Sleep and Health—A Lifestyle Medicine Approach

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INTRODUCTION

Sleep is vital for health and healing, yet it may not be getting the attention it deserves as a requirement for physical as well as mental and emotional health. Insufficient or disordered sleep is associated with serious disease, morbidity, and mortality.[1] Moreover, poor sleep has presented challenges to public health and safety. It is also the foundation upon which other lifestyle therapies, such as diet and exercise, are improved. It is very difficult for patients to adhere to a healthy diet and exercise when fatigued and not afforded mental clarity.[2]

The perspective of sleep as preventive medicine is furthered by appreciating its 2-way impact: Poor sleep increases the risk of disease and illness, as well as the converse, disease and illness disrupt sleep. This often creates a vicious cycle in which the cumulative effect is deepened morbidity and mortality.[3] Modern medicine has developed treatments with a focus on pharmacology and interventions that have been helpful. Yet, for the family physician, the burden and the growth of sleep challenges will require reframing with a focus on prevention.

RISKS ASSOCIATED WITH POOR SLEEP

Sleep disorders negatively impact both short- and long-term health. The more immediate effects reduce a sense of well-being and performance.[4] Moreover, excessive daytime sleepiness is commonly experienced, although not always recognized and/or connected to poor sleep. Accumulated effects of disordered sleep include premature mortality, cardiovascular disease, hypertension, obesity, metabolic syndrome, diabetes and impaired glucose tolerance, immunosuppression, inflammation, cancer, cognitive impairment, and psychiatric disorders such as anxiety and depression.[5]

SLEEP AND OBESITY

Today, we are witnessing 2 epidemics: increasing obesity and increasing sleep disorders.[6,7] Obesity is reaching overwhelming proportions throughout the developed world and is attributed largely to industrialization, increased food consumption, and lower levels of physical activity.[7,8] The role of sleep in obesity is becoming increasingly understood. Sleep deprivation and disorders have been hypothesized to contribute toward obesity by decreasing leptin, increasing ghrelin, and compromising insulin sensitivity.[9] There is a negative relationship between sleep duration and central adiposity. This has been recognized as a significant risk factor in the pathophysiology of obstructive sleep apnea in adults. Furthermore, obstructive sleep apnea is associated with increased body mass index.[10]

SLEEP AND HEART DISEASE

Atherosclerotic cardiovascular disease (ASCVD) is one of the most prevalent diseases in industrial nations. Even with an improved ability to diagnose and treat ASCVD, the disease and its consequences are important contributors to morbidity and mortality. Therefore, it is necessary to go beyond the management of traditional ASCVD risk factors and seek other factors and comorbidities that might contribute to its development and progression.[11]

SLEEP AND DIABETES

The increasing prevalence of type 2 diabetes (T2D) can be attributed to dramatic lifestyle changes in response to the industrialization of modern society that may not be limited to changes in diet and physical activity.[12] As with cardiovascular disease, one such factor strongly associated with the

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development and progression of T2D is sleep. Population studies have observed a U-shaped relationship between sleep duration and T2D risk; those who self-report habitually sleeping less than 7 hours or more than 8 hours are at increased risk.[13] Decreased insulin sensitivity due to short sleep duration is observed among patients and in laboratory studies.[14-23] Furthermore, when sleep time is extended in short sleepers, insulin sensitivity improves.[24]

SLEEP AND IMMUNITY/INFLAMMATION

Poor immune status and increased inflammation are also associated with poor quantity or quality of sleep. There are no clear studies indicating whether inflammation causes poor sleep or the reverse. However, the combination of poor immune status and increased inflammation puts patients at risk for poor sleep and poor health. It is appropriate for the immune system to be turned on in the setting of infection or illness, but inflammation may be observed when the immune system is triggered. It is increasingly appreciated that lifestyle practices, especially poor sleep, directly impact both inflammation and immunocompetence.[25-27]

As vaccinations have been a cornerstone of preventive medicine, it is important to draw the connections between sleep and vaccinations. Sleep promotes antiviral immunity by supporting the adaptive immune response,[28] with evidence that experimental and naturalistic sleep loss is associated with poorer immunologic memory after a vaccination.[29-31] For example, one may not achieve the full benefit of the hepatitis B series as well as the hepatitis A and influenza vaccinations if followed by less than 6 hours of overnight sleep.

