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INTRODUCTION

Nocturia, one of the storage-type lower urinary tract symptoms (LUTS), is defined by the International Continence Society (ICS) as the complaint of waking at night to void.¹ Despite this simple definition, nocturia is idiosyncratic in a number of ways. For example, nocturia of equivalent frequency causes markedly different reductions in quality of life for different people. Consequently, quality of life improvements deriving from treatment responses may differ between study populations. In some patients nocturia progresses slowly, while in others it remains stable or regresses with time. Finally, nocturia is multifactorial in etiology, making both assessment and treatment a potential challenge. This challenge is an especially important one, however, as nocturia may indicate serious underlying illness. Illnesses such as cardiovascular, renal or endocrine disease can disrupt water and salt homeostasis, resulting in increased production of urine.² For this reason, even one nightly void may be considered a progression from no nocturia, and thus an opportunity for secondary prevention. In such contexts, where the pathophysiology of nocturia is not in the lower urinary tract but reflecting systemic disease, alluding to it as a LUTS is potentially misleading.

The body of literature describing the evaluation and management of nocturia has expanded at a rapid rate. For this reason, in 2012, the International Consultations on Urological Diseases (ICUD) partnered with the Société Internationale d'Urologie (SIU) to convene a Consultation on Male LUTS. The goal of this Consultation was to utilize established criteria to assign objective levels of evidence (LOE, 1 through 4) and grades of recommendation (GOR, A through D) to the most salient research in the field.³ The

purpose of this review is to present a condensed summary of the ICUD-SIU evaluation of nocturia, incorporating additional subsequent panel review of the evidence base, which offers contemporaneous expert consensus on this topic. LOEs and GORs are presented here as the verbatim conclusions of the ICUD-SIU panel, with more detailed descriptions published elsewhere.⁴ Where published evidence was found to be sparse, but the committee considered a recommendation was required, the GOR is given without any LOE.

EPIDEMIOLOGY

Prevalence

Studies of nocturia prevalence have demonstrated that it is relatively common in both genders and all age groups. For example, in the population-based FINNO Study, 1 out of 8 men and women 18-79 years old reported at least 2 voids/night.⁵ Among young respondents, nocturia was more common in women than men, but this gender difference disappeared after middle age.

Incidence

The incidence of nocturia is not well understood, as the required longitudinal studies are difficult to perform. In the community-based Krimpen study, for example, nocturia was assessed longitudinally with frequency-volume charts (FVCs) over a period of several years.⁶ Overall incidence and remission rates for nocturia ≥ 2 voids/night after 2 years were 24% and 37%, respectively. Considerable fluctuation were noted at different study time points.

Bother and Impact on Quality of Life (QOL)

Sleep disturbance is an important cause of the increased morbidity that is associated with nocturia. However, one nightly void does not appear to be sufficiently disruptive to cause significant bother in most patients. In the FINNO study, for example, the majority of people reported having bother when the number of nocturia episodes was two, and two voids per night was associated with impaired HRQoL. Two nocturia episodes impaired HRQoL compared with those with no nocturia.⁷

Impact of Nocturia: Falls, Fractures, Mortality, and Productivity

Much of the increased mortality associated with nocturia may be due to the risk of hip fracture in patients who frequently wake to void. Interestingly, in a study of men aged 40-80 years, nocturia ≥ 2 voids/night was an age-independent risk factor for hip fracture.⁸

Conclusions

The ICUD committee considered that nocturia is a highly prevalent symptom, with similar overall prevalence in both genders. Prevalence increases more markedly with age in men. The literature on the incidence of nocturia remains relatively sparse. Incidence of nocturia increases with age, but significant short-term fluctuation in nocturia severity in individuals makes studies on incidence challenging. Two or more episodes of nocturia per night constitutes clinically meaningful nocturia severity in the general population, affecting quality of life and perceived health, while a single episode

usually does not. Nocturia has been suggested to increase risk of falls, fractures, death, and impaired productivity.⁴

