GO TO BED

The Clinician's Handbook for Understanding SLEEP

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WHY THIS BOOK?

By the Author

With nearly one-third of our lives spent sleeping, it's something that we can often take for granted.

Until our sleep becomes disrupted.

Whether through personal stress, injury, or the myriad of other instigating factors, our sleep can become disturbed and its impacts can be far reaching. Our ability to think clearly, treat others with care, or function becomes impaired.

As health care providers, we work with patients who have disrupted sleep. Yet often we avoid conversations about sleep health. Addressing sleep with our patients can provide an opportunity to more fully treat the whole person.

By helping our patients with their sleep, we can support their physical recovery and return to greater levels of function. Healthy sleep equals a healthy body.

We are all too aware of the increasing prevalence of chronic or persistent pain in our society and in our patient populations. And whether a triggering or resulting factor, sleep is impacted.

It's an active process of recovery for the body and impaired sleep can impact healthy functioning, healthy beliefs and cognitions and recovery of acute or chronic injuries.

Prior to my research, I would have conversations with patients about their sleep issues and would quickly exhaust my education—limited

to commonly known sleep hygiene rules. I was frustrated with my lack of knowledge in this important area and frustrated with my inability to engage in more transformative conversations with my patients.

When researching this topic online, you'll find a plethora of sleep information tidbits, but nothing that helps identify and summarize the specifics used to help health care clinicians with their patients.

The purpose of this book is to provide a concise, practical handbook for health care providers to assist their patients with sleep. I reviewed over 170 academic journal articles along with a multitude of sleep science textbooks and popular sleep help books. From this research, I pulled out the most important information related to sleep health and wellness.

I hope you find this book, and the associated resources, a valuable clinical resource that will improve your care of patients with sleep disturbance.

To better sleep,

Andrew Koppejan, PT

AUTHOR

Andrew Koppejan, PT

Nearly one-third of our lives are spent sleeping, so when our sleep is disrupted it has immediate effects on our ability to think, act and reason clearly.

Andrew Koppejan, a registered physiotherapist and founder of ignitephysio, an online learning community, has spent the better part of his medical professional life seeking to improve connection and collaboration between medical professionals for the benefit of patients. Certified in GunnIMS, Koppejan regularly works with chronic pain patients and has seen the powerful relationship between sleep and pain.

Through over 170 academic articles, textbooks and popular sleep help books, Koppejan has sought answers to the enigmatic relationship between sleep and health, knowing already that "healthy sleep equals a healthy body," but missing the "why."

Health care providers are in a unique position to deliver the keys to great sleep health and this book is the perfect concise, practical handbook to do just that.

Research Contributors

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CHAPTER 1

WHEN SLEEP GOES WRONG

Understand the prevalence of disrupted sleep and the key health impacts of poor sleep.

COVERED IN THIS CHAPTER:
Understanding Disrupted Sleep
Effects of Sleep Deprivation
Health Impacts of Disrupted Sleep

UNDERSTANDING DISRUPTED SLEEP

Disrupted sleep is a significant problem in our society and can affect people across the lifespan.

The Problem

Poor sleep is a growing problem and one that affects a large number of people. In the United States, an estimated 50-70 million adults suffer from a sleep or wakefulness disorder. Almost 20% of all serious car accidents, independent of alcohol, are a result of driver sleepiness.[1] It has been reported that one third of the adult population is affected by insomnia occasionally and between 9-12% on a chronic basis.[4]

There are a significant number of Americans who suffer from other sleep disorders:

- 3 to 4 million suffer from moderate to severe obstructive sleep apnea
- 15 million (5% of the general population) suffer from restless leg syndrome and periodic limb movement disorders[1]

In a survey of 2,000 Canadians, nearly 20% said they were dissatisfied with their sleep, and 40% had more than one symptom of insomnia including trouble falling or staying asleep, or early morning awakening and 14% had met all the criteria for insomnia.[5]

Disturbed sleep can be defined when one or more of these problems is present:

- Insomnia
- Abnormal movements, and sensations or behaviors during sleep or during nocturnal waking
- Excessive sleepiness during the day[6]

Understanding the Impact

We don't have to look far at the impact of disrupted sleep in society. Just look at colossal tragedies including the disasters of Chernobyl and the Exxon Valdez, among others. Each of these had fatigue-related performance errors. Although disrupted sleep doesn't always show up in significant ways, disrupted sleep, including chronic insomnia, have a significant impact on our economies and society as a whole.

