Productivity, vitality and utility in a group of healthy professionally active individuals with nocturia

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OBJECTIVES

To assess the effect of nocturia on productivity, vitality and utility in a selected group of professionally active individuals with nocturia, compared with matched controls, and investigate the effect of symptom severity, to test the hypothesis that lack of sleep caused by frequent sleep interruptions could reduce an individuals' daytime energy and activity levels.

SUBJECTS AND METHODS

Subjects (203) were recruited in Sweden through advertisements, and their suitability for the study assessed in a structured interview. Controls (80) matched for age and gender were randomly selected from a market research panel and given the same interview. Both groups completed a productivity questionnaire, a generic quality-of-life questionnaire with a specific domain for vitality and a utility instrument.

RESULTS

The study group with nocturia had a significantly lower level of vitality and utility, and greater impairment of work and activity, than the control group. Women were more affected than men. Symptom severity correlated with all three measures.

CONCLUSIONS

In an otherwise healthy and professionally active group of individuals, waking at night to void significantly diminishes their overall well-being, vitality and productivity, leading to a significant level of indirect and intangible costs.

KEYWORDS

nocturia, indirect costs, productivity, vitality, utility

INTRODUCTION

Nocturia has been defined by the International Continence Society as waking at night to void, with each of the voids preceded and followed by sleep. The term thus refers to micturition at night, but can also express the subjective impression of an excessive number of voids interrupting sleep. In clinical terms, the symptom can be the result of an excessive urine production during the night (nocturnal polyuria), limited bladder capacity, abnormal nocturnal detrusor activity or a combination of these [1]. Currently, there is no universally accepted definition of nocturia, as it is difficult to define 'abnormal' nocturnal urine production or 'excessive' nocturnal frequency and occurrence. Recently, a composite measure was described including the quantity of urine produced (mL/night or nocturnal volume as a percentage of daytime volume), the number of voids per period and the degree of bother the symptoms cause to an individual [1].

There have been several prevalence studies but the definitions of nocturia are inconsistent across them. Diokno *et al.* [2] estimated the prevalence in individuals aged >60 years based on three or more voids per night. Other studies have used a definition of voiding twice or more every night [3,4]. Malmsten *et al.* [5] and Sagnier *et al.* [6] used a less severe definition of one or more voids per night to investigate the prevalence by age.

Some of these studies also investigated to what extent people with some element of nocturia were bothered by the symptom. Saigner *et al.* [6] estimated that 26–48% (depending on what other urinary tract symptoms were present), perceived the symptom as truly bothersome. Jolleys *et al.* [7] estimated that two-thirds of patients with nocturia (two or more voids) were bothered, while Scarpa [8] reported that three-quarters of patients with symptoms of nocturia perceived it as a problem. However, none of the studies investigated the degree of bother, and how it might relate to the severity of symptoms.

The need to void one or more times at night implies that an individual has to wake several times during a night's sleep, reducing the amount of undisturbed sleep. However, there is limited information about self-reported quality of sleep or reduced daytime functioning. Asplund and Aberg [9] investigated the relationship between sleep and nocturnal micturition in a sample of 3000 women and found sleep deteriorated in association with increased night-time voiding. Women with three or more voids per night reported four times more often that they lacked sleep, had nightmares and suffered from daytime sleepiness.

We therefore hypothesized that nocturia and the associated sleep deprivation would have a detrimental effect on individuals' vitality and quality of life (QoL). Although nocturia increases with age, we expected the detrimental effects to be greatest in younger professionally active individuals, as it might affect their productivity at work or cause absence from work. Thus the objective of this study was to investigate the effect of nocturia on productivity, vitality and utility in a group of working individuals in Sweden.

SUBJECTS AND METHODS

One of the issues when identifying a study sample is that nocturia is not a well-known disease, and individuals with frequent night-time voiding will rarely consult a physician. Thus, using patient charts at outpatient departments or general practices would probably select patients with severe symptoms and potentially several comorbidities, or those who are severely

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distressed by the symptoms. However, to investigate the effect of nocturia only, and of symptom severity, a sample with limited comorbidity and representing all levels of symptom severity is required.

