THE
HARVARD MEDICAL
SCHOOL GUIDE TO
A Good Night’s
Sleep
Also from Harvard Medical School

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*The Harvard Medical School Guide to Achieving Optimal Memory*, by Aaron P. Nelson, Ph.D., with Susan Gilbert

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Preface

Why would I write a book on sleep? After all, everyone sleeps, it looks easy, and nothing much seems to happen while you’re doing it. That’s what I used to think before I started studying sleep. I first came across the intricacies and mysteries of sleep as an undergraduate studying psychobiology at UCLA in the 1970s. I was amazed at how much was actually happening during what most people think of as downtime or wasted hours. Still more fascinating was the emerging idea that time spent asleep was essential to proper functioning. As we gained more knowledge, it became clearer that proper sleep plays a large role in maintaining health, promoting learning, performing at top proficiency, and sustaining emotional well-being.

In some ways, this shouldn’t be a mystery. Anything we devote a third of our lives to must be important. Just about every animal we have looked at shows periods of sleep. The sleep of all mammals is very similar to our own, differing only in the amount of time spent asleep. Even birds show a rapid eye movement (REM)/non-REM cycle similar to ours.

Sleep is a complex undertaking, requiring numerous pathways through multiple parts of the brain. Several of these areas seem to function just to direct other regions. Every multistep process in the body is vulnerable to potential problems at any point in that process. It is these problems that cause disease, and the same is true with sleep. Given its complexity, the true mystery is that most of the time everything works correctly.

This brings me back to how I’ve come to write this book. After my first exposure to studying sleep, I filed my interest away and went on with my education, finishing college and medical school. But I didn’t learn about sleep and sleep disorders in medical school. That didn’t happen until I was doing my residency in internal medicine and found out about a sleep disorder called sleep apnea. To understand this disorder, I had to learn about sleep again, which rekindled my interest.

At that time, the only way to study sleep disorders was to do so as part of another field. I chose pulmonary and critical care medicine at Cedars-Sinai Medical Center in Los Angeles, where Dr. Philip R. Westbrook had just arrived from the Mayo Clinic to set up a sleep disorders center. Under his tutelage, I learned about the different sleep systems, the various disorders, and the available treatments. I also learned what a big impact poor sleep and sleep deprivation have on people. This was probably the most valuable lesson—sleep is important in maintaining good health and enjoying life.

There continues to be much to learn. My time working at Sleep HealthCenters has given me the opportunity to be part of the Harvard Medical School system and interact with some of the foremost experts in sleep physiology, circadian rhythms, and sleep medicine. I work in a truly exciting place, and I am indebted to all of my colleagues who continue to educate me.

An important part of my job is to educate others, both physicians and patients, about the value of good sleep. I do this by seeing patients in a clinic setting, giving talks, writing papers, and preparing videos and slide sets. It’s also as simple as telling people at a party what I do for a living. Invariably the response I get is, “Boy, do I need to talk to you!” I have found that a lot of people need and want to learn how to sleep better.
So when Dr. Anthony Komaroff at Harvard Health Publications invited me to write this book, it was a great opportunity to continue to get the message out. My goal was to create a source the reader could come to for general information as well as specific steps for identifying and solving problems. I hope this book stimulates your interest and also helps you improve your sleep.
Acknowledgments

The timing for this book couldn’t be better. Sleep medicine has come into its own with increased scientific and clinical interest in sleep and sleep disorders. There has also been a surge in the general public’s interest in sleep and the need for materials to explain new discoveries. This convergence of new science and public interest served as the impetus for writing this book.

The book is based on the work of multiple pioneers in sleep medicine who had the vision to explore areas that others thought was uninteresting and unrewarding. I would like to thank those who sparked my interest in sleep medicine and taught me the lessons that continue to guide my practice and ongoing education, particularly Adrian J. Williams, M.D., and Philip R. Westbrook, M.D.

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PART I

Understanding The Need for Sleep
Some nights, sleep comes easily, and you cruise through the night with minimal interruption. Waking up after a night of good sleep is wonderful—you feel refreshed, energized, and ready to take on the world. Other nights, sleep comes slowly or not until the early morning hours. Or you may fall asleep, only to awaken throughout the night.

As you probably know from experience, sleepless nights often trigger a series of unwanted events. Merely getting out of bed when the alarm goes off can seem like a Herculean task. You may snap at your spouse over cereal for something trivial. At work, you may lack motivation to do normally enjoyable tasks. Perhaps you doze off while watching the evening news—just before the segment you most wanted to see. A few hours later, it’s time to go to bed again, and you’re faced with the uncertainty of whether you’re in for another night of tossing and turning. How can something so right go so wrong?

In this book, I’ll help you find the answer. You’ll understand what happens during sleep, what can go wrong, and how you can help yourself get a truly good night’s sleep.

