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Fluid manipulation among individuals with lower urinary tract symptoms: a mixed methods study

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Abstract

Aims and objective—To determine, qualitatively and quantitatively, how individuals use fluid manipulation to self-manage the urinary symptoms of daytime frequency, urgency and urine leakage and the underlying rationale for this behaviour.

Background—Lower urinary tract symptoms are prevalent and burdensome, and little is known about how individuals with lower urinary tract symptoms manipulate their fluid intake.

Design—A mixed methods design included statistical analysis of data from a population-based survey of urologic symptoms and qualitative analysis of in-depth interviews.

Method—Quantitative data came from 5503 participants of the baseline Boston Area Community Health Survey, a population-based, random sample epidemiologic survey of urologic symptoms. Qualitative data came from in-depth interviews with a random subsample from Boston Area Community Health of 152 black, white and Hispanic men and women with LUTS.

Results—Qualitative data showed that some respondents restricted fluid intake while others increased it, in both cases with the expectation of improved symptoms. Quantitative data showed that fluid intake was greater in men and women reporting frequency ($p < 0.001$). Women with frequency drank significantly more water ($p < 0.001$), while women with urgency drank significantly less water ($p = 0.047$).

Conclusions—This study found divergent expectations of the role of fluids in alleviating symptoms, leading some individuals to restrict and others to increase fluid intake. Individuals with lower urinary tract symptoms may need guidance in fluid management.

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Contributions

Study design: EE, NM, JM, ST; data collection and analysis: EE, NM and manuscript preparation: EE, NM, JM, ST.

Conflicts of interest

The authors have no conflicts of interest to declare.

Relevance to clinical practice—Nurses should be aware that patients may self-manage lower urinary tract symptoms by restricting fluid intake, putting them at risk for dehydration, constipation and urinary tract infection, but also that they may be increasing their fluid intake, which could worsen symptoms. This study pinpoints a specific area of need among patients with lower urinary tract symptoms and provides a practical opportunity for nurses to assist their patients with behavioural and fluid management by emphasising the clinical guidelines.

Keywords

behaviour; care needs; coping; lower urinary tract symptoms; mixed methods; qualitative approaches; self-management

Introduction

The term lower urinary tract symptoms (LUTS) describes a constellation of voiding and storage symptoms (Abrams *et al.* 2003) that affect 18.7% of the population (Kupelian *et al.* 2006) and have been linked to diminished quality of life, decreased mobility, social isolation, impaired work-related productivity and depression (Abrams *et al.* 2000). Not surprisingly, individuals with LUTS employ a battery of self-management strategies, including scheduled urination, prescription medication, bladder or pelvic muscle exercises, special clothing to conceal urine loss and fluid manipulation (Skoner 1994, Talbot & Cox 1995, Ricci *et al.* 2001, Diokno *et al.* 2006). Current clinical guidelines on fluid manipulation recommend that total daily fluid intake amount of 1500–2000 ml should not be reduced (de la Rosette *et al.* 2001, Brown *et al.* 2004); however, there is a paucity of research to show how individuals in the community actually use fluid manipulation in the self-management of their symptoms. These specific fluid-manipulation strategies have clinical significance for nurses, as certain fluid-manipulation behaviours such as restricting fluid intake can put patients at risk for dehydration, constipation and urinary tract infection (Foster 1998, Whitmore 2002, Gray & Krissovic 2003), while increasing fluid intake to control LUTS can worsen symptoms (Swithinbank *et al.* 2005).

Background

Previous studies have identified fluid manipulation as a commonly used strategy for self-management among individuals with LUTS. For example, (Miller *et al.* 2003) measured the proportion of individuals at different ages reporting certain fluid-intake strategies, while (Talbot & Cox 1995) looked at the fluid-intake strategies of persons with different types of urinary incontinence. Other studies have used more open-ended qualitative approaches to determine what kinds of coping strategies individuals use (Klemm & Creason 1991, Skoner 1994, Diokno *et al.* 2006, MacDonald & Butler 2007). Additionally, researchers have reported on the effect of fluid management and intake (caffeinated and otherwise) on urinary symptoms, concluding that fluid-management strategies should be considered as first-line treatment of individuals with LUTS and urinary incontinence (Swithinbank *et al.* 2005, Kincade *et al.* 2007).