Recommendations

The ICUD committee considered that epidemiological studies need to employ strictly-defined and clearly-stated criteria of terminology and assessment. Approaches to identify intra-individual variation and other confounding influences need to be considered. Longitudinal studies using high quality methodology remain a priority requirement. Nocturia of twice or more per night may be a threshold of clinical significance in the general population. However, this threshold is not irrefutably established, and should not be extrapolated to sub-populations. Research into all grades of nocturia severity may yield information of clinical relevance.⁴

PATHOPHYSIOLOGY

Classification and risk Factors

Nocturia may be divided into five causative categories:

1. Bladder storage problems,
2. 24-hour (global) polyuria (>40 ml/kg urine output over a 24-hour period),
3. Nocturnal polyuria ¹ (NP; nocturnal output exceeding 20% of 24-hour urine output in the young, or 33% of urine output people aged over 65),
4. Sleep disorders,
5. Mixed etiology.

Examples of bladder storage problems include overactive bladder and urinary tract infection. Global polyuria is commonly caused by polydipsia and by conditions such as diabetes insipidus. NP is seen with peripheral edema and circadian defects in arginine vasopressin (AVP) secretion, among many other conditions.² Sleep disorders may be primary or secondary. Nocturia of mixed etiology is caused by combinations of any of the above. A summary of the ICUD-SIU conclusions regarding common risk factors for nocturia is presented in Table 1.

Conclusions and Recommendations

The ICUD committee considered that the pathophysiology of nocturia can be divided into five categories and associated with several risk factors (LOE 2, GOR B): 1) bladder storage problems, 2) nocturnal polyuria, 3) global polyuria, 4) sleep disorders, 5) mixed mechanisms. Research into pathophysiology remains a priority. Mechanisms underlying nocturia are poorly understood. Establishing why some patients manifest nocturia and not others with apparently similar predisposing factors, basic research into age-related circadian rhythms, effects on sleep quality, and the relationship between nocturia and restorative stages of sleep are a priority.⁴

ASSESSMENT

Components of clinical assessment of nocturia are presented in Figure 1 and Table 2.

Conclusions and recommendations

The ICUD committee considered that validated symptom questionnaires are recommended as tools for initial and treatment response evaluation in the clinical

setting (Grade C). Questionnaires are unsuitable for the estimation of nocturnal voiding frequency (LOE 4, Grade C). Nocturia-specific quality of life questionnaires can be used to determine impact of nocturia on quality of life (LOE 4, Grade C). Urinary diaries are essential in the analysis of nocturia (LOE 4, Grade C). The ICIQ bladder diary has been developed according to methodological requirements for assessment tools, and has proceeded through contextual validations (LOE 2, Grade B)⁹. Medication review is an important part of nocturia clinical assessment (Grade A). Physical examination, flow rate testing and urinalysis as relevant to assessment of LUTS help identify potential contributory mechanisms in some cases of nocturia (Grade C). Post void residual measurement is directly relevant to nocturia (Grade C). Routine use of invasive urodynamics, such as filling cystometry and pressure flow study, is not recommended (Grade D). Blood chemistry examination is optional (Grade C~D). Radiological examinations or cystoscopy should only be used where indicated by the medical context, such as suspected malignant disease (Grade D).⁴

TREATMENT

Selected studies that were assigned LOEs by the ICUD-SIU Consultation are briefly described. A particular issue in these studies is the extent to which any reduction in nocturia could be considered clinically beneficial. Small reductions in nocturia severity as compared against a control group could be statistically significant, but may not be regarded as clinically significant. This is particularly the case if reduction compared with placebo is <0.5 episode per night. Nonetheless, it should be remembered that statistical analysis is derived from the full population. A small overall change could reflect varied

responses in the population, with some (“responders”) seeing a clinically useful reduction, and others seeing no change or only marginal reduction. Furthermore, placebo responses can be comparatively large, which can obscure detection of therapeutic response. Thus, a small additional reduction in the overall study population does not preclude the possibility that some patients could get useful benefit from an intervention. Most published studies were not clear on whether the results could indicate the presence of a sub-group of responders, and this is an area in which future research publications should be explicit.