SLEEP AND SAFETY

Sleep problems are associated with accidents and human errors.[32] Insomnia and poor sleep are major contributors to unintentional fatal injuries in general as well as in fatal motor vehicle injuries.[33] Traffic accidents and injuries among shift workers are also more likely to occur during nighttime hours. This surges around 2:00 to 3:00 AM, when there is the greatest tendency toward sleep with the circadian rhythm.[34]

BENEFITS OF HEALTHY SLEEP

The casual view of sleep as simply a dormant and passive unconsciousness with the suspension of normal bodily activities shifted as neurology laid the foundation for understanding sleep using electroencephalography (EEG). The brain is very active during sleep, in which vital restoration of the mind and body occurs with each night's rest. Sleep affects our daily functioning and is essential to our physical, mental, and emotional health. William Shakespeare so insightfully and aptly described sleep as "nature's soft nurse." Quality sleep improves learning, memory, and mood and enhances motivation for other lifestyle-enhancing behaviors, such as exercise and healthy food choices.[35-38]

AMOUNT OF SLEEP NEEDED

The simple response to the question of "how much sleep do I need?" is the sleep time that permits a person to be wide awake, alert, and energetic throughout the day without the aid of stimulants such as coffee. The vast amount of the adult population requires about 8 hours of sleep.

The National Sleep Foundation Scientific Advisory Council has recommended sleep ranges for all age groups (see **TABLE 1**).[39]

Optimal sleep for an individual varies from person to person and during their lifetime. Moreover, some adults do not fit into the guidelines for optimal sleep. Requiring more than 9 hours of sleep (being a "long sleeper") or needing less than 6 hours (being a "short sleeper") does not reflexively diagnose an individual with a sleep disorder. There are genetic predispositions that allow people to be outside of the recommended sleep parameters and have normal and healthy daytime functioning. Approximately 5% to 10% of the adult population are "long sleepers," and about 5% function well as "short sleepers."[39]

ASSESSING SLEEP CHALLENGES

Although more than half of primary care patients may experience insomnia, only about one-third report this problem to their physicians. With only 5% of people seeking treatment,[40,41] the vast majority of people with insomnia remain untreated.[42] Given the fast pace of primary care visits and the time needed to understand underlying etiology, it is not surprising that two-thirds of patients with insomnia report a poor understanding of treatment options, and many turn to alcohol (28%) or untested over-the-counter remedies (23%).[40]

Asking patients about daytime fatigue is likely to elicit reports of sleep problems. In addition to daytime fatigue, the presenting problems may include anxiety, depression, loss of libido, hypertension, lack of concentration, concerns about possible attention-deficit/hyperactivity disorder, weight gain, relationship problems, and concerns about memory loss. Before initiating pharmacologic and/or behavioral treatment, it is important to rule out a few common and often overlooked etiologies for poor sleep. These include (1) circadian rhythm disorders, (2) eating habits, and (3) poor sleep hygiene.

A brief interview is often sufficient to assess for circadian rhythm disorders. When asking the patient, "Do you consider yourself a night owl?" or "If you did not have early morning

responsibilities, when would you prefer to go to sleep?" you are listening for those who prefer early bedtimes or those who prefer to go to bed at midnight or later. It is the mismatch between the body's preferred bedtime and scheduling demands that is causing the sleep problem.

Eating patterns and food choices influence overall health as well as sleep health. Individuals consuming an excessive number of calories report short sleep time and quality.[43] Concentrated carbohydrates such as sugars, just like caffeine, act as stimulants on the body, influencing a wide range of neurotransmitter shifting that makes the ability to fall asleep and stay asleep more difficult.[44] Individual variance in food tolerance, such as spicy foods and dairy, also impacts the ability to physically be soothed to be able to sleep. Large meals eaten close to bedtime typically disrupt sleep onset and/or sleep quality. As discussed earlier, poor sleep creates the hormonal and neurochemical basis for food cravings. Again, we see the vicious cycle of poor sleep leading to both overconsumption and poor food choices, limiting restorative sleep.

Sleep hygiene issues such as depriving oneself of sleep to enjoy nighttime activities and the use of electronics late into the night can create sleep difficulties that patients may be willing to modify.

TREATMENT OF INSOMNIA

The paradigm of therapy starts with etiology: comorbid insomnia due to another sleep disorder or a medical disorder that requires treatment of the underlying process or the more common psychophysiologic insomnia requiring cognitive and behavioral approaches. Cognitive behavioral therapy for insomnia (CBT-I), which is a well-established, evidence-based, and efficacious treatment for insomnia,[45-48] is commonly prescribed for depression. However, clinical trials have shown it is the most effective long-term solution for those with insomnia.[49] Patients already on a prescribed sleep aid can be tapered off the drug and started on CBT-I concurrently.

