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The Effect of Nocturia on Sleep Quality in Patients with Benign Prostatic Obstruction and Their Female Partners

Noktürinin Benign Prostat Obstrüksiyonu Olan Hastalarda ve Partnerlerinde Uyku Kalitesine Etkisi

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Abstract

Objective: Previous studies showed that nocturia has a negative effect on patients' sleep quality. However, studies that focused on the sleep quality of patients' partners are limited. In this study, we evaluated the impact of nocturia on sleep quality in patients with benign prostatic obstruction (BPO) and their female partners.

Materials and Methods: We included 50 BPO patients with nocturia (group 1), 50 patients without nocturia (group 2) and their female partners. Lower urinary tract symptoms of the patients were evaluated by international prostate symptom score, serum prostate-specific antigen, uroflowmetry and urinary ultrasonography. The sleep quality of the patients and their partners were assessed by Pittsburgh sleep quality index (PSQI). The demographic and evaluation outcomes of the participants were recorded.

Results: The mean age of the patients and their partners were 63±7.9 and 57.4±8.5 years, respectively, with no statistical significance. The patients and their partners in group 1 had significantly higher global PSQI compared with those in group 2. The percentage of poor sleep in patients and partners in group 1 was higher than that in group 2.

Conclusion: Nocturia negatively affects the sleep quality of patients with BPO and their partners.

Keywords: Benign prostatic obstruction, nocturia, Pittsburgh sleep quality index, sleep quality

Öz

Amaç: Noktürinin hastaların uyku kalitesine olan negatif etkisi daha önce yapılan çalışmalarda gösterilmiştir. Ancak, hastaların partnerlerinin uyku kalitesinin değerlendirildiği çalışma sayısı sınırlıdır. Bu çalışmada, benign prostat obstrüksiyonu (BPO) olan hastalarda ve kadın partnerlerinde noktürinin uyku kalitesine olan etkisini incelemeyi amaçladık.

Gereç ve Yöntem: Noktürisi olan 50 BPO hastası (grup 1), noktürisi olmayan 50 hasta (grup 2) ve kadın partnerleri çalışmaya dahil edildi. Hastaların alt üriner sistem yakınmaları uluslararası prostat semptom skoru, serum prostat spesifik antijen, üroflovmetri ve üriner ultrasonografi ile değerlendirildi. Hastaların ve partnerlerinin uyku kalitesi Pittsburgh uyku kalite indeksi (PUKİ) ile değerlendirildi.

Bulgular: Hastalar ve partnerlerinin yaş ortalamaları sırasıyla; 63±7,9 ve 57,4±8,5 idi ve gruplar arasında istatistiksel olarak anlamlı farklılık izlenmedi. Grup 1'de bulunan hasta ve partnerleri grup 2'ye göre daha yüksek total PUKİ değerine sahipti. Grup 1'deki hasta ve partnerlerinin zayıf uyku kalite oranı grup 2'den daha yüksekti.

Sonuç: Noktüri, BPO olan hastalarda ve partnerlerinde uyku kalitesini negatif olarak etkilemektedir.

Anahtar Kelimeler: Benign prostat obstrüksiyonu, noktüri, Pittsburgh uyku kalite indeksi, uyku kalitesi

Introduction

Sleep is essential for restoration of the body and for maintaining energy (1). In recent years, awareness of various problems associated with sleep that are common among the population has been increased (2). Current evidences show that sleep quality affects health with disturbances in immune regulation (3), association with cardiovascular diseases and diabetes mellitus (4), daytime function (5), and quality of life (QoL) (6). Sleep disturbances can impact daytime functioning resulting in waking up tired in the morning, decreased work productivity, proneness to accidents, inability to concentrate and frequent daytime naps (7). Therefore, sleep disturbances

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are important to determine, since it is mostly modifiable risk factor. Determining the biological mechanisms underlying sleep disturbance may adverse bad health consequences and even prevent morbidity.

