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MRS HEATHER MARGARET PIERCE (Orcid ID : 0000-0002-3760-935X)

PROFESSOR LIN PERRY (Orcid ID : 0000-0002-8507-1283)

PROFESSOR ROBYN GALLAGHER (Orcid ID : 0000-0001-5588-9351)

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DELAYING VOIDING, LIMITING FLUIDS, URINARY SYMPTOMS AND WORK PRODUCTIVITY: A SURVEY OF FEMALE NURSES AND MIDWIVES

Running head: Fluids, toilets and work

AUTHORS:

1. **Heather PIERCE:**
   PhD, BMid(Hons), BAppSc(Phty) RM
   Faculty of Health, University of Technology Sydney, Australia

2. **Lin PERRY:**
   PhD, MSc, DipN
   Professor of Nursing Research and Practice Development,
   Prince of Wales Hospital, Sydney Hospital and Sydney Eye Hospital;
   Professor, Faculty of Health, University of Technology Sydney, Australia

3. **Robyn GALLAGHER:**
   PhD, MN
   Professor of Nursing, Charles Perkins Centre, Sydney School of Nursing, University of Sydney;

4. **Pauline CHIARELLI:**
   PhD, MMedSc, DipPhysio
   Conjoint Associate Professor, School of Health Sciences, University of Newcastle, Australia

Corresponding Author Email ID: Heather.Pierce@uts.edu.au

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Author contribution table

Criteria	**Author Initials**
Made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data;	HP, LP, RG, PC
Involved in drafting the manuscript or revising it critically for important intellectual content;	HP, LP, RG, PC
Given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content;	HP, LP, RG, PC
Agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.	HP, LP, RG, PC

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ABSTRACT

Aim: To examine the relationships between workplace bladder practices, urinary symptoms and work productivity.

Design: Cross-sectional observational survey.

Methods: Surveys were distributed June - November 2016 to at least 600 female nurses and midwives at three urban hospitals in New South Wales, Australia. Nurses self-reported restricted workplace access to toilets, delaying voiding, limiting of fluid intakes and urinary symptoms at work. Logistic modelling was used to examine whether nurses' bladder practices impaired their time management, ability to concentrate or perform physical demands.

Results: Of 353 useable surveys, one in five nurses (22.4%; N=79) reported restricted access to toilets at work, most (77.1%; N=272) delayed voiding and one in four (26.9%; N=95) limited fluid intakes to delay voiding at work. Almost half the sample had urinary symptoms at work (46.7%; N=165); delaying voiding increased the likelihood of impaired mental concentration and limiting fluid intakes increased the likelihood of impaired time management.

Conclusion: As workplace access to toilets and related bladder practices are modifiable, associated urinary symptoms and productivity loss may be preventable.

Impact:

Nurses' often experience restricted accesses to amenities due to job demands and workplace environments. The impact of nurses' poor bladder practices in the workplace is not known.

In this study most nurses delayed voiding and many purposefully limited fluid intakes at work. These behaviours impacted a nurse's ability to manage time and/or concentrate at work.

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Results have implications for nurses' personal health, the design of workplace environments, workforce management, occupational health policy and patient care.

Keywords: nurses, midwives, toilet facilities, fluid intake, drinking behaviour, occupational health, urinary incontinence, urinary bladder, workforce, workplace.

INTRODUCTION

Access to clean drinking water and sanitation is a human right essential for health (United Nations, 2010) and health is essential to productivity at work (Wang et al. 2003). Despite national workplace health and safety legislations and regulations for the provision of adequate amenities (Worksafe Victoria 2008, Australian Government, 2011) job demands and workplace environments of high-income nations can restrict workers' ability to meet these fundamental human needs (Palmer et al. 2012, Linder and Nygaard 1998). Restricted access to toilets during work hours necessitates suppression of the urge to void, often accompanied by purposeful limitation of fluid intakes (Nygaard and Linder 1997, Pierce et al. 2019). However, suppression of urinary urge to delay voiding may cause bladder discomfort, lead to bladder over-distension, altered bladder sensation and increase the risk of urinary tract infections (Segal et al. 2011). Inadequate fluid consumption is also associated with urinary tract infections (Nygaard and Linder 1997), as well as constipation (Leung et al. 2011) and may negatively alter cognition (Benton 2011). Further, several serious health conditions are linked to chronic mild dehydration, including kidney stones (Sorokin et al. 2017), bladder cancer (Zhou et al. 2014) and cardiovascular disease (Burgio et al. 2013, Thornton 2010). Delaying voiding and the related practice of limiting fluids are common bladder practices in

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nurses, highlighting a major health workforce group at risk of health and related productivity issues (Bendtsen et al. 1991, Wan et al. 2017, Palmer and Newman 2015).

Background

An expert consensus statement on healthy bladder practices includes the recommendation of adequate fluid intake (25-30 mL per kg body weight per day) to void every three to four hours during waking hours (Lukacz et al. 2011). Bladder control or 'continence', usually achieved in early childhood, is a complex cognitive process, involving sensory, afferent, motor and reflex processing, where a person selectively tunes into awareness of bladder fullness to determine when and where to void (Gillespie et al. 2009). People with normal bladder function and unrestricted accesses to amenities drink and empty their bladders at will, preserving continence. It is not usual practice to wait until the bladder is perceived as absolutely full before responding to the 'need to go' (Gillespie et al. 2009).

Lack of bladder control, or 'incontinence', is a storage lower urinary tract symptom (LUTS) (Haylen et al. 2010). People with storage LUTS may experience bladder sensations more regularly and intensely than normal. Storage symptoms include a sudden urge to empty the bladder that is difficult to defer (urinary urgency), feeling the need to pass urine frequently (urinary frequency), waking from sleep to pass urine (nocturia) or involuntary urine loss (urinary incontinence) (Haylen et al, 2010). When an individual experiences urinary urgency, with urinary frequency and/or nocturia (with or without incontinence) the condition is referred to as an 'overactive bladder' (OAB), when there is no urinary tract infection or other obvious pathology present (Haylen et al. 2010). Storage LUTS are often managed by altering the amount of fluids drunk and ensuring regular bladder emptying (Elstad et al. 2010, Cardozo et al. 2009).

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Prevalence of LUTS increases with age (Milsom et al. 2017), representing intimate, embarrassing problems that remain under-reported despite being common and costly (Deloitte Access Economics 2011). Almost half (45.2%) of the world's population (2008) are thought to experience at least one type of LUTS (Irwin et al. 2011); with one in 10 adults developing new symptoms over a 5-year period, as they age (Maserejian et al. 2013). Females generally have higher prevalence rates than males (Irwin et al. 2011), with an estimated two of every three females experiencing storage LUTS (Irwin et al. 2006). Symptoms are commonly associated with childbearing, obesity, pelvic organ prolapse, menopause, pelvic surgery, constipation, diabetes, urinary tract infections, anxiety, depression and back pain (Milsom et al. 2017).

People with LUTS are likely to experience symptoms at work (Irwin et al. 2005), especially where restricted access to amenities may challenge symptom management (Fultz et al. 2005). Restricted access may arise from practical barriers such as location or number of toilets in the workplace, lack of regulated work breaks, or workers' inability to leave job demands (perceived or actual) to attend to personal needs. Additionally, workers with normal bladder function may experience bladder discomfort from delaying voiding (intentional or of necessity) when they perceive that they are unable to access the toilet as required. While suppression of urinary urge is a normal physiological and social response, recurrent delaying of voiding may increase symptoms of bladder discomfort, urinary urgency and incontinence (Palmer et al. 2017, Wan et al. 2017). Urinary symptoms may consequently be initiated or influenced by work-related factors and bladder practices adopted to manage LUTS or normal urinary urge, dictated by role demands and workplace environments (Palmer et al. 2012).