While these previous studies have identified fluid manipulation as an often used coping strategy and tested its effect on symptoms, there remains a gap in the literature on exactly how individuals in the community alter their fluid intake (in particular total fluid intake) in response to their symptoms. To address this gap in the literature, this study assesses fluid intake behaviour among individuals with certain LUTS and underlying rationale for this behaviour to improve provider–patient communication and provision of care. Towards these aims, in this mixed methods study, we (1) qualitatively examined how individuals with specific daytime LUTS (urgency, frequency and/or urine leakage) manipulate their fluid

intake through in-depth interviews and (2) quantitatively assessed the emergent hypothesis that individuals increase or decrease overall fluid intake to cope with symptoms in ways divergent with behavioural management strategies recommended by the clinical practice guidelines.

Methods

Study design

A mixed methods design was used to analyse qualitative and quantitative data from a population-based survey of urologic symptoms. Mixed methods designs are well suited to the context of nursing, given ‘the complexity of nursing and the continual interaction of the art and science of practice’ (Carr 2009). In this study, we employed a modified sequential explanatory design, a mixed methods design that employs qualitative data to help explain existing quantitative data (Creswell & Plano Clark 2007). We modified the sequential explanatory design using qualitative data to gain a broad understanding of fluid-manipulation behaviour and the rationale behind this behaviour in the context of coping with urinary symptoms and to define areas of inquiry for quantitative analysis of an existing data set.

The Boston Area Community Health (BACH) survey

The BACH survey is a population-based, random-sample epidemiologic survey ($n = 5503$) of a broad range of urologic symptoms. A multistage, stratified cluster sample design was used to obtain approximately equal numbers of black, Hispanic and white men and women aged 30–79. Participants included 3202 women and 2301 men, 1767 blacks, 1877 Hispanics and 1859 whites. Self-reported information regarding urologic symptoms and various sociodemographic, medical and lifestyle factors was collected during an at-home interview from 2002–2005. The sampling design and study methods (McKinlay & Link 2007) and the prevalence and correlates of urologic symptoms (Fitzgerald *et al.* 2007) have been previously reported. Participants provided written informed consent, approved by the New England Research Institutes Institutional Review Board, separately for both the BACH study and the qualitative sub-study described below.

Qualitative sub-study

We conducted a qualitative sub-study consisting of focus groups and in-depth interviews with a random sample drawn from the BACH study. A primary objective was to explore factors underlying the coping and management of urinary symptoms. Participants for focus groups and interviews were randomly sampled from each of the six subgroups of the BACH sample and included individuals who reported one or more LUTS on the survey.

Operationalisation of LUTS and assessment of fluid intake

Lower urinary tract symptoms were assessed in the BACH study using the American Urological Association symptom index (AUA-SI) and additional reliable assessment questions on symptoms of urine leakage (described in Table 1). The AUA-SI is a validated instrument with excellent test–retest reliability (Barry *et al.* 1992). LUTS generally prescribe a constellation of storage and voiding symptoms [e.g. frequency, urgency, incomplete emptying, intermittent stream, weak stream, straining, nocturia (Abrams *et al.* 2003) and weekly urine leakage (Tennstedt *et al.* 2008)]; however, for the purposes of facilitating synthesis across qualitative and quantitative data, only certain LUTS were included in our analysis. Thus, LUTS was operationalised in this study to include the specific daytime storage symptoms of frequency, urgency and/or urine leakage.

In the quantitative arm of our analysis, fluid intake was assessed by asking the BACH survey participants how many eight ounce (one cup) servings they drank on an average over the past seven days by type of beverage (water, coffee, tea, herbal tea, juice, soda and milk, with separate questions on alcohol consumption). In the qualitative sub-study, respondents were asked an open-ended question about any changes to diet and fluid intake they had made as self-management of urinary symptoms.

