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Prevalence and Characteristics of Urinary Incontinence in a Treatment-Seeking Male Prospective Cohort – Results from the LURN Study

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Abstract

Purpose: Male urinary incontinence (UI) is thought to be infrequent. We sought to describe the prevalence of UI in a male treatment-seeking cohort enrolled in the Symptoms of Lower Urinary Tract Dysfunction Research Network (LURN).

Materials and Methods: The inclusion/exclusion criteria, including men with prostate cancer or a neurogenic bladder, have been previously reported. LURN participants prospectively completed questionnaires regarding lower urinary tract symptoms (LUTS) and other clinical variables. Men were grouped based on type of incontinence (1=non-UI; 2=post-void dribbling [PVD] only; 3=UI). Comparisons were made using analysis of variance and multivariable regression.

Results: Among 477 men, 24% reported non-UI, 44% PVD only, and 32% UI. Black men and those with sleep apnea were more likely to be in the UI group compared with the non-UI group (odds ratio [OR]=3.2, p=0.02 and OR=2.73, p=0.003, respectively). UI was associated with significantly (p<0.001) higher bother compared to those without leakage. Compared to men

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without UI and men with PVD only, men with UI were significantly ($p<0.01$) more likely to report higher scores (more severe symptoms) on patient-reported outcomes measurement information system (PROMIS) questionnaires regarding bowel issues, depression, and anxiety, compared to those without UI.

Conclusions: UI is common among treatment-seeking men. This is concerning because the guideline-recommended questionnaires for assessing male LUTS do not query for UI. Thus, clinicians may be missing an opportunity to intervene and improve patient care. This provides a substantial rationale for a new or updated symptom questionnaire that provides a more comprehensive symptom assessment.

Keywords

male; urinary incontinence; treatment-seeking; lower urinary tract dysfunction; patient questionnaire

INTRODUCTION

Urinary incontinence (UI) is a common complaint that is thought to be significantly more prevalent in the female population, with an estimated prevalence up to 55%. UI can be categorized as urgency UI (UUI), stress UI (SUI), and mixed UI (MUI), in which both SUI and UUI are present. The International Continence Society has defined post-void (or post-micturition) dribbling (PVD)/post-void urinary incontinence (PV-UI) as a separate symptom associated with the phenomena of involuntary loss of urine immediately after a person has finished passing urine.[1] Urinary leakage is extremely bothersome, usually associated with anxiety and depression, causes a decreased quality of life (QOL), and is a significant economic burden.[2–5] However, because UI can be embarrassing and there is a perception that it is a normal and untreatable part of aging, not everyone with UI seeks treatment. This may be particularly relevant to the male population, where UI is historically thought to be infrequent.

In men, the prevalence of UI and PVD is largely unknown. Most previous studies evaluating UI prevalence have been conducted in women. Few studies in men distinguished between different types of UI. Prior studies of community-dwelling men, including the National Health and Nutrition Examination Survey, Boston Area Community Health (BACH) Survey, Expanded Prostate Cancer Index Composite (EPIC), and Epidemiology of Lower Urinary Tract Symptoms (EpiLUTS) studies, reported prevalence of UI in men ranging from 5.3%-45.8%.[6] Among men with UI in these cohorts,1.2%-48.6% were UUI, 0.8%-12.5% SUI, 1.0%-15.4% MUI, and 2.9%-59% other UI, including PVD.[6] Subsequent evaluation of the BACH cohort demonstrated that 8.7% of men reported PVD.[7] In EPIC, 16.9% of men reported post-micturition symptoms; in EpiLUTS, PVD constituted 93.0% of the other incontinence group.[8]

The frequency of UI is unknown among men who actively seek treatment. The prevalence and types of UI in care-seeking men may differ from that of community-based men, and characterization of care-seeking men would be extremely relevant for their care. We sought to assess the prevalence and characteristics of care-seeking men with and without UI and its

subtypes, and to examine the relationships with medical comorbidities (e.g., diabetes, sleep apnea, bowel symptoms, sexual functioning, anxiety, depression, stress).

