: Results From the SUMiT Trial. *J Urol.* 2010;183(4):1438-1443. doi:10.1016/j.juro.2009.12.036
12. Peters KM, MacDiarmid SA, Wooldridge LS, et al. Randomized Trial of Percutaneous Tibial Nerve Stimulation Versus Extended-Release Tolterodine: Results From the Overactive Bladder Innovative Therapy Trial. *J Urol.* 2009;182(3):1055-1061. doi:10.1016/j.juro.2009.05.045
13. MacDiarmid SA, Peters KM, Shobeiri SA, et al. Long-Term Durability of Percutaneous Tibial Nerve Stimulation for the Treatment of Overactive Bladder. *J Urol.* 2010;183(1):234-240. doi:10.1016/j.juro.2009.08.160
14. Lo C-W, Wu M-Y, Shei-Dei Yang S, Jaw F-S, Chang S-J. Comparing the Efficacy of

- OnabotulinumtoxinA, Sacral Neuromodulation, and Peripheral Tibial Nerve Stimulation as Third Line Treatment for the Management of Overactive Bladder Symptoms in Adults: Systematic Review and Network Meta-Analysis. *Toxins (Basel)*. 2020;12:128. doi:10.3390/toxins12020128
15. He Q, Li B, Zhang C, Zhang J, Luo D, Wang K. Treatment for refractory overactive bladder: a systematic review and meta-analysis of sacral neuromodulation and onabotulinumtoxinA. *Int Urogynecol J*. 2020;(37). doi:10.1007/s00192-020-04427-w
 16. Amundsen CL, Komesu YM, Chermansky C, et al. Two-Year Outcomes of Sacral Neuromodulation Versus OnabotulinumtoxinA for Refractory Urgency Urinary Incontinence: A Randomized Trial [Figure presented]. *Eur Urol*. 2018;74(1):66-73. doi:10.1016/j.eururo.2018.02.011
 17. Amundsen CL, Richter HE, Menefee SA, et al. Onabotulinumtoxin a vs sacral neuromodulation on refractory urgency urinary incontinence in women: A randomized clinical trial. *JAMA - J Am Med Assoc*. 2016;316(13):1366-1374. doi:10.1001/jama.2016.14617
 18. Gajewski JB, Hassouna MM, Corcos J, Gray GJ, Tu LM, Dwyer N. The history of sacral neuromodulation in Canada. *Can Urol Assoc J*. 2020;14(4):88-91. doi:10.5489/cuaj.6499
 19. Benner JS, Nichol MB, Rovner ES, et al. Patient-reported reasons for discontinuing overactive bladder medication. *BJU Int*. 2010;105(9):1276-1282. doi:10.1111/j.1464-410X.2009.09036.x
 20. Elterman DS. The novel Axonics® rechargeable sacral neuromodulation system: Procedural and technical impressions from an initial North American experience. *Neurourol Urodyn*. 2018;37(December 2017):S1-S8. doi:10.1002/nau.23482
 21. Liechti MD, van der Lely S, Knüpfer SC, et al. Sacral Neuromodulation for Neurogenic Lower Urinary Tract Dysfunction. *NEJM Evid*. Published online July 7, 2022. doi:10.1056/EVIDoa2200071