Qualitative methods

Focus groups—Eight focus groups were conducted to generate broad themes around coping with and managing urinary symptoms to inform the development of the in-depth interview discussion guide. Focus groups were stratified by gender and ethnic group. Separate groups were conducted in English and Spanish for Hispanic participants based on language preference. Themes were generated from the focus groups in a manner consistent with the analysis of the in-depth interviews described below. As the primary data source in this study was the in-depth interviews, findings from the focus groups are not addressed in this paper.

In-depth interviews—An interview guide was developed and then refined through the use of the focus groups. The final interview guide posed several questions related to the respondents' experiences of living with urinary symptoms, as well as what they do on their own cope and manage with their symptoms. The particular section of the interview guide pertaining to coping and managing is displayed in Table 2.

A total of 152 in-depth interviews were conducted with: 26 white men, 25 white women, 25 black men, 25 black women, 26 Hispanic men and 25 Hispanic women who had not participated in the focus groups. Interviews were conducted by trained interviewers in participants' homes and lasted approximately 60 minutes. Interviews were digitally audio-recorded and transcribed verbatim. Spanish interviews were translated into English. Given our restricted operationalisation of LUTS, interviews with respondents who did not report urgency, frequency and/or urine leakage were excluded from analysis, yielding a sample of $n = 118$ respondents for the qualitative interviews.

Qualitative data analysis—An inductive theoretical approach, consistent with Strauss and Corbin's approach for creating theory grounded in the data (Strauss 1987), was used to analyse the qualitative data. In-depth interview transcripts were read by the qualitative researcher (EE) and a research assistant to generate a 'start list' of codes, a process referred to as 'open coding' (Strauss & Corbin 1998). Transcripts were read a second time to refine the coding structure and explicit definitions were stored in a code book. Transcripts were then coded using *Atlas.ti* software (Muhr 2004). Finally, patterns across transcripts were examined, and emergent themes were compared by gender and ethnic/racial group. Trustworthiness of qualitative data was established through three kinds of triangulation: data triangulation, through the use of both focus groups and interviews to develop and refine themes; methods triangulation, through the use of both qualitative and quantitative methods; and investigator triangulation, through the use of multiple investigators in analysis and interpretation of the data (Johnson 1997).

Quantitative statistical methods

Quantitative hypotheses were developed based on emergent themes from the qualitative findings (Table 3). Fluid manipulation was a frequently cited coping mechanism among respondents with urinary symptoms; thus, we sought to quantify the relationship between specific LUTS and fluid intake among the full BACH sample ($n = 5503$). Additionally, as

qualitative results indicated that Hispanics often consume herbal drinks to cope with symptoms, we explored intake of tea and herbal tea by race/ethnicity.

We conducted multivariate linear regression considering presence of the urinary symptom (yes/no) as the independent variable and the log-transformed continuous measure of non-alcoholic fluid intake (log of servings/day + 1) as the dependent variable. We separately analysed three common symptoms—frequency, urgency and urine leakage (as defined in Table 1) for their associations with total fluid, water, coffee, tea and herbal tea intake. Total fluid intake included the latter four beverages as well as juice, soda and milk.

Boston Area Community Health's sampling design requires weighting observations inversely proportional to their probability of selection in order for the analysis to be representative of the Boston population. Weights were poststratified to the Boston population 2000 census. All statistical tests were two sided, performed at $\alpha = 0.05$ and conducted in SAS v.9.1 (SAS Institute Inc., Cary, NC, USA) or SUDAAN v.9.0.1 (Research Triangle Institute, Research Triangle Park, NC, USA), separately by gender. We used multivariate linear regression to allow interpretation of beta estimates as the per cent change in fluid intake comparing those with the urinary symptom to those without the symptom. The final models adjusted for factors that were statistically significant and changed estimates of fluid intake by $\geq 10\%$: age, race/ethnicity, socio-economic status, physical activity, waist circumference, alcohol intake, cigarette smoking, use of prescription antispasmodic or anticholinergic medications and, in women, surgery for urinary incontinence (Table 4 footnotes). Models for frequency and urgency mutually adjusted for the other symptom. The following factors were considered as covariates, but they were not statistically significant and/or did not appreciably change the estimates of interest and so were not included in the final model: history of cardiac disease, diabetes, stroke, multiple sclerosis, cancer, Parkinson's, depressive symptoms, use of a bladder catheter, vaginal child delivery, surgery on the prostate, penis or bladder and use of the following medications: diuretics, alpha blockers, 5-alpha-reductase inhibitors, or tricyclic antidepressants.