There are many reasons causing sleep disturbance including primary sleep disorders and physiologic, behavioral, and environmental factors requiring targeted diagnostic and treatment intervention (2). Nocturia is defined as "the number of times urine is passed during the main sleep period with each urination followed by sleep or the intention to sleep" by International Continence Society (8). Several medical conditions including benign prostatic obstruction (BPO), overactive bladder, diabetes mellitus, diabetes insipidus, and cardiovascular diseases may cause nocturia (9). Nocturia leads sleep fragmentation therefore, sleep quality of the patients is deteriorated. Several studies reported that nocturia negatively affected the sleep quality of the patients in both genders (10-12). Although there is no surprise that nocturia may also affect the sleep quality of the patients' bed sharing partners, sleep quality of the spouses has been understudied. The current study aimed to evaluate the effect of nocturia on sleep quality in patients with BPO and their partners.

Materials and Methods

This prospective cohort study was approved by an institutional review board (E1-21-1781) and conducted in accordance with the principles of the Declaration of Helsinki. Between May 2021 and December 2021, male patients with lower urinary tract symptoms (LUTS) due to newly diagnose of BPO and their female partners who shared a bed with patients and accompanied their partners at visit were included in this study. All participants (patients and their partners) gave written informed consent. Both patients and their partners were asked to complete questionnaires at the first visit with the assistance of the authors.

The patients and their partners with a history of medical or surgical treatment for LUTS and/or BPO, urological malignancy, or diagnosed with diabetes mellitus, diabetes insipidus, or congestive heart failure, primary sleep disorders, and those with active urinary tract infection were excluded. In addition, patients had no partners or did not share a bed with their partners were not included in the study.

Evaluation of LUTS

In the current study, we used International Prostate Symptom Score (IPSS) questionnaire to evaluate LUTS. IPSS contains seven questions evaluating storage and voiding symptoms (13). The patient chooses 1 of 6 answers that are assigned from 0 to 5 points indicating the severity of the symptom. The total IPSS score ranges from 0 to 35 (asymptomatic to very symptomatic). IPSS is an self-administered questionnaire which is recommended to evaluate the patients with LUTS by European Association of Urology (EAU) (14). Nocturia frequency of the patients was determined by the seventh question of IPSS. The patients were divided into two groups. Patients with nocturia (n=50) were enrolled as group 1 and patients without nocturia (n=50) as group 2.

In addition to IPSS questionnaire, the patients were evaluated by digital rectal examination, uroflowmetry, urinary ultrasound, and serum prostate specific antigen level according to EAU recommendations (14). The patients with IPSS>7, prostate volume >20 mL, and maximum flow rate (Q_{max}) <15 mL/sec were included.

Evaluation of Sleep Quality

We used Pittsburgh sleep quality index (PSQI) (15) to determine the sleep quality of the patients and their partners. PSQI consists of four open and 14 rating scale questions (0 to 3). These items evaluate seven ''component'' scores including component 1: Subjective sleep quality, component 2: Sleep latency, component 3: Sleep duration, component 4: Habitual sleep efficiency, component 5: Sleep disturbances, component 6: Use of sleeping medication, and component 7: Daytime dysfunction. The sum of the seven components' scores yields the global score. It is widely accepted that PSQI global score >5 indicates "poor quality sleep" (16). In clinical settings, PSQI is the most commonly used measurement tool of sleep quality which is strongly reliable and valid (16).

Both IPSS and PSQI that were applied to participants were validated Turkish versions of the questionnaires. The demographic, LUTS and sleep quality assessment outcomes of the participants were recorded.

Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) v. 25 for Windows (SPSS Inc. Chicago, IL, USA) was used to perform the statistical analyses. Kolmogorov-Smirnov test was performed to determine the distribution of patients. Mann-Whitney U and chi-squared tests were performed to compare the groups. Logistic regression analysis was performed to study the relationship between nocturia and sleep problems. The comparison of sleep quality according to nocturia frequency was performed using Kruskal-Wallis test. A value of $p<0.05$ was considered to be statistically significant.

Results

The mean age of the patients and their partners were 63±7.9 (46-75) and 57.4±8.5 (39-71) years, respectively. Patients were divided into two groups. Group 1 consisted of 50 patients who had nocturia and group 2 consisted of 50 patients without nocturia. The comparison of the groups in terms of clinical and LUTS parameters were shown in Table 1.