The survey was therefore advertised in regional newspapers and by radio, covering most of Sweden, and subjects with frequent night-time voiding were invited to contact the Department of Urology of the Lund University Hospital. Respondents were interviewed by a research nurse, following a structured questionnaire to assess their suitability for the study. While this process is similar to enrolment into a clinical study and ensures a sample with the desired characteristics, the sample will not be population-based but represent individuals who are aware of their symptoms.

The baseline questionnaire included data on age, gender, living situation, professional activity (type and number of hours), voiding and sleeping patterns, average liquid intake and evening food or drink habits. To participate in the study, individuals had to be >18 years of age, have definite symptoms of nocturia and have a professional activity. Individuals with night-time work, excessive fluid intake or severe comorbidity were excluded. Individuals who qualified were then mailed a set of three questionnaires covering QoL (with a focus on vitality), utility and productivity.

When 200 baseline questionnaires were completed, the sample demographics were analysed to define a group of 80 controls matched for gender, age and working time. Controls were randomly identified using the database of a market-research organization, contacted by telephone and interviewed using the same structured questionnaire as for the subjects, to ascertain that they did not have nocturia. The same exclusion criteria as for the nocturia group were applied to controls, and they were asked to complete the same set of mailed questionnaires.

QUESTIONNAIRES

To assess productivity a quantitative work productivity and activity impairment (WPAI) measure was used [10]. The instrument was developed in 1993 for use in clinical trials, tested for construct validity and reproducibility in 106 working individuals with diverse health problems (cardiovascular, musculoskeletal disorders, allergies and pain), and subsequently validated in several studies in different diseases [11–13]. The WPAI is a simple instrument with seven questions related to the time taken off work because of the specific health problem, other health problems or any other reason, hours worked at reduced productivity because of the specific health problem, and the effect of the problem on activities other than work. The instrument allows an estimate of the proportion of working time lost through a disease, the impairment while at work or while doing other things, and the overall work impairment as a combination of work absence and reduced productivity.

VITALITY AND UTILITY

It was expected that the largest effect of nocturia on the subjects' QoL would be caused by lack of sleep. There is no validated QoL instrument available to measure such an effect, as sleep questionnaires focus more on the quality and quantity of sleep rather than on the consequences of the lack of sleep. Therefore, two generic QoL instruments were used, the EQ-5D (EuroQol) [14–16] to measure overall QoL as one index (utility) and the Short Form-36 (SF-36) [17] to evaluate the effect of nocturia on different QoL domains, but particularly on vitality and energy.

In economic evaluation, QoL is measured as utility (individuals' or society's preference for certain health states). Utility is an overall index of QoL on a cardinal scale anchored between 0 (death) and 1 (full health). The EQ-5D is the most widely used instrument to assess utility in clinical studies or surveys. It is a simple self-administered instrument with questions addressing five domains of QoL. Scores from the questionnaire can then be related to a health-states system established with the general population to derive the respondents' utilities. The EQ-5D also incorporates a simple visual analogue scale in the format of a 'thermometer' where respondents indicate their current health state. The thermometer is anchored between 0 = worst health state and 100 = best health state, and cannot therefore be used to derive utilities; rather, it indicates the individuals' rating of their health.

The SF-36 is currently the most widely used generic QoL instrument, and values for the general population and for many different diseases have been published. This allows comparisons of the results to the normal population, or to other illnesses or symptoms. The SF-36 covers eight domains of QoL, with each domain scored between 1 and 100, where higher values indicate better QoL. In the absence of a validated instrument to measure the effect of the lack of sleep, we used the domain of 'vitality' as the main QoL measure in the present study. However, results for all eight domains are also compared between the nocturia and control groups, and with the published population scores of the SF-36 in Sweden, matched for age and gender.

ANALYSIS

All three instruments were analysed according to their scoring instructions. Descriptive statistics are presented for all variables, including an analysis of utility, work impairment, activity impairment and vitality by severity of symptoms. Multiple regression analysis was used to estimate the difference in utility, vitality and overall work impairment in the control group and between genders, as well as by the level of severity of symptoms.