Conservative Management

Behavioral Modification with Biofeedback

Burgio *et al.* conducted a randomized controlled trial (RCT) of 143 men with bladder outlet obstruction (BOO) and overactive bladder (OAB) who had failed alpha-blocker therapy.¹⁰ Patients were assigned to eight weeks of behavioral therapy or oxybutynin. Behavioral therapy reduced nocturia by 0.7 voids/night, as compared to 0.32 voids/night for oxybutynin ($p=0.05$) (LOE 3).

Song *et al.* randomized 139 women with OAB and nocturia to 12-weeks of bladder training, tolterodine, or both.¹¹ Nocturia decreased by 56% in the bladder training group, 65% in the tolterodine group, and 66% for both ($p<0.05$) (LOE 3).

Conclusions

The ICUD committee considered that lifestyle changes and behavioral modification are non-invasive, conservative methods that can successfully reduce the number of nocturia episodes (LOE 3). Behavioral modification in conjunction with anti-muscarinic pharmacotherapy is more effective at reducing nocturia episodes than either method alone (LOE 3).⁴ However, larger studies may be necessary to support this latter finding.

Recommendations

The ICUD committee considered that lifestyle changes, such as reducing intake of caffeine and alcohol, limiting night-time fluid intake and improving sleep hygiene, are effective methods that help reduce nocturnal urine volume and episodes of nocturia (GOR C). Consider using bladder training in conjunction with anti-muscarinic medication (GOR C).⁴

Pharmacotherapy

1. 5-alpha Reductase Inhibitors

A recent systematic review summarized the evidence of 23 RCTs encompassing 21,945 men to assess the efficacy and risks of finasteride versus placebo for LUTS associated with benign prostatic enlargement (BPE).⁴ Although finasteride did significantly improve some LUTS, no significant effect was seen on nocturia in either short- or long-term use for the overall cohort. Men over the age of 70 did apparently see a reduction in nocturia in one study, but the modest reduction compared with placebo (-0.29 vs -0.11 respectively) means the clinical benefit was marginal.⁴

Conclusions

The ICUD committee considered that finasteride does not reduce nocturia episodes in men. Finasteride may be improve nocturia in men with LUTS aged 70 and older (GOR C).⁴

2. Selective Alpha-1 Adrenergic Antagonists

Roehrborn *et al.* pooled the results of 3 RCTs of patients with BPE who were randomized to receive alfuzosin or placebo.¹² The treatment and placebo groups experienced reductions of 1.1 and 0.8 voids/night, respectively ($p < 0.05$) (LOE 1).

Johnson *et al.* performed an RCT of 3,047 men with LUTS suggestive of BPE who were assigned to receive doxazosin alone, finasteride alone, combination therapy, or placebo.¹³ At four year follow-up, rates of self-reported nightly nocturia episodes were reduced in the doxazosin and combination groups as compared to placebo ($p < 0.05$) (LOE 1). In a separate study, Johnson *et al.* performed a secondary analysis of data from the VA Cooperative Study Program Trial.¹⁴ In that trial, 1,229 men with BPH aged 45 to 80 years were assigned to treatment with terazosin, finasteride, a combination, or placebo. Terazosin and combination therapy were the most effective, though the advantage of terazosin over placebo was only 0.3 voids/night (LOE 1).

Chapple *et al.* randomized 955 men with LUTS to receive silodosin, tamsulosin, or placebo for 12 weeks.¹⁵ Only silodosin significantly reduced nocturia vs. placebo, but

the absolute value of the difference in the study population was modest (-0.9 vs. -0.7 voids/night, $p=0.0013$) (LOE 1).