Mixing methods

The first and second author (EE, NM) met on a regular basis to discuss the findings from the qualitative analysis to develop the parameters of the quantitative analysis (i.e. define variables) based on emergent qualitative themes; then on completion of both analyses, the authors met to synthesise findings across methods. Table 3 shows the development of quantitative variables based on qualitative findings around symptom self-management through fluid manipulation. Qualitative and quantitative 'stories' were then considered in concert to form a more comprehensive account of fluid-manipulation behaviour and underlying rationale.

Results

Qualitative results

Qualitative sub-study participants ranged in age from 31–80 years old and consisted of 77 (26 white, 26 black and 25 Hispanic) men and 75 women (25 in each race/ethnic group). This analysis was limited to those respondents who reported urinary frequency, urgency and/or urine leakage symptoms ($n = 118$). Despite the fact that fluid manipulation was not explicitly addressed in the interview discussion guide (see Table 2), the manipulation of fluid intake emerged as a commonly cited coping mechanism for urinary symptoms. Respondents reported several different coping strategies involving fluid manipulation, including situational/temporal fluid manipulation (e.g. reducing fluid intake before going

outside or to bed), increasing and restricting fluid intake and, in the case of Hispanic respondents, the use of herbal and fruit drinks considered to be medicinal.

Increasing vs. restricting fluid intake—Major response domains and demonstrative quotes for fluid manipulation are displayed in Table 5. Many respondents reported restricting their fluid intake to manage or cope with their urinary symptoms. Men and women across all three racial/ethnic groups explained the decision to decrease fluid intake by drawing a connection between increased fluid intake, bladder filling and increased voiding frequency. However, responses were mixed on whether decreasing fluid intake helped alleviate symptoms and most respondents reported limited improvement. The words ‘fluid’ and ‘water’ were often used interchangeably. Fluid restriction was often accompanied by concerns about dehydration.

Notably, other men and women reported increasing fluid intake, also with expectations of improved symptoms. Respondents who increased their fluid intake reported mixed success of this strategy. The reasoning for increasing fluid intake differed by gender group; women often referenced popular health messages about recommended daily fluid intake, explaining that water was ‘good for you,’ while men tended to describe the function of water in the body, e.g., the ability of water to ward off infection, ‘flush out the kidneys,’ or ‘keep your system cool.’

Herbal drinks and agua fresca—Male and female Hispanics reported using numerous herbs brewed as a tea (e.g. flaxseed, roselle, sun thistle, horsetail and corn silk) and ‘agua fresca,’ a cool water-based drink infused with fruit or herbs, which some respondents considered to have healing or soothing properties (Table 6). Hispanic respondents reported that these herbal or fruit drinks were recommended to them by their family or were traditional remedies from their home country. In general, Hispanic respondents spoke assuredly about the positive effects of herbal teas and agua fresca, while black and white respondents tended to be more speculative and sceptical about the effect of herbal remedies on their symptoms.

Quantitative results

Overall, in 5503 BACH study participants, the median (interquartile range) total daily intake of eight-ounce servings of non-alcoholic fluids was 10 (7–13) servings/day in men and 16 (15–20) servings/day in women. As shown in Table 4, men with urinary symptoms drank more total fluids than men without these symptoms, but the association was statistically significant only for frequency (symptomatic men had 17.5% higher intake). Intake of water or coffee was not significantly different between men with and without symptoms. Men with urine leakage drank significantly less tea (14.2% less) and herbal tea (10.8% less) than men without urine leakage. Herbal tea was also consumed less by men with urgency.

