



## Impaired Sleep Quality is Associated With More Significant Lower Urinary Tract Symptoms in Male Shift Workers

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<b>OBJECTIVE</b>	To determine the association between sleep quality and severity of lower urinary tract symptoms (LUTS) in men working nonstandard shifts, a population at risk of poor sleep quality.
<b>METHODS</b>	Men who presented to a single andrology clinic between July and October 2014 and worked nonstandard shifts completed the International Prostate Symptom Score (IPSS) and responded to questions regarding their work habits, sleep quality, and physical or cognitive function. We assessed the relationship between age, sleep quality, physical or cognitive function, and severity of LUTS.
<b>RESULTS</b>	A total of 228 men with a mean $\pm$ standard deviation age of $41.8 \pm 5.7$ (range 21-76) years reported working nonstandard shifts, with the majority working these shifts for more than 1 year (81%). Men with difficulties falling asleep reported more severe LUTS than men who did not have difficulty falling asleep (IPSS score 9 vs 6, $P < .001$ ). Men who reported difficulty staying asleep or falling back asleep after awakening also reported more severe LUTS (IPSS scores 6 vs 13, $P = .004$ ; 5 vs 13, $P < .001$ , respectively). Men with a decreased sense of well-being or decreased physical or cognitive function also reported more severe LUTS (IPSS score 6 vs 9, $P < .0010$ ; 6 vs 10, $P = .016$ , respectively). All findings were independent of subject age.
<b>CONCLUSION</b>	Men working nonstandard shifts who have difficulty falling asleep, staying asleep, and falling back asleep report more severe LUTS than men without similar sleep difficulties. Men with a decreased sense of well-being or decreased physical or cognitive function also report worse LUTS. These findings implicate sleep quality as a possible risk factor for LUTS symptom severity. UROLOGY 99: 197–202, 2017. © 2016 Elsevier Inc.

Lower urinary tract symptoms (LUTS) are one of the most common and problematic medical conditions in older men. LUTS may be present in up to 97% of men older than 65 years old and are associated with worse health quality.<sup>1</sup> Sequelae of LUTS include nocturia and consequent sleep disturbances, and more severe LUTS increases the risk of impaired sleep quality.<sup>2</sup> Conversely, improvement in LUTS results in improved sleep.<sup>3</sup> Im-

paired sleep quality may contribute to numerous other conditions including hypertension, diabetes mellitus, arteriosclerosis,<sup>4</sup> and cardiovascular events.<sup>5</sup> However, the relationship between sleep quality and LUTS remains unclear.

Sleep quality can be affected by abnormal sleep schedules, and shift workers often cannot maintain a normal sleep pattern as a result of their work schedule. Shift workers comprise 15%-25% of the workforce and often develop impaired sleep quality, with 10%-32% developing shift work disorder (SWD).<sup>6</sup> SWD is a circadian rhythm disorder characterized by insomnia and sleepiness in people whose working hours overlap those of a normal sleep period, typically at night. Patients with SWD are more likely to have decreased daytime alertness and impaired cognitive function,<sup>7</sup> higher body mass indices, cholesterol levels, triglycerides, and rates of hypertension than non-shift workers.<sup>7,8</sup> The prevalence of depression is also greater in

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night shift workers than in daytime workers. The mechanisms underlying development of SWD sequelae are unclear, although obesity,<sup>9</sup> inflammation,<sup>10</sup> autonomic dysregulation,<sup>11</sup> and metabolic dysregulation<sup>12</sup> can all result from sleep impairment; dysregulated neurotransmission may also result from SWD.<sup>13,14</sup> Because LUTS can arise from these same factors,<sup>12,15</sup> impaired sleep quality may not only be a consequence of, but also an exacerbating factor for LUTS.

Whether impaired sleep quality predisposes to LUTS or vice versa (bidirectional causality) has not been extensively studied. However, evidence suggests that poor sleep quality increases the risk of developing LUTS within 5 years of diagnosis.<sup>15</sup> Here, we identify a relationship between the level of sleep quality and the severity of LUTS in male nonstandard shift workers.