The assessment of sleep quality with PSQI showed that patients in group 1 and their partners had worse PSQI total scores compared with group 2 ($p<0.001$). The poor sleep quality rate of the patients and their partners in group 1 was significantly higher than group 2 [44 (88%) vs 19 (38%), $p<0.001$] and [39 (78%) vs 14 (28%), $p<0.001$], respectively. The assessment of sleep quality in patients was presented in Table 2 and in their partners in Table 3.

In patients, logistic regression analysis showed that subjective sleep quality [odds ratio (OR)=4.02, 95% confidence interval (CI)=1.74-9.28, p=0.001], sleep latency (OR=2.88, 95% CI=1.52-5.46, p=0.001), sleep duration (OR=9.43, 95%

CI=3.31-26.82, p<0.001), habitual sleep efficiency (OR=4.84, 95% CI=2.35-9.97, p<0.001), sleep disturbances (OR=7.92, 95% CI=3.41-18.43, p<0.001), and total score of PSQI (OR=1.94, 95% CI=1.52-2.49, p<0.001) significantly related with nocturia while use of sleeping medication (OR=1.74, 95% CI=0.71-4.23, p=0.225) and daytime dysfunction (OR=1.11, 95% CI=0.59-2.12, p=0.743) were not. In the partners of the patients, logistic regression analysis revealed that subjective sleep quality (OR=3.06, 95% CI=1.48-6.31, p=0.002), sleep latency (OR=4.01, 95% CI=1.78-9.04, p=0.001), sleep disturbances (OR=2.66, 95% CI=1.34-5.28, p=0.005), and total score of PSQI (OR=1.64, 95% CI=1.27-2.13, p<0.001) had a significant relationship with nocturia. However, sleep duration (OR=1.57, 95% CI=0.61-4.02, p=0.350), habitual sleep efficiency (OR=1.05, 95% CI=0.57-1.94, p=0.876), use of sleeping medication (OR=1.61, 95% CI=0.58-4.45, p=0.361), and daytime dysfunction (OR=1.87, 95% CI=0.85-4.10, p=0.119) had no significant relationship with nocturia.

In group 1, total score of PSQI in patients and their partners according to the number of nocturia were differed insignificantly (Table 4).

Discussion

In the current prospective study, we aimed to assess the effect of nocturia on sleep quality of patients with BPO and their partners. For the assessment we compared the BPO patients with and without nocturia and their spouses using validated

Table 1. Patients' LUTS and clinical parameters

Variables	Nocturia group (n=50)	Non-nocturia group (n=50)	p
Age (years)	63.5±7.8	62.6±8.1	0.528
Partner age (years)	57.2±8.8	57.2±8.3	0.684
IPSS (pts)	24.1±4.6	16.4±4.1	**<0.001**
Prostate volume (mL)	54.6±19.1	44.4±19.1	**0.003**
Serum PSA (ng/mL)	2.3±1.6	2.3±2.7	**0.038**
Q_{max} (mL/sec)	8.9±2.7	10.5±2.6	**0.002**
PVR volume (mL)	42.5±19.8	34.9±17.2	0.057

IPSS: International prostate symptom score, PSA: Prostate specific antigen, Q_{max}: Maximum flow rate, PVR: Postvoid residual, data are presented as mean ± standard deviation, p-values were determined using the Mann-Whitney U test, bold font indicates statistical significance

Table 2. Evaluation of sleep quality of the patients with PSQI

Components	Nocturia group (n=50)	Non-nocturia group (n=50)	p
Subjective sleep quality	1.5±0.6 (1-3)	1.2±0.5 (0-2)	**0.001**
Sleep latency	1.8±0.8 (0-3)	1.3±0.5 (1-3)	**0.001**
Sleep duration	1.2±0.5 (0-2)	0.6±0.6 (0-2)	**<0.001**
Habitual sleep efficiency	1.7±0.7 (0-3)	1±0.6 (0-2)	**<0.001**
Sleep disturbances	2.1±0.6 (1-3)	1.3±0.6 (1-3)	**<0.001**
Use of sleeping medication	0.3±0.6 (0-3)	0.2±0.4 (0-1)	0.301
Daytime dysfunction	0.8±0.7 (0-2)	0.7±0.6 (0-2)	0.839
Total score	9.4±2.2 (5-13)	6.2±1.8 (4-12)	**<0.001**

