REVIEW ARTICLE

Sleep Disorders & Treatment

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Abstract: Sleep disorders are a common complaint in the primary care setting and have important medical and social consequences. Diagnosis can usually be made through history and physical. Polysomnography is useful for the diagnosis of obstructive sleep apnea and limb movement disorders. Insomnia is the most common sleep disorder and numerous treatment options are available. Non-pharmacologic treatment of insomnia is the preferred first line treatment. Circadian rhythm sleep disorders are a shift in the normal timing of a 24 hour sleep wake cycle and standard treatment include melatonin and bright light therapy. Obstructive sleep apnea is characterized by repeated episodes of apnea and should be diagnosed by in home or in lab sleep study. Standard treatment is with CPAP or an oral appliance. Sleep behavior disorders can be classified as occurring during REM sleep or non REM sleep. Treatments depend on the disorder, but supportive care such as a safe sleep environment are crucial. Daytime sleepiness disorders include narcolepsy and idiopathic hypersomnia, both are treated with stimulants to increase wakefulness. Sleep movement disorders include restless leg syndrome and periodic limb movement disorder. RLS is associated with low ferritin and can be readily treated with iron or other specific medications. Sleep bruxism is best treated with a dental device to protect the teeth from damage.

INTRODUCTION

Sleep disorders are conditions that disrupt the normal quality and pattern of sleep for patients and are very common in the general population. Using a good history, physical exam and selected diagnostic testing, sleep disorders can also be well managed by the family physician. Sleep disorders account for a significant number of outpatient visits, with any sleep disturbance accounting for over 12.1 million visits in 2010 according to NHANES 1999-2010.[1] Similarly visits related to sleep apnea and sleep related breathing disorders rose 400% in the same survey, accounting for 5.8 million visits. The direct and indirect costs associated with sleep disorders are substantial, with the direct costs of the treatment but the majority of costs related to work absenteeism and lower productivity.[2-3] Health impacts of sleep disorders are well documented with numerous associations effecting every organ system. A growing body of research points to inadequate sleep implicated in the risk of diabetes, coronary artery disease, hypertension and weight gain.[4-7] Inadequate sleep is also associated with decreased alertness, memory impairment, and occupational injury and is implicated in a significant proportion of motor vehicle accidents.[8-12] Currently medical education is being transformed by new research on the effects of sleep deprivation on alertness leading to reduced work hours for medical residents, with the resultant educational outcomes yet to be evaluated.[13-15] In all, sleep disorders and sleep deprivation pose a significant social and medical burden. For the purpose of this review, sleep disorders will be categorized into six areas, insomnia, circadian rhythm disorders, sleep related breathing disorders, sleep movement disorders, sleep behavior disorders and daytime sleepiness disorders.

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HISTORY & PHYSICAL EXAMINATION

As with any disorder, evaluation starts with a good history and physical examination. The importance of a reliable history regarding sleep can often lead to accurate diagnosis without excessive diagnostic testing. The American Academy of Sleep Medicine joint consensus statement on sleep duration, recommends that the average adult should get between 7-9 hours of sleep per night.[16] Ideally this would be continuous uninterrupted sleep, although the historical record would indicate that uninterrupted sleep at night is a relatively new phenomenon and that sleep at night need not be continuous to be considered adequate.[17,18] Sleep duration less than 6 hours is associated with several deleterious health effects, and interestingly, sleep duration of more than 9 hours has similar, but less clear association with poor health outcomes.[6,7] The clinician should ask about duration, quality and pattern of sleep. History from the patient can be augmented with information from the bed partner, as this can also provide important clues regarding sleep.[19] Care should be taken to differentiate primary sleep disorders and sleep complaints secondary to another disorder. For instance, diagnostic criteria for several psychiatric illnesses including Attention Deficit Hyperactivity Disorder (ADHD), anxiety, depression, and bipolar disorder include sleep disturbance as part of the criteria but these would obviously be incorrectly categorized as a sleep disorder and should be treated with appropriate modalities. Sleep disturbance is also comorbid with several chronic health conditions such as Chronic Obstructive Pulmonary Disease (COPD), Alzheimer's dementia, asthma, fibromyalgia, and other chronic

pain syndromes. Medications, including supplements, should be reviewed in any patient complaining of sleep disorder. Alcohol, food, and caffeine consumption, including chocolate, should also be reviewed. Some key historical features suggestive of a specific diagnosis include cataplexy with narcolepsy, limb movements after falling asleep in sleep movement disorders and limb movement preventing sleep initiation in restless leg syndrome. One of the more useful tools in the history in evaluating sleep disorders is a patient completed sleep diary. This diary should also include activities and behaviors just before bedtime as well, such as exercise and smartphone, tablet, laptop or television "screen time." While sleep diaries are useful, patients typically over-report sleep duration when compared to objective measures.[20] Multiple night wrist actigraphy can provide objective measures of sleep duration and has been well validated to correlate with actual sleep duration.[21,22] Diagnosis of sleep disorders can often be made by history alone, but in some cases diagnostic testing is indicated. Testing strategies include in home polysomnography or full formal polysomnography in a sleep lab. Most patients do not require advanced testing, but it should be considered if sleep apnea or a sleep movement disorder is suspected, or if the interventions for a sleep disorder fail. In home sleep studies have been shown to accurately diagnose obstructive sleep apnea but cannot differentiate between central and obstructive sleep apnea.[23-25] The multiple sleep latency test is needed for the diagnosis of narcolepsy, and is useful for monitoring response to treatment. Physical exam is typically benign in most sleep disorders, but care should be taken to assess for craniofacial abnormalities, tonsillar hypertrophy and neck circumference. Clinicians can consider an easy screen for sleep disorders by adding the question "Have you had any difficulty with sleep in the past week" to the review of systems in a regular office visit.

INSOMNIA

Insomnia is the most common sleep disorder. Between 6-10% of the population meets diagnostic criteria for insomnia and up to one third of the population report at least some symptom of insomnia at any given time.[26] There are two main diagnostic rubrics for the diagnosis of insomnia that can be used, either from the Diagnostic and Statistical Manual edition 5 (DSM-5) published by the American Psychiatric Association or from the International Classification of Sleep Disorders version 2 (ICSD-2) published by the American Academy of Sleep Medicine (AASM).[27,28] Both are accurate in the diagnosis of insomnia, with the ICSD-2 further subdividing insomnia into 12 further specific insomnia disorders. The diagnostic criteria for both are presented in Table 1. Clinicians should feel free to use either scheme as they both are able to support a primary diagnosis of insomnia remembering that the diagnosis rests mainly in the clinical interview. The duration of insomnia is important as the symptoms often wax and wane, and the most common form of insomnia is a secondary insomnia triggered by acute psychosocial distress. Sleep diaries, including peri-bedtime behaviors provide valuable information but should be used in conjunction with clinical interview as the patient with insomnia often over-estimates the time needed to fall asleep and underestimates the total time spent sleeping.[29] History should also include the timing of insomnia, difficulty with initiation of sleep, waking in the middle of the night or waking too early.[30] Interesting clues can be discovered if the patient is asked about their perception of the cause of insomnia, the subjective amount of sleep a patient feels is necessary as well as if the patient is taking daytime naps.

Numerous treatment modalities exist and while numerous pharmacologic agents exist, medications should be considered among the final options for management. Polling suggests that 4 out of 10 patients with chronic insomnia self-medicate with either over the counter sleep aids, usually anti-histamines, or alcohol.[31] Several effective non-pharmacologic approaches are available all easily

TABLE 1:

Diagnostic criteria for insomnia

DSM 5 diagnostic criteria for insomnia	ICSD diagnostic criteria for insomnia
A. Predominant complaint of dissatisfaction in sleep quantity of quality, with one or more of the following 1. Difficulty initiating sleep 2. Difficulty maintain sleep 3. Early morning awakening	A. A complaint of difficulty initiating sleep, maintaining sleep, waking up too early of chronically non-restorative or poor quality sleep
B. The sleep disturbance causes impairment in important areas of function (social, work , school, behavior)	B. The sleep difficulty occurs despite the adequate opportunity an circumstances for sleep
C. Occurs at least 3 night a week	C. At least one of the following daytime impairment 1. Fatigue of malaise 2. Attention, concentration or memory impairment 3. Poor social, vocational or school performance 4. Mood disturbance or irritability 5. Daytime sleepiness 6. Motivation, energy or initiative reduction 7. Proneness to errors at work or driving 8. Tension, headaches or GI symptoms in response to sleep loss 9. Concerns or worries about sleep
D. The difficulty is present for at least 3 months	
E. Occurs despite the adequate opportunity for sleep	
F. The insomnia is not better explained by another sleep disorder	
G. The insomnia is not due to the effects of a substance	
H. Co-morbid medical or psychiatric disorders do not adequately explain the insomnia	

Adapted from DSM 5 and ICSD-2, [27,28]

discussed by the Family Physician in the office setting. The first step is to address sleep hygiene, the actual environment in which the patient sleeps and pre bedtime behaviors. Nicotine, large meals, caffeine, vigorous exercise, and alcohol should be avoided for several hours before bedtime. The bedroom should be cool, dark, well ventilated and the bed should be comfortable. Reading, watching television and computers, basic stimulus control, should be avoided while in the bedroom. While sleep hygiene is important, evidence suggest that sleep hygiene recommendations alone are not effective in the treatment of insomnia.[32] Sleep restriction therapy has been shown to increase total time spent sleeping and decreasing sleep latency. In general sleep restriction therapy involves going to bed about 15 minutes before adequate time for sleep and gradually increasing this time to a full night.[33] Naps are avoided and a routine wake time is established as well. One study noted that simply reducing the total time spent in bed increased the amount of sleep, a very simple intervention.[34] Cognitive Behavioral Therapy (CBT) is another treatment known to be effective and should be considered first line therapy after sleep hygiene, but is use is limited in practice by the need for trained therapists to administer this modality. CBT involves a combination of sleep restriction, stimulus control, and cognitive measures to challenge the patient perceptions of insomnia. Cognitive therapy can involve writing worries about sleep in a journal, writing distressing thoughts to help clear the patients mind prior to bed and discussion of thought patterns that hinder sleep. CBT has been shown to be effective for long term treatment in as little as two sessions.[35] Self-help programs and online resources are also available at relatively low cost and given the efficacy of CBT should be dispensed as often as medications.

Several pharmacologic agents are available for insomnia each with relative advantages and disadvantages (*Table 2*). As the ideal pharmacologic agent with a short half-life, no risk of dependence, and no next day sedation that works for both sleep initiation and maintenance does not exist, clinicians should weigh benefits of the choice of pharmacologic therapy for each patient. In general, medications can be divided into three categories, benzodiazepines, non-benzodiazepines, and other agents. Benzodiazepine sleep agent use is limited by tolerance and dependence, and their use has been supplanted by the non-benzodiazepines, the so-called "z-drugs" such as zolpidem, eszopiclone, and zaleplon. Other agents include medications that are FDA approved for insomnia and work outside of the benzodiazepine receptor model. Some physicians may choose to prescribe trazodone or mirtazapine for sleep, but there is little evidence to suggest these work for sleep outside of insomnia associated with depression.[36] While sedating, anti-psychotic agents should be avoided as sleep aids given the significant potential for adverse effects.[37] There is significant debate on the long term nightly use of sleep aid medications. Agents should be used as sparingly as possible and for the shortest time needed. Zolpidem has been used nightly for up to one year without dose escalation or rebound insomnia, but about one third of patients gradually discontinued use of benzodiazepine sleep agents reverted back to nightly use by two years.[38,39]

CIRCADIAN RHYTHM DISORDERS

Circadian rhythm sleep disorders are caused by a misalignment of the natural internal clock of the human body and the 24-hour external environment. The human body has a natural sleep-wake cycle determined by a complex interaction of the central circadian pacemaker located in the suprachiasmatic nucleus, endogenous melatonin production, and core body temperature as well as external cues such as light/dark cycles. Studies have demonstrated that the internal circadian clock in the absence of external cues is about 24.2 hours.[40] Several circadian sleep disorders are recognized, including advanced or delayed sleep phase disorders, shift worker disorder and jet lag syndrome. Diagnosis for all is usually made by history and a sleep diary, but actigraphy can provide objective information on sleep wake cycles.

As the names imply, advanced or delayed sleep phase syndromes are the timing of sleep onset outside of socially accepted norms. Patients with advanced sleep phase difficulties will generally report an involuntary and significant urge to fall asleep from 6-9 PM, while delayed sleep phase syndrome patients will report an inability to fall asleep until 2-6 AM. Care should be taken to differentiate behavioral references for different bedtimes and sleep phase disorders. Patients with sleep phase disorders will have increasing difficulty adhering to societal conventions as time passes. Objective information with 7 nights of actigraphy or of a shift in core body temperature nadir, which is naturally lowest in the morning after a full night sleep, can aid in diagnosis. The therapy of choice for sleep phase disorders are chronotherapy, bright light therapy and melatonin. Chronotherapy is the delay of sleep by 3 hours every 2 days in delayed sleep phase, and the advancement of sleep by 3 hours every 2 days until the desired bedtime if reached. This technique requires significant time and strict adherence.[41] Timed bright light for 2 hours, either in the morning from 7-9 for delayed sleep phase, or in the evening from 7-9 in advanced sleep phase. Melatonin, up to 3mg, given 5 hours before the desired bedtime in delayed sleep phase syndrome also appears effective, although most recommendations are based on expert opinion given a paucity of controlled trials.[41]

Shift work disorder is the result of having to sleep during nonstandard hours. Estimates are that 20% of the workforce in industrialized countries work nonstandard hours and of those patients up to 10% have shift work disorder.[41] Patients usually complain of non-refreshing sleep and excessive sleepiness that varied with work schedule. Treatment options include bright light exposure during the night, morning melatonin before sleep and adherence to sleep hygiene measures. Bright light and melatonin are used to help reset the circadian clock. Workers with rapidly varying schedules should likely not try to change circadian clock with bright light or melatonin. Stimulants such as caffeine, 200-400 mg at the start of a shift, or prescription modafinil 200 mg at the start of the shift. Modafinil is FDA approved for shift work disorder, but caution is advised as the stimulants improve sleepiness, but do not appear to improve alertness.[41]

Jet lag is the rapid desynchronization of an established circadian rhythm to a new rhythm, made possible by modern air travel. Symptoms are directly related to the number of time zones traversed and the main symptoms are insomnia and daytime sleepiness. Treatment usually lasts only for 3-4 days, with melatonin administered between 10-12 pm at the destination preceded by 3 nights of melatonin around 6 PM prior to leaving.[42] Eastward travelers can be advised to avoid bright light in the morning and seek bright light in the evening and westward travelers can be advised to seek the opposite.

TABLE 2:

Medications for insomnia

Name	Cost/Generic Available	Half Life (Hours)	Controlled Substance / FDA Approved	Other Considerations
Nonbenzodiazepine				
Zaleplon (Sonata)	$15 - $30 / Yes	1	Yes / Yes	Ultra-short duration of action, rapid onset
Zolpidem (Ambien)	$6 - $12 / Yes	2 - 3	Yes / Yes	Controlled release formulas available, risk of abnormal sleep behaviors, max dose different for men and women
Eszopiclone (Lunesta)	$20 - $70 / Yes	6	Yes / Yes	1mg starting dose as 3mg can cause excess sedation for over 11 hours, unpleasant aftertaste
Benzodiazepine				
Triazolam (Halcion)	$9 - $30 / Yes	1.5 - 5.5	Yes / Yes	Rapid onset, risk of complex sleep related behaviors, aggression, caution when used with opiate analgesics
Temazapam (Restoril)	$8 - $12 / Yes	8.8	Yes / Yes	Intermediate onset, caution if used with opiate analgesics
Melatonin Receptor Agonist				
Ramelteon (Rozerem)	$300 - $350 / No	2 - 5	No / Yes	Can worsen depression, suicidal ideation
Orexin Receptor Agonist				
Suvorexant (Belsomra)	$290 - $300 / No	12	Yes / Yes	Long half-life can lead to next day sedation, give with caution to patients with respiratory problems, rarely associated with cataplexy
Antidepressants				
Doxepin (Silenor)	$330 - $340 / No	15	No / Yes	Generic 10mg Doxepin is generic and much less costly. Anticholinergic side effects, next day somnolence
Mirtazapine (Remeron)	$4 - $12 / Yes	20 - 40	No / No	Edema, increased hunger, weight gain, suicidality in patients under 24 with depression
Trazodone	$4 - $12 / Yes	3 - 6	No / No	Anticholinergic side effects, sexual dysfunction, next day somnolence suicidality in patients under 24 with depression
Antihistamines				
Doxylamine	$4 - $12 / Yes	10	No / Yes	Available over the counter, CNS depression, tolerance can develop quickly
Diphenhydramine	$4 - $12 / Yes	3 - 9	No / Yes	Available over the counter, CNS depression, tolerance can develop quickly

Prices from GoodRx.com, the best available price for 30 day supply, with coupon if freely available, reflecting prices in the authors' hometown and the nearest 2 metropolitan areas.

SLEEP RELATED BREATHING DISORDERS

Obstructive sleep apnea (OSA) has long been recognized, likely first characterized as Pickwickian syndrome in the 19th century, but with the advent of effective treatment obstructive sleep apnea has become an important target for detection and management. OSA is caused by lack of airflow through the upper airway, with several risk factors, including craniofacial abnormalities, narrow upper airway, tonsillar hypertrophy or laxity in the musculature of the upper airway leading to collapse during breathing. The classic symptoms of OSA include snoring, daytime hypersomnia and larger body habitus, but other symptoms such as morning headaches, nocturia and erectile dysfunction can also be symptomatic of OSA.[43] Nocturnal gasping or choking are the most reliable indicators of OSA.[44] Untreated OSA has important clinical consequences such as difficult to control hypertension, cardiac arrhythmias and congestive heart failure.[43]

Several screening tools have been developed for us in primary care to help identify patients at risk for obstructive sleep apnea, with the STOP-Bang and Berlin questionnaire as the most sensitive tool for finding patients with moderate to severe OSA.[45] There is not a recommendation for the primary care physician to screen for sleep apnea in the general population from primary care professional societies. Diagnosis of sleep apnea requires a sleep study, either in home or in a sleep lab. Traditionally, full in lab polysomnography was thought to be required for diagnosis but in home testing has been shown to be as effective in identifying patients with OSA, regardless of pretest probability.[46,47] Sleep testing looks for episodes of stopping breathing of shallow breathing, with or without hypoxia. These episodes are translated into the apnea-hypopnea index, the AHI, essentially the number of times per hour a patient has a significant respiratory disturbance. OSA does not have a universally accepted definition, but the AASM defines mild OSA as an AHI of 5-15, moderate as 15-30 and severe as 30 or more, and daytime sleepiness must be present.[48]

Treatment of OSA usually involves continuous positive airway pressure (CPAP) devices. CPAP provides constant upper airway support, alleviating the collapse the upper airway. Several other airway support devices such as bi-level positive airway pressure (BiPAP), adaptive servovntilation (SV) and volume assured pressure support (VAPS) are also available, but are limited to very specific clinical situations. Adherence to CPAP is notoriously poor but educational and behavioral interventions have been shown to increase adherence.[49] Oral appliances can be used for sleep apnea, but are more appropriate for mild OSA or for patients intolerant of CPAP. One study demonstrated that oral appliances were as effective as CPAP, but the study conclusions are limited by short duration, one month, and low adherence rate to CPAP.[50] Oral appliances do not appear to improve daytime sleepiness symptoms but do decrease snoring, the clinical significance of which is not clear.[51] Surgical resection of the upper airway to improve patency has limited outcomes at this time and should only be considered as a last resort for treatment of OSA.

SLEEP BEHAVIOR DISORDER

Commonly known as parasomnias, sleep behavior disorders involve complex movement and behaviors during sleep. Patients may seem to move or behave with purpose in a goal directed fashion, but by definition of the disorder, the patient is asleep. Diagnosis is usually clinical, based on history alone but overnight video polysomnography can be obtained is the diagnosis is not clear. Collateral informants are key to the history and a validated questionnaire, The Mayo Sleep Behavior Questionnaire, is also available to aid in diagnosis.[52] Sleep behavior disorder can be very distressing for both the patient and bed partner and have some of the most unusual symptoms of all of the sleep disorders. In describing sleep behavior disorders, it is useful to categorize the disorder as occurring during REM sleep or not during REM sleep. REM sleep is the phase of sleep when dreams occur and is accompanied by muscle paralysis.

Common non-REM sleep disorders include, sleep walking, sleep talking, and sleep terrors. While these are very different events, they do share some common clinical features. Patients do not remember the events, have minimal cognitive function and often appear awake, patients may even have their eyes open during the events.[53] Sleep terrors should not be confused with a nightmare, as the patient is not having a dream, as they are not in REM sleep. Patients in a sleep terror can sound extremely distressed, but bed partners should be assured that the episode is not harmful. A specific sub-type of sleepwalking includes sleep related eating disorder, when patients will have amnestic episodes of eating during sleep.[54] The underlying etiology of these events are not clear but they do seem to be related to acute psychosocial stress. Treatment is rarely needed, usually education about the transient and benign nature of the events. Medications that are associated with the events include serotonin modifying antidepressants and short acting hypnotics and should be stopped if clinically warranted. Paradoxically, sleep related eating disorder first line treatment includes selective serotonin reuptake inhibitors (SSRIs), while topiramate is a reasonable second option.[55] If the events do become more common, a safe sleep environment should be ensured.

REM associated sleep behavior disorders include nightmare disorder and REM sleep behavior disorder. Nightmare disorder sounds as if it should be similar to sleep terror, but there are several important distinguishing features. Nightmare disorder usually involves intense and vivid dreams that the patient will remember. Patients will move very little during a nightmare and will behave relatively normally upon wakening, whereas sleep terrors can involve intense movements and patients are typically very confused upon wakening. Treatment is usually supportive if needed. If a patient is particularly active, violent or are enacting very complex activities, REM sleep behavior disorder (RBD) should be considered as an alternate diagnosis. RBD usually corresponds to the dream state of patients, typically a dream that involves the patient being attacked, or the patient being placed in an unpleasant situation, although this presumption is still under debate.[56,57] RBD occurs because of pathological loss of the normal muscle paralysis with REM sleep. Assault of bed partners or expletive laden vocalizations can occur. RBD tends to respond very well to either melatonin or clonazepam.[58] Patients and bed partners should seek to maximize safety, such as removing sharp objects, firearms etc. RBD is associated with neurodegenerative diseases such as Parkinson's disease and Lewy body dementia.[59] RBD may precede the onset of these conditions by decades but if the disorder presents in younger patients, medication side effects are more often the etiology.

DAYTIME SLEEPINESS DISORDERS

Narcolepsy and idiopathic hypersomnia are the most common disorders falling under this term. Both involve excessive daytime sleepiness with the cardinal distinguishing feature of narcolepsy being cataplexy, sudden loss of muscle tone triggered by emotions.[60,61] Loss of muscle tone can be very subtle, such as a head bob or loss of jaw tone, or can be very profound such as general loss of tone resulting in collapse, the "sleep attack." Both require daytime sleepiness, but patients with idiopathic hypersomnia typically do not find daytime naps to be refreshing. The Epworth Sleepiness Scale, presented in Table 3, can help identify patients with significant daytime sleepiness and correlates well with sleep latency, the time needed to fall asleep, as measured on a multiple sleep latency test. The diagnosis of narcolepsy typically includes an overnight sleep study followed by a multiple sleep latency test, to prove the markedly reduced time needed to fall asleep. Narcolepsy diagnosis can also be made clinically based on daytime sleepiness with cataplexy. A decrease in CSF hypocretin level in the presence of daytime sleepiness and cataplexy is diagnostic of narcolepsy and can be considered in lieu of a multiple sleep latency test.[62]

Treatment of narcolepsy and idiopathic hyper somnolence is very similar, typically consisting of stimulants. Modafinil, 200-400 mg daily, reduces daytime somnolence and has the FDA indication for narcolepsy.[63] Other stimulants such as methylphenidate and amphetamines are tempting to use but sympathomimetic side effects tend to limit use, and should be considered second line treatment. Armodafinil is a long acting isomer of modafinil and has similar effects, but does not carry the FDA indication for narcolepsy and evidence is lacking regarding superiority. Cataplexy associated with narcolepsy traditionally was treated with either fluoxetine or clomipramine, but there is no evidence of efficacy of this treatment.[64] Cataplexy can be treated with sodium oxybate with a goal dose of 6-9 grams per night.[65] Titration to goal dose can take several weeks and optimal response usually takes 8-12 weeks.

SLEEP MOVEMENT DISORDER

Common sleep movement disorders include restless leg syndrome (RLS), Periodic Limb Movement Disorder (PLMD) and sleep bruxism. While RLS and PLMD sound very similar it should be noted that they are in fact distinct diagnoses. Likely more common than previously appreciated, these disorders are an important cause of poor sleep for patients and bed partners.

RLS, recently also referred to as Willis Ekbom disease, has certainly grown in public awareness as a neurological disorder. Though unpleasant and uncomfortable, it is often not "painful." Typically, symptoms are distal to the knee and deep, not in the skin, but can also involve arms. Common descriptive terms patients may offer in the history include feelings of crawling, creeping, pulling, itching, burning, twitching, aching and restlessness.[66,67] The diagnosis of RLS/WED can usually be made on clinical grounds, while the polysomnograph may be useful with the periodic limb movement assessment. Diagnostic criteria are the urge to move the legs, usually accompanied by the unpleasant sensations and the urge or sensations begin or worsen during periods of inactivity, such as lying, sitting, or going to bed. The patient experiences partial or total relief by movement or activity, such as walking or stretching for the duration of the activity and the symptoms are worse in the evening or night than during the day or that they occur only at night. RLS/WED is idiopathic or primary in most patients; but comorbid associations, especially with iron deficiencies, RLS/WED may be the initial presentation of an iron deficiency. Checking a serum ferritin level is often useful, with a target ferritin level of greater than 50 ng/mL.[68] The exact pathophysiology of RLS is not understood, but given the responses to iron supplementation and dopaminergic medications the role of central nervous system stores of iron and dopamine seems central. Targeting dopaminergic pathways, commonly used agents to date have included short acting dopamine antagonists dosed typically much lower than the indication of Parkinson Disease. Targeting dopaminergic pathways, commonly used agents to date have included short acting dopamine agonists dosed typically much lower than the indication of Parkinson Disease (PD).[69] The downside of the dopaminergic agents include normal

TABLE 3:

Epworth Sleepiness Scale

How likely are you to fall asleep or doze off in the following situations?

0 = No chance of dozing 1 = Slight chance of dozing 2 = Moderate chance 3 = High chance of dozing

- Sitting and reading
- Watching TV
- Sitting inactive in a public place (theater, meeting)
- As a passenger in a car for an hour without a break
- Lying down to rest in the afternoon when circumstances permit
- Sitting and talking to someone
- Sitting quietly after lunch without alcohol
- In a car, while stopped for a few minutes in traffic

TOTAL SCORE INTERPRETATION

0 - 7: Unlikely abnormally sleepy

8 - 9: Average amount of daytime sleepiness

10 - 15: May be excessively sleepy depending on the situation, consider medical advice

16 - 24: Excessively sleepy, consider medical attention

Adapted from Johns MW. A new method for measuring daytime sleepiness: The Epworth Sleepiness Scale. Sleep 1991; 14(6):540-5.

dopamine agonist side effects and the phenomenon of augmentation, in which symptoms tend to migrate to become more severe during the day.[70] These include cardilopa-levodopa, pramipexole and ropinerole with similar typical titration approaches up to a maximum for the RLS/WED indication. GABA analogs gabapentin and pregabalin have been used with success and in some studies a lower augmentation rate than the Parkinsonian agents.[71,72] Exercise has been shown to decrease symptoms and abstinence from caffeine, nicotine, alcohol and antihistamines should be considered.[73]

PLMD is repetitive, highly stereotypical movements during sleep that is associated with many sleep and neurological disorders including RLS, OSA, REM sleep behavior disorder, narcolepsy, and PD.[74] The relationship with symptoms such as insomnia and daytime somnolence is inconsistent and therefore controversial. PLMD is diagnosed based on history and observation of limb movements during a sleep study. One should take the view PLMD may accompany another disorder but assignment of a diagnosis of PLMD should be reserved for when unaccompanied by another disorder and the limb movements themselves are suspected to be the causation of excessive sleepiness or insomnia. PLMD is thought to be a distinct and mutually exclusive diagnosis from RLS/WED. Many patients with RLS have PLMD but the converse is not necessarily true. Management of such has rather limited data and most approaches are indeed derived from managing the related disorders, for example, the GABA analogues and dopaminergic agonist agents all seem to affect a reduction in the periodic limb movement index, similar to RLS.[75] For PLMD without RLS symptoms treatment should focus on the primary disorder with independent treatment of PLMD rarely needed.

Sleep bruxism is teeth grinding and rhythmic masticatory muscle activity (RMMA) occurring during sleep, keeping in mind that up to 60% of normal adults demonstrate RMMA without teeth grinding. Risk factors include obstructive sleep apnea syndrome and other sleep breathing disorders, loud snoring, moderate daytime sleepiness, heavy alcohol use, caffeine consumption, smokers, anxiety and being subjected to a highly stressful life.[76] Complications and consequences include destruction of tooth structure, periodontal and other dental problems, damage to the TMJ, myofascial pain, muscle contracture and other muscular problems.[77] There are significant implications for iatrogenic emergence of RLS and bruxism with the use of SSRIs and venlafaxine intended to treat any combination of anxiety, depression and insomnia. Dental splinting device is a common non-pharmacological approach to arrest progression of dental and periodontal complications and should be considered the first line therapy. Referral to dentistry should be sought early in the disease for fitting of an oral appliance. Mandibular advancement devices decrease bruxing but device discomfort is the greatest barrier to consistent use and occlusal devices protect the teeth from further damage but do not decrease bruxing.[78,79] Pharmacologic interventions are second line therapy, effective agents including clonidine and clonazepam, with therapy considered only when pain affects quality of life or in patients at risk for significant tooth damage.[78,80] Other medications such as levodopa, propranolol, amitriptyline and bromocriptine have been shown to be ineffective and should be avoided.[78]

CONCLUSION

Sleep disorders are a common complaint that will be encountered by the family physician. Management can easily be initiated based on history and physical exam. Full polysomnography is not needed for all sleep complaints. Patient centered therapy and education are critical for long term successful treatment.

REFERENCES:

1. Ford ES, Wheaton AG, Cunningham TJ, Giles WH, Chapman DP, Croft JB. Trends in outpatient visits for insomnia, sleep apnea, and prescriptions for sleep medications among US adults: findings from the National Ambulatory Medical Care survey 1999-2010. Sleep. 2014;37(8):1283-93
2. Wickwire EM, Shaya FT, Scharf SM. Health economics of insomnia treatments: The return on investment for a good night's sleep. Sleep Med Rev. 2015;30:72-82.
3. Daley M, Morin CM, Leblanc M, Grégoire JP, Savard J. The economic burden of insomnia: direct and indirect costs for individuals with insomnia syndrome, insomnia symptoms, and good sleepers. Sleep. 2009;32(1):55-64.
4. Kohatsu ND, Tsai R, Young T, et al. Sleep duration and body mass index in a rural population. Arch Intern Med. 2006;166(16):1701-5.
5. Knutson KL, Ryden AM, Mander BA, Van cauter E. Role of sleep duration and quality in the risk and severity of type 2 diabetes mellitus. Arch Intern Med. 2006;166(16):1768-74.
6. Gottlieb DJ, Punjabi NM, Newman AB, et al. Association of sleep time with diabetes mellitus and impaired glucose tolerance. Arch Intern Med. 2005;165(8):863-7.
7. King CR, Knutson KL, Rathouz PJ, Sidney S, Liu K, Lauderdale DS. Short sleep duration and incident coronary artery calcification. JAMA. 2008;300(24):2859-66.
8. Vijayan VK. Morbidities associated with obstructive sleep apnea. Expert Rev Respir Med. 2012;6(5):557-66.
9. Pace-schott EF, Spencer RM. Sleep-dependent memory consolidation in healthy aging and mild cognitive impairment. Curr Top Behav Neurosci. 2015;25:307-30.
10. Uehli K, Mehta AJ, Miedinger D, et al. Sleep problems and work injuries: a systematic review and meta-analysis. Sleep Med Rev. 2014;18(1):61-73.
11. Malik SW, Kaplan J. Sleep deprivation. Prim Care. 2005;32(2):475-90.
12. Horne J, Reyner L. Vehicle accidents related to sleep: a review. Occup Environ Med. 1999;56(5):289-94.
13. Sanches I, Teixeira F, Dos santos JM, Ferreira AJ. Effects of Acute Sleep Deprivation Resulting from Night Shift Work on Young Doctors. Acta Med Port. 2015;28(4):457-62.
14. Maltese F, Adda M, Bablon A, et al. Night shift decreases cognitive performance of ICU physicians. Intensive Care Med. 2016;42(3):393-400.
15. Mansukhani MP, Kolla BP, Surani S, Varon J, Ramar K. Sleep deprivation in resident physicians, work hour limitations, and related outcomes: a systematic review of the literature. Postgrad Med. 2012;124(4):241-9.
16. Watson NF, Badr MS, Belenky G, et al. Recommended Amount of Sleep for a Healthy Adult: A Joint Consensus Statement of the American Academy of Sleep Medicine and Sleep Research Society. J Clin Sleep Med. 2015;11(6):591-2.
17. Yetish G, Kaplan H, Gurven M, et al. Natural Sleep and Its Seasonal Variations in Three Pre-industrial Societies. Curr Biol. 2015;25(21):2862-8.