METHODS

Study Design and Population

The goal of the Symptoms of Lower Urinary Tract Dysfunction Research Network (LURN) is to phenotype men and women with LUTS in order to develop improved clinical tools and treatments. Men and women in the LURN Observational Cohort Study[9] were recruited from tertiary referral centers between January 2015-January 2017; however, only male participants are included in this analysis.[10] Briefly, all consenting participants were adults (≥18 years) presenting to a LURN physician as new or existing patients with at least one urinary symptom identified based on the LUTS Tool.[11] The exclusion criteria have previously been reported.[10] Men with prostate cancer, including those with low-risk disease, were excluded as to remove potential confounding of LUTS by a pelvic malignancy. Data collection at the baseline visit included a standard clinical exam, medical history, and patient-reported urinary symptoms, pelvic floor symptoms, psychological symptoms, and QOL.

Measures

The LUTS Tool[11] (Lower Urinary Tract Symptom [LUTS] Tool, Version 1.0. Copyright 2007 by Pfizer, Inc. Used with permission.) is a 44-item questionnaire assessing the frequency and bother of LUTS. Seven questions regarding incontinence (Questions 16a-g: “How often in the past week have you (a) leaked urine just after you have finished urinating? (b) leaked urine in connection with a sudden need to rush to urinate? (c) leaked urine in connection with laughing, sneezing, or coughing? (d) leaked urine in connection with physical activities, such as exercising or lifting heavy objects? (e) leaked urine while you are sleeping? (f) leaked urine during sexual activity? and (g) leaked urine for no reason?”) and one question regarding terminal dribble (Question 5: “During the past week, how often have you had a trickle or dribble at the end of your urine flow?”) were used to categorize men into UI, PVD only, and non-UI groups. Responses of “rarely” or “never” on all eight questions were classified as “non-UI”; responses of “sometimes” or greater on terminal dribble or leaked-after-voiding questions without indications of other incontinence symptoms were classified as “PVD only”; and responses of “sometimes” or greater on at least one other symptom of incontinence were classified as “UI”.

In addition to the LUTS Tool, participants completed the American Urological Association Symptom Index (AUA-SI);[12] Patient-Reported Outcomes Measurement Information System (PROMIS) measures of constipation, diarrhea, bowel incontinence, depression, and anxiety; [13] International Index of Erectile Dysfunction (IIEF);[14] Perceived Stress Scale (PSS);[15] and Childhood Traumatic Events Scale.[16] PROMIS[13] measures were administered via short forms scored as T-scores normalized to a reference population (mean=50, standard deviation [SD]=10 by definition), with the exception of bowel incontinence, for which there were not enough items to convert to the T-score metric. The Childhood Traumatic Events Scale was

collapsed into a summary measure indicating whether or not the participant had experienced any trauma.

Statistical Methods

Complete responses to the eight questions required for UI grouping were required for study inclusion. Demographic and clinical data were missing <1%. Questionnaire data were missing 3%-8%, except for the AUA-SI, which was missing for 12% of the cohort. Analyses of a given measure were used only in participants for which the measure could be scored according to validated guidelines.

Demographic and clinical characteristics of the LURN male cohort are shown using means and SDs for continuous variables and frequencies and percentages for categorical variables. Tests for group differences were performed using chi-square and non-parametric analysis of variance (ANOVA; Kruskal-Wallis tests). Similar descriptive statistics and statistical tests were calculated for each physical and psychological measure. The PROMIS measures are presented as continuous measures and percentage exhibiting severe symptoms, defined as greater than one SD above the population mean (i.e., T-scores of >60).

Multivariable multinomial models were fitted. Candidate covariates included age, race, body mass index (BMI), education, employment status, smoking status, diabetes, sleep apnea, Functional Comorbidity Index (FCI),[17] and LURN site. Multivariable linear regression was used to explore adjusted associations between measures of fecal incontinence, sexual function, and psychological health using the same set of predictors. Model selection was guided by the method of best subsets,[18] and final model determination incorporated clinical expertise and judgement. All p-values were adjusted for multiple comparisons using the false-discovery rate correction.[19] Analyses were completed using SAS 9.4 (SAS Institute, Cary, NC).