Too often we forget that sleep is a basic physiological drive, like hunger or thirst, and necessary for life and proper functioning. Those who don’t pay attention to ensuring they get adequate, restful sleep can suffer ill health and enjoy life less. I’ve treated people with sleep problems for more than fifteen years, and I’ve found that the overwhelming majority of individuals can get better sleep—if they’re willing to make sleep a priority, identify the source of their sleep problem (possibly with a physician’s assistance), and then follow through on the recommended treatment.

There is much to look forward to, but before we dive in, I’d like to start by raising a few key points about sleep.

You Are Not Alone

If you don’t sleep as well as you’d like to, you have plenty of company. A 2005 survey by the National Sleep Foundation (NSF) found that, during the preceding year, 75 percent of adults had at least one symptom of a sleep problem, such as waking a lot during the night or snoring, and 54 percent experienced at least one symptom of insomnia. Here are some additional statistics:

- An estimated 30 to 40 percent of the U.S. population suffers occasionally from insomnia, with 10 to 15 percent having a chronic problem.
- Forty percent of adults snore; 2 to 4 percent suffer from obstructive sleep apnea (pauses in breathing during sleep); and about 5 to 10 percent have restless legs syndrome (RLS), causing them to experience painful or unpleasant tingling in their legs at night.
- The partner of someone with a sleep disorder often experiences sleep that is just as disrupted as that of the person with the disorder. For instance, researchers at the Mayo Clinic found that treating one person’s sleep apnea and snoring allowed his or her spouse to get, on average, an
hour more of sleep each night during the same amount of time in bed.

- Americans average 6.9 hours of sleep a night—less than the 7.5 to 8 hours sleep experts believe most people need to function at their best.

- Each year, Americans spend an estimated $2 billion on sleep medications and make almost two million overnight visits to sleep laboratories.

The number of Americans diagnosed and treated for sleep problems has risen in recent years and is expected to continue to grow in the future. Some of this is due to increased awareness—more patients are going to their doctors with sleep complaints and more doctors now recognize the signs of sleep disorders. But other factors—the increasingly hectic pace of modern life, the rising prevalence of obesity, and the aging of the population—may also be contributing to a genuine increase in the percentage of people with sleep problems.

**Poor Sleep Is a Serious Problem**

We pay a high price for getting an insufficient amount of sleep, individually and as a society:

- Lack of sleep is directly linked to poor health, with new research suggesting it increases the risk of diabetes, heart disease, and obesity. A study published in the journal *Sleep* in 2004 found that women who averaged less than five hours of sleep per night had a significantly higher death rate than those who slept seven hours.

- Even a few nights of bad sleep can be detrimental. One study found that people who were limited to three straight nights of sleeping five hours or less were more likely to have physical ailments such as headaches, stomach problems, and sore joints. Other studies have shown that curtailing sleep to four hours a night for several nights results in changes in metabolism that are similar to those that occur in normal aging and that raise levels of hormones linked with overeating and weight gain.

- Sleep debt is cumulative. Studies have shown that performance on tests of alertness and thinking continues to get worse the longer sleep deprivation lasts. In other words, we do not adapt to sleep deprivation.

- The combination of sleep deprivation and driving can have deadly consequences. Nearly one in five drivers admits to having fallen asleep at the wheel, and the National Highway Traffic Safety Administration conservatively estimates that one hundred thousand police-reported crashes are caused by drowsy drivers each year, causing seventy-six thousand injuries and fifteen thousand deaths.

- Sleep deprivation played a role in catastrophes such as the Exxon Valdez oil spill off the coast of Alaska, the space shuttle Challenger disaster, and the nuclear accident at Three Mile Island.

- Sleep deprivation and sleep disorders are estimated to cost Americans over $100 billion annually in lost productivity, medical expenses, sick leave, and property and environmental damage.

Even when sleep deprivation does not cause illness or accidents, it can affect your quality of life.
Sleep problems affect virtually every aspect of day-to-day living, such as your mood, mental alertness, work performance, and energy level. According to the 2005 NSF survey, almost three in ten working adults say they have missed work or made errors at work because of sleep-related issues in the past three months. And nearly one-fourth of partnered adults say they have sex less often or have lost interest in sex because they are too sleepy.

Unfortunately, despite some recent progress, fewer than 3 percent of Americans with sleep problems get treatment because both patients and their primary care doctors often do not consider sleep an important health issue. This is partly due to lack of training for physicians and partly because many people accept poor sleep as inevitable.

A survey of American medical schools in 1990 showed that 37 percent did not offer any training in sleep medicine. As recently as 1998, the average amount of sleep education averaged a little more than two hours during the four years of medical school. As a result, doctors frequently fail to ask patients about their sleep.

On the patient side, people with sleep problems often do not report them to their physicians. They believe poor sleep is not a medical problem and incorrectly assume it is normal to feel tired throughout the day or have difficulty getting to sleep at night.

The good news is that this situation is starting to change. Medical training institutions are adding sleep medicine training programs, sleep medicine is now recognized as an official medical subspecialty, and physicians can demonstrate their proficiency by taking board-certification examinations. Between 1993 and 2003, the number of physicians certified in sleep medicine increased more than six-fold to nearly two thousand.