Conclusions

The ICUD committee considered that the majority of studies were undertaken in the context of men with LUTS and presumed BPE, and assessment employed the IPSS, which has limitations in respect of evaluation of nocturia. Evaluation of secondary outcome measures could introduce Type I errors (false-positive relationships).

Alfuzosin, doxazosin, naftopidil, silodosin, tamsulosin and terazosin are more effective than placebo at reducing number of nocturia episodes in patients with BPE (LOE 1), but the extent of reduction was small in the overall study populations. Administering an alternative alpha adrenergic antagonist may achieve improvement if nocturia fails to improve sufficiently with the first drug tried (LOE 3). Studies comparing efficacy between agents need to take into account dose equivalence and population studied. Improving nocturia is an important factor for improving overall quality of life.⁴

Recommendations

The ICUD committee considered that alpha adrenergic antagonists may be offered to men with nocturia in association with LUTS and BPE (GOR A). In the event of insufficient response to an alpha adrenergic antagonist, another may be offered (GOR C).⁴

3. Combination Therapy

5-alpha reductase inhibitor + selective alpha-1 adrenergic antagonist

Johnson *et al.* performed an RCT of 3,047 men with LUTS suggestive of BPE who were randomly assigned to receive doxazosin, finasteride, combination therapy, or placebo.¹³ At four year follow-up, rates of self-reported nightly nocturia episodes were reduced in the doxazosin and combination groups as compared to placebo ($p < 0.05$), as described previously (LOE 1).

Anti-muscarinic + alpha-1 adrenergic antagonist

Kaplan *et al.* studied the efficacy of tolterodine extended release (ER), tamsulosin, or both, as compared to placebo for the treatment of men with both BPE and OAB.¹⁶ For the 879 men enrolled in this randomized study, only those who received combination therapy experienced a significant reduction in voids/night (-0.59 vs -0.39 episodes per night, $p = 0.02$) (LOE 1b).

Alpha-1 adrenergic antagonist + PDE5 inhibitor

Kaplan *et al.* conducted an RCT of 62 men with LUTS suggestive of BPE who also had erectile dysfunction (ED).¹⁷ Patients were randomized to receive alfuzosin, sildenafil, or both for 12 weeks. Patients treated with the combination experienced the greatest improvement in IPSS score (-24%), compared with -16% for alfuzosin alone and 12% for sildenafil alone. Nocturia as measured by voiding diary was significantly improved by both the combination and alfuzosin alone (LOE 3).

Conclusions

The ICUD committee considered that alpha adrenergic antagonists can be used in conjunction with 5-alpha reductase inhibitors. Combination therapy may be more effective than either drug used separately (LOE 1). A combination of an anti-muscarinic and an alpha-1 adrenergic blocker significantly reduces the number of nocturnal micturitions over placebo (LOE 1). A combination of an anti-muscarinic and an alpha-1 adrenergic blocker can improve urgency, frequency and nocturia severity compared with alpha-1 adrenergic blockade alone (LOE 3). Alpha-1 adrenergic blockers may be more effective at improving nocturia when given with a PDE5 inhibitor (LOE 3).⁴ However, many of these studies were not originally designed with nocturia improvement as a primary endpoint. Because these results thus represent secondary analysis, the resulting conclusions are somewhat weakened.

Recommendations

The ICUD committee considered that alpha adrenergic antagonists in conjunction with 5-alpha reductase inhibitors may be offered to men with nocturia in association with LUTS and BPE (GOR A). Alpha adrenergic antagonists in conjunction with anti-muscarinic drugs may be offered to men with nocturia in association with storage LUTS (GOR A). Alpha adrenergic antagonists in conjunction with PDE5 inhibitors may be offered to men with nocturia (GOR C).⁴

4. Anti-cholinergic/Anti-muscarinic

Wyndaele *et al.* studied the effects of flexible-dose fesoterodine (no placebo control) in 516 men with OAB.¹⁸ By the end of the 12 week study period, patients experienced a

31% decrease in nightly voids from 2.6 to 1.8 voids/night (LOE 3). Rackley *et al.* conducted an RCT of 850 patients assigned to receive tolterodine ER or placebo 4 hours before bed.¹⁹ Although tolterodine ER was effective in reducing OAB-related and severe OAB-related nocturnal micturitions (30% and 59% reduction respectively) vs. placebo (22% and 43%), it was not effective for non-OAB micturitions. Chapple *et al.* studied the effects of treatment with fesoterodine, tolterodine, or placebo in 1,135 patients with OAB.²⁰ After 12 weeks of treatment, the median decrease in nocturnal micturitions was 23-29%, with no difference between treatment groups and placebo (LOE 1).