RESULTS

Over 900 individuals contacted the Department of Urology within one week of the advertisement for the study. In all, 242 baseline interviews were conducted and 207 individuals with definite nocturia included in the study. Questionnaires were mailed to all of these and 203 questionnaires were returned. All questionnaires were complete and hence no individual had to be excluded from the study. Similarly, all questionnaires from the 80 controls who had agreed to participate in the study could be used.

DEMOGRAPHICS

Table 1 presents the demographics and baseline assessment of the two groups. The nocturia group included 48% men and 52% women, and the control group thus matched this distribution. In both groups women were slightly younger and had a slightly shorter average working time than men, as more women worked part-time. The mean age in the nocturia group was significantly higher than in the control group, and with a wider range (24–82 compared with 30–68 years). This difference stems from the enrolment method, where individuals in the nocturia group contacted the department of urology and were enrolled provided that they were working, while controls were randomly extracted from the market research database using the criteria 'working', i.e. an age range below retirement age. It was thus not possible

to identify controls aged 70–80 years to match the nocturia group. However, while the difference in the mean age between the two groups is significant, age was not significant in any of the regression analyses for productivity, vitality or utility. We therefore decided not to recruit further individuals into the study to better match the age distribution.

By definition, the population in this study was very healthy; 30% of those in the control and 27% in the nocturia group reported diseases unrelated to the urinary system, with only three in the nocturia group reporting more than one disease. Most individuals reporting other diseases had mild asthma, heart disease or diabetes. However, 44 individuals with nocturia also reported day-time stress incontinence. We decided not to exclude these from the study, as the analysis focused on night-time symptoms only.

TABLE 1 The demographics of the two groups of participants

Variable	Control	Nocturia	Difference*, *P*
Number	80	203	
Mean (SD) [range]:			
Age, years	47.0 (8.2) [30–68]	52.9 (9.8) [24–82]	< 0.05
Professional activity, %			
Working full time	84	83	
Working part time	16	17	
Working hours	38.9 (8.5) [6–80]	39.0 (8.8) [10–66]	
Co-morbidity			
Not urinary diseases, %	30	27	
Mean/subject	0.29 (0.46) [0–1]	0.29 (0.45) [0–1]	> 0.05
Stress incontinence, %	–	22	
Mean/subject (all diseases)	0.29 (0.46) [0–1]	0.51 (0.5) [0–1]	< 0.05
Nocturia, frequency			
Voids last night	0.05 (0.22 [0–1]	1.81 (0.94) [0–5]	< 0.05
Voids/night last week	0.09 (0.16) [0–1]	2.07 (0.99) [0–5]	< 0.05
Productivity, utility, vitality			
[N] mean (SD) {Pop}†:			
Overall work impairment, %	[71] 4.61 (13.05)	[187] 13.80 (13.77)	< 0.001
Men	[37] 3.84 (12.80)	[86] 14.25 (14.83)	
Women	[34] 5.45 (13.45)	[93] 13.24 (12.90)	
Work hours missed last week	[75] 1.80 (6.69)	[187] 0.61 (3.42)	< 0.001
Impairment while working, %	[75] 3.47 (8.62)	[203] 12.32 (13.08)	< 0.001
Activity impairment, %	[80] 5.24 (12.23)	[203] 18.12 (19.29)	< 0.001
Men	[40] 3.13 (8.82)	[90] 15.16 (17.55)	
Women	[40] 7.35 (14.70)	[105] 20.45 (20.65)	
Utility			
EQ-5D	[80] 0.90 (0.12) {0.92}	[203] 0.81 (0.17) {0.93}	< 0.001
EQ-5D VAS	[79] 85.89 (14.18) {85.9}	[201] 79.24 (15.45) {86.0}	< 0.001
Vitality domain SF-36	[80] 71.75 (19.68) {68.8}	[203] 57.59 (22.45) {68.3}	< 0.001

**Differences between the groups were estimated with regression analysis, controlled for age and gender. Age was not significant in any of the regressions, whereas gender was significant, with women having a higher impairment in all regressions. †Scores for the normal population were calculated by matching each study participant with the score for an individual of the same gender and age (5-year groups) from the values published for the general population. VAS, visual analogue scale.*