PSQI: Pittsburgh sleep quality index, data are presented as mean ± standard deviation (minimum-maximum), p-values were determined using the Mann-Whitney U test, bold font indicates statistical significance

Table 3. Evaluation of sleep quality of the partners with PSQI

Components	Nocturia group (n=50)	Non-nocturia group (n=50)	p
Subjective sleep quality	1.1±0.5 (0-2)	0.7±0.7 (0-2)	**0.001**
Sleep latency	1.5±0.6 (0-3)	1±0.5 (0-2)	**<0.001**
Sleep duration	0.9±0.5 (0-2)	0.8±0.4 (0-1)	0.391
Habitual sleep efficiency	1±0.8 (0-3)	0.9±0.5 (0-2)	0.848
Sleep disturbances	1.6±0.7 (0-3)	1.2±0.6 (0-3)	**0.003**
Use of sleeping medication	0.2±0.4 (0-1)	0.1±0.5 (0-3)	0.075
Daytime dysfunction	0.5±0.5 (0-2)	0.3±0.5 (0-1)	0.137
Total score	6.7±2 (3-12)	5.2±1.5 (4-9)	**<0.001**

PSQI: Pittsburgh sleep quality index, data are presented as mean ± standard deviation (minimum-maximum), p-values were determined using the Mann-Whitney U test, bold font indicates statistical significance

Table 4. Evaluation of sleep quality according to number of nocturia in patients and partners						
Parameters	Nocturia number					p
	1 (n=5)	2 (n=12)	3 (n=18)	4 (n=9)	5 (n=6)	
Patients PSQI	8.2±2	9.1±1.8	9.5±2.4	10±2.3	9.8±2.9	0.434
Partners PSQI	6±0.7	6±1.7	7.1±2.5	7±1.6	7±2.5	0.634
PSQI: Pittsburgh sleep quality index, data are presented as mean ± standard deviation, p-values were determined using the Kruskal-Wallis test						

self-reported questionnaires namely IPSS to evaluate LUTS and PSQI to evaluate quality of sleep. The patients with nocturia and their partners had higher PSQI score and poor sleep quality incidence compared to those without nocturia.

Benign prostatic obstruction is a common condition, with severe LUTS due to BPO being reported at a rate of approximately 25% in men aged ≥50 years (17). Nocturia is one of the most common LUTS in patients with BPO. Night-time voiding symptoms are more bothersome than day-time LUTS and sleep problems are the underlying causes of bother (18). A cross sectional study included 1.200 elderly men showed that nocturia independently increased the risk of poor sleep quality and poor sleep was associated with poor physical component of QoL and the mental component of QoL (19). Hernández et al. (20) found that nocturia was related to worse sleep quality in BPO patients. Another study that compared BPO patients with nocturia and without nocturia showed that patients with nocturia had a higher global PSQI scores. However, this difference was not statistically significant in the components namely sleep latency, sleep duration, use of sleep medication, and daytime dysfunction. The authors of the study stated that severe sleep disorders were more common in patients with nocturia than patients without nocturia (21). Bal et al. (22) found that nocturia was associated with increased daytime sleepiness. However, the authors could not show significant effect of the timing and frequency of nocturia on sleep quality (22). In our study, our results are consistent with previous studies and patients with nocturia had higher total score of PSQI and higher incidence of poor sleep. However, according to our results nocturia did not significantly affect use of sleep medication, and daytime dysfunction.

Symptoms of lower urinary tract and BPO negatively affect the health status of both patients and their partners (17,23). Mitropoulos et al. (24) reported that 28% of the partners of the patients with BPO suffered from sleep disturbances. Sells et al. (25) evaluated the morbidity in the partners of patients with BPO with a questionnaire that developed by the authors. They found that 76% of the partners were woken up more than once a night and 42% felt tired because of sleep disturbances. Another study supported these results and found that sleep disturbance was the most inconvenient morbidity in the partners of BPO patients (26). In a study by Shvartzman et al. (27) it was reported that approximately half of the partners of the patients with BPO regularly awaken at night due to nocturia. In this study 13% of the partners stated that they slept inadequately. Marklund et al. (28) compared the partners of men with LUTS and without LUTS in terms of quality of life and sleep quality. They used the questionnaire developed by Sells et al. (25) and sleep quality with the basic nordic sleep questionnaire (BNSQ) and Uppsala sleep inventory (USI). The answers for the questions focusing on awakenings and tiredness were significantly different between. However, according to BNSQ and USI quality of sleep did not differ between the groups. In the current study, we did not focus on other LUTS and assessed only the effect of nocturia on sleep quality. According to our results partners of the men with nocturia had higher global score of PSQI, components of subjective sleep quality, sleep latency, sleep disturbances and higher percentage of poor sleep compared to the partners of the men without nocturia.