Zinner *et al.* reported the results of a 12 week multicenter study in which 523 patients with OAB were randomized to receive trospium chloride or placebo.²¹ After 12 weeks of treatment, patients in the treatment group reported a reduction of 0.47 voids/night, versus 0.29 voids/night for placebo ($p < 0.05$) (LOE 1).

Conclusions

The ICUD committee considered that anti-muscarinic drugs can significantly reduce the number of nocturnal micturitions versus placebo (LOE 1). Anti-muscarinic drugs are more effective than placebo at reducing OAB-related, but not non-OAB nocturnal micturitions (LOE 1). Anti-muscarinic drugs are not effective for reducing nocturia in nocturnal polyuria (LOE 1).⁴

Recommendations

The ICUD committee considered that anti-muscarinic drugs can be offered to men with OAB-related and severe OAB-related nocturnal micturitions with suitable counseling in regard to potential adverse effects (GOR A). Anti-muscarinic drugs should not be offered to men with nocturnal polyuria and no urinary urgency symptoms (GOR B).⁴

5. Antidiuretic Pharmacotherapy

In a systematic review of 13 trials of desmopressin for the treatment of nocturia, Zong *et al.* reported that desmopressin effectively extends the duration of the first sleep period.²² Sleep quality improved and nocturnal voids also decreased (LOE1).

Van Kerrebroeck *et al.* reported the results of the Noctopus trials, a set of 3 short-term RCTs of desmopressin for the treatment of nocturia²³. At 12-month follow-up, among over 1,000 patients, 67% experienced a significant reduction in nocturnal voids versus placebo (LOE 1).

Weiss *et al.* conducted a 4-week RCT of 757 patients with nocturia who were randomized to receive various doses of desmopressin oral disintegrating tablet (ODT) or placebo.²⁴ Significant reductions in nocturnal voids were seen with the 50 and 100 microgram doses ($p < 0.05$). Transient, clinically significant hyponatremia ($\text{Na} < 125 \text{mmol/L}$) occurred in 7 patients over the age of 65 years (LOE 1).

Conclusions and Recommendations

The ICUD committee considered that desmopressin can decrease the frequency of nocturnal voids and decrease nocturnal diuresis (LOE 1). However, many of the evaluated studies employed a dose titration phase, which may represent a source of bias.²⁵ Clinically significant hyponatremia (serum Na<125mmol/L) is a rare but serious event; patients over the age of 65 are at greater risk (LOE 1). Desmopressin can be prescribed to decrease nocturnal diuresis and night-time frequency in men (GOR A). Due to the risk of hyponatremia, serum sodium testing is essential when starting desmopressin to exclude low sodium levels, particularly in patients over the age of 65 (GOR A).⁴

6. Diuretic Pharmacotherapy

Reynard *et al.* conducted an RCT of 49 men with nocturnal polyuria (NP) who were randomized to receive furosemide or placebo 6 hours before sleep.²⁶ Patients in the treatment group experienced a decrease of 0.5 voids/night, versus 0 voids/night for placebo, suggesting that men with NP may benefit from timed diuretic therapy (LOE 2).

Pederson *et al.* reported the results of an RCT of 28 patients with nocturia ≥ 2 voids/night who received late-afternoon bumetanide or placebo.²⁷ A decrease of 4 nightly voids/week was seen in the treatment group only after excluding the 10 patients with BPH (LOE 3).