PRODUCTIVITY, UTILITY AND VITALITY

Most participants answered all questions in all three questionnaires and no individual was excluded because of excessive missing data. However, for the WPAI, some questions were not answered by all respondents. For instance, while the question relating to activity impairment was answered by all respondents, some answers were missing for work impairment. This could be interpreted as no work absence and no impairment, but also as a decision not to answer a particular question, or not understanding the question. As the same proportion of answers was missing in both groups, we used all valid answers for the analysis. On the EQ-5D, all individuals answered all questions and only three answers were missing for the visual analogue scale. Lastly, the SF-36 provides an algorithm to impute missing answers in most cases. The results from the three questionnaires are also shown in Table 1.

Overall work impairment was significantly greater for the nocturia group and a higher proportion of subjects in this group reported sick-leave for any reason (21% vs 12.5% in the control group). However, the average number of hours missed during the last week was higher in the control group, as seven individuals (9%) reported absences of 20–40 h. This compares with only 3.6% of individuals in the nocturia group reporting absences of >20 h. The overall impairment is thus driven by reduced productivity during work hours, as a consequence of nocturia (13% in the nocturia group vs 8.6% for controls). The largest difference between the groups was for activity impairment, which for the nocturia group was twice the level in controls.

The nocturia group had significantly lower utility (EQ-5D) and vitality scores (SF-36) than the control group, or than a matched sample from the general population. On the SF-36, the nocturia group had lower scores than the general population in most domains (six of eight). Contrary to this, scores for the control group were no different from normal values. Rather, controls had slightly higher values than the general population (seven of eight domains), which could be explained by this group probably being healthier than a sample from the general population, as individuals with severe diseases were excluded. Figure 1 shows the SF-36 scores for the two groups.

RESULTS BY SYMPTOM SEVERITY

The hypothesis was that work impairment would increase, and vitality and QoL decrease, as the severity of nocturia symptoms increased. Symptom severity was defined as the average number of voids per night over the past week, and regression analysis conducted with the number of voids as the independent variable and overall work impairment, utility and vitality as dependent variables, controlled for age and gender. As in the previous estimates, age was not significant in any of the regression analyses,

FIG. 1. Individuals with nocturia (green bars) had significantly lower scores (P < 0.001) than controls (red hatched bars) in all domains of the SF-36 (where higher values indicate better QoL). For the main measure of vitality, the nocturia group also had a significantly lower score than an age- and gender-matched sample from the general population (green circles and line; P < 0.001), while the control group showed no difference (red squares and line).

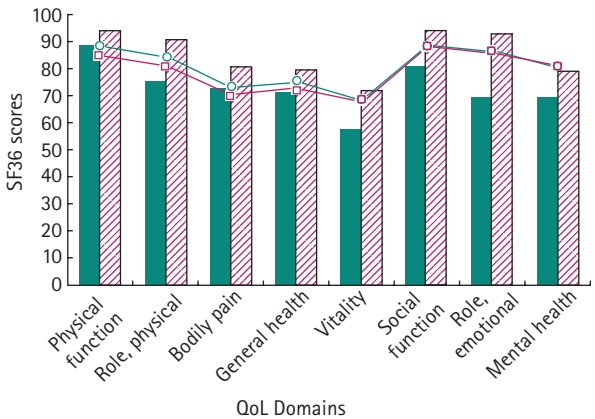
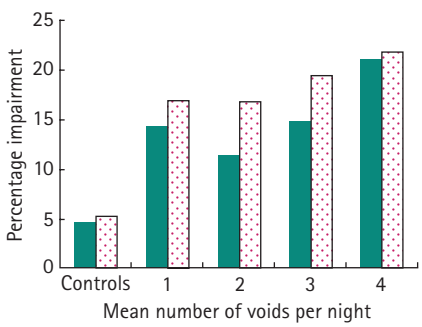


FIG. 2. The mean impairment for different levels of symptom severity, defined by the average number of voids per night during the past week. In multiple regression analysis, work impairment (green bars) was significantly correlated with the number of voids, with impairment increasing on average by 2% with each additional void. The effect on activity impairment (red stippled bars) was not significantly related to the number of voids.



while gender was again significant, i.e. women had more impairment. Overall work impairment increased significantly with increasing severity of symptoms ($P < 0.05$), while vitality decreased ($P < 0.01$). The effect of symptom severity on utility was significant at the 10% level and insignificant on activity impairment. Figure 2 shows the mean work and activity impairment for the two groups.

