CONCLUSIONS: Poor sleep quality is significantly associated with worse LUTS, and improvement in sleep hygiene is associated with improved LUTS. Men presenting with LUTS and older men at risk for LUTS should be counseled about optimizing sleep quality to minimize the impact of sleep on LUTS.

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PD65-09
IMPACT OF THE CONTROLLING NUTRITIONAL STATUS (CONUT) SCORE ON SEVERE NOCTURIA IN MALES

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INTRODUCTION AND OBJECTIVES: While the relationship between nocturia and metabolic syndrome has been reported, that between nocturia and malnutrition has yet not been fully examined although both nocturia and malnutrition are reportedly associated with overall survival. The controlling nutritional status (CONUT) score, as calculated from serum albumin, total cholesterol concentration, and total lymphocyte count, is a practical tool for nutritional assessment. In this study, we investigated the effect of malnutrition as evaluated by the CONUT score on nocturia in males.

METHODS: This retrospective study included 340 men whose CONUT scores and other variables were recorded at the initial visit for voiding-related symptoms between 2015 and 2018 in our hospital. We assessed frequency of nocturnal voiding according to International Prostate Symptom Score. Severe nocturia was defined as voiding at night $\geq$ 3 times. Malnutrition was defined as CONUT score $\geq$ 4. Associations of severe nocturia with malnutrition and other clinical variables were examined using univariate and multivariate logistic regression analyses. The other variables collected were age, prostate-specific antigen, prostate volume, body mass index (BMI), hypertension, diabetes, insomnia, sleep apnea syndrome (SAS), cardiovascular disease, use of any medications for voiding symptoms, serum sodium concentration, C-reactive protein (CRP), and estimated glomerular filtration rate (eGFR).

RESULTS: Median age and CONUT score were 72 years and 1, respectively. Numbers of times voiding at night were 0-1/2/3/4+ in 86/75/84/95 men, respectively. The rates of malnutrition (CONUT score $\geq$ 4) in men with voiding at night 0-1/2/3/4- were 2%/5%/17%/20% ($<$ 0.01), respectively. Univariate analysis demonstrated that age, BMI, hypertension, SAS, sodium concentration, CRP, eGFR and malnutrition were associated with severe nocturia. In multivariate analysis, malnutrition (odds ratio [OR] 4.0, P $<$ 0.01) was an independent risk factor of severe nocturia in males, as were higher age (OR 2.3, P $<$ 0.01), lower BMI (OR 1.9, P = 0.01), the presence of SAS (OR 8.0, P $<$ 0.01), higher CRP (OR 2.1, P $<$ 0.01), and lower eGFR (OR 4.9, P $<$ 0.01).

CONCLUSIONS: To our knowledge, this is the first study to demonstrate that malnutrition as evaluated by the CONUT score is associated with severe nocturia in males.

Univariate and multivariate analyses of variables' relationships to severe nocturia

	Univariate		Multivariate (Final model)	
	OR	*P*	OR	*P*
Age (≥ 75 vs. < 75, year)	2.77	< 0.01	2.34	< 0.01
Prostate-specific antigen (< 0.42 vs. ≥ 0.42, ng/mL)	2.15	0.23	-	-
Prostate volume (≥ 50 vs. < 50, ml)	1.12	0.68	-	-
Body mass index (< 21.6 vs. ≥ 21.6)	2.32	< 0.01	1.90	0.01
Hypertension (+ve vs. -ve)	1.72	0.01	-	-
Diabetes (+ve vs. -ve)	1.39	0.21	-	-
Insomnia (+ve vs. -ve)	1.42	0.23	-	-
Sleep apnea syndrome (+ve vs. -ve)	6.79	< 0.01	8.02	< 0.01
Cardiovascular disease (+ve vs. -ve)	1.81	0.16	-	-
Medication use for dysuria (+ve vs. -ve)	0.71	0.23	-	-
Sodium concentration (< 139 vs. ≥ 139, mEq/L)	3.52	< 0.01	-	-
C-reactive protein (≥ 2.2 vs. < 2.2, mg/L)	2.93	< 0.01	2.11	< 0.01
Estimated glomerular filtration rate (< 45 vs. ≥ 45, ml/min/1.73m^2)	4.81	< 0.01	4.90	< 0.01
CONUT score (≥ 4 vs. < 4)	5.26	< 0.01	4.02	< 0.01

* OR; odds ratio

Source of Funding: none

PD65-10
EARLY NOCTURNAL SURGE IN URINE PRODUCTION IN PATIENTS WITH NOCTURNAL POLYURIA SYNDROME

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INTRODUCTION AND OBJECTIVES: Nocturnal Polyuria (NP) in the absence of identifiable contributory comorbidities is known as the *Nocturnal Polyuria Syndrome* (NPS) and is thought to be due to blunted secretion of endogenous arginine vasopressin (AVP) during the course of sleep. This study aims to determine if patients with NPS have a uniform vs. phasic nocturnal diuresis rate by comparing early (before first nocturnal void) and late (after first nocturnal void) nocturnal diuresis rates.