Conclusions

The ICUD committee considered that men with nocturnal polyuria may benefit from diuretic therapy with furosemide 6 hours prior to sleep (LOE 2) (GOR B). Bumetanide may reduce number of nocturnal micturitions, but is not beneficial in men with BPE (LOE 3) (GOR C).⁴

7. Botulinum Toxin

In a study by Chapple et al., intravesical injection of onabotulinum-A achieved a reduction in Nocturia (LOE 2); the study population was predominantly female, and data were not given separately for men.²⁸ In a pilot study of 10 patients, Hamidi Madani *et al.* utilized intraprostatic botulinum toxin in men with LUTS suggestive of BPE who had failed medical therapy and were poor surgical candidates.²⁹ Nocturia decreased from 4.1 voids/night pre-injection to 2.4 voids/night post-injection ($p < 0.001$) (LOE3).

Conclusions and Recommendations

The ICUD committee considered that botulinum toxin can reduce the number of nocturnal micturitions in patients who fail oral medical therapy and who are not surgical candidates (LOE 3), and therefore can be offered as a treatment option in this group of patients. Due counseling related to unlicensed use, very limited evidence base and potential need for self-catheterization is mandatory (GOR C).⁴ More evidence is needed before botulinum toxin for therapy of nocturia can be recommended in other contexts (GOR C).

8. Non-steroidal Anti-inflammatory Agents (NSAIDs)

Shin *et al.* sought to evaluate the effect of NSAIDs on nocturia by assigning 40 patients to therapy with either loxoprofen + alpha-blocker + 5-alpha reductase inhibitor (5-ARI) vs. alpha-blocker + 5-ARI.³⁰ At 3-month follow-up, the treatment group which received additional NSAID experienced a greater reduction in nocturia (-1.5 ± 0.9 vs -1.1 ± 0.9 ; $p=0.034$). However, at 6 and 12-month follow-up, that group also reported an increased incidence of gastrointestinal side-effects (LOE 3).

Falahatkar *et al.* performed an RCT of 80 men with nocturia with BPE who were assigned to treatment with celecoxib or placebo.³¹ At 1-month follow-up, men in the celecoxib group reported a decrease in nocturnal frequency from 5.17 to 2.5 voids/night ($p<0.001$), as compared to no statistically significant decrease in the placebo group (LOE 3).

Conclusions and Recommendations

The ICUD committee considered that loxoprofen sodium may reduce nocturia for up to three months, but should not be continued long-term because of potential adverse effects (LOE 3). Celecoxib may reduce nocturia in men with BPE (LOE 3). More evidence is needed before NSAID therapy can be recommended for therapy of nocturia (GOR C).⁴

Surgical Interventions for Benign Prostatic Enlargement

Van Dijk *et al.* retrospectively analyzed 1,258 men who had undergone various treatments for LUTS suggestive of BPE, including watchful waiting, alpha-blockers,

transurethral resection of prostate (TURP), and transurethral needle ablation (TUNA).³² After 6-12 months of follow-up, the various modalities improved nocturia by 7%, 17%, 75%, and 32%, respectively (LOE 3).

Schatzl *et al.* prospectively studied a cohort of 95 men with BPE who were non-randomized to treatment with TURP, TUNA, high-intensity focused ultrasound (HIFU), visual laser ablation (VLAP), or transurethral electro-surgical vaporization (TUVP).³³ All modalities other than VLAP resulted in significant reductions in nocturia frequency (LOE 3).

Simaioridis *et al.* randomized 66 men with LUTS suggestive of BPE to receive TURP or tamsulosin.³⁴ At 3-month and 1-year follow-up, TURP was more effective than tamsulosin in reducing the number of nocturnal awakenings, IPSS, ICIQ-N, and ICIQ-NQoL scores (LOE 2).