ECONOMIC CONSIDERATIONS

This study was not primarily devised to undertake an economic analysis, and any conclusion in economic terms can therefore be only speculative. However, it is possible to translate the results into economic consequences caused by the effects of nocturia on productivity and utility.

Direct costs to the healthcare system that can be clearly related to nocturia are likely to be minimal, as few individuals with the symptoms may seek specific medical advice, particularly if they are otherwise healthy. However, it is conceivable that they would consult for other symptoms, e.g. tiredness. However, this information was not collected in the present study; rather the focus was on productivity and utility in individuals with a professional activity, as indirect and intangible costs may be not negligible.

In an economic evaluation, indirect costs are generally estimated by using the human capital approach, i.e. productivity is considered to be equal to the gross average income. In 2001, the average annual gross salary including employers' contributions for a full-time worker (39.9 h) was 370 600 SEK (39 850 €). In the present sample, individuals with nocturia had a 9.2% greater overall work-impairment than controls. Thus, in theory, the indirect cost could be estimated at 9.2% of the annual income or 34 100 SEK (3700 €).

Intangible costs are defined as the loss of QoL caused by a disease and can be expressed as a loss of quality-adjusted life years (QALYs). QALYs are a combination of quality and quantity of life, where time (e.g. 1 year) is weighted by a quality factor (utility). In the present sample, the utility of individuals with nocturia is on average 0.09 below the utility of the control group. Thus, they will loose 0.09 QALYs during each year, compared with controls. Intangible costs could then be expressed as the loss of QALY multiplied by the willingness to pay for one QALY. However, there is no officially established value for a QALY, although generally 30000–60000 € is mentioned in published economic evaluations. Using these values, intangible costs would be 2700–5400 €.

From these results it is also possible to estimate the loss of QALYs caused by increasing severity of the symptoms. According to the regression analysis, each additional void will decrease the utility on average by 0.027 in this sample, i.e. a reduction of 0.027 QALY/year. Thus, utilities for different levels of symptoms can be calculated, by gender (which was significant in the analysis), as shown in Table 2.

Using these utilities for different symptom severity, a hypothetical estimate of the cost-effectiveness of a treatment that reduces the severity of symptoms can be derived. To illustrate this, we used two clinical trials with desmopressin in men and women [18,19]. In these trials, night-time voiding was reduced from a mean of 2.92 for women and 3.0 for men at baseline, to 1.61 and 1.74, respectively, after treatment. Using the utility data from the present study, the QALY gain with treatment can thus be calculated at 0.0348 for women and 0.0334 for men. The cost of the treatment can be calculated from drug usage in the trials and the price of desmopressin in Sweden, leading to a cost per QALY gained with treatment at 205 200 SEK (22 000 €) and 213 300 SEK (23 000 €), respectively. If the same calculations are carried out using the change in night-time voiding compared with placebo (– 0.76 for females and – 0.84 for males), the cost per QALY gained increases to 353 700 SEK (38 000 €) for women and 463 400 SEK (50 000 €) for men.

DISCUSSION

This study provides some insight into the effect that nocturia can have on otherwise healthy individuals in terms of utility, vitality/energy, general QoL and work. The hypothesis was that vitality and energy levels would be lower than normal because of sleep

deprivation, thereby affecting the individuals' productivity at work. The hypothesis was confirmed and the present findings relative to the comparisons with the control group are highly significant, despite the relatively few subjects in this pilot study. In addition, we tested whether the severity of symptoms would affect these variables, and again this effect was confirmed. However, for this analysis the sample size was somewhat limited and only work impairment and vitality were very significantly affected, while the effect on utility was borderline. Utility is affected by several variables, amongst which nocturia is only one. The relevant question for the present analysis is whether the symptoms have an effect, and whether this effect is significant, rather than the size of the effect.