In comparison to healthy sleepers, those with sleep loss have been found to experience greater health care needs such as emergency and health care visits, as well as increased prescription medications.[7] They also experience an increased likelihood of injury. In fact, it is estimated that 110,000 sleep related injuries and 5,000 fatalities result from car accidents involving commercial trucks.[1]

There are a number of indirect costs associated with insomnia which include increased missed work days and loss of productivity. While it has been estimated that direct costs associated with insomnia in the USA are between $2 to 16 billion per year, indirect costs soar all the way to $75-100 billion per year.[7]

Understanding Those Affected

It is important to understand those who are more likely to be affected by, and are at risk for, disturbed sleep. Here is a summary of key demographic segments who are at a greater risk of disrupted sleep including insomnia:

> **Age:** Insomnia increases with age. The odds of experiencing chronic insomnia increases 1.1 fold for every decade of life and there is almost a doubling of insomnia in those greater than 75 years of age.[8] In fact, the elderly have a 1.5x higher rate of difficulty falling asleep and elderly women use more hypnotics to improve their sleep.[9]

Female: Women are more likely to suffer from insomnia. Insomnia rates are double that of men across the lifespan and studies show a consistent increased risk ratio for women (range of 1.32 to 1.64).[8]

Lower Socioeconomic Class: Both lower socioeconomic class and education levels affect sleep quality.[8]

Older adults are at risk for disrupted sleep including insomnia. As we age, sleep quality is impacted by inactivity, decreased light exposure, decreased arousal threshold, elevated autonomic activity and changes to circadian rhythms.[10]

However, disrupted sleep isn't partial to adults. Children can also suffer from sleep problems. In fact, approximately 40-45% of children will experience sleep disorders during infancy and adolescence. Insomnia has been found to occur in 20% of children on a regular basis.[11]

EFFECTS OF SLEEP DEPRIVATION

Both total and partial sleep deprivation have significant effects on physical and psychological well-being.

Sleep Deficiency

Even though it is easy to dismiss poor sleep as a reality of the modern life, the impacts on our health are many. By understanding the impacts of poor sleep caused by insomnia, we can help communicate the importance of sleep and the value of addressing sleep issues to enhance recovery and improve overall health.

Sleep deficiency can be defined as insufficient quantity or inadequate quality of sleep obtained relative to that needed for optimal health, performance and well-being.[12]

Fatigue following 20-25 hours of awake time impairs performing tasks to the same level of alcohol intoxication at a 0.10% blood level concentration (legally drunk in many jurisdictions).[13]

Effects of Total Sleep Deprivation

Total sleep deprivation highlights the significant impacts on psychological and physiological function. These have been described in the literature[13,14,15]:

Psychological Effects:

- Impaired attention and loss of concentration
- Longer reaction time
- Slowed reasoning
- Distractedness
- Increased stress
- Impaired creative thinking
- Deterioration of short-term memory and consolidation of long-term memory
- Irritability and mood disturbance
- Loss of motivation
- Fear, frustration and/or anger of being unable to sleep

Physical Effects:

- Physical weariness, fatigue and tiredness
- Muscle aches, including headaches and neck pain, due to the lack of muscle motor inhibition normally observed during sleep
- Exacerbation of tremors, intensifying the longer the reduction in sleep lasts
- Decreased postural control and balance
- Reduced anaerobic power
- Double vision or tunnel vision
- Greater number of visual errors or hallucinations
- Difficulty verbalizing and experiencing thoughts and concepts
- Slowed speech, stammering, monotone expression
- Increased use of word repetitions and clichés

Although total sleep deprivation studies help to more clearly identify the physiological effects, partial and acute sleep restriction can help to give us a better sense of the impacts associated with everyday life. Not only do total sleep deprivation studies show significant changes to various homeostatic health systems, but partial sleep deprivation studies, which more closely mimic real life, also show remarkable changes within the body.

The impacts of poor sleep are many. Once you begin to discover the impact of poor sleep on general health, you will begin to appreciate the need for a higher level of importance to be placed on sleep health.

HEALTH IMPACTS OF DISRUPTED SLEEP

Chronic sleep deprivation can lead to increased obesity and diabetes risk, decreased immunity and increased inflammation.