Conclusion

Our results suggested that partners of the BPO patients with nocturia had worse sleep quality compared with partners of the BPO patients without nocturia. We believe that in clinical practice it should be focused on sleep quality of not only the patients with nocturia but also their partners.

Ethics

Ethics Committee Approval: This prospective cohort study was approved by an institutional review board (E1-21-1781) and conducted in accordance with the principles of the Declaration of Helsinki. Between May 2021 and December 2021, male patients with lower urinary tract symptoms (LUTS) due to newly diagnose of BPO and their female partners who shared a bed with patients and accompanied their partners at visit were included in this study.

Informed Consent: All participants (patients and their partners) gave written informed consent.

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Authorship Contributions

Surgical and Medical Practices: Ç.Ş., A.A., İ.C.A., Concept: Ç.Ş., Design: Ç.Ş., Data Collection or Processing: Ç.Ş., A.A., İ.C.A., Analysis or Interpretation: Ç.Ş., M.Y.Ş., A.A., İ.C.A., H.F., Literature Search: Ç.Ş., M.Y.Ş., Writing: Ç.Ş., M.Y.Ş.

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References

1. Shapiro CM, Flanigan MJ. ABC of sleep disorders. Function of sleep. BMJ 1993;306:383-5.
2. Buysse DJ, Yu L, Moul DE, Germain A, Stover A, Dodds NE, Johnston KL, Shablesky-Cade MA, Pilkonis PA. Development and validation of patient-reported outcome measures for sleep disturbance and sleep-related impairments. Sleep 2010;33:781-92.