RESULTS

Four-hundred-seventy-seven of 519 men enrolled in the LURN Observational Cohort were included. The mean age was 60.9±13.3 years. The cohort was mostly Caucasian (80%), educated (60% had a bachelor's degree or higher), and either employed full-time (38%) or not employed/not looking for work (49%, Table 1). About half of subjects reported being current or former smokers (46%), 26% had a diagnosis of sleep apnea, and 18% were diabetic. The average FCI[17] was 2.1±1.8.

UI was reported in half of the men (51%). PVD and UUI were most common, occurring in 41% and 29% of men, respectively (Figure 1), while SUI was less common (3%-4%). PVD and UUI were most bothersome, with 39% and 35% reporting to be at least somewhat bothered, respectively (Figure 1).

Categorization into incontinence subgroups revealed 116 males without UI or PVD (24%), 211 PVD only (44%), and 150 UI (32%). Compared with other groups, the PVD only group was younger (mean 57.9±14.1 years, p=0.001), while the UI group was more likely to have comorbidities, such as obesity (48%, p=0.02), diabetes (27%, p=0.01), and obstructive sleep

apnea (36%, p=0.01). Fifty percent of black participants were in the UI group, compared with 29% of white participants and 35% of participants of "other" race (p=0.07). The UI group was more likely to report urinary urgency (86%) and leakage due to urgency (87%, Table 2). PROMIS constipation and diarrhea scores were close to population means for all groups, although higher in the UI group compared with the non-UI and PVD only groups (p=0.02 and p=0.03, respectively). Elevated scores on the constipation scale were more common in the UI group (13%) compared with the PVD only (7%) and non-UI (4%) groups (p=0.07).

Sexual functioning was impaired in the cohort on average, with mean scores in the moderate dysfunction range (mean±SD =15.5±11.3). Erectile function was worse in the UI group (mean=12.6), with 65% reporting moderate or severe dysfunction (IIEF <17, p <0.01).

PROMIS depression and anxiety scores, on average, were close to the normative population mean of 50, with less than 10% overall reporting elevated depression or anxiety scores, defined as T-scores >60 (one SD above population mean scores). Elevated depression and anxiety were more common in the UI group, with 15% and 17% reporting scores above 60, respectively, compared with 3%-6% in the PVD only and non-UI groups ($p \leq 0.001$). PSS scores were also higher in the UI group (means, 13.0 [UI], 10.7 [PVD only], 8.4 [non-UI], p <0.001).

Significant predictors of the UI group included age, race, sleep apnea, and clinical site (Table 3). The odds of being in the PVD only group compared with the non-UI group were 3% lower per year increase in age (odds ratio [OR]=0.97, 95% confidence interval [CI]=0.95-0.99), whereas black participants had three times higher odds of being in the UI group compared with the non-UI group (OR=3.20, 95% CI=1.35-7.62). Diagnosis of sleep apnea also increased the odds of being in the UI group compared with the non-UI group (OR=2.73, 95% CI=1.51-4.95).

After adjustment for the factors listed above, all significant differences between the urinary symptom groups remained statistically significant, except for differences in IIEF (Table 2; see Supplemental Table S1 for full model results). For all other measures, differences between UI and non-UI groups were significant; however, PVD only and non-UI groups showed no significant differences. Average estimated scores for UI compared with non-UI groups were 0.75 units higher for bowel incontinence, 2.41 units higher for diarrhea scale, and 3.00 units higher for constipation scale. Depression scores were 4.80 units higher in the UI group; anxiety scores were higher by a similar magnitude.