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Globally, nurses and midwives constitute the largest portion of the healthcare workforce and females comprise at least 90% of this workforce (Australian Institute of Health and Welfare 2015, World Health Organisation 2018). The job conditions of nurses and midwives ('nurses') may be a factor contributing to nurses' experience of urinary symptoms at work (Liao et al. 2006). Nurses' work environments are often busy and stressful; heavy workloads, high time-pressure demands (Brennan 2017), inadequate breaks and insufficient rest break times, acknowledged by at least half of studied nurses, represent global occupational issues (Wendsche et al. 2017). Of concern, female nursing workforce groups are reported with higher rates of LUTS than comparable general populations (Wan et al. 2017, Pierce et al. 2016). Prevalence rates for nurses of at least one type of LUTS are estimated at 65% (Liao et al. 2009) to 90% (Zhang et al. 2013), with storage LUTS most commonly reported (Wan et al. 2017).

Nurses experiencing urinary symptoms at work related to bladder practices may be less productive. Reduced work productivity, where defined as being unable to perform work tasks at the usual level (Tang et al. 2011, Lerner et al. 2001), has been associated with OAB in a United States study of 2,876 male and 2,820 female workers aged 40-65 years (Sexton et al. 2009). In another American study of 4,511 women aged 54-65 years, urinary incontinence increased the risk of limiting the kind or amount of work a woman was able to perform (Hung et al. 2014). Further, in an Australian study of female nurses and midwives (aged 21 to 67 years), urinary incontinence reduced the ability to concentrate or manage time (Pierce et al. 2018). Compounding these work-based bladder health issues, behaviours such as "…waiting too long to urinate at work" (Palmer et al. 2017 p.1) can trigger nurses' experience of urinary urgency (Wan et al. 2017). Bladder practices at work negatively influence nurses' experience of urinary symptoms and may also contribute to work productivity impairments, but to date this has been little researched (Pierce et al. 2016).

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THE STUDY

Aims

This study aimed to examine the relationship between nurses' work productivity and their workplace urinary symptoms and bladder practices. In female nurses at work we examined: 1) the proportion who have restricted access to toilets, delay voiding, or purposefully limit their fluid intakes to delay voiding; 2) the prevalence of urinary symptoms (bladder discomfort and/or storage LUTS); and 3) in those with urinary symptoms at work, the relationship between restricted access to toilets, delaying voiding, limiting fluid intakes and their ability to do their job.

Design

Cross-sectional observational survey design addressed the study objectives. The survey forms part of a mixed-method exploratory investigation of the relationship between pelvic floor dysfunctions and work. In a previous report related to this project, we examined the impact of urinary incontinence on nurses' work productivity (Pierce et al. 2018). The current work is secondary analyses of the same data set to provide further unique insights into the potential impact of LUTS at work by examining related bladder behaviours. In this report, nurses' behaviours associated with bladder control such as delaying voiding and limiting fluids are referred to as 'bladder practices' as they are viewed not just as actions of choice but as responses to social, cultural and physical workplace environments (Holman and Borgstrom 2016).

A conceptual model of work-related risk factors for the development of LUTS provided the theoretical framework this study (Figure 1) (Liao et al. 2006, Pierce et al. 2019). In this model, work-related factors restricting access to amenities such as adequate rest breaks and job conditions are acknowledged alongside individual characteristics and personal habits for

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maintenance of pelvic floor health and the experience of LUTS in women at work. We sought to extend this model by determining whether work-based behaviours of delaying voiding and the related practice of purposeful limitation of fluid intakes were linked with nurses' experience of LUTS and consequently their work productivity.

Sample/Participants

Female registered or enrolled nurses, midwives, and assistants in nursing who were not pregnant working in busy urban settings, at three major tertiary referral hospitals in Sydney, Australia, were eligible to participate.

Data Collection

The Director of Nursing at each hospital sent an email to invite nurse managers and educators to support distribution of the survey: electronically through staff email lists (providing a link to enable the survey to be completed on a computer, tablet or phone) or as paper copies left in work areas or handed to staff at study information sessions. Email invitations and paper surveys were distributed between June and November 2016. A reminder invitation with survey link was sent two weeks after the initial contact; then a final reminder was sent one month before the end of the recruitment period at each hospital. The survey remained open for approximately 6 months. We estimated a combined total of 2,750 female nurses and midwives working across the three hospitals. To achieve 95% confidence (with estimated 4.1% margin of error) 600 paper surveys were distributed, based on an anticipated 56% paper response rate (Cook et al. 2009) and 5% electronic response rate (Perry et al. 2016).

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Data collected included age, body mass index (BMI) and ethnicity; work role, specialty, contract and shift pattern. Health and female gender-related data known to influence the occurrence of LUTS included questions sourced from the Australian Longitudinal Study on Women's Health,(Brown et al. 1996), such as: "Have you had any of the following health problems in the past 12 months: urinary tract infections, constipation, back pain, anxiety, depression?" Response options "sometimes or often" were coded as having the problem. Diabetes was determined by a positive response to: "Have you ever been diagnosed with diabetes Type I or Type II?" Female gender data included self-report of: current pregnancy and number of births; menopausal status: "Have your menstrual periods ceased permanently? (more than12 months since your last period)"; use of hormone therapy; the presence of pelvic organ prolapse derived from diagnosis by a doctor or a positive response to: "Do you have a sensation of tissue protrusion or a lump or bulging in your vagina?" (Price et al. 2006); history of pelvic surgery: caesarean section, hysterectomy, bladder or prolapse repair.

Bladder practices at work

To investigate bladder practices in nurses we used questions sourced from the Taiwan Nurse Bladder Survey.(Liao et al. 2009). Question development and instrument validation for this survey built on a conceptual model for the primary prevention of LUTS (Palmer 2002), developed from investigations of teachers and nurses (Liao et al. 2006, Liao et al. 2007, Liao et al. 2009). Three questions related to bladder control asked nurses about their experience at work in the last month: 1) Whether they could access the toilet whenever required, with response options of "never, occasionally or sometimes" coded as restricted access to toilets; 2) How often they delayed passing urine at work, with response options of "sometimes, most of the time or all of the time" coded as delaying voiding; 3) How often they reduced fluid

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intakes to delay or avoid passing urine at work, with response options of "sometimes, most of the time or all of the time" coded as limiting fluid intakes.

Urinary symptoms

We established the presence of urinary symptoms at work by a positive response ("yes'" rather than "no") to a single question: "In the last month, did you experience urinary symptoms at work? By urinary symptoms, we mean feeling the need to pass urine more frequently than usual; feeling discomfort because of the need to delay passing urine; needing to rush or hurry to pass urine when you get the urge, or leaking urine with work activities or with the need to hurry to pass urine?" (Liao et al. 2009). We also asked, "How much do your urinary symptoms bother you?" with a numeric scale response option from '0' (not at all) to '10' (a great deal).

The overall prevalence and subtypes of storage LUTS experienced in the last month were identified by responses to questions from the International Consultation on Incontinence Questionnaires: Female Lower Urinary Tract Symptoms (Brookes et al. 2004) and Urinary Incontinence - Short Form (Avery et al. 2004). Questions asked nurses their experience (on average) in the last 4 weeks: "How often do you pass urine in the day?" Response options "7-8 times" or more were coded as urinary frequency. "How many times do you get up at night to pass urine, on average?" Responses of "2" or more were coded as nocturia. "Do you need to rush or hurry to pass urine when you get the urge?" Response options "sometimes, most of the time or all of the time" were coded as urinary urgency. "How often do you leak urine?" The response option "never" was coded as not having urinary incontinence.

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Work productivity

The potential impact of nurses' urinary symptoms on work productivity was investigated using questions from the Work Limitations Questionnaire (WLQ) - Long Form (Lerner et al. 2001). To enable comparisons with previous work in this area, the selection of questions to measure a 'urinary-specific' work impairment followed the example of a large multi-national investigation of the impact of overactive bladder symptoms in general workforce populations (Coyne et al. 2011). The domains of the WLQ included in our survey were: time management (five questions), mental concentration (one question) and physical demands (six questions) (for examples of questions used see (Pierce et al. 2018). In accordance with the WLQ scoring instructions, a urinary symptom-specific work impairment score (US-WLQ) was computed, scoring from zero '0' for no limitation up to 100% for most limited (Lerner et al. 2009). The US-WLQ was then categorised as a binary response, coding "no" as no work productivity impairment and "yes" for any work impairment (included scores >4%).

Ethical considerations

The University of Technology Sydney Human Research and Ethics Committee: HREC 2015000478 and South Eastern Sydney Local Health District HREC: Reference No. 15/283(LNR 15/POWH/540) provided ethics approval.

Data analyses

Descriptive statistics provided information about the health and work characteristics of nurses, the prevalence and degree of bother of urinary symptoms when at work and the prevalence of storage LUTS (at any time). Independent t-tests and Chi-Square tests compared differences in the health and work characteristics of nurses who had restricted access to

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toilets, delayed voiding and/or limited their fluid intakes at work and those who did not. Independent t-tests determined any significant differences between work limitations scores in relation to reported restricted access to toilets, delaying voiding and/or limiting fluid intakes for nurses with urinary symptoms at work.

Logistic regression modelling determined whether restricted access to toilets, delaying voiding or limiting fluid intakes, by nurses experiencing urinary symptoms at work, had an independent effect on the reporting of a time management, mental concentration or physical demand impairment. Potential predictor variables had independent bivariate associations ($P < 0.25$) with the outcome variables of each US-WLQ domain. Age and BMI were included in each model (Wan et al. 2017). Other predictor variables included back pain, anxiety, depression, storage LUTS "at any time" (coded as a single variable for at least one of the following symptoms: urinary frequency, urinary urgency, nocturia) and "other PF dysfunction" (prolapse, constipation and/or urinary tract infection). Diabetes was not included in the model due to small numbers. There was no evidence of strong co-linearity between predictor variables (Pearson's r or Spearman's Rho < 0.25) (See supplementary material for details).

Where no symptom data were entered, this was coded as not having the condition; other missing data were dealt with on a case-by-case basis where individual cases were excluded if they were missing data required for each analysis (see sample numbers supplied in Tables 1 and 2 for detail). It was necessary to exclude cases from analyses where there were inadequate responses to determine US-WLQ score (N=2), or respondents indicated that the item "does not apply to my job" (N=16). All analyses were performed using SPSS (IBM statistics for Windows) version 22.0®. A p value of <0.05 (two-tailed) was considered statistically significant.

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Validity and reliability

Questions used in the survey were employed or adapted from established surveys (Brown et al. 1996) or validated tools (Price et al. 2006, Liao et al. 2009). Questions sourced from the workplace LUTS instrument were in English (Liao et al. 2007). The LUTS instruments are internationally recognised, validated and internally consistent (Cronbach's alpha 0.63 - 0.75 and 0.95) (Brookes et al. 2004, Avery et al. 2004) and use accepted terminology, as recommended by the International Continence Society (Milsom et al. 2017). The WLQ (Lerner et al. 2001) has demonstrated internal consistency (Cronbach's alpha of 0.92-0.97) and validity (moderate to high correlations with other work-specific measures) (Tang et al. 2011).

A draft of the survey was reviewed by a Urogynaecologist, then piloted with 20 nurses and midwives with opportunity for feedback. This process verified the acceptability of content, survey length and question format to nurses. Minor revisions were required prior to distribution, the main amendments were to reduce the number of questions related to the measurement of work productivity. We recognise that this limits the validity of this component of the survey however some questions were not applicable to urinary symptoms or to nurses' work.

RESULTS

Demographic and work characteristics

We received 365 returned surveys: 243 (40.5%) on paper and 122 electronically (but we had no way of knowing how many nurses had access to the electronic version of the survey). Excluding those reporting a current pregnancy (N=11) and one incomplete survey, 353 surveys were analysed. The mean age of included respondents was 42.3 years (SD 12.6,

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range 21-67 years); mean BMI 25.5 kg/m^2 (SD 5.1, range 17.7-59.8 kg/m^2) and 55.0% (N=194) were nulliparous (Table 1). The mean hours worked each week was 35.5 hours (SD 9.9, range 8-80 hours): 58.4% (N=206) worked shifts (not days only), 62.0% (N=219) worked a full time contract, 32.9% (N=116) part-time and 5.1% (N=18) casual, pool or agency.

Restricted access to toilets, delaying voiding and limiting fluids at work

When at work 22.4% (95% CI: 18-27%; N=79) of all nurses in the sample could not access the toilet when required. Delaying voiding was reported by 77.1% (95% CI: 73-81; N=272) of nurses and 26.9% (95% CI: 22-32%; N=95) limited fluid intakes to delay or avoid voiding at work. There were no significant differences in bladder practices by nurses' roles, specialties or forms of work contract. Nurses with restricted toilet access were more likely to report anxiety, depression, back pain and urinary symptoms at work compared with those who did not have restricted toilet access (Table 1). Nurses delaying voiding were more likely to report back pain and urinary symptoms compared with those who did not delay voiding. Limiting fluid intakes at work was associated with diabetes, urinary urgency and nocturia (Table 1).

Urinary symptoms at work

The overall prevalence of urinary symptoms in nurses at work was 46.7% (95% CI: 42-52%; N=165) with mean bother score 2.5 (SD 2.6, range 0-10). Those with urinary symptoms at work were more likely to have a higher mean (SD) BMI (26.3 (5.7) kg/m^2, compared with 24.8 (4.2) kg/m^2 (t (df=2778) = -2.66, p = 0.008) and were more likely to be parous (54.7% compared with 45.3%, (x^2 (df=1) = 7.39; p =0.007).

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Delaying voiding, limiting fluids and work productivity

Mean (SD) US-WLQ scores for nurses with urinary symptoms at work for each domain were: time management 16.4% (16.0; range 5.00-100; N=66); mental concentration 33.2% (18.1; range 25.0-100; N=61); physical demands 15.3% (12.7; range 4.2-70.8; N=51). Mean US-WLQ scores for mental concentration impairment were significantly higher for nurses who delayed voiding or had restricted access to toilets at work (Table 2). Those who delayed voiding or limited fluids at work were more likely to have higher physical work impairment scores (Table 2). Nurses who delayed voiding at work were eight times more likely to report concentration impairment, after accounting for age, BMI, back pain, restricted access to the toilet and limited fluids at work. Those who limited fluid intakes at work to delay voiding were almost four times more likely to have a time management impairment, after accounting for age, BMI, back pain, storage LUTS at any time, "other pelvic floor dysfunctions" and delayed voiding (Table 3).

DISCUSSION

In this workforce study, almost one in four female nurses reported restricted access to toilets, with most delaying voiding at work. Compounding this issue, one in four nurses limited their fluid intake to delay or avoid voiding at work. Results suggest that urinary symptoms were a significant issue for nurses as almost half of those surveyed experienced bothersome symptoms at work. For some of these nurses, delaying voiding reduced their ability to concentrate and limiting fluids reduced their ability to manage time. The capacity to access and use toilets and drink fluids at work as needed are important issues for female nurses. The linkage with nurses' health and work abilities means they warrant urgent attention from managers, employers and policymakers.

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Restricted toilet access and delaying voiding were linked to a range of physical and mental health issues in nurses (Table 1). Those with restricted toilet access were more likely to report anxiety or depression, supporting a relationship between nurses' work stress and LUTS (Zhang et al. 2013). However, the finding that nurses with restricted toilet access or delayed voiding practices were more likely to report back pain was unexpected. Common factors may contribute to the development of back pain and LUTS such as urinary incontinence (Smith et al. 2014, Pierce et al. 2017). Two-thirds (61.5%) of nurses in our study reported back pain and almost half (48.7%) experienced urinary incontinence. These prevalence rates are somewhat higher than the state wide survey of Australian nurses and midwives (mean age 48 years) at 46.6% for back pain (Perry et al. 2016) and 32% for urinary incontinence (Pierce et al. 2017) despite similar reporting measures and our younger sample (mean age 42.3 years). Our sample characteristics may reflect the urban hospital setting and there may be response bias for reporting of urinary symptoms. None-the-less, considering the high prevalence of these health issues, these results deserve further exploration.

Delaying voiding: the 'nurses' bladder'

Results of the present study on the delayed voiding practices of nurses are consistent with other studies that investigate a similar phenomenon. The 'nurses' bladder' was described in 1991 by authors of a study of 72 female Danish nurses (mean age 32 years) working in a busy surgical department (Bendtsen et al. 1991). A large proportion of nurses in the Danish study (n = 50, 57-80%) suppressed the desire to void during work hours. This behaviour was explained by "busyness at work" with a further eight nurses (5-21%) claiming bad toilet facilities (Bendtsen et al. 1991). This proportion of delayed voiding is comparable to our

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finding of 77.1% of nurses, with our additional finding that 22.4% could not access the toilet when required. Likewise, 67.3% of female nurse practitioners surveyed in the USA (N=113, mean age 43 years) delayed voiding when busy (Palmer and Newman 2015) and it was again the most common "unhealthy bladder habit" in Chinese female clinical nurses (N=636; mean age 31 years) (Wan et al. 2017). Finally, female Turkish nurses were reported to have "poorer bladder habits" (although habits were not clearly defined) compared with secretaries, the authors concluding that where job control is low, prolonged voiding intervals are likely (Kaya et al. 2016). Clearly, delayed voiding is a common international phenomenon for female nurses in many roles and settings.

Our study supports the association of delayed voiding for nurses and urinary symptoms (including storage LUTS) particularly occurring during work hours. Delaying voiding was associated with at least one type of LUTS (including void or post-micturition symptoms) in a study of 636 Chinese nurses (Wan et al. 2017), after accounting for demographic, work and health characteristics. The overall prevalence of storage LUTS in these Chinese nurses was 40.3%, compared with 68.6% in our somewhat older sample (mean age 42.3 versus 31 years), supporting a relationship of increased LUTS prevalence with age. Importantly, younger compared with older nurses in our study were more likely to delay voiding. This may reflect the clinical workload of younger nurses (Perry et al. 2017) with less perceived opportunities to access the toilet. Perhaps younger nurses have not developed skills in time management related to self-care, or lack the confidence to request support to leave duties to attend to personal needs (Pierce et al. 2019). Habitual suppression of the urge to void at work as these nurses' age probably supports increased risk of LUTS in nurses compared with related general populations; however, we propose this with caution as further investigation with longitudinal studies is required to substantiate links.

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Bladder practices and work productivity

Several studies have drawn attention to the relationship between work environments and LUTS, but the demonstration of an association between delaying voiding, limiting fluid intakes and work productivity is new. In a United States household survey of 3,364 employed women (Fultz et al. 2005), as the severity of urinary incontinence increased, the odds increased of more severe work-related impact on workers' ability to concentrate, perform physical activities or complete tasks without interruption. Our study adds to these findings by describing the relationship between bladder practices for nurses with urinary symptoms and their ability to do their job. Those delaying the urge to void were more likely to have impaired concentration and those limiting fluids were less likely to have good time management. Restricted access to toilets partially explains delaying voiding, however antecedents to nurses' workplace behaviours are complex and barriers to healthy behaviours require identification to counter any associated productivity loss

Socio-ecological models of health have been offered to address the multiple influences on an individual's health practices beyond personal choice for health issues such as tobacco control (Borland et al. 2010) and sedentary lifestyles (Green et al. 2006). Levels of influence on health behaviours for workers may include the local workplace environment (social work relationships and physical environmental factors) and system level or organisational factors such as workforce management, resources and policies (Sallis and Owen 2015). Identification of the various levels of influence on nurses' workplace bladder behaviours through analyses of focus group discussions of Australian nurses working in busy urban settings has provided insights for organisations to develop strategies that promote healthy workplace behaviours and bladder health (Pierce et al. 2019).

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Employers and managers are advised to pay attention to work-related access to amenities given nursing work roles are physically demanding, require effective time management and errors related to impaired concentration can have serious negative consequences for clinical care (Melnyk 2018). Education of nurses regarding personal health behaviours may prevent or improve symptoms (Fultz et al. 2005, Liao et al. 2009); however, there is also a need for the removal of workplace barriers to healthy practices. Occupation-specific factors for nurses include busy workloads and high patient-staff ratios or high patient acuity; role-specific factors include constant workplace attendance with regulated breaks or stand-in relief inadequate or lacking. Solutions to improving bladder health practices require strategies that support nurses taking their breaks and encouraging fluid intakes, with openness towards the sensitivities and potential embarrassment of nurses who are bothered by LUTS and encouragement of help-seeking where symptoms can be better managed or cured.

Environmental barriers to toilet access include number, location and cleanliness of amenities in the workplace (Pierce et al. 2019). Where amenities are inadequate, time to access other facilities needs to be provided. While employers are legally bound to comply with relevant regulations, the basis for the number of 'sufficient amenities' for female workers recommended by building codes is obscure and open to interpretation (Australian Building Codes Board 2016). There is a humanitarian appeal to further defining "sufficient" toilet access for female workers that enables autonomy over their bladder function (Nygaard and Linder 1997). If nurses have easy access to toilets, there is no need for purposeful limiting of fluid intakes. Overall, further investigation is required to ascertain the adequacy of amenities and provide optimal solutions for the removal of workplace barriers to bladder health.

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Limitations

The limitations of this study include the cross-sectional design, which precludes inferences of causality and findings may have been influenced by uncontrolled confounding. The analyses are not able to account for relationships between factors and it is possible there may be multiple influences at play. There may be self-section bias in our sample, as nurses with urinary symptoms may have been more likely to respond to the survey. The desired response rate was not achieved however, response rates for different modes of survey data collection vary: our sampling strategy meant that the number of nurses with final access to the survey was unknown and response rates may have been better than they appeared. The electronic survey response rate was in the expected range, similar to that achieved in other electronic surveys of nurses (Bogossian et al. 2012, Perry et al. 2016). Our findings are strengthened by the close similarity of the demographic profile of our sample to that of the Australian nursing and midwifery workforce, increasing the likelihood our sample was roughly representative (Australian Institute of Health and Welfare 2015), at least of nurses working in urban hospitals. The WLQ was modified to be urinary-specific and included scores with minimal impairment (>4%). Questions for LUTS were self-report and as such may reflect perceptions rather than diagnoses of conditions.

CONCLUSION

The ability to access amenities is an important issue for female nurses at work. Delaying voiding and limiting fluid intakes are common practices in this workforce, which may impair productivity, compromise clinical care, be associated with the experience of urinary symptoms and contribute to the development of serious health conditions. Importantly, these practices are modifiable and accompanying work impairments suggested by these findings may be preventable. This is an overlooked health issue but should be a priority for an aging workforce, to allay future costs for employers and healthcare systems.

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It appears the environment exerts a powerful influence on behaviours and that environmental modification may play a role in improving nurses' health. Further research is required using longitudinal design and larger sample size to confirm work-related risk factors and causality for LUTS in the nursing workforce. Evaluation of nurses' needs and workplace barriers to healthy practices are required to ascertain how toilet access can be improved, work impairments minimized and nurses' bladder health maximized. Bladder health promotion in the workplace will raise awareness and provide educational opportunities for nurses. Health promotion initiatives will require evaluation of the benefits to nurses' personal health, bladder health practices and flow-on effects for workforce productivity and cost savings. The ability to drink fluids and access toilets in the workplace is a hidden nursing workforce crisis and a question of dignity and human rights.

Conflict of interest statement

No conflict of interest was declared by the authors in relation to the study itself. Note that Robyn Gallagher is a JAN editor but, in line with usual practice, this paper was subjected to double blind peer review and was edited by another editor.

Accepted Article

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Accepted Article

REFERENCES

Australian Government (2011) *Work Health and Safety Act 2011. C2011A00137.* Retrieved from https://www.legislation.nsw.gov.au/#/view/act/2011/10

Australian Building Codes Board (2016) National Construction Code. Council of Australian Governments. Retrieved from http://www.abcb.gov.au/Resources/Publications/NCC/NCC-2016-Volume-One

Australian Institute of Health and Welfare (2015) Health workforce. Australian Institute of Health and Welfare. Retrieved from http://www.aihw.gov.au/workforce/

Avery, K., Donovan, J., Peters, T.J., Shaw, C., Gotoh, M. & Abrams, P. (2004) A brief and robust measure for evaluating the symptoms and impact of urinary incontinence. *Neurourology and Urodynamics,* **23**, 322-330.

Bendtsen, A.L. andersen, J.R. & Andersen, J.T. (1991) Infrequent voiders syndrome (nurses bladder). Prevalence among nurses and assistant nurses in a surgical ward. *Scandinavian Journal of Urology and Nephrology,* **25**(3), 201-4.

Benton, D. (2011) Dehydration influences mood and cognition: A plausible hypothesis? *Nutrients,* **3**(5), 555-573.

Bogossian, F.E., Hepworth, J., Leong, G.M., Flaws, D.F., Gibbons, K.S., Benefer, C.A. & Turner, C.T. (2012) A cross-sectional analysis of patterns of obesity in a cohort of working nurses and midwives in Australia, New Zealand and the United Kingdom. *International Journal of Nursing Studies,* **49**(6), 727-738.

This article is protected by copyright. All rights reserved.

Accepted Article

Borland, R., Young, D., Coghill, K. & Zhang, J.Y. (2010) The tobacco use management system: analyzing tobacco control from a systems perspective. *American Journal of Public Health,* **100**(7), 1229-36.

Brennan, E. (2017) Towards resilience and wellbeing in nurses. *British Journal of Nursing,* **26**(1), 43-47.

Brookes, S.T., Donovan, J.L., Wright, M., Jackson, S. & Abrams, P. (2004) A scored form of the Bristol Female Lower Urinary Tract Symptoms questionnaire: Data from a randomized controlled trial of surgery for women with stress incontinence. *American Journal of Obstetrics and Gynecology,* **191**(1), 73-82.

Brown, W., Bryson, L., Byles, J., Dobson, A., Manderson, L., Schofield, M. & Williams, G. (1996) Women's Health Australia: Establishment of the Australian Longitudinal Study on Women's Health. *Journal of Women's Health* **5**, 467-472.

Burgio, K.L., Newman, D.K., Rosenberg, M.T. & Sampselle, C. (2013) Impact of behaviour and lifestyle on bladder health. *International Journal of Clinical Practice,* **67**(6), 495-504.

Cardozo, L., Chapple, C.R., Dmochowski, R., Fitzgerald, M.P., Hanno, P., Michel, M.C., Staskin, D., Van Kerrebroeck, P., Wyndaele, J.J., Yamaguchi, O. & Yoshida, M. (2009) Urinary urgency - translating the evidence base into daily clinical practice. *International Journal of Clinical Practice,* **63**(12), 1675-82.

Cook, J.V., Dickinson, H.O. & Eccles, M.P. (2009) Response rates in postal surveys of healthcare professionals between 1996 and 2005: An observational study. *BMC Health Services Research,* **9**.

Coyne, K.S., Sexton, C.C., Kopp, Z.S., Ebel-Bitoun, C., Milsom, I. & Chapple, C. (2011) The impact of overactive bladder on mental health, work productivity and health-

This article is protected by copyright. All rights reserved.

Accepted Article

related quality of life in the UK and Sweden: results from EpiLUTS. *British Journal of Urology International,* **108**(9), 1459-1471.

Deloitte Access Economics (2011) The economic impact of incontinence in Australia. Barton, ACT. Retrieved from https://www2.deloitte.com/au/en/pages/economics/articles/economic-impact-incontinence-australia.html

Elstad, E.A., Maserejian, N.N., McKinlay, J.B. & Tennstedt, S. (2010) Fluid manipulation among individuals with LUTS: a mixed methods study. *Journal of Clinical Nursing,* **20**, 156 - 165.

Fultz, N., Girts, T., Kinchen, K., Nygaard, I., Pohl, G. & Sternfeld, B. (2005) Prevalence, management and impact of urinary incontinence in the workplace. *Occupational Medicine (Oxford),* **55**(7), 552-7.

Gillespie, J.I., Van Koeveringe, G.A., De Wachter, S.G. & De Vente, J. (2009) On the origins of the sensory output from the bladder: the concept of afferent noise. *BJU International,* **103**(10), 1324-1333.

Green, L.W., Orleans, C.T., Ottoson, J.M., Cameron, R., Pierce, J.P. & Bettinghaus, E.P. (2006) Inferring strategies for disseminating physical activity policies, programs and practices from the successes of tobacco control. *American Journal of Preventive Medicine,* **41 (Supp. 4)**, S66-S81.

Haylen, B.T., de Ridder, D., Freeman, R.M., Swift, S.E., Berghmans, B., Lee, J., Monga, A., Petri, E., Rizk, D.E., Sand, P.K. & Schaer, G.N. (2010) An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. *International Urogynecology Journal,* **21**(1), 5-26.

This article is protected by copyright. All rights reserved.

Holman, D. & Borgstrom, E. (2016) Applying social theory to understand health-related behaviours. *Medical Humanities,* **42**(2), 143-145.

Hung, K.J., Awtrey, C.S. & Tsai, A.C. (2014) Urinary incontinence, depression and economic outcomes in a cohort of women between the ages of 54 and 65 years. *Obstetrics and Gynecology,* **123**(4), 822-827.

Irwin, D.E., Kopp, Z.S., Agatep, B.E. & et al (2011) Worldwide prevalence estimates of lower urinary tract symptoms, overactive bladder, urinary incontinence and bladder outlet obstruction. *BJU International,* **108**, 1132-39.

Irwin, D.E., Milsom, I., Hunskaar, S., Reilly, K., Kopp, Z., Herschorn, S., Coyne, K., Kelleher, C., Hampel, C., Artibani, W. & Abrams, P. (2006) Population-based survey of urinary incontinence, overactive bladder and other lower urinary tract symptoms in five countries: Results of the EPIC Study. *European Urology,* **50**(6), 1306-1315.

Irwin, D.E., Milsom, I., Kopp, Z., Abrams, P. & Cardozo, L. (2005) Impact of overactive bladder symptoms on employment, social interactions and emotional well-being in six European countries. *BJU International,* **97**(1), 96-100.

Kaya, Y., Kaya, C., Baseskioglu, B., Ozerdoğan, N., Yenilmez, A. & Demirüstü, C. (2016) Effect of work-related factors on lower urinary tract symptoms in nurses and secretaries. *Lower Urinary Tract Symptoms,* **8**(1), 49-54.

Lerner, D., Amick, Benjamin C., Rogers, W.H., Malspeis, S., Bungay, K. & Cynn, D. (2001) The Work Limitations Questionnaire. *Medical Care,* **39**(1), 72-85.

Lerner, D., Rodgers, W.H. & Chang, H. (2009) Technical Report: Scoring the Long Form of the Work Limitations Questionnaire (WLQ-LF©). The Health Institute of Tufts - New England Medical Centre, Boston, MA.

This article is protected by copyright. All rights reserved.

Accepted Article

Accepted Article

Leung, L., Riutta, T., Kotecha, J. & Rosser, W. (2011) Chronic constipation: An evidence-based review. *Journal of the American Board of Family Medicine,* **24**(4), 436-451.

Liao, Y.M., Dougherty, M., Biemer, P., Boyington, A., Liao, C.T., Palmer, M.H. & Lynn, M.R. (2007) Prevalence of lower urinary tract symptoms among female elementary school teachers in Taipei. *International Urogynecology Journal,* **18**(10), 1151-1161.

Liao, Y.M., Dougherty, M.C., Boyington, A.R., Lynn, M.R. & Palmer, M.H. (2006) Developing and validating a Chinese instrument to measure lower urinary tract symptoms among employed women in Taiwan. *Nursing Outlook,* **54**(6), 353-361.

Liao, Y.M., Yang, C.Y., Kao, C.C., Dougherty, M.C., Lai, Y.H., Chang, Y.M., Chen, H.L. & Chang, L.I. (2009) Prevalence and impact on quality of life of lower urinary tract symptoms among a sample of employed women in Taipei: A questionnaire survey. *International Journal of Nursing Studies,* **46**(5), 633-644.

Linder, M. & Nygaard, I.E. (1998) *Void where prohibited: Rest breaks and the right to urinate on company time,* Cornell University Press, New York, USA.

Lukacz, E.S., Sampselle, C., Gray, M., Macdiarmid, S., Rosenberg, M., Ellsworth, P. & Palmer, M.H. (2011) A healthy bladder: a consensus statement. *International Journal of Clinical Practice,* **65**(10), 1026-1036.

Maserejian, N.N., Chen, S., Chiu, G.R., Wager, C.G., Kupelian, V., Araujo, A.B. & McKinlay, J.B. (2013) Incidence of lower urinary tract symptoms in a population-based study of men and women. *Feamle Urology,* **82**(3), 560-564.

Melnyk, B. (2018) A national study links nurses'physical and mental health to medical errors and percieved worksite wellness. *Journal of Occupational and Environmental Medicine,* **60**(2), 126.

This article is protected by copyright. All rights reserved.

Accepted Article

Milsom, I., Altman, D., Cartwright, R., Lapitan, M.C., Nelson, R., Sjostrom, S. & Tikkinen, K. (2017) Epidemiology of urinary incontinence (UI) and other lower urinary tract symptoms (LUTS), pelvic organ prolapse (POP) and anal incontinence (AI). In *Incontinence. 6th International Consultation on Incontinence, Tokyo, September 2016.*, Vol. 1 (Abams, P., Cardozo, L., Wagg, A. and Wein, A. eds.) ICUD, Arnhem, The Netherlands, pp. 5-141.

Nygaard, I. & Linder, M. (1997) Thirst at work - an occupational hazard? *International Urogynecology Journal,* **8**(6), 340-3.

Palmer, M.H. (2002) Primary prevention research on incontinence in older adults. *Western Journal of Nursing Research,* **24**(4), 390-405.

Palmer, M.H., Athanasopoulos, A., Lee, K.S., Takeda, M. & Wyndaele, J.J. (2012) Sociocultural and environmental influences on bladder health. *International Journal of Clinical Practice,* **66**(12), 1132-1138.

Palmer, M.H. & Newman, D.K. (2015) Women's toileting behaviours: an online survey of female advanced practice providers. *International Journal of Clinical Practice,* **69**(4), 429-435.

Palmer, M.H., Willis-Gray, M.G., Zhou, F., Newman, D.K. & Wu, J.M. (2017) Self-reported toileting behaviors in employed women: Are they associated with lower urinary tract symptoms? *Neurourology and Urodynamics*, 1-9.

Perry, L., Gallagher, R., Duffield, C., Sibbritt, D., Bichel-Findlay, J. & Nicholls, R. (2016) Does nurses' health affect their intention to remain in their current position? *Journal of Nursing Management,* **24**(8), 1088-1097.

Perry, L., Xu, X., Duffield, C., Gallagher, R., Nicholls, R. & Sibbritt, D. (2017) Health, workforce characteristics, quality of life and intention to leave: The 'Fit for the Future'

This article is protected by copyright. All rights reserved.

survey of Australian nurses and midwives. *Journal of Advanced Nursing,* **73**(11), 2745-2756.

Pierce, H., Perry, L., Chiarelli, P. & Gallagher, R. (2016) A systematic review of the prevalence and impact of symptoms of pelvic floor dysfunction in identified workforce groups. *Journal of Advanced Nursing,* **72**(8), 1718-1734.

Pierce, H., Perry, L., Gallagher, R. & Chiarelli, P. (2017) Urinary incontinence, work and intention to leave current job: A cross sectional survey of the Australian nursing and midwifery workforce. *Neurourology and Urodynamics,* **36**(7), 1876-1883.

Pierce, H., Perry, L., Gallagher, R. & Chiarelli, P. (2018) Severity of urinary incontinence and its impact on work productivity among nurses and midwives in urban Australia. *Australian and New Zealand Continence Journal,* **24**(1), 7-15.

Pierce, H., Perry, L., Gallagher, R. & Chiarelli, P. (2019) Culture, teams and organisations: A qualitative exploration of nurses' and midwives' urinary symptoms at work. *Journal of Advanced Nursing*.

Price, N., Jackson, S., Avery, K., Brookes, S. & Abrams, P. (2006) Development and psychometric evaluation of the ICIQ Vaginal Symptoms Questionnaire: the ICIQ-VS. *BJOG: An International Journal of Obstetrics & Gynaecology*, **113**(6), 700-12.

Sallis, J.F. & Owen, N. (2015) Ecological models of health behaviour. In *Health behaviour. Theory, research and practice.*(Glanz, K., Rimer, B. K. and Viswanath, K. eds.) Jossey-Bass, San Fransisco, pp. 43-64.

Segal, S., Saks, E.K. & Arya, L.A. (2011) Self-Assessment of fluid intake behavior in women with urinary incontinence. *Journal of Women's Health,* **20**(12), 1917-1921.

This article is protected by copyright. All rights reserved.

Accepted Article

Sexton, C.C., Coyne, K.S., Vats, V., Kopp, Z.S., Irwin, D.E. & Wagner, T.H. (2009) Impact of overactive bladder on work productivity in the United States: Results from EpiLUTS. *American Journal of Managed Care*, **15**, S98-S107.

Smith, M.D., Russell, A. & Hodges, P.W. (2014) The relationship between incontinence, breathing disorders, gastrointestinal symptoms and back pain in women: a longitudinal cohort study. *The Clinical Journal of Pain*, **30**(2), 162-167.

Sorokin, I., Mamoulakis, C., Miyazawa, K., Rodgers, A., Talati, J. & Lotan, Y. (2017) Epidemiology of stone disease across the world. *World Journal of Urology*, **35**(9), 1301-1320.

Tang, K., Beaton, D.E., Boonen, A., Gignac, M.A.M. & Bombardier, C. (2011) Measures of work disability and productivity: Rheumatoid Arthritis Specific Work Productivity Survey (WPS-RA), Workplace Activity Limitations Scale (WALS), Work Instability Scale for Rheumatoid Arthritis (RA-WIS), Work Limitations Questionnaire (WLQ) and Work Productivity and Activity Impairment Questionnaire (WPAI). *Arthritis Care Research*, **63**(S11), S337-S349.

Thornton, S.N. (2010) Thirst and hydration: physiology and consequences of dysfunction. *Physiology and Behavior*, **100**(1), 15-21.

Wan, X., Wu, C., Xu, D., Huang, L. & Wang, K. (2017) Toileting behaviours and lower urinary tract symptoms among female nurses: A cross-sectional questionnaire survey. *International Journal of Nursing Studies*, **65**, 1-7.

Wendsche, J., Ghadiri, A., Bengsch, A. & Wegge, J. (2017) Antecedents and outcomes of nurses' rest break organization: A scoping review. *International Journal of Nursing Studies*, **75**, 65-80.

This article is protected by copyright. All rights reserved.

Accepted Article

Worksafe Victoria (2008) Workplace amenities and work environment - Compliance code. Victorian Workcover Authority, Online, pp. 1-48.

United Nations General Assembly 64/292 (2010) The human right to water and sanitation. In *Resolution adopted by the United Nations General Assembly 28th July 2010.*United Nations Department of Economic and Social Affairs. Retrieved from http://www.un.org/es/comun/docs/?symbol=A/RES/64/292&lang=E

World Health Organisation (2018) Health Workforce: Nursing and Midwifery Personnel. In *Global Health Observatory data*, Vol. 2018.

Worksafe Victoria. 2008. *Workplace amenities and work environment - Compliance code*. Retrieved from http://www.worksafe.vic.gov.au/pages/forms-and-publications/forms-and-publications/workplace-amenities-and-work-environment-compliance-code

Zhang, C., Hai, T., Yu, L., Liu, S., Li, Q., Zhang, X., Xu, T. & Wang, X. (2013) Association between occupational stress and risk of overactive bladder and other lower urinary tract symptoms: A cross-sectional study of female nurses in China. *Neurourology and Urodynamics*, **32**(3), 254–260.

Zhou, J., Kelsey, K.T., Giovannucci, E. & Michaud, D.S. (2014) Fluid intake and risk of bladder cancer in the Nurses' Health Studies. *International Journal of Cancer*, **135**(5), 1229 - 1237.

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Table 1: Comparison of the health characteristics of female nurses and midwives who do and do not have restricted access to toilets, delay voiding or limit their fluid intakes at work.

Characteristic	Total		Restricted access to toilet					Delaying voiding					Limiting fluid intake				
			No		Yes		*p**	No		Yes		*p* *	No		Yes		*p* *
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**		**Mean**	**SD**	**Mean**	**SD**		**Mean**	**SD**	**Mean**	**SD**	
Age yrs. (n=333)	42.3	(12.6)	42.7	(12.8)	40.9	(12.1)	0.272	45.3	(13.0)	41.4	(12.4)	0.021	42.8	(12.8)	40.9	(12.0)	0.219
BMI kg/m^2 (n=320)	25.5	(5.1)	25.3	(4.7)	26.3	(6.2)	0.158	24.6	(4.4)	25.8	(5.2)	0.071	25.2	(4.9)	26.6	(5.4)	0.034
			No		Yes		*p* †	No		Yes		*p* †	No		Yes		*p* †
N (%)	**353**	**(100)**	**274**	**(77.6)**	**79**	**(22.4)**		**81**	**(23.0)**	**272**	**(77.1)**		**258**	**(73.1)**	**95**	**(26.9)**	
Health																	
Parity ≥ 1 birth	159	(45.0)	124	(45.3)	35	(43.3)	0.881	36	(44.4)	122	(45.2)	0.902	116	(45.0)	43	(45.3)	0.891
Pelvic surgery	99	(28.0)	75	(27.4)	24	(30.4)	0.600	19	(23.5)	80	(29.4)	0.295	72	(27.9)	27	(28.4)	0.924
Diabetes	14	(4.0)	11	(4.0)	3	(3.8)	0.931	2	(2.5)	12	(4.4)	0.432	6	(2.3)	8	(8.4)	0.009
Back pain	217	(61.5)	159	(58.0)	57	(73.4)	0.013	42	(51.9)	174	(64.3)	0.043	158	(61.2)	59	(62.1)	0.882
Anxiety	93	(26.3)	60	(21.9)	33	(41.8)	<0.001	17	(21.0)	76	(27.9)	0.212	63	(24.4)	30	(31.6)	0.176
Depression	66	(18.7)	45	(16.4)	21	(26.6)	0.041	11	(13.6)	55	(20.2)	0.178	43	(16.7)	23	(24.2)	0.107
Menopause	109	(30.9)	90	(32.8)	19	(24.1)	0.136	34	(42.0)	75	(27.6)	0.014	82	(31.8)	27	(28.4)	0.544
HRT	31	(8.8)	25	(9.1)	6	(7.6)	0.672	10	(12.3)	21	(7.7)	0.197	20	(7.8)	11	(11.6)	0.260
Urinary symptoms at work	165	(46.7)	119	(43.4)	46	(58.2)	0.020	20	(24.7)	145	(53.3)	<0.001	115	(44.6)	50	(52.6)	0.178
Storage LUTS at any time‡	249	(68.6)	185	(67.5)	58	(73.4)	0.319	55	(67.9)	188	(69.1)	0.836	175	(67.8)	68	(71.6)	0.500
Urinary frequency	89	(25.2)	17	(6.2)	9	(11.4)	0.120	8	(9.9)	18	(6.6)	0.324	16	(6.2)	10	(10.5)	0.168

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Urinary urgency	99	(28.0)	74	(27.0)	25	(31.6)	0.419	17	(21.0)	82	(30.1)	0.107	63	(24.4)	36	(37.9)	0.012
Nocturia	79	(22.4)	42	(15.3)	14	(17.7)	0.608	12	(14.8)	44	(16.2)	0.768	34	(13.2)	22	(23.2)	0.023
Incontinence	172	(48.7)	133	(48.5)	39	(48.7)	0.897	33	(40.7)	139	(51.1)	0.101	127	(49.2)	45	(47.4)	0.757
Other PF symptoms																	
Constipation	89	(25.2)	64	(23.4)	25	(31.6)	0.135	18	(22.2)	71	(26.1)	0.480	58	(22.5)	31	(32.6)	0.051
Prolapse	58	(16.4)	42	(15.3)	16	(20.3)	0.298	10	(12.3)	48	(17.7)	0.258	40	(15.6)	18	(18.9)	0.439
UTI	31	(8.8)	23	(8.4)	8	(10.1)	0.632	5	(6.2)	26	(9.6)	0.345	19	(7.4)	12	(12.6)	0.121

BMI, Body Mass Index; HRT, Hormone Replacement Therapy; LUTS, Lower Urinary Tract Symptom; PF, Pelvic Floor; UTI, Urinary tract infection; SD, Standard Deviation; * Independent t-test; † Chi Square, ‡ Storage LUTS at any time includes one or more of listed symptoms: urinary frequency, urgency, nocturia or incontinence.

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Table 2: Comparison of work impairment scores for nurses with urinary symptoms at work who do and do not have restricted access to toilets, delay voiding or limit their fluid intake at work.

Bladder practices at work		**Restricted access to the toilet**			**Delaying voiding**			**Limiting fluid intake**		
		No	Yes	*p* value*(t)	No	Yes	*p* value (t)	No	Yes	*p* value (t)
US-WLQ [a]:	**n=140 (%) [b]**	**17 (12.4)**	**123 (87.6)**		**99 (70.1)**	**41 (29.9)**		**97 (69.3)**	**43 (29.7)**	
Time management	Mean (SD)	3.24 (7.06)	8.34 (13.21)	0.150 (-1.5)	7.30 (11.27)	8.72 (18.32)	0.578 (-0.6)	6.24 (11.82)	11.06 (16.77)	0.054 (-1.9)
Mental concentration	Mean (SD)	4.41 (14.24)	15.85 (20.81)	0.005 (-2.4)	11.87(19.01)	20.73 (22.3)	0.018 (-2.4)	12.89 (19.13)	18.02 (22.70)	0.169 (-1.4)
Physical demands	Mean (SD)	1.72 (4.43)	6.12 (11.10)	0.004 (-2.3)	4.97 (8.67)	7.07 (14.26)	0.382 (-0.9)	3.76 (8.09)	9.69 (14.05)	0.013 (-2.5)

US-WLQ, Urinary Specific version of the Work Limitations Questionnaire; *Independent t-test

a) US-WLQ score is % of work impairment for the domain demands during the previous 2 weeks of the reporting period.

b) Note: Sample size n=140. Proportions different to text values as 18 scores not calculated due to missing data: n=16 “does not apply to my job”, n=2 not enough responses in item for score calculation.

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Table 3: Delaying voiding or limiting fluid intake as predictors of work impairment for nurses with urinary symptoms at work.

US-WLQ	Predictor	OR	95% CI	*p* value
Mental concentration	Delaying voiding	8.38	1.03 - 68.45	0.047 [a]
Time management	Limiting fluid intake	3.87	1.63 - 9.15	0.002 [b]

CI: Confidence interval; LUTS: Lower Urinary Tract Symptoms; OR: Odds ratio; US-WLQ: Urinary specific version of the WLQ

Statistical model: Linear logistic regression

a) Model statistics x^2 =16.37, df=7, n=131, p=0.022; Covariates: age, BMI, back pain, other PF dysfunction, delayed voiding, restricted access to toilet, and limited fluids at work. Nagelkerke R square = 0.158 (the model explains 15.8% of the variance).

Diabetes not included in models due to small numbers of data (n=11).

b) Model statistics x^2 =19.73, df=8, n=131, p=0.011; Covariates: age, BMI, back pain, storage LUTS (any time), other pelvic floor dysfunction, delayed voiding, restricted access to toilet, limited fluids at work. Nagelkerke R square = 0.187 (the model explains 18.7% of the variance).

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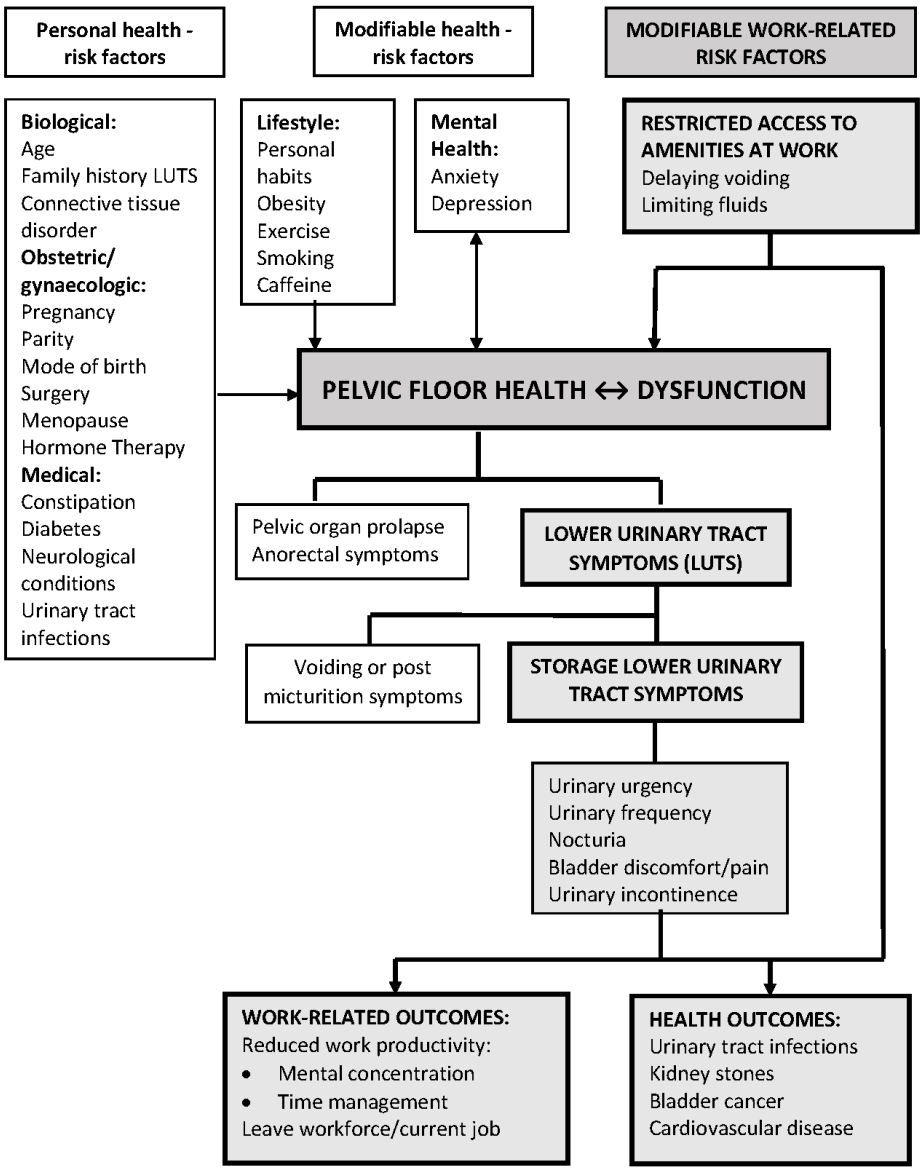

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