Conclusions

The ICUD committee considered that bladder outlet obstruction reducing procedures using various modalities of intervention can reduce the number of nocturnal micturitions (LOE 3). TURP is more effective than tamsulosin for treatment of BPE-related nocturia (LOE 3).⁴

Recommendations

The ICUD committee considered that bladder outlet obstruction reducing procedures may improve nocturia in some patients with voiding LUTS and BOO who fail medical therapy, and who are good surgical candidates (GOR C). Surgery for relief of BOO is not indicated for management of patients whose primary complaint is nocturia (GOR C). Comprehensive evaluation of the cause(s) of nocturia is essential before contemplating a surgical approach (GOR C). Patients must be warned of potential non-response of nocturia and of risks associated with surgery (GOR C).⁴

Phytotherapy

In a Cochrane review of 30 RCTs of saw palmetto extract for the treatment of nocturia, Tacklind *et al.* found no significant difference between saw palmetto and placebo (LOE 1).³⁵ Barry *et al.* conducted an RCT of 369 men with nocturia who were treated with saw palmetto or placebo.³⁶ No difference in nocturia outcomes was seen at 24 or 48-week follow-up (LOE 2).

Wilt *et al.* reported the results of a Cochrane review of 18 RCTs of *Pygeum africanum* for the treatment of men with nocturia.³⁷ Although *Pygeum africanum* was not directly compared to drug therapy, it did appear to reduce nocturia versus placebo by 19% (LOE 1). Wilt *et al.* also reviewed the literature on Cernilton, a rye-grass pollen derivative, which has been used to treat nocturia.³⁸ Treatment with Cernilton appeared to relieve nocturia more effectively than did placebo and other phytotherapy-based active-controls (LOE 1).

Conclusions and Recommendations

The ICUD committee considered that *Serenoa repens* (saw palmetto) does not reduce the number of nocturnal micturitions compared to placebo (LOE 1). *Pygeum africanum* (African plum tree) and *Cernilton* (rye pollen) reduce the number of nocturnal micturitions when compared to placebo (LOE 1). *Serenoa repens* should not be prescribed for treatment of nocturia (GOR A). *Pygeum africanum* and *Cernilton* can be offered as an option for treating nocturia (GOR A).⁴

Agents to Promote Sleep

Kaye described personal experience with oxazepam for the self-treatment of nocturia.³⁹ Nocturia severity was reduced by 63%, but nocturnal urine volume was unchanged (LOE 3). Takami *et al.* conducted a cross-sectional study of 123 patients assigned to triazolam, nitrazepam, or control groups for the treatment of nocturia.⁴⁰ The primary influence of therapy appeared to entail improving return to sleep after each episode, for which nitrazepam was most effective (LOE 3).

Drake *et al.* reported the results of an RCT of 20 men with BOO and nocturia who were assigned to treatment with bedtime melatonin or placebo.⁴¹ Melatonin and placebo caused a decrease in nocturia of 0.32 and 0.05 episodes per night, respectively ($p=0.07$). In this study, the presence of a sub-group of “responder” patients was identified.

Conclusions and Recommendations

The ICUD committee considered that hypnotics do not appear to influence nocturia directly, but may be used to aid return to sleep (LOE3, GOR C). Potential adverse effects of hypnotics should be considered. Melatonin may reduce number of nocturnal voids (LOE 2, GOR C).⁴

CONCLUSIONS

The complex nature of nocturia has led to a significant proliferation in clinical studies that explore its epidemiology, pathophysiology, assessment, and treatment. In an attempt to grade these studies in a standardized way, the ICUD-SIU Consultation on LUTS recently assigned LOEs and GORs to the most influential research in this field. This Consultation's recommendations provide contemporaneous expert consensus on this topic and offer practical recommendations for urologists who are faced with nocturia in everyday practice.

FIGURE AND TABLE LEGENDS

Figure 1: *Summary diagram for assessment of male nocturia patients based on potential mechanisms.*

Table 1: *Representative studies demonstrating common risk factors for nocturia.*

Table 2: *ICUD-SIU recommendations regarding the clinical assessment of nocturia.*

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