Among women, only those with frequency symptoms had a significantly higher intake of total fluids, drinking 13% more per day ($p < 0.001$) and in particular, 11% more water ($p < 0.001$). In contrast, women with urgency drank 9% less water than did women without urgency and the association bordered statistical significance ($p = 0.05$). Women with frequency drank significantly less tea and women with urine leakage drank significantly less herbal tea.

Considering preliminary results from the qualitative portion of the study showing that Hispanic men and women reported drinking herbal tea and agua fresca to treat urinary symptoms and improve their health, we conducted additional exploratory analyses of symptoms and tea, herbal tea and juice intake by race/ethnicity. No significant associations were observed among Hispanics with tea or with herbal tea in particular. Juice was not

associated with LUTS in Hispanic men, but Hispanic women with urgency symptoms drank 23.9% more juice ($p = 0.02$) than did those without urgency symptoms. In statistical tests for multiplicative interactions, the interaction terms between race/ethnicity and urgency were not statistically significant for determining consumption of tea, herbal tea, or juice.

Discussion

A mixed methods design employed qualitative and quantitative data to inform the question of how individuals use fluid manipulation to self-manage their urinary symptoms and the underlying rationale for this behaviour. We started out by assessing qualitative data to define the parameters of statistical analysis of existing BACH data. Our findings around situational/temporal fluid manipulation were similar to those described by others (Skoner 1994, Talbot & Cox 1995, Diokno *et al.* 2006), thus we have focused on the unique contributions of this study by emphasising fluid intake amount and type.

In our qualitative analysis, we found that many individuals restricted their fluid intake, as reported by others (Klemm & Creason 1991, Skoner 1994, Talbot & Cox 1995, Ricci *et al.* 2001, Diokno *et al.* 2006), but also that many individuals increased their fluid intake. Reasons for increasing or decreasing fluid intake varied by gender, but with the same goal of alleviating LUTS. Qualitative data also revealed that Hispanics relied on herbal remedies and fruit drinks considered to have healing properties in a way that black and white respondents did not. These qualitative data informed the design of statistical analyses with which we quantified the relationship between LUTS and overall fluid intake by gender and between herbal tea intake and LUTS specifically by race/ethnicity.

The quantitative data generally corroborated the qualitative findings; individuals with LUTS may have significantly altered their fluid intake compared to individuals without LUTS. For example, our qualitative finding that some people decreased fluid intake as a coping mechanism was supported by our quantitative findings of decreased tea consumption among men and women with various LUTS and decreased water consumption among those with urgency symptoms. Meanwhile, men and women with frequency symptoms drank significantly more total fluids than men and women without these symptoms. While these quantitative results may be partly because of the fact that greater fluid intake is likely to lead to frequency symptoms, our qualitative results suggest other possible explanations as well. For example, women with LUTS may have increased their fluid intake to cope with their symptoms based on a belief that water has cure-all properties. These results suggest that popular health messages touting water as a panacea may be influencing behaviour, particularly among women. Among men, the idea that water functions to keep the body 'flushed out' or 'well greased-up' suggests a mechanical view of the body also found by Meadows (Meadows *et al.* 2008). This view is illuminated by Watson's proposed 'male body schema', derived from his finding that, while health professionals conceptualise the body biologically or physiologically, lay men tend to concern themselves with aspects of pragmatic or functional embodiment (i.e. the body as an instrument to serve ends/fulfil roles) (Watson 2000). Within this paradigm, it follows that men's mechanical descriptions of the function of water in the body may be indicative of more pervasive notions of functional embodiment.