Health and regulatory officials, as well as the general public, are also starting to wake up to the importance of sleep. For example, some school districts, urged on by frustrated parents, have changed starting times for classes to make them more amenable to adolescents’ natural sleep patterns. In New Jersey, drowsy driving is now treated as a criminal offense similar to driving while intoxicated; other states are considering following suit.

Dramatic Improvements in Diagnosis and Treatment

Much has happened in recent decades to make it easier to recognize and treat sleep problems.

Diagnosis
Sleep disorders are now more easily diagnosed, thanks to a better understanding of patient needs and improvements in technology. Overnight sleep centers are now designed to resemble hotels rather than hospitals, making patients feel more comfortable. The monitoring equipment is more sensitive than in the past, making for more accurate diagnoses. And computerization and miniaturization have led to the development of equipment so small and light that testing can sometimes be done at home rather than at a sleep center.

Medication
We have a larger and more effective arsenal to treat sleep problems today than we did even five years ago. Today’s drugs for insomnia are safer and less likely to cause morning grogginess or lead
to dependence. There are now several classes of potent medications useful in treating RLS, and we are on the verge of finding medical treatments for narcolepsy that may cure the disorder rather than just treat its symptoms.

**Hi-Tech Treatments**

The devices used to treat sleep disorders are more effective now because of better materials and improved designs. For example, positive airway pressure (PAP), the primary treatment for sleep apnea, can now be tailored to a particular patient’s facial shape, and the new equipment is smaller, lighter, and designed to make travel easier. Oral appliances for snoring have also improved. Surgery, a last resort for sleep apnea and snoring, has advanced with the use of lasers, radio frequency waves, and plastic stents. Many procedures can now be done in an office setting with only local anesthesia. Light, focused on the back of the eye, can be used to reset the internal clock and treat circadian rhythm disorders such as jet lag. As sleep disorders receive more attention, treatments will continue to advance, improving both comfort and success.

**Setting Realistic Expectations**

As we start this journey, what should you expect? Will you be able to sleep as well today as you did as a child? Will you learn to fall asleep in two minutes every night without fail? Probably not. But you can look forward to improving the quality and quantity of the sleep you get each night and, as a result, how you feel during the day.

To start out, you’ll learn about normal sleep, which will allow you to recognize if what you are experiencing is a genuine problem or not. Perhaps it’s not—as you’ll see, it’s not abnormal to have trouble falling or staying asleep on occasion, especially as you age.

But if you do have a problem, you’ll learn to identify it and then find the appropriate treatment strategy or remedy. If your trouble stems from failing to make enough time for sleep or from flaws in your sleep environment, then adjusting your routine and correcting the fault may be the solution. If you find you have a sleep disorder, you’ll need to get appropriate treatment.

Regardless of the problem’s source, addressing it should improve your sleep and your daytime energy and alertness. You’ll be less likely to doze off unexpectedly at the movies or while watching TV, and you should see quality of life improvements such as reduced sick days, higher energy, and better mental health. It’s not uncommon for a patient I’ve treated to tell me he or she feels like a whole new person.

Before you can identify and address what’s causing your difficulties, you need an understanding of the ABCs of sleep. So in **Part I** of this book, we’ll explore exactly what happens physiologically when you sleep and the different factors that can cause sleep problems. You’ll need that fundamental knowledge as we move on to **Part II**, which covers the different sleep disorders and range of available treatments.
Given how much time we spend sleeping, it’s remarkable how little many of us know about what actually happens to our brains and bodies during sleep. While there’s no need for you to be an expert on sleep physiology to address your own sleep difficulties, the more you understand about the need for sleep and the mechanics of good sleep, the better able you’ll be to prevent sleep problems from developing, fix problems that do occur, and know when to seek help to treat a sleep disorder.

It’s time for Sleep 101. But don’t worry, there won’t be a quiz at the end of the chapter.

Sleep and Brain Waves

For many centuries, scientists scrutinized minute aspects of human activity but showed little interest in the time that people spent sleeping. Sleep seemed inaccessible to medical probing and was perceived as a passive state in which both the body and the brain were quiet and unresponsive—a subject best suited to poets and dream interpreters who could conjure meaning out of the void.

That changed in the 1930s, when scientists discovered that chemical reactions in the brain produced waves of electrical current that could be detected on the surface of the body. The next step was to place sensitive electrodes on the scalp to capture a recording of electrical activity. Measured in cycles per second, this recording is called an electroencephalogram (EEG). Originally recorded on paper charts, today’s tracings from an EEG go directly into a computer.

The size and frequency of brain waves varies depending on where in the brain the waves originate, how alert the person is, and how urgent the message being transmitted is. These different states produce brain waves of varying speed (fast and slow) and size (large and small). As a result, the picture of brain activity displayed on an EEG changes constantly from fast, small waves when a person is active or engaged in specific mental activities to large, slow waves when he or she is resting or in deep sleep.

To understand the recording of brain waves, imagine yourself standing on the edge of a pond. You throw in a small