DISCUSSION

Half of men with LUTS who sought care at tertiary referral urology clinics reported some form of urinary leakage. Most commonly reported were UUI and PVD. In comparison to prior community-dwelling male studies,[6,20, 21] there is a significantly higher prevalence of UI among men who seek clinical care for LUTS (Supplemental Figure S1). A likely explanation for the increased frequency of UI in our study relates to patient care-seeking behaviors. EpiLUTS data suggest that only a relatively small proportion of patients actively

seek care for LUTS (ranging from 5.6%-29.1%, based upon LUTS symptom).[8] However, LURN only included patients who presumably were bothered enough to seek care, supported by the high level of bother reported in the current study (Figure 1). In addition, previous studies conducted within the LURN demonstrate a relationship between symptom bother/severity and treatment-seeking behaviors.[22]

The association between race and UI is supported by several studies,[20, 23] including the overactive bladder (OAB)-POLL, which[24] demonstrated that black men had a significantly higher prevalence of UUI than other racial groups (10% vs. 6%, respectively). The current results also highlight other self-reported comorbidities that have been previously associated with UI, including sleep apnea. Historically thought to contribute only to nocturia, several recent studies have suggested that sleep disturbance is also associated with many daytime LUTS.[25, 26] Secondary analyses of the EpiLUTS data demonstrated that patients with sleep apnea are 1.6 times more likely to experience UI compared to men without sleep apnea.[11] Although the mechanisms that link UI and sleep apnea are unknown, it potentially opens an opportunity for a non-pharmacologic therapy for UI (e.g., pressure airway systems).

The physiology of urologic and gastrointestinal function is known to be interrelated. Crosstalk between neural pathways in the pelvic organs is necessary for the routine mediation of bladder, bowel, and sexual function.[27, 28] This crosstalk also provides a pathway for abnormal function of these organs, with the potential for dysfunction of one pelvic organ leading to functional changes in another organ system. The results of this study support this theory of increasing frequency of bowel dysfunction (specifically constipation) in men with UI.

The associations between UI groups and measures of psychosocial health likely reflect the large psychologic impact of urinary leakage; however, no causal relationships can be determined from this observational study. EpiLUTS also demonstrated a high frequency of anxiety and depression among men with UI.[3] These findings were consistent with other studies demonstrating higher anxiety and depression rates among patients with UI.[29, 30] The direction of the relationship(s) between UI and mental health are as yet unknown and may be bidirectional. Additional research is warranted to further define these relationships and potentially exploit novel opportunities for intervention.

We identified a relationship between increased LUTS and PVD compared to men without UI. This supports previous findings demonstrating that PVD is more prevalent in men with voiding and storage symptoms.[7] Other comorbidities, including bowel dysfunction, anxiety, and perceived stress, were also increased in this group compared with the non-UI group (Table 2). While the exact etiology of PVD remains unknown, these factors may provide insight into its pathophysiology. Further studies aimed at pinpointing the mechanisms underlying PVD are required.

The results of this study should be evaluated in the context of its limitations. The prevalence of UI in this study may have been underestimated since many patients with SUI were excluded from the study due to history of prostate cancer. We presented self-reported symptoms from the LUTS Tool. However, patients reporting these symptoms did not present

with a chief complaint of all these symptoms; it is possible incontinence was not the primary reason for seeking care. Therefore, presence of UI may ultimately not be the most clinically-significant symptom that motivated their visit. Many patients in this study had previously undergone medical or surgical intervention for their LUTS before presenting to tertiary referral centers. As such, the impact of these previous interventions on UI remains to be determined. Comparison between LURN and other previous study cohorts may be limited by administered questionnaires. The treatment-seeking cohort in LURN is distinct from community populations, in that urinary symptoms that drive men to seek care may be unique and especially bothersome.