## METHODS

All men presenting to a single academic men's health clinic between July and October 2014 were asked to complete an electronic survey about their work schedules, specifically regarding whether they worked nonstandard shifts. Survey respondents were not selected for presenting symptoms, age, or race. As defined in the literature, men who work nonstandard shifts begin work before 7 AM or after 2 PM, regularly rotate between standard and nonstandard formats, or regularly work hours outside of a standard 7 AM-6 PM workday.<sup>16</sup> Men who work nonstandard shifts were asked how long they have been working these shifts, and were asked to complete the validated International Prostate Symptom Score (IPSS) questionnaire,<sup>17</sup> as well as nonvalidated questionnaires to inform quality of life and cognitive function (Supplementary Data, Figure S1).

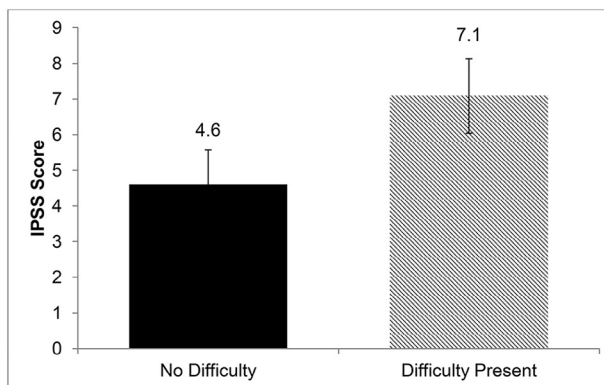
Responses were collected electronically, and only responses with complete questionnaire data were included for analysis. We associated sleep quality (falling asleep, staying asleep, and getting back to sleep), quality of life, and cognitive or physical function with IPSS data. Because age is an important risk factor for LUTS,<sup>18</sup> we compared subject ages across all response groups to determine whether the relationship between sleep, quality of life, and LUTS was independent of age. We compared means using Student *t* test, multivariate analysis of variance, and linear regression, where appropriate. SPSS Statistics 22 (IBM Corporation, Somers, NY) was used for all statistical analyses, with *P* < .05 considered statistically significant.

## RESULTS

We hypothesized that sleep quality would impact LUTS severity, as it has been shown to exacerbate numerous other conditions. We asked men who work nonstandard shifts to report their quality of sleep and LUTS severity using the IPSS. A total of 228 men reported working nonstandard shifts and were included in the study, with a mean ± standard deviation age of 41.8 ± 5.7 (range 21-76) years (Table 1). Men reported working an average of

**Table 1.** Cohort demographics

Variable	Value
Age (mean ± SD) (y)	41.8 ± 5.7
Number of days per week working nonstandard shifts (mean ± SD)	3.8 ± 1.9
Duration of nonstandard shift work (N[%])	
<1 month	16 (7%)
1-6 months	17 (7%)
7-12 months	9 (4%)
1-5 years	60 (26%)
>5 years	126 (55%)
IPSS score (mean ± SD)	6.0 ± 5.6
IPSS quality of life score (mean ± SD)	1.4 ± 1.4



**Figure 1.** Relationship between difficulty falling asleep and severity of lower urinary tract symptom (*P* < .001).

3.8 ± 1.9 nonstandard shifts per week, and 81% of men (*n* = 186) reported working nonstandard shifts for more than 1 year. The average IPSS score for nonstandard shift workers was 6.0 ± 5.6, with an average quality of life score of 1.4 ± 1.4.

To identify poor sleep as a potential risk factor for LUTS severity, we used sleep quality as the independent variable. Men who reported difficulty falling asleep had more severe LUTS than men without difficulty falling asleep (IPSS score 7.1 vs 4.6, *P* < .001) (Fig. 1). Because of the independent associations between age, sleep quality, and LUTS, we confirmed that the relationship between impaired sleep quality and LUTS severity was independent of subject age. Importantly, there was no difference in mean age between men who did not report difficulty falling asleep and men with such difficulties (43.1 vs 41.7 years old, *P* = .08). A direct relationship was observed between LUTS severity and difficulty staying asleep or falling back asleep (*P* < .001) (Fig. 2). Similarly, these findings were independent of subject age across all levels of sleep difficulties (*P* > .05).

Because physical and psychological well-being increases the risk of other conditions, and because LUTS have been associated with decreased emotional and physical well-being, we examined the relationship between self-reported sense of well-being or physical or cognitive function and

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