METHODS: A frequency-volume chart (FVC) database of 773 entries from 440 men treated at a Veterans Affairs Urology clinic was analyzed. FVCs completed by patients $\geq$18 years with $\geq$2 nocturnal voids were included. Only the first FVC was used for patients with multiple diaries. Patients with alternate causes of NP (diuretic use, sleep apnea, heart failure, edema, kidney disease, and diabetes insipidus) were excluded. Patients were divided into two cohorts by NP status using two definitions for NP: nocturnal urine production (NUP) $>$90 mL/h and nocturnal polyuria index (NPi) $>$0.33.

Standard FVC parameters were used to calculate an "early nocturnal diuresis rate" (*ENDR*; first nocturnal voided volume/duration of first uninterrupted sleep period), "late nocturnal diuresis rate" (*LNDR*; remaining nocturnal urine volume/remaining hours of sleep), and "diurnal diuresis rate" (*DDR*; daytime urine volume/hours awake) (Table 1a&1b). A Wilcoxon signed-rank test was used for significance.

RESULTS: Within the NPS cohort, significant differences between ENDR and LNDR were observed for both NUP $>$90 mL/h (152 vs. 120 mL/h, p=0.02) and NPi $>$0.33 (120 vs. 91.2 mL/h, p=0.02) (Figure 1). Within the non-NPS cohort, no significant differences were seen between ENDR and LNDR at NUP $\leq$90 or NPi $\leq$0.33.

CONCLUSIONS: In NPS patients, there exists a unique skew in nocturnal urine production such that a disproportionately large amount of the nocturnal volume is produced in the early hours of sleep. This may provide the specific substrate for short-acting AVP replacement pharmacotherapy approved for use in patients with nocturia owing to NPS.

Figure I: Circadian Pattern of Diuresis Rates by Nocturnal Polyuria Syndrome (NPS) Status

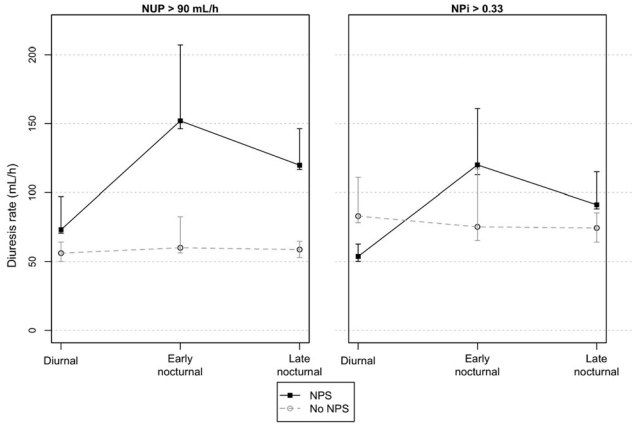

Figure 1: Median diuresis rates with error bars representing 95% confidence intervals. The Wilcoxon signed-rank test was used to determine significance between parameters obtained from the same group. "Diurnal" [(24-hour volume – nocturnal urine volume)/(24 – sleeping hours)] denotes the mean diuresis rate during non-sleep hours; "Early Nocturnal" (First nocturnal voided volume/first uninterrupted sleep period duration) denotes the rate from time to bed until the first nocturnal awakening to void; "Late Nocturnal" [(nocturnal urine volume – first nocturnal voided volume)/(sleeping hours – first uninterrupted sleep period duration)] denotes the rate from after the first nocturnal void until the end of sleep.

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PD65-11

NOCTURNAL DIURESIS RATE PATTERNS IN NOCTURNAL POLYURIA SYNDROME AND SECONDARY NOCTURNAL POLYURIA

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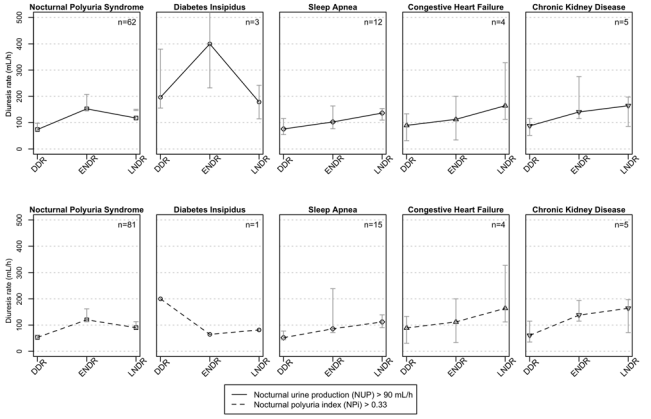
INTRODUCTION AND OBJECTIVES: In this study, we investigate how nocturnal diuresis rates differ at different portions of sleep for 5 different etiologies of nocturnal polyuria (NP) to aid in identifying optimal management strategies for the distinct clinical entities of NP.