CONCLUSION

UI is a common symptom among men presenting at urology clinics. This is particularly concerning because the recommended and most commonly-used questionnaire for assessing male LUTS in the United States is the International Prostate Symptom Score/AUA-SI.[12] This questionnaire does not assess for UI or PVD and, therefore, may be associated with a false negative impression that urinary leakage is not present or problematic for patients. UI and PVD are bothersome for all patients and associated with significantly decreased health-related QOL.[3, 4, 7] This report provides a substantial rationale for a new or updated symptom questionnaire that provides a more comprehensive assessment. Capturing UI and PVD information and assessing for the presence of other related comorbidities (e.g., sleep apnea, diabetes, BMI, anxiety) will have the potential to significantly improve current clinical practices and treatments for men presenting with LUTS. Based upon these associations, clinicians should consider screening for incontinence and LUTS among men with these comorbidities.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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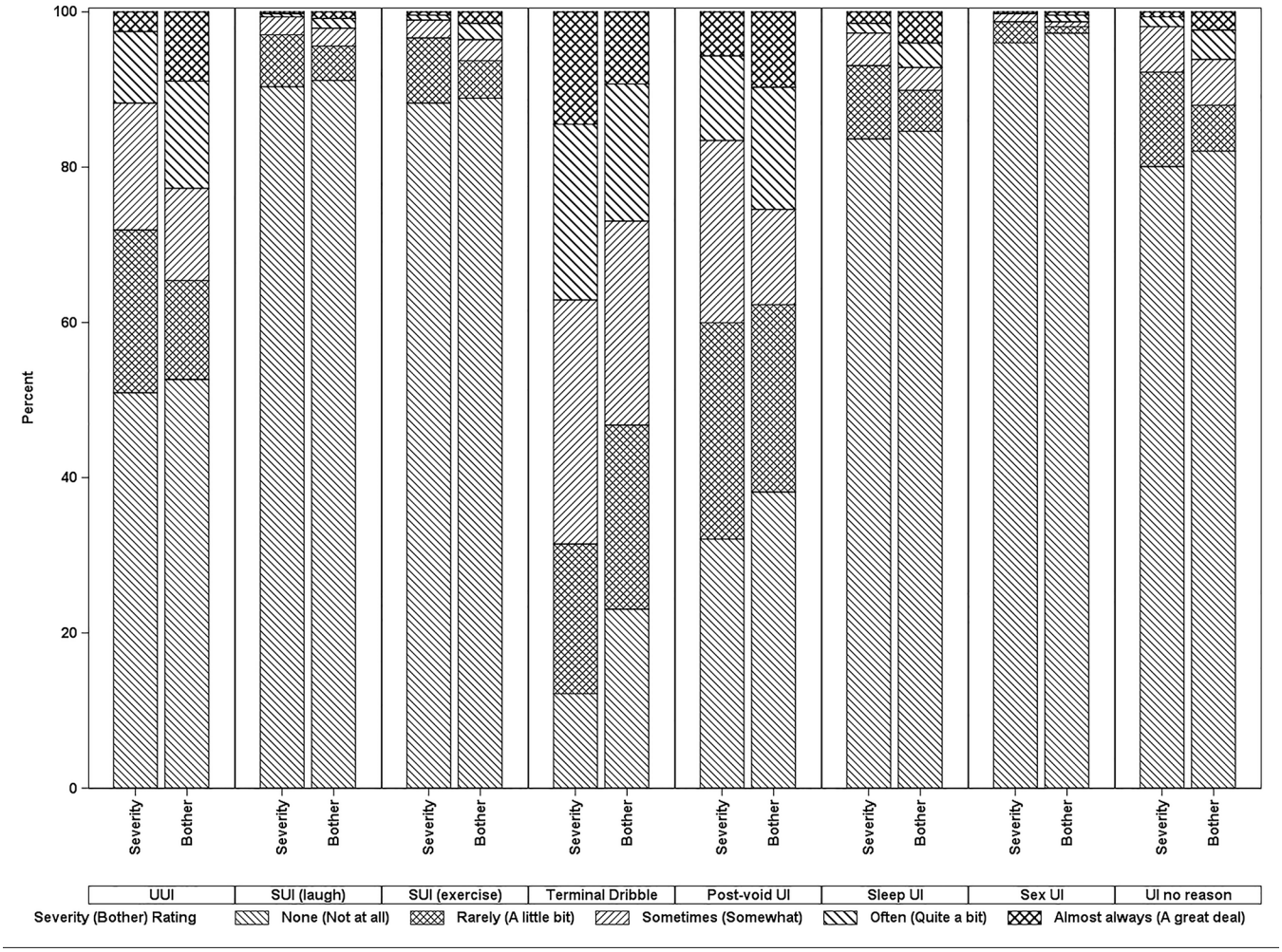

