

Nocturia and Disturbed Sleep: Where Do We Stand?

Commentary on Zeitzer et al. Nocturia compounds nocturnal wakefulness in older individuals with insomnia. *J Clin Sleep Med* 2013;9:259-262.

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Nocturia is defined as waking up one or more times at night to void,¹ and is a common affliction among elderly.^{2,3} The prevalence of nocturia increases across age groups to more than 50% reporting 2 or more voids per night at age of 70.³ Higher prevalence of nocturia in this age group is multifactorial, and possible contributing causative factors include impaired bladder voiding, reduced bladder capacity, decreased vasopressin levels at night, increased comorbid conditions, and sleep disturbances.⁴

Nocturia has been associated with lower quality of life, cardiovascular disease, mortality, falls, and hip fractures.^{5,6} It has been suggested that decreased quality of life and some of the adverse health outcomes could be due to sleep disruption from nocturia.⁷ Several studies have looked at self reported sleep measures and suggest a causal association between nocturia and poor sleep after controlling for confounders such as diabetes mellitus, congestive heart failure, and diuretics.⁸ These studies used questionnaires or survey and report poor sleep quality, increased awakening, difficulty in falling back to sleep, decreased total hours of sleep, and daytime fatigue in subjects with nocturia.⁹⁻¹¹ In these studies, sleep histories were not validated with objective measures such as wrist actigraphy or polysomnography (PSG).

In a study by Parthasarathy et al. of 6,342 Sleep Heart Health Study subjects who had PSG and filled questionnaires about sleep habits that was summarized over 1 month, nocturia was associated with less total sleep period, poor sleep efficiency, higher arousal index, and sleep disordered breathing (SDB). These objective sleep parameters were not adjusted for SDB and other factors.¹² The primary aim of the study was to understand if the association between nocturia and cardiovascular disease was independent of SDB. Another study looked at objective sleep measure of sleep using PSG in 20 subjects with benign prostate hypertrophy. Nocturia was associated with increased daytime sleepiness but not with sleep efficiency or total sleep time. This was a small study, only 70% had nocturia, and more than half also had had sleep apnea.¹³

In this issue of the *Journal*, additional evidence is presented relating to the putative association between nocturia and sleep.¹⁴ Zeitzer et al. studied association between nocturia and sleep via simultaneous assessment of both subjective and objective sleep measures in older subjects with insomnia. The mean age of males (n = 55) was 64.3 years and mean age of females

(n = 92) was 62.5 years. All subjects maintained sleep logs for 2 weeks, and a subset (n = 60) wore an actigraph for a week. The mean RDI was 3.4, and only 2 subjects had SDB. Only 54.2% of nocturnal awakenings were associated with bathroom use. The number of trips to the bathroom was positively associated with wake time after sleep onset (WASO) (r = 0.24, linear regression; $F_{6,409} = 5.66$, $p < 0.001$ ANOVA), number (r = 0.23, linear regression; $F_{6,409} = 5.03$, $p < 0.001$ ANOVA), and length of wake bouts (r = 0.13, linear regression; $F_{6,409} = 3.48$, $p < 0.01$ ANOVA) measured using actigraph and negatively with feeling of restedness (r = -0.13, linear regression; $F_{4,1093} = 4.27$, $p < 0.01$ ANOVA) and sleep efficiency (r = -0.22, linear regression; $F_{4,1768} = 24.5$, $p < 0.001$ ANOVA) obtained from sleep diary. Furthermore, in subset of subjects (n = 19) who had 2 nights of bathroom use and 2 nights of no bathroom use, the bathroom use was associated with longer wake time, but there was no difference in total sleep time or sleep structure. The authors reported that nocturia in subjects with insomnia is associated with increased wake time and subjective feeling of decreased restedness.

However, the study has several limitations. Even though the regression coefficients were statistically significant, as evident in the ANOVA F p-values, the residual error levels, that is, variance in the dependent variables, are extremely high. These as such indicate very weak precision in the models (**Table 1**). Also, the authors do not indicate whether or not the categorical groupings of the independent variable were indicator or dummy coded, since the groupings of trips were made into a categorical variable they need to be indicator coded (k-1).

Regarding the magnitude of the effect, taking just one of the six measures, mean wake bout length, if we look at the difference from zero trips in actual seconds, we can see the data demonstrate a very tiny effect (**Table 2**). There was a 9 second difference in the wake bout length if there was 1 trip and -3 seconds if there were 2 trips.

The subjects with insomnia were recruited in the study, what is unclear is if insomnia *per se* prompts more trips to the bathroom. With age, insomnia is the most common sleep complaint, and adults tend to experience more awakenings and difficulty in maintaining sleep.¹⁵

In conclusion, the relation between nocturia and its causal effect on sleep parameters needs to be further elucidated. Further, prospective studies controlling for major confounders need to

Table 1—Unexplained variance of dependent variables

Dependent Measures	Report r	Non-Reported r ²	Coefficient of Determination	% Unexplained Variance in Dependent Measures
Restedness	-0.13		0.0169	98.31
Sleep efficiency	-0.22		0.0484	95.16
Sleep efficiency actigraph	-0.099		0.0098	99.10
Wake bouts	0.23		0.0529	94.71
Wake bout length	0.13		0.0169	98.31
WASO	0.24		0.0576	94.24

Table 2—Difference in wake bout length in seconds

	Trips to the bathroom			
	1	2	3	≥ 4
Difference in wake bout length from zero trips in actual seconds	9	-3	21	40

be conducted to better clarify this relationship. Future studies should consider polysomnogram to capture awakening and associated voids, bladder monitoring to study if sleep disturbances per se cause awakening and hence nocturia, or vice versa by looking at the effect of bladder manipulation on sleep. This would help to tailor the treatment according to patient and possibly improve sleep and related consequences.

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The author has indicated no financial conflicts of interest.