Nocturia
Nocturia

Causes, Consequences and Clinical Approaches
Dedications to
Nocturia: Causes, Consequences
and Clinical Approaches

This book is dedicated to our families, patients, and residents who have inspired us to practice and teach medicine while advancing its knowledge.

We would also like to dedicate this textbook to Dr. Jens Peter Norgaard, who, with utmost academic integrity for the past two decades, has championed a most fruitful collaboration between academia and industry in advancement of the study of Nocturia.
Nocturia has been variously described as a symptom, a condition, a symptom complex, and a syndrome. A case can be made for any of these descriptions. By the simplest of criteria, nocturia is a symptom, defined below. However, a thorough understanding of the many medical and surgical conditions that may contribute to the genesis of nocturia in individual patients leads to the conclusion that diagnosis and treatment of this symptom are a gateway to high-quality medical care in the broadest sense. Physicians intent upon unlocking the many contributing factors to nocturia will find themselves learning amazing things about their patients, which most often rise well past the level of the lower urinary tract to include problems with cardiac, pulmonary, renal, endocrine, and nervous systems. It may well be that there is not another solitary symptom, the study of which ties together so much fascinating pathophysiology. It is for this reason that the editors devote an entire textbook to recording the state of the art in evaluating and managing this common and vexing medical complaint.

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Chapter 1
Introduction

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Keywords  Introduction • Nocturia • Nocturnal urine volume (NUV) • Nocturnal polyuria • Global polyuria • Mixed nocturia • Sleep Deprivation

Definition of Nocturia

Nocturia is defined by the International Continence Society as waking during the night at least once to urinate. It has additionally been suggested that a nocturia-related void is preceded and followed by sleep [1]. Whether sleep must follow a nocturia-related void is not entirely clear. Thus, for example, if someone arises an hour earlier than planned with the urge to void but could not return to sleep, nocturia seems evident but would not be considered as such if one rigidly adheres to the notion that a nocturia-related void must be followed by sleep. In the same sense, nocturnal voiding with failure to return to sleep leading to a second void which is then followed by sleep may cause confusion in designation of nocturia severity. Voiding during hours of sleep resulting from awakening for reasons other than the urge to void is not considered nocturia, although from a practical standpoint it is difficult to keep track of “convenience voids” at night as opposed to true nocturia-related voids. Thus, most studies of nocturia in the literature from a practical standpoint include voiding for all reasons during sleep hours.

There are several scientific questions associated with this definition. For example, how should sleep time be defined? Sleep time varies by individual but on average it is 8 h a night [2]. This definition can affect evaluation of nocturia as the number of nocturnal voids depends partly on how many hours an individual actually sleeps. Another question concerns whether the patient is awakened by the need to void or...
the patient voids after being awakened for other reasons. Although most patients in one study with nocturia were awakened by the need to void, the rest were awakened by thirst, uncomfortable temperature, noises, worry, pain or other stimuli [3]. Further, since at least 16% of the population is composed of shift workers who sleep during daylight, “nocturia” may in fact normally occur during the day [4].

**Diary-Based Classification of Nocturia**

Evaluation of nocturia begins with a focused history and physical examination with regard to aspects such as sleep quality, urinary complaints, fluid intake, cardiac problems, type and timing of various medications, prior lower urinary tract surgery and other comorbidities that might account for excessive nocturnal urine output, detrusor overactivity or abnormal bladder sensory function. A key tool in the evaluation and diagnosis of nocturia is the Frequency Volume Chart (FVC), in which patients record the volume and timing of daytime and nighttime voids for 1–3 days. The voiding patterns revealed by FVC data can provide clinicians with invaluable guidance regarding etiology and treatment. The use of FVCs is additionally recommended because of demonstrated discrepancies between nocturnal voiding data obtained using FVCs and data obtained from subjective questionnaires such as the International Prostate Symptom Score [5]. Based upon analysis of the 24 h FVC, the patient may be categorized as having any of the following: (1) nocturnal polyuria (NP); (2) low nocturnal bladder capacity despite normal global bladder capacity; (3) diminished global bladder capacity; (4) mixed (a combination of NP and low global or nocturnal bladder capacity) and (5) global (24 h) polyuria. Each category is associated with a differential of several medical conditions which may be investigated further and treated as part or all of the conditions associated with nocturia (see Table 1.1). Unfortunately, despite appropriate evaluation, in many patients clearly identifiable remediable conditions are not found, in which case nocturia may be idiopathic and would require a therapeutic approach on an empiric basis.

Nocturnal urine volume (NUV) is the volume of urine voided throughout the night, and includes the first morning void since this void is excreted by the kidneys during the hours of sleep. However, the first morning void is considered a normal diurnal voiding episode and should not be included with the tally of actual nightly voids. Maximum voided volume (MVV) is defined as the largest volume of urine voided throughout the 24-h period. The Nocturia index (Ni) is calculated by dividing NUV by MVV [6]. When the Ni is greater than 1 the NUV exceeds the bladder maximal storage capacity and nocturia occurs (enuresis may also occur if the patient does not awaken).

*Nocturnal polyuria.* NP is an increased production of urine at night which is offset by lowered daytime urine production such that 24-h urine volume remains within normal limits [7]. The nocturnal polyuria index (NPI) is defined as NUV divided by the 24-h urine volume. Normally, urine is produced in an age-dependent circadian pattern. In young people (age <25 years) mean NPI = 0.14 compared to that of older