The qualitative finding that Hispanics consume herbal concoctions or teas to alleviate LUTS was reflected in the exploratory quantitative analysis, in the finding of a positive association between juice and urgency observed only in Hispanic women. The lack of a quantitative association with herbal tea itself may be because of the terminology used in the BACH Survey, which was not designed to capture *agua fresca* or alternative herbal remedies and asked about 'tea,' 'herbal tea' and 'juice' in those broad terms. Hispanic women with

urgency drank significantly more juice than those without urgency, but the lack of association between juice and LUTS among Hispanic men and among women with other urinary symptoms suggest that the term 'juice' also did not capture the meaning of agua fresca. We know that the herbal drinks consumed by Hispanic respondents did not cure their symptoms, primarily because the qualitative interviews were conducted after the baseline BACH survey. However, this is no assurance that these herbal drinks are not offering some relief, or alternatively, exacerbating symptoms. The use of herbal concoctions and agua fresca by Hispanics to treat or manage urinary symptoms is an important consideration for nurses, especially because Hispanic patients may not disclose herb use to their provider (Howell *et al.* 2006, Gardiner *et al.* 2007).

This mixed methods analysis has several strengths. First, on its own, the BACH survey is of a large, community based and diverse random sample of 5503 men and women. BACH is a study of symptoms rather than of diagnoses, and as such it captures populations before seeking treatment or for whom symptoms continued despite treatment. Weights were poststratified to represent the 2000 Boston Census, and thus, results are considered to be generalisable. Further, the qualitative arm of this study used a random subsample of 152 respondents from the BACH sample and thus is similarly diverse, with approximately equal numbers of black, white and Hispanic men and women. To our knowledge, this is the largest qualitative study of coping strategies for urinary symptoms to date; previous studies have had sample sizes $n \leq 38$ (Klemm & Creason 1991, Skoner 1994, Milne 2008, Nicolson *et al.* 2008). Finally, the use of both qualitative and quantitative methods allowed for a more complete depiction of how and why individuals use fluid manipulation to self-manage LUTS.

Limitations

A few limitations must be noted. First, self-reported responses (e.g. fluid intake based on recall over the past seven days) are prone to error; however, any resulting bias is likely to be non-differential by LUTS status and therefore bias results towards the null. Null quantitative results may also be owing to the fact that some people increased intake of certain fluids while others decreased their intake; this possibility is clearly indicated by the qualitative results. Additionally, qualitative and quantitative data were collected during two separate time periods: 2002–2005 (quantitative) and 2007–2008 (qualitative). During this time span, management strategies (e.g., fluid intake) may have changed and symptoms may have worsened or improved. While we were able to use our qualitative findings to inform our statistical analyses, the fact that the qualitative study was conducted subsequent to the BACH survey prevented us from designing the quantitative survey questions based on our qualitative findings (a 'true' sequential explanatory design). Finally, our inability to capture the use of folk remedies in the quantitative phase prohibits a comprehensive assessment of their harms and benefits.

Conclusions

This study found divergent expectations of the role of fluids in alleviating symptoms, leading some individuals to restrict and others to increase fluid intake. The divergent fluid-manipulation behaviours (i.e. restricting or increasing fluid intake) of individuals with LUTS found in this study suggest that patients may need additional guidance around appropriate fluid management for urinary symptoms. Overall, the reasons women cited for increasing fluid intake (e.g., touting popular health messages) and those men cited (e.g., around the function of water in the body) elide any reference to standard practice recommendations, suggesting that respondents may not have sought or received fluid-management recommendations from their health care provider.

Relevance to clinical practice

This study is particularly germane to nursing practice as it pinpoints a specific area of need among patients with LUTS and provides a practical opportunity for nurses to assist their patients with behavioural and fluid management by emphasising the clinical guidelines. Nurses should be aware that patients may be confused about appropriate strategies for fluid management of their symptoms and may self-manage LUTS by restricting fluid intake, putting them at risk for dehydration, constipation and urinary tract infection (Foster 1998, Whitmore 2002, Gray & Krissovich 2003), or increase their fluid intake, which could worsen symptoms (Swithinbank *et al.* 2005). Current self-management programmes suggest that the recommended total daily fluid intake amount of 1500–2000 ml should not be reduced (de la Rosette *et al.* 2001, Brown *et al.* 2004). Nurses should advise patients with LUTS around appropriate total daily fluid intake amount, not just caffeine and alcohol reduction and timing of fluid intake (AUA Practice Guidelines Committee 2003).