3. Savard J, Laroche L, Simard S, Ivers H, Morin CM. Chronic insomnia and immune functioning. Psychosom Med 2003;65:211-21.
4. Raj JP, Hansdak SG, Naik D, Mahendri NV, Thomas N. SLEep among diabetic patients and their GlycaEmic control (SLEDGE): A pilot observational study. J Diabetes 2019;11:122-8.
5. Fortier-Brochu E, Beaulieu-Bonneau S, Ivers H, Morin CM. Insomnia and daytime cognitive performance: a meta-analysis. Sleep Med Rev 2012;16:83-94.
6. Guallar-Castillón P, Bayán-Bravo A, León-Muñoz LM, Balboa-Castillo T, López-García E, Gutierrez-Fisac JL, Rodríguez-Artalejo F. The association of major patterns of physical activity, sedentary behavior and sleep with health-related quality of life: a cohort study. Prev Med 2014;67:248-54.
7. Bollu PC, Kaur H. Sleep Medicine: Insomnia and Sleep. Mo Med 2019;116:68-75.
8. Hashim H, Blanker MH, Drake MJ, Djurhuus JC, Meijlink J, Morris V, Petros P, Wen JG, Wein A. International Continence Society (ICS) report on the terminology for nocturia and nocturnal lower urinary tract function. Neurourol Urodyn 2019;38:499-508.
9. Weiss JP, Everaert K. Management of Nocturia and Nocturnal Polyuria. Urology 2019;133S:24-33.
10. Coyne KS, Zhou Z, Bhattacharyya SK, Thompson CL, Dhawan R, Versi E. The prevalence of nocturia and its effect on health-related quality of life and sleep in a community sample in the USA. BJU Int 2003;92:948-54.
11. Obayashi K, Saeki K, Kurumatani N. Quantitative association between nocturnal voiding frequency and objective sleep quality in the general elderly population: the HEIJO-KYO cohort. Sleep Med 2015;16:577-82.
12. Shao IH, Wu CC, Hsu HS, Chang SC, Wang HH, Chuang HC, Tam YY. The effect of nocturia on sleep quality and daytime function in patients with lower urinary tract symptoms: a cross-sectional study. Clin Interv Aging 2016;11:879-85.
13. Barry MJ, Fowler FJ, Jr., O'Leary M P, Bruskewitz RC, Holtgrewe HL, Mebust WK, Cockett AT; Measurement Committee of the American Urological Association. The American Urological Association Symptom Index for Benign Prostatic Hyperplasia. J Urol 2017;197:S189-S97.
14. Gravas S, Cornu JN, Gacci M, Gratzke C, Herrmann TRW, Mamoulakis C, Rieken M, Speakman MJ, Tikkinen KAO. European Association of Urology Guidelines on Management of Non-Neurogenic Male Lower Urinary Tract Symptoms (LUTS), incl. Benign Prostatic Obstruction (BPO). 2021 Available from: https://uroweb.org/guidelines/management-of-non-neurogenic-male-luts. (Accessed 26 December 2021)
15. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res 1989;28:193-213.
16. Mollayeva T, Thurairajah P, Burton K, Mollayeva S, Shapiro CM, Colantonio A. The Pittsburgh sleep quality index as a screening tool for sleep dysfunction in clinical and non-clinical samples: A systematic review and meta-analysis. Sleep Med Rev 2016;25:52-73.
17. Roehrborn CG, Marks L, Harkaway R. Enlarged prostate: a landmark national survey of its prevalence and impact on US men and their partners. Prostate Cancer Prostatic Dis 2006;9:30-4.
18. Everaert K, Anderson P, Wood R, Andersson FL, Holm-Larsen T. Nocturia is more bothersome than daytime LUTS: Results from an Observational, Real-life Practice Database including 8659 European and American LUTS patients. Int J Clin Pract 2018. doi: 10.1111/ijcp.13091
19. Abdel Rahman TT, El Gaafary MM. Nocturia among elderly men living in a rural area in Egypt, and its impact on sleep quality and health-related quality of life. Geriatr Gerontol Int 2014;14:613-9.
20. Hernández C, Estivill E, Cantalapiedra A. [Impact of nocturia on sleep quality in patients with lower urinary tract symptoms suggesting benign prostatic hyperplasia (LUTS/BPH). The NocSu Study]. Actas Urol Esp 2010;34:450-9.
21. Doo SW, Lee HJ, Ahn J, Kim JH, Yun JH, Yang WJ, Song YS. Strong impact of nocturia on sleep quality in patients with lower urinary tract symptoms. World J Mens Health 2012;30:123-30.
22. Bal K, Ayik S, Issi Y, Bolukbasi A, Akhan G. Sleep analysis of patients with nocturia and benign prostatic obstruction. Urology 2012;80:383-8.
23. Boyle P, Robertson C, Mazzetta C, Keech M, Hobbs R, Fourcade R, Kiemeney L, Lee C; UrEpik Study Group. The relationship between lower urinary tract symptoms and health status: the UREPIK study. BJU Int 2003;92:575-80.
24. Mitropoulos D, Anastasiou I, Giannopoulou C, Nikolopoulos P, Alamanis C, Zervas A, Dimopoulos C. Symptomatic benign prostate hyperplasia: impact on partners' quality of life. Eur Urol 2002;41:240-4.
25. Sells H, Donovan J, Ewings P, MacDonagh RP. The development and validation of a quality-of-life measure to assess partner morbidity in benign prostatic enlargement. BJU Int 2000;85:440-5.
26. Kim SC, Lee SY. Men's lower urinary tract symptoms are also mental and physical sufferings for their spouses. J Korean Med Sci 2009;24:320-5.
27. Shvartzman P, Borkan JM, Stoliar L, Peleg A, Nakar S, Nir G, Tabenkin H. Second-hand prostatism: effects of prostatic symptoms on spouses' quality of life, daily routines and family relationships. Fam Pract 2001;18:610-3.
28. Marklund H, Spångberg A, Edéll-Gustafsson U. Sleep and partner-specific quality of life in partners of men with lower urinary tract symptoms compared with partners of men from the general population. Scand J Urol 2015;49:321-8.