Figure 1:
Distribution of responses to LUTS Tool questions related to UI and PVD

Table 1:

Descriptive characteristics of male LURN participants

	Overall (n=477)	*UI[α] (n=150)*	*PVD[β] (n=211)*	*non-UI[γ] (n=116)*	*p-value[*]*
	Mean (SD) or N (%)	*Mean (SD) or N (%)*	*Mean (SD) or N (%)*	*Mean (SD) or N (%)*	
Age	60.9 (13.3)	63.5 (11.5)	57.9 (14.1)	63.1 (12.8)	0.001
Race					0.42
American Indian or Alaskan Native	0%	1%	0%	0%	
Asian	4%	5%	3%	4%	
Black	10%	16%	8%	8%	
White	80%	73%	83%	83%	
Other	5%	5%	5%	4%	
Unknown	0%	1%	0%	1%	
Education					0.17
< HS diploma/GED	3%	1%	4%	4%	
HS diploma/GED	10%	11%	10%	10%	
Some college/tech school - no degree	19%	23%	20%	13%	
Associate's degree	7%	6%	10%	4%	
Bachelor's degree	24%	25%	25%	22%	
Graduate degree	36%	33%	32%	47%	
Employment status					0.39
Employed part-time	10%	11%	9%	9%	
Employed full-time	38%	32%	43%	37%	
Unemployed (looking for work)	3%	3%	4%	2%	
Not employed (not looking for work)	49%	54%	44%	52%	
BMI	29.7 (5.7)	30.7 (6.3)	29.1 (4.8)	29.3 (6.2)	0.08
<25	20%	19%	17%	26%	0.02
25-30	40%	33%	48%	34%	
>30	41%	48%	35%	41%	
Current or former smoker	46%	51%	46%	41%	0.31
Diabetic	18%	27%	13%	18%	0.01
Sleep apnea	26%	36%	23%	19%	0.01
Functional comorbidity index	2.1 (1.8)	2.5 (1.9)	2.0 (1.7)	1.9 (1.7)	0.03
PVR (ml, median, IQR)	27 (0-82)	28.5 (0-79)	30 (14-90)	21 (0-62)	0.13
Facility					0.002
A	12%	7%	14%	16%	
B	20%	27%	11%	28%	
C	19%	17%	20%	19%	
D	14%	15%	14%	15%	
E	19%	17%	24%	14%	
F	15%	17%	17%	9%	

[*] p-value from chi-square or non-parametric ANOVA test of at least one pairwise difference between the three groups.

[α] Responded sometimes, often, or almost always on at least 1 of 6 LUTS Tool questions related to incontinence (excludes question related to PV-UI).

[β] Responded sometimes, often, or almost always to PVD and/or PV-UI question and never or rarely to remaining 6 LUTS Tool questions related to incontinence.

[γ] Responded never or rarely to all 7 questions related to incontinence and 1 question related to PVD on LUTS Tool.

Abbreviations: ANOVA, analysis of variance; BMI, body mass index; GED, general educational development; HS, high school; IQR, interquartile range; LURN, Symptoms of Lower Urinary Tract Dysfunction Research Network; LUTS, lower urinary tract symptoms; PVD, post-void dribbling; PVR, post-void residual; SD, standard deviation; UI, urinary incontinence.

Table 2:

LUTS, bowel, and psychological symptoms in men in the LURN cohort

	Overall (n=477)	*UI[α] (n=150)*	*PVD[β] (n=211)*	*non-UI[γ] (n=116)*	*p-value[*]*	*Adjusted p-value*
LUTS						
AUA-SI	13.7 (7.0)	16.3 (7.3)	14.3 (6.4)	9.3 (5.3)	<0.001	-
AUA-SI voiding	6.7 (4.9)	7.8 (5.3)	7.6 (4.7)	3.8 (3.6)	<0.001	-
AUA-SI storage	7.0 (3.3)	8.6 (3.1)	6.7 (3.1)	5.5 (3.1)	<0.001	-
AUA-SI QOL	3.7 (1.4)	4.3 (1.2)	3.7 (1.4)	3.1 (1.5)	<0.001	-
Feelings of urgency	57%	87%	50%	31%	<0.001	-
Leakage due to feelings of urgency	28%	89%	0%	0%	<0.001	-
Bowel Symptoms						
PROMIS GI bowel incontinence (raw scale)	4.8 (1.8)	5.4 (2.3)	4.5 (1.4)	4.5 (1.5)	0.001	0.001
PROMIS GI diarrhea (T-score)	46.5 (7.5)	47.9 (8.0)	46.5 (7.3)	45.0 (6.9)	0.03	0.04
PROMIS GI diarrhea (T-score) > 60	4%	6%	4%	3%	0.52	-
PROMIS GI constipation (T-score)	48.6 (7.9)	50.5 (7.9)	48.2 (7.8)	47.0 (7.4)	0.002	0.01
PROMIS GI constipation (T-score) > 60	8%	13%	7%	4%	0.07	-
Erectile Functioning						
IIEF	15.5 (11.3)	12.6 (10.9)	17.2 (11.0)	15.9 (11.6)	0.002	0.17
Moderate/severe dysfunction (IIEF < 17)	53%	65%	46%	50%	0.004	-
Psychological Symptoms						
PROMIS depression (T-score)	47.6 (8.3)	50.4 (8.8)	47.3 (7.9)	44.4 (7.0)	<0.001	<0.001
PROMIS depression (T-score) > 60	8%	15%	6%	4%	0.002	-
PROMIS anxiety (T-score)	47.9 (8.9)	50.4 (9.8)	47.7 (8.2)	45.1 (7.9)	<0.001	<0.001
PROMIS anxiety (T-score) > 60	9%	17%	6%	3%	<0.001	-
Perceived stress scale	10.9 (7.0)	13.0 (7.2)	10.7 (6.9)	8.4 (5.9)	<0.001	<0.001
Childhood traumatic events scale	65%	66%	67%	59%	0.42	-
Childhood traumatic sexual experience	7%	10%	5%	7%	0.39	-

[*] p-value from chi-square or non-parametric ANOVA test of at least one pairwise difference between the three groups

[α] Responded sometimes, often, or almost always on at least 1 of 6 LUTS Tool questions related to incontinence (excludes question related to PV-UI).

[β] Responded sometimes, often, or almost always to PVD and/or PV-UI question and never or rarely to remaining 6 LUTS Tool questions related to incontinence.

[γ] Responded never or rarely to all 7 questions related to incontinence and 1 question related to PVD on LUTS Tool.

Abbreviations: ANOVA, analysis of variance; AUA-SI, American Urological Association Symptom Index; GI, gastrointestinal; IIEF, International Index of Erectile Dysfunction; LURN, Symptoms of Lower Urinary Tract Dysfunction Research Network; LUTS, lower urinary tract symptoms; PROMIS, patient-reported outcomes measurement information system; PVD, post-void dribbling; QOL, quality of life; UI, urinary incontinence

Table 3:

Associations between demographic and clinical participant characteristics and urinary symptom group – results from multivariable multinomial logistic regression *

	Incontinence Group (ref=non-UI)	*Odds Ratio*	*95% Confidence Interval*	*p-value*	*FDR p-value*
Age				<.001	<.001
	PVD	0.97	(0.95-0.99)	0.004	0.008
	UI	1.01	(0.98-1.03)	0.576	0.632
Race (ref=white)				0.055	0.085
Black	PVD	1.54	(0.62-3.80)	0.350	0.410
	UI	3.20	(1.35-7.62)	0.008	0.017
Other race	PVD	0.79	(0.33-1.90)	0.600	0.651
	UI	1.35	(0.55-3.27)	0.511	0.572
Sleep apnea				0.002	0.005
	PVD	1.44	(0.80-2.61)	0.224	0.278
	UI	2.73	(1.51-4.95)	<.001	0.003

* Also adjusted for LURN site.

Abbreviations: FDR, false discovery rate; LURN, Symptoms of Lower Urinary Tract Dysfunction Research Network; PVD, post-void dribbling; UI, urinary incontinence