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Table 1

Assessment of lower urinary tract symptoms (LUTS) in this study

Frequency¹: At least one of the following reported:

- Urinate again <2 hours (occurring fairly often, usually, or almost always)
- Frequent urination during the day (occurring fairly often, usually, or almost always)
- Number of daytime urinations is ≥8

Urgency¹: At least one of the following reported to occur fairly often, usually, or almost always:

- Difficulty postponing urination
- Strong urge or pressure

Urine leakage²: Experiencing the following at least weekly ('one or more times per week' or 'every day')

- Leakage of 'even a small amount of urine'
-

¹(Fitzgerald *et al.* 2007).

²(Tennstedt *et al.* 2008).

Table 2

Section of interview discussion guide pertaining to self-management of urinary symptoms

These next questions are about what you do for your symptoms.

- 1 People might do many different things for their health problems or symptoms besides going to the doctor. Other than going to the doctor, what kinds of things have you tried to make your urinary, bladder or pelvic problems better?

Probes:

- Have you tried changing your diet?
 - Have you tried taking special herbs?
 - Have you tried buying medicine over-the-counter?
 - Have you tried acupuncture, prayer, or other kinds of self-care?
- 2 Have any of the steps we have just talked about been helpful for your symptoms?
 - 2a Why or why not?
-

Table 3

The development of parameters for quantitative analysis based on emergent qualitative themes

Emergent qualitative theme	Resulting quantitative analytic parameter
Fluid manipulation was a commonly cited coping mechanism among individuals reporting frequency, urgency and urine leakage	Fluid intake separately analysed for associations with frequency, urgency and urine leakage
Individuals reported increasing and decreasing intake of fluid generally	'Total fluid intake' was included in the analysis (including water, coffee, tea, herbal tea, juice, soda and milk)
Individuals reported increasing and decreasing intake of water specifically	Associations of urinary symptoms with water intake were separately analysed
Hispanic individuals in particular noted the use of herbal drinks in self-management of urinary symptoms	Analysed intake of tea and herbal tea by race/ethnicity

Difference in fluid intake among urinary symptomatic and asymptomatic men and women from multivariate regression models, among 2301 men and 3202 women in the Boston Area Community Health survey¹

Table 4

Urinary Symptom	Per cent difference (Higher +, or Lower -) fluid intake, compared to men or women without that symptom				
	Total fluids ²	Water	Coffee	Tea	Herbal tea
Men					
Frequency <i>n</i> = 641 (27.8%)	+17.5 ^{***}	+2.8	-2.1	+5.9	+5.3
Urgency <i>n</i> = 252 (9.3%)	+0.9	-7.2	-8.3	-4.2	-8.1 *
Urine Leakage <i>n</i> = 127 (5.3%)	+6.2	+1.6	+6.0	-14.2 *	-10.8 ^{**}
Women					
Frequency <i>n</i> = 1108 (36.9%)	+13.0 ^{**}	+10.9 ^{**}	-0.4	-9.3 *	+0.2
Urgency <i>n</i> = 501 (14.2%)	-4.8	-9.0 *	-6.1	-1.9	+2.7
Urine Leakage <i>n</i> = 332 (10.4%)	+1.7	-7.8	-6.4	-5.8	-6.6 *

¹ Multivariate regression model controlled for age (five-year categories), race (black, Hispanic, or white), socio-economic status (low, medium, or high), physical activity (low, medium, or high), waist circumference (quintiles), alcohol intake (0, 0-1, 1-3, or ≥3 drinks/day), cigarette smoking (never-smoker, <2.5, 2.5-10, 10-20, or ≥20 pack-years), use of prescription antispasmodic or anticholinergic medications (yes/no), surgery for urinary incontinence (in women) and total fluid intake (log-transformed 8-ounce servings/day). The multivariate models for urinary frequency and urgency additionally mutually controlled for symptoms of urgency or frequency.