TABLE 2 Utility scores by gender for different levels of symptoms

	Utility*	
Number of voids	Men	Women
1	0.8762	0.8097
2	0.8496	0.7831
3	0.8231	0.7566
4 +	0.7965	0.7300

**Utilities are calculated using the multiple regression: 0.8362 – (S * 0.0265) + (G * 0.0665), where S, number of voids; G, gender (1 = male, 0 = female). Symptoms and gender were significant in the regression.*

Contentious issues in this study might be the potential bias introduced with the recruitment of participants through advertising, and the collection of data using cross-sectional survey techniques with mailed questionnaires. Using an advertisement to recruit individuals will select a group that is aware of and bothered by the symptoms, and hence represents a somewhat selected group, rather than a population-based sample of people with nocturia. This is similar to a sample recruited for a clinical trial, and thus we consider it does not represent a problem. The present objective was to investigate the potential effect of the symptoms and symptom severity in a well-defined group, rather than estimate the overall effect of nocturia. Also, we limited the study to people who had a professional activity and limited comorbidity, resulting in a sample that is considerably younger and healthier than the overall population with nocturia. The present results can therefore not be generalized for nocturia overall, but rather are valid for a special group for whom the symptom may be particularly bothersome. One confirmation of this is possibly that within days of the advertisement, over 900 people had contacted the department of urology; it could be argued the sample in this study would be the primary target of any intervention to alleviate the symptoms.

The selection of the control group is less of an issue. To match the nocturia group, individuals were randomly selected from a large market research database, first based on professional activity and then by gender and 10-year age groups. It is unlikely that individuals who agreed to participate were different from the general population with the same inclusion criteria, but it cannot be totally excluded that they were a more active group. The main problem in the control group is the age range; while the nocturia group included individuals aged >65 years, based on their professional activity and symptoms, it is difficult to find a matching number of elderly in a market research panel, when the search criterion is professional activity. As a result, the mean age in the nocturia group was higher by ≈5 years. However, age was not significant in any of the regressions, and the results are therefore not influenced by age. In particular for the QoL and utility data, a difference of 5 years will not affect the results substantially, as population values are defined in 5- or 10-year groups. When individuals aged >68 years were excluded, vitality and utility scores, and general QoL scores, remained unchanged. Similarly, work impairment did not change substantially.

Generally, it is difficult to collect medical data using questionnaires; we therefore assessed the medical variables in a telephone interview and limited the mail survey to questionnaires that are always self-assessed and have been widely used in this setting (SF-36, EQ-5D, WPAI). The response rate for these questionnaires was close to 100%, and the missing answers within the questionnaires were minimal, indicating that individuals had no difficulty in completing the forms. However, the amount of data that can be collected in such a study is limited, and detailed clinical questions cannot therefore be addressed.

A further issue is the inclusion of individuals who reported some degree of stress incontinence. Although incontinence was specifically excluded from the study, we decided to include individuals with mild stress incontinence, as this would not lead to night-time symptoms. Nevertheless, some effect cannot be totally excluded. However, when stress incontinence was included as a dummy variable in the regression analyses, it had no significant effect on the results.

Contrary to our expectations, the nocturia group reported extremely low absence from work or of sick leave. These findings contradict earlier data in Sweden, where Asplund and Aberg [6] found that women with frequent micturition had an average sick listing of 75 days. However, the earlier study enrolled women regardless of comorbidity and type of employment, and the samples in the two studies cannot therefore be directly compared. Nevertheless, the difference is striking, and one explanation may be a recent change in Sweden of the regulation of sick leave, where the first days of sick absence are not paid for by the health insurance system.