FIGURES AND TABLES

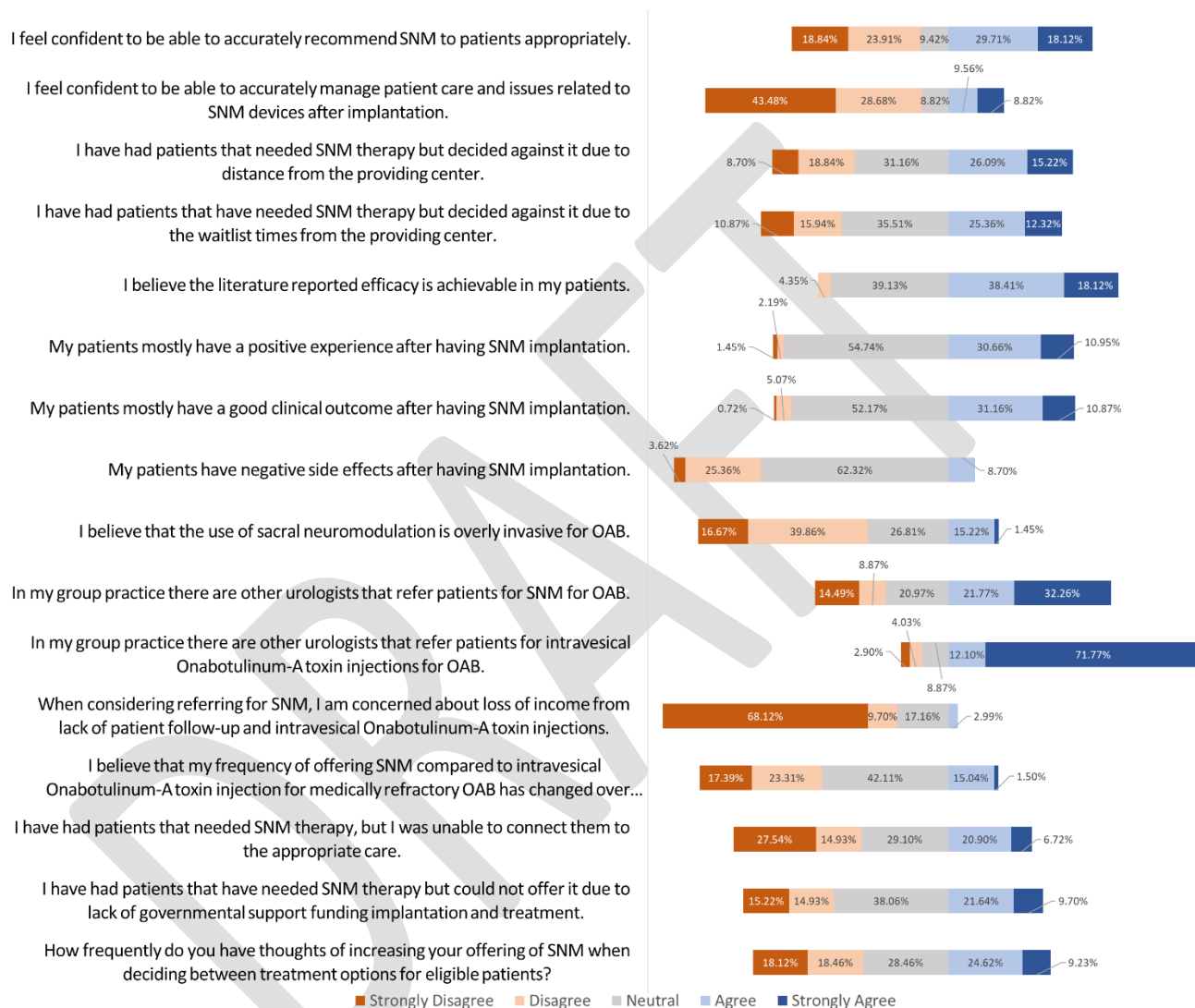
Figure 1. Urologist respondent agreement by survey item stratified by response in percentage.

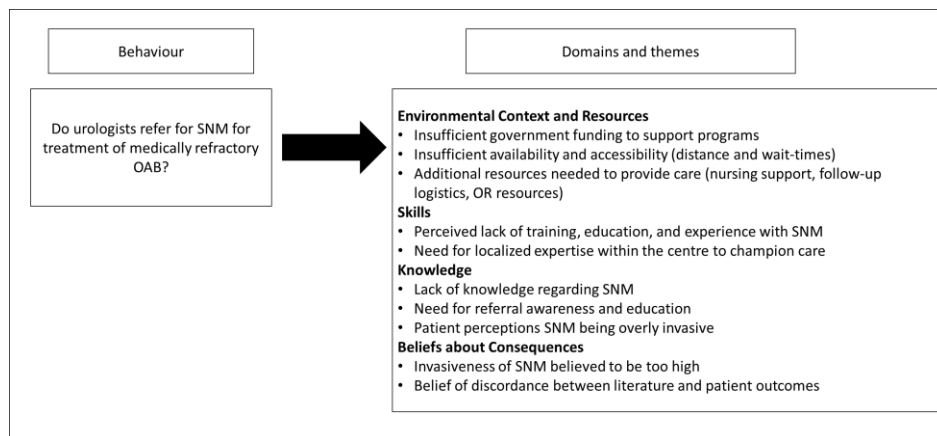
Figure 2. Barriers to urologists' referrals for SNM for the treatment of medically refractory overactive bladder (OAB).

Table 1. Respondent urologist demographic characteristics	
Respondent characteristic	n (%)
Age decile	
<40	66 (46.5)
40–49	41 (28.9)
50–59	18 (12.7)
60–69	12 (8.5)
>70	5 (3.5)
Location of practice	
Ontario	66 (46.5)
Quebec	16 (11.3)
British Columbia	15 (10.6)
Alberta	12 (8.5)
Nova Scotia	11 (7.7)
Other	22 (15.5)
Type of practice centre	
Academic – provides SNM care	37 (19.0)
Academic – does not provide SNM	50 (35.2)
Community – provides SNM care	3 (2.1)
Community – does not provide SNM	62 (43.7)
Type of practice setting	
Solo practice	20 (14.1)
Small group practice (2–5 urologists)	56 (39.4)

Large group practice (>5 urologists)	66 (46.5)
Years in-practice following residency	
Mean (SD), n = 139	11.69 (10.90)
Experience with SNM	
Unaware	0
Aware but no experience	47 (33.1)
Aware and have observed SNM care	22 (15.5)
Aware and provided SNM care	12 (8.5)
Aware and have referred for SNM	50 (35.2)
Previous or current SNM implanter	11 (7.7)

DRAFT