Impacts on General Health

There are a number of general health implications resulting from poor sleep which impact interconnected areas of weight gain, glucose regulation, diabetes and hypertension. Unfortunately, the more chronic sleep deprivation becomes, the greater the risk for developing a variety of co-morbidities (hypertension, dyslipidemia, diabetes, obesity) as well as a reduced ability to tolerate stressful stimuli.[14,16,17]

The following table highlights the increased prevalence of various medical disorders reported by those with insomnia versus those without insomnia[8]:

Medical Problem	Prevalence in those with Insomnia	Prevalence in those without insomnia
Heart disease	22%	9%
Cancer	9%	4%
Hypertension	43%	19%
Neurologic Disease	7%	1%
Diabetes	13%	5%
Chronic Pain	50%	18%

Note: Adapted from Lichstein et al. (Numbers have been rounded)

As you can see from this table, the prevalence of medical problems is increased significantly in those with insomnia.

Altered sleep also impacts mortality. In one study, the risk of death increases by 12% for those that get less than 7 hours of sleep.[12]

Influence on Obesity And Diabetes

The rising epidemic of obesity and diabetes in North America is alarming. As movement experts, the significant effects on mobility and function are a significant cause for concern. Research has shown that there is relationship between weight gain, obesity and poor sleep.[14, 16] Authors Buxton et al, argue that in addition to the pillars of exercise and diet, sleep should be included as a primary pillar of health.

It appears that even when confounding variables such as obesity and overweight are removed, sleep is independently related to diabetes risk. In a pooled analyses of over 100,000 adults, sleeping less than 6 hours per night had a RR (risk ratio) of 1.28 in predicting T2DM and over sleeping (>8-9 hours) resulted in a RR of 1.48. Difficulty falling asleep and staying asleep also had a strong relationship with diabetes risk (RR 1.48, RR 1.84).[12]

The increase in weight gain associated with decreased sleep appears to have a few different connections:

- Studies have shown that hormones such as ghrelin (appetite stimulant) increase and appetite suppressing hormones (leptin) decrease with reduced sleep.
- There is an altered brain response to food. Specifically, there is an increased desirability for food through activating the central reward systems and a decrease in self-control.
- Energy expenditure is altered, including the resting metabolic rate (RMR).[12]

In one particular controlled study, participants who were put on a sleep restricted program (4 hours per night) showed a 15% increase in food intake and a 39% increase in fat consumption.

Glucose regulation also appears to be affected by partial sleep deprivation. A number of studies show glucose dysregulation and decreased insulin sensitivity as a result of impaired sleep. Important to glucose regulation is the hormone cortisol. Whether with total or partial sleep deprivation, cortisol has been shown to increase (45% vs 37%) the following day altering 24- hour cortisol profiles.[12]

Impacts on Immune Function

When it comes to the effect that sleep deprivation has on our immunity, there is still a lot to learn. Although the majority of studies investigating this relationship have been done on rats, preliminary findings suggest that sleep is an important key in immunity.[18]

What we know so far is that physical restoration occurs during deep or slow wave sleep (SWS).[14] When sleep loss reduces time spent here, our body's ability to rejuvenate is inhibited. From a micro level, sleep deprivation has a negative effect on cell immunity and cytokine function. Without adequate sleep, there is a reduction in the function of peripheral blood lymphocytes and natural killer cells, as well as an increase in inflammatory markers such as interleukin and tumor necrosis factor.[14,16,18] With such physiological changes, there comes an increased susceptibility to infections, a poor ability to fight infections and a greater incidence of sepsis.[18]

Impact on Inflammation

As we know, inflammation is a non-specific immune response that is usually activated when the body experiences injury or infection. It can sometimes be activated with disease and some genetic predispositions.[19]

Insomnia and sleep deprivation can result in increases in a variety of inflammatory processes—pro-inflammatory effects—which can cause negative effects on health.[19] Pro-inflammatory responses involve increased cytokine secretion ex: IL-1, tumor necrosis factor (TNF) and IL-6, and increased circulating monocytes, NK cells, and CRP.[20,21,22]

As well, studies are showing that the relationship of inflammation and sleep deprivation may be bidirectional: sleep dysfunction can cause inflammation, and the inflammatory response can alter sleep quality and quantity.[19]

Key Take-Aways

- A significant number of people suffer from disrupted sleep.
- Sleep deprivation has wide ranging effects on human functioning and performance.
- Insomnia is associated with a number of medical problems and contributes to increased risk of obesity, hypertension and diabetes.
- Immune function can become impaired with sleep deprivation and sleep deprivation contributes to increased inflammation in the body.