² Total fluid intake includes water, coffee, tea and herbal tea, as well as juice, soda and milk. Intake of each fluid was assessed by asking respondents to report the number of eight-ounce servings consumed per day in the past seven days.

* $p \leq 0.05$.

** $p < 0.001$.

Statistically significant values are in bold.

Table 5

Illustrative quotes from in-depth interviews around fluid manipulation

Major themes	Quotes
Restricting fluid intake improves symptoms	'I know that if I drink, it's just going to go right through me, so then I just don't drink.' (<i>white woman</i>) 'Well, eliminating water. I thought by not drinking any water the problem would stop.' (<i>Hispanic man</i>) 'I try not to drink too much liquid so I can avoid going to the bathroom so much.' (<i>Hispanic woman</i>)
Perceptions of effectiveness of restricting fluid intake	'I've experimented with cutting back on fluids, but it doesn't seem to make a difference.' (<i>white man</i>) 'Cutting down on liquids... That helps a little bit, but I still urinate a lot.' (<i>black man</i>)
Increasing fluid intake improves symptoms	'You have to drink a lot of water; it can help.' (<i>black woman</i>) 'I just increased my water intake. Self-care: Drink more water!' (<i>white woman</i>)
Perceptions of effectiveness of increasing fluid intake	'Drink more water... I don't know if it helped or if it didn't.' (<i>white woman</i>) 'I guess it does something because your urine isn't as yellow as it is without water; it's more clear. So that's good, isn't it? I guess; I don't know.' (<i>white woman</i>) 'I drink a lot of water. But the water doesn't help because it makes me have to the bathroom a lot.' (<i>Hispanic woman</i>)
Notion that water is good for you	'Drink more water!... The standard recommendation of drinking eight 8-ounce glasses of water a day.' (<i>white woman</i>) 'Water is good for you.' (<i>black woman</i>)
Notions of the function of water within the body	'If you don't drink water, your system is going to shut down.' (<i>black man</i>) 'I keep myself pretty well greased-up with water.' (<i>white man</i>) 'You drink water, it passes through your system and gets flushed out through your kidney. Your kidneys got to work.' (<i>white man</i>) 'If you don't drink fluids... your organs tighten up... so you've got to have some fluid going inside your system.' (<i>black man</i>)
Concern that fluid restriction is unhealthy	'My biggest problem is cutting back on fluids... I get dehydrated. So I'm damned if I do, damned if I don't.' (<i>white woman</i>) 'I try not to drink liquid, which isn't good because you're supposed to drink water all the time.' (<i>Hispanic woman</i>) 'I don't think there's anything I can really do other than just don't drink water, and I think it's worse to be dehydrated than to have to pee. So I really don't think there's anything I could do.' (<i>white man</i>)

Table 6

Illustrative quotes from Hispanics on herbal teas and agua fresca

Herbal teas	<p>'I've tried maize silk... It's very good for the urinary tract. You boil it and drink a cup... [It is] soothing and makes me feel better. All of these things affect your organs.' (<i>Hispanic woman</i>)</p> <p>'[Flax] has some properties that reduce inflammation quite a bit. Roselle, barley. And another thing that's quite rejuvenating—a little seed called 'chan'... It soothes the urinary tract.' (<i>Hispanic man</i>)</p> <p>'They say drink horsetail... in Columbia, and that's good for urinary problems.' (<i>Hispanic woman</i>)</p>
Agua fresca	<p>'Some people say that pineapple skin is very rejuvenating. So we buy pineapple and... make juice with the skin that is very healthy.' (<i>Hispanic man</i>)</p> <p>'I drink Tamarind drink so that my body, my organs, will work well.' (<i>Hispanic woman</i>)</p> <p>'Tamarind, coconut milk, cranberry... When I start to feel... that my organs are starting to fail, that's when I try to drink these juices.' (<i>Hispanic woman</i>)</p>