Lastly, for discussion, we provided an estimate of indirect and intangible costs based on the productivity impairment and utility, and a hypothetical cost-effectiveness calculation for treatment with desmopressin. However, these latter calculations should be viewed with caution, as the present study was not devised to conduct an economic evaluation. More importantly, the patient sample in the two clinical trials was clearly different from the present sample. However, we were able to show that nocturia and the related lack of sleep affects productivity at work and QoL, and that the degree of impairment increases with the severity of symptoms.

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REFERENCES

1 van Kerrebroeck P *et al.* The standardization of terminology in nocturiu: report from the standardization subcommittee of the International Continence Society. *BJU Int* 2002; **90** (Suppl. 3): 11–5
2 Diokno A, Brock BM, Brown MB, Herzog AR. Prevalence of urinary incontinence and other urological symptoms in the noninstitutionalized elderly. *J Urol* 1986; **136**: 1022–5
3 Ouslander J. Aging and the lower urinary tract. *Am J Med Sci* 1997; **314**: 214–8
4 Rembratt A, Robertson GL, Noorgard JL, Andersson KE. Pathogenic aspects of nocturia in the elderly: differences between nocturics and non-nocturics. Poster presentation. Tampere, Finland, ICS 2000
5 Malmsten UG, Milsom A, Molander U, Norlen LJ. Urinary incontinence and lower urinary tract symptoms: an epidemiological study of men aged 45–99 years. *J Urol* 1997; **158**: 1733–7
6 Sagnier P, MacFarlane G, Richard F, Botto H, Teillac P, Boyle P. Results of an epidemiological survey using a modified American Urological Association symptom index for benign prostatic hyperplasia in France. *J Urol* 1994; **151**: 1266–70
7 Jolleys J, Donovan JL, Nanchalal K, Peters DJ. Urinary symptoms in the community: how bothersome are they. *Br J Urol* 1994; **74**: 551–5
8 Scarpa R. Lower urinary tract symptoms. what are the implications for the patients? *Eur Urol* 2001; **40** (Suppl. 4): 12–20
9 Asplund R, Aberg H. Nocturnal micturition, sleep and well-bing in women of ages 40–64. *Maturitas* 1996; **24**: 73–81
10 Reilly C, Zbrozek A, Dukes E. The validity and reproducibility of a work productivity and activity impairment instrument. *Pharmacoeconomics* 1993; **4**: 353–65
11 Reilly MC, Tanner A, Meltzer E. Work, classroom and activity impairment instruments. Validation studies in allergic rhinitis. *Clin Drug Invest* 1996; **11**: 278–88
12 Chirban JT, Jacobs RJ, Warren J, Prakash E, Sodomsky ME, Clarke JF. The Short Form Health Survey (SF36) and the Work Productivity and Activity Impairment Questionnaire (WPAI) in panic disorder. *Dis Manag Health Outcomes* 1997; **1**: 154–64
13 Wahlqvist P, Carlsson P, Stalhammar NO, Wiklund I. Validity of a Work Productivity and Activity Impairment Questionnaire for patients with symptoms of gastro-esophageal reflux disease (GORD) – Results from a cross-sectional study in Sweden. *Value Health* 2002; **5**: 106–13
14 The EuroQol Group. EuroQol – a new facility for the measurement of health-related quality of life. *Health Policy* 1990: 199–208
15 Dolan P. A social tariff for EuroQol: results from a UK general population survey *Centre for Health Economics*. York: University of York, 1995
16 Brooks R and the EuroQol Group. EuroQol: the current state of play. *Health Policy* 1996; **37**: 53–72
17 Ware J, Sherbourne C, McHorney C. The MOS 36-Item Short Form Health Survey. *Med Care* 1993; **31**: 247–63
18 Mattiasson A, Abrams P, van Kerrebroeck P, Walter S, Weiss J. The efficacy of desmopressin in the treatment of nocturia: a double-blind placebo-controlled study in men. *BJU Int* 2002; **89**: 855–862
19 Lose G. The efficacy and safety of oral desmopressin in treatment of nocturia in women. *Neurourol Urodynamics* 2001; **20**: 457–8

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Abbreviations: **QoL**, quality of life; **WPAI**, work productivity and activity impairment; **SF–36**, Short Form-36; **QALY**, quality-adjusted life year.