METHODS: We retrospectively analyzed a database of voiding diaries from patients managed for nocturia at a Veterans Affairs urology clinic from 2007-2018. The first complete entries were included for males aged ≥18 with clinically-significant nocturia (≥2 nocturnal voids) owing to NP using the two most common definitions of NP: nocturnal urine production [NUP] ≥90 mL/h and nocturnal polyuria index [NPi] ≥0.33. Patients meeting criteria were divided into 5 sub-groups with a single diagnosis of either Nocturnal Polyuria Syndrome (NPS), diabetes insipidus (DI), obstructive sleep apnea (OSA), congestive heart failure (CHF), and chronic kidney disease (CKD). NPS was defined as NP in the absence of all aforementioned diagnoses. Early nocturnal diuresis rate (ENDR), defined as first nocturnal voided volume/first uninterrupted sleep period, late nocturnal diuresis rate (LNDR), defined as remaining nocturnal urine volume/remaining hours of sleep, and diurnal diuresis rate (DDR), defined as daytime urine volume/hours awake, were calculated and displayed with Wilcoxon confidence intervals in Figure 1.

RESULTS: At both NUP ≥90 mL/h and NPi ≥0.33, patients with NPS demonstrated an increase in diuresis rate during the early portion of sleep, followed by a decline in the latter portion of sleep, which followed the same pattern for patients with DI with NP defined as NUP ≥90 mL/h. Only 1 patient was identified with DI and NP defined as NPi ≥0.33 following inclusion and exclusion criteria. At both NUP ≥90mL/h and NPi ≥0.33, patients with OSA, CHF, and CKD were observed to have a gradual increase in diuresis rate from early nocturnal to the late nocturnal period.

CONCLUSIONS: Patients with NPS and DI exhibited an early nocturnal surge in diuresis rate, followed by a decline in the latter portion of sleep. In contrast, patients with NP of cardiogenic and renal etiology displayed a gradual increase in diuresis rate from the early to latter portion of sleep. Nocturia interventions may vary according to the differing underlying mechanisms in these subtypes of nocturnal polyuria.

Figure I: Circadian Pattern of Diuresis Rates by Nocturnal Polyuria Etiology



Source of Funding: none

PD65-12

SALT INTAKE REDUCTION AS A TREATMENT OPTION FOR OVERACTIVE BLADDER

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INTRODUCTION AND OBJECTIVES: Although overactive bladder (OAB) is primarily treated using anticholinergic drugs and β3 adrenergic stimulants, patients are concerned regarding adverse events like dysuria, dry mouth, constipation, and fluctuation of blood pressure, and there is a particular desire for the emergence of safe treatments for elderly patients.

Chronic high salt intake is closely related to lifestyle diseases, such as hypertension and diabetes, which have a significant influence on the development of OAB. However, there are no studies that examine the impact of salt reduction, a representative element of lifestyle disease, on the OAB symptoms. This study aimed to analyze the therapeutic effect of reducing salt intake in OAB patients.

METHODS: The subjects were OAB patients with excessive salt intake (≥8 g/day for men and ≥7 g/day for women). OAB was defined as an overactive bladder symptom score (OABSS) of ≥2 points for Q3 (urgency) and a total score of ≥3 points. The subjects were provided nutrition guidance related to salt reduction every four weeks using brochures. We prospectively examined urinary symptoms at the start of salt reduction and 12 weeks into salt reduction using OABSS and the frequency volume chart (FVC). The daily salt intake was estimated by examining the sodium and creatinine concentrations of spot urine samples using a formula that was adjusted for body height, body weight, and age. Value of $P<0.05$ was considered statistically significant.

RESULTS: A total of 98 subjects (52 men), with a mean age of 66.7 ± 11.5 years were evaluated. During the observation period, 71 subjects (72.4%) achieved salt reduction (Success [S] Group), while 27 subjects (27.6%) did not (Failure [F] Group].

With respect to the OABSS, the S Group demonstrated an improvement in not only Q1 (daytime frequency) and Q2 (nocturia) from 1.2 ± 1.0 to 0.6 ± 1.0 ($P<0.001$) and from 2.1 ± 0.5 to 1.4 ± 0.7 ($P<0.001$), respectively, but also in Q3 (urgency), Q4 (urgency incontinence), and total score from 2.3 ± 0.5 to 2.0 ± 0.7 ($P<0.001$), from 1.3 ± 1.0 to 1.1 ± 1.0 ($P=0.003$), and from 6.9 ± 1.0 to 5.1 ± 2.2 ($P<0.001$), respectively. With respect to FVC, the S group showed improvement in voided volume from 247.8 ± 25.1 mL to 260.4 ± 32.6 mL ($P<0.001$), and nocturia from 2.5 ± 1.0 times to 1.6 ± 0.9 times ($P<0.001$). The F group showed no improvement in any of the parameters of OABSS and FVC.