18. Wehr TA. In short photoperiods, human sleep is biphasic. J Sleep Res. 1992;1(2):103-107.
19. Fenton ME, Heathcote K, Bryce R, et al. The utility of the elbow sign in the diagnosis of OSA. Chest. 2014;145(3):518-24.
20. Lauderdale DS, Knutson KL, Yan LL, Liu K, Rathouz PJ. Self-reported and measured sleep duration: how similar are they?. Epidemiology. 2008;19(6):838-45.
21. Matuzaki L, Santos-silva R, Marqueze EC, De castro moreno CR, Tufik S, Bittencourt L. Temporal sleep patterns in adults using actigraph. Sleep Sci. 2014;7(3):152-7.
22. Morgenthaler T, Alessi C, Friedman L, et al. Practice parameters for the use of actigraphy in the assessment of sleep and sleep disorders: an update for 2007. Sleep. 2007;30(4):519-29.
23. Aurora RN, Putcha N, Swartz R, Punjabi NM. Agreement Between Results of Home Sleep Testing for Obstructive Sleep Apnea with and Without a Sleep Specialist. Am J Med. 2016;
24. El shayeb M, Topfer LA, Stafinski T, Pawluk L, Menon D. Diagnostic accuracy of level 3 portable sleep tests versus level 1 polysomnography for sleep-disordered breathing: a systematic review and meta-analysis. CMAJ. 2014;186(1):E25-51.
25. Guerrero A, Embid C, Isetta V, et al. Management of sleep apnea without high pretest probability or with comorbidities by three nights of portable sleep monitoring. Sleep. 2014;37(8):1363-73.
26. Hamblin JE. Insomnia: an ignored health problem. Prim Care. 2007;34(3):659-74, viii.
27. Medicine AAS, American Academy of Sleep Medicine, American Academy of Sleep Medicine. The international classification of sleep disorders diagnostic and coding manual ; (ICSD). 2nd ed. United States: American Academy of Sleep Medicine; December 31, 2001.
28. American Psychiatric Association (Corporate Author). Diagnostic and Statistical Manual of Mental Disorders, Dsm-5. American Psychiatric Publishing, Incorporated; 2013.
29. Harvey AG, Tang NK. (Mis)perception of sleep in insomnia: a puzzle and a resolution. Psychol Bull. 2012;138(1):77-101.
30. Winkelman JW. CLINICAL PRACTICE. Insomnia Disorder. N Engl J Med. 2015;373(15):1437-44.
31. National Sleep Foundation. Sleep in America Poll. 2002. Washington, DC. National Sleep Foundation
32. Morgenthaler T, Kramer M, Alessi C, et al. Practice parameters for the psychological and behavioral treatment of insomnia: an update. An american academy of sleep medicine report. Sleep. 2006;29(11):1415-9.
33. Lande RG, Gragnani C. Nonpharmacologic approaches to the management of insomnia. J Am Osteopath Assoc. 2010;110(12):695-701.
34. Falloon K, Elley CR, Fernando A, Lee AC, Arroll B. Simplified sleep restriction for insomnia in general practice: a randomised controlled trial. Br J Gen Pract. 2015;65(637):e508-15.
35. Edinger JD, Sampson WS. A primary care "friendly" cognitive behavioral insomnia therapy. Sleep. 2003;26(2):177-82.
36. Becker PM. Pharmacologic and nonpharmacologic treatments of insomnia. Neurol Clin. 2005;23(4):1149-63.
37. Anderson SL, Vande griend JP. Quetiapine for insomnia: A review of the literature. Am J Health Syst Pharm. 2014;71(5):394-402.
38. Macfarlane J, Morin CM, Montplaisir J. Hypnotics in insomnia: the experience of zolpidem. Clin Ther. 2014;36(11):1676-701.
39. Morin CM, Bélanger L, Bastien C, Vallières A. Long-term outcome after discontinuation of benzodiazepines for insomnia: a survival analysis of relapse. Behav Res Ther. 2005;43(1):1-14.
40. Bjorvatn B, Pallesen S. A practical approach to circadian rhythm sleep disorders. Sleep Med Rev. 2009;13(1):47-60.
41. Barion A, Zee PC. A clinical approach to circadian rhythm sleep disorders. Sleep Med. 2007;8(6):566-77.
42. Zisapel N. Circadian rhythm sleep disorders: pathophysiology and potential approaches to management. CNS Drugs. 2001;15(4):311-28.
43. Stansbury RC, Strollo PJ. Clinical manifestations of sleep apnea. J Thorac Dis. 2015;7(9):E298-310.
44. Myers KA, Mrkobrada M, Simel DL. Does this patient have obstructive sleep apnea?: The Rational Clinical Examination systematic review. JAMA. 2013;310(7):731-41.
45. Miller JN, Berger AM. Screening and assessment for obstructive sleep apnea in primary care. Sleep Med Rev. 2015;29:41-51.
46. Aurora RN, Putcha N, Swartz R, Punjabi NM. Agreement Between Results of Home Sleep Testing for Obstructive Sleep Apnea with and Without a Sleep Specialist. Am J Med. 2016; 2016 Mar 8. pii: S0002-9343(16)30203-0. doi: 10.1016/j.amjmed.2016.02.015. [Epub ahead of print]
47. Guerrero A, Embid C, Isetta V, et al. Management of sleep apnea without high pretest probability or with comorbidities by three nights of portable sleep monitoring. Sleep. 2014;37(8):1363-73.
48. Epstein LJ, Kristo D, Strollo PJ, et al. Clinical guideline for the evaluation, management and long-term care of obstructive sleep apnea in adults. J Clin Sleep Med. 2009;5(3):263-76
49. Wozniak DR, Lasserson TJ, Smith I. Educational, supportive and behavioural interventions to improve usage of continuous positive airway pressure machines in adults with obstructive sleep apnoea. Cochrane Database Syst Rev. 2014;1:CD007736.
50. Phillips CL, Grunstein RR, Darendeliler MA, et al. Health outcomes of continuous positive airway pressure versus oral appliance treatment for obstructive sleep apnea: a randomized controlled trial. Am J Respir Crit Care Med. 2013;187(8):879-87.
51. Marklund M, Carlberg B, Forsgren L, Olsson T, Stenlund H, Franklin KA. Oral Appliance Therapy in Patients With Daytime Sleepiness and Snoring or Mild to Moderate Sleep Apnea: A Randomized Clinical Trial. JAMA Intern Med. 2015;175(8):1278-85.
52. Available at: http://www.mayoclinic.org/documents/msq-copyrightfinal-pdf/DOC-20079462. Accessed April 5, 2016.
53. Fleetham JA, Fleming JA. Parasomnias. CMAJ. 2014;186(8):E273-80.
54. Inoue Y. Sleep-related eating disorder and its associated conditions. Psychiatry Clin Neurosci. 2015;69(6):309-20.
55. Chiaro G, Caletti MT, Provini F. Treatment of sleep-related eating disorder. Curr Treat Options Neurol. 2015;17(8):361.
56. Fernández-arcos A, Iranzo A, Serradell M, Gaig C, Santamaria J. The Clinical Phenotype of Idiopathic Rapid Eye Movement Sleep Behavior Disorder at Presentation: A Study in 203 Consecutive Patients. Sleep. 2016;39(1):121-32.
57. D'agostino A, Manni R, Limosani I, Terzaghi M, Cavallotti S, Scarone S. Challenging the myth of REM sleep behavior disorder: no evidence of heightened aggressiveness in dreams. Sleep Med. 2012;13(6):714-9.
58. Aurora RN, Zak RS, Maganti RK, et al. Best practice guide for the treatment of REM sleep behavior disorder (RBD). J Clin Sleep Med. 2010;6(1):85-95.
59. Howell MJ, Schenck CH. Rapid Eye Movement Sleep Behavior Disorder and Neurodegenerative Disease. JAMA Neurol. 2015;72(6):707-12.
60. Billiard M, Sonka K. Idiopathic hypersomnia. Sleep Med Rev. 2015;29:23-33.
61. Scammell TE. Narcolepsy. N Engl J Med. 2015;373(27):2654-62.

62. Mignot E, Lammers GJ, Ripley B, et al. The role of cerebrospinal fluid hypocretin measurement in the diagnosis of narcolepsy and other hypersomnias. Arch Neurol. 2002;59(10):1553-62.

63. Golicki D, Bala MM, Niewada M, Wierzbicka A. Modafinil for narcolepsy: systematic review and meta-analysis. Med Sci Monit. 2010;16(8):RA177-86.

64. Vignatelli L, D'alessandro R, Candelise L. Antidepressant drugs for narcolepsy. Cochrane Database Syst Rev. 2008;(1):CD003724.

65. Swick TJ. Treatment paradigms for cataplexy in narcolepsy: past, present, and future. Nat Sci Sleep. 2015;7:159-69.

66. Phillips B, Hening W, Britz P, Mannino D. Prevalence and correlates of restless legs syndrome: results from the 2005 National Sleep Foundation Poll. Chest. 2006;129(1):76-80.

67. Allen RP, Picchietti D, Hening WA, et al. Restless legs syndrome: diagnostic criteria, special considerations, and epidemiology. A report from the restless legs syndrome diagnosis and epidemiology workshop at the National Institutes of Health. Sleep Med. 2003;4(2):101-19.

68. Sun ER, Chen CA, Ho G, Earley CJ, Allen RP. Iron and the restless legs syndrome. Sleep. 1998;21(4):371-7.

69. Zintzaras E, Kitsios GD, Papathanasiou AA, et al. Randomized trials of dopamine agonists in restless legs syndrome: a systematic review, quality assessment, and meta-analysis. Clin Ther. 2010;32(2):221-37.

70. Scholz H, Trenkwalder C, Kohnen R, Riemann D, Kriston L, Hornyak M. Levodopa for restless legs syndrome. Cochrane Database Syst Rev. 2011;(2):CD005504.

71. Garcia-borreguero D, Larrosa O, De la llave Y, Verger K, Masramon X, Hernandez G. Treatment of restless legs syndrome with gabapentin: a double-blind, cross-over study. Neurology. 2002;59(10):1573-9.

72. Allen RP, Chen C, Garcia-borreguero D, et al. Comparison of pregabalin with pramipexole for restless legs syndrome. N Engl J Med. 2014;370(7):621-31.

73. Aukerman MM, Aukerman D, Bayard M, Tudiver F, Thorp L, Bailey B. Exercise and restless legs syndrome: a randomized controlled trial. J Am Board Fam Med. 2006;19(5):487-93.

74. Berry RB, Brooks R, Gamaldo CE, et al. The AASM manual for the scoring of sleep and associated events: rules, terminology and technical specifications, version 2.0, American Academy of Sleep Medicine, Darien, IL 2012.

75. Aurora RN, Kristo DA, Bista SR, et al. The treatment of restless legs syndrome and periodic limb movement disorder in adults--an update for 2012: practice parameters with an evidence-based systematic review and meta-analyses: an American Academy of Sleep Medicine Clinical Practice Guideline. Sleep. 2012;35(8):1039-62.

76. Ohayon MM, Li KK, Guilleminault C. Risk factors for sleep bruxism in the general population. Chest. 2001;119(1):53-61.

77. Dao TT, Lund JP, Lavigne GJ. Comparison of pain and quality of life in bruxers and patients with myofascial pain of the masticatory muscles. J Orofac Pain. 1994;8(4):350-6.

78. Huynh NT, Rompré PH, Montplaisir JY, Manzini C, Okura K, Lavigne GJ. Comparison of various treatments for sleep bruxism using determinants of number needed to treat and effect size. Int J Prosthodont. 2006;19(5):435-41.

79. Macedo CR, Silva AB, Machado MA, Saconato H, Prado GF. Occlusal splints for treating sleep bruxism (tooth grinding). Cochrane Database Syst Rev. 2007;(4):CD005514.

80. Huynh NT, Lavigne GJ. Clonidine reduces sleep bruxism activity in a double-blind randomized crossover trial: preliminary findings. J Sleep Res 2004;13 (Suppl 1):1 (Abstract).