The positive effects of CBT-I on sleep quality are robust over time.[50,51] CBT-I has been found to be 70%–80% efficacious in populations with a variety of comorbid medical conditions,[52] including comorbid insomnia,[53] comorbid psychiatric conditions,[54] and chronic pain.[55-58]

CBT-I helps identify the negative attitudes and beliefs that hinder sleep and replaces them with positive thoughts, effectively "unlearning" the negative beliefs.[59] The behavioral aspect of CBT-I focuses on helpful sleep habits and avoiding unhelpful sleep behaviors. Behavioral techniques—CBT-I over a period of 6-8 weekly sessions for most adults in either individualized- or group-based administration of CBT-I—have been shown to be effective,[52,60,64] yet these techniques are greatly underutilized in comparison to pharmacologic approaches. There is an app called CBT-I Coach that is both evidence-based and available at no cost.[65] More recently, digital cognitive behavioral therapy for insomnia was shown to promote later health resilience during the coronavirus pandemic.[65]

TABLE 1. **Recommended sleep duration by age group[39]**

Age group	Sleep hours per day
Newborns (0-3 months)	14-17
Infants (4-11 months)	12-15
Toddlers (1-2 years)	11-14
Preschoolers (3-5 years)	10-13
School-age children (6-13 years)	9-11
Teenagers (14-17)	8-10
Younger adults (18-25)	7-9
Adults (26-64)	7-9
Older adults (≥65)	7-8

LIFESTYLE AS TREATMENT

The important impact of lifestyle behaviors on sleep must be appreciated. Supporting the patient's connection to their environment, healthy nutrition, exercise, and stress management provides opportunities for better health and sleep.

The impact of the environment on sleep health is highlighted by the effect of the diurnal light and darkness cycle on sleep quality and duration. Light is the strongest synchronizing agent for the circadian system. Moreover, it is the strongest external cue to stimulate the reticular activating system in the brain and alertness. A proposed mechanism includes the suppression of endogenous melatonin. Blood levels of the pineal hormone melatonin are high at night and low during the day.[66] A cornerstone of healthy sleep is routine, as well as regular patterns. The modern era, with digital screens and 24-hour expectations, has challenged our physiology to promote sleep. As melatonin production is inherently reduced from adolescence to adulthood, this begins to explain why some individuals benefit from supplementation of melatonin to induce and promote sleep. For this to be effective, partnership and buy-in from the patient are essential given the commitment needed. Furthermore, the family physician may wish to collaborate with a sleep medicine specialist, given the complexity of dosing and timing.

In recent years, many nutritional supplements have been used to benefit sleep wellness. However, the relationship between nutritional components and sleep is complicated. Nutritional factors vary dramatically with different

diet patterns and depend significantly on the digestive and metabolic functions of each individual. Moreover, nutrition can significantly affect the hormones and inflammation status that directly or indirectly contribute to insomnia. With the rise of personalized medicine and personalized nutrition, there has been a growing body of research and clinical experience on individualizing nutritional factors, carbohydrates, lipids, amino acids, and vitamins to promote sleep and reduce sleep disorders.[67] Simply put, nutrition and dietetics are important opportunities for better sleep health.

The National Sleep Foundation's 2013 Sleep in America poll highlighted the association between exercise and better sleep.[68] It is thought that a physically active daytime uses adenosine triphosphate resources such that the cleaving of the phosphate bonds results in a higher amount of adenosine by bedtime. Adenosine promotes sleep induction and deep sleep stages. Exercisers, compared with nonexercisers, are more likely to report restorative sleep. Poor sleep makes us less likely to exercise, which in turn leads to relative difficulty falling asleep or falling back asleep in the middle of the night and waking up too early.[69-71] Thus, there is a vicious cycle of reduced physical activity and reduced sleep. Although the timing of exercise has been widely debated, it is likely to be based on individual experience. Regardless, daily physical activity promotes nightly rest.

Stress and sleep are closely related as a result of the substantial overlap in neurotransmitter signaling and regulatory pathways between the neural centers that modulate mood and the sleep-wake cycle. Both acute and chronic stressors, and individual variability in coping with stress, are major determinants of sleep quality and quantity. Different approaches to stress reduction demonstrate opportunities to promote sleep onset, sleep maintenance, and daytime robustness. As with both nutrition and exercise, there are different levels of sleep benefits with stress reduction. Individualizing approaches offers a greater likelihood for sleep health and overall health.[72,73]

As outlined in this article, there is a great opportunity to help patients see the relationship between successful sleep and their food intake, exercise, and stress management. As this is the province of preventive lifestyle medicine, it is a key to optimal health. Some patients approach sleep using pharmaceutical aids, and there is an opportunity for family physicians to educate and offer patients resources for healthy sleep. Lifestyle medicine and healthy sleep are essential pillars that we can offer to all of our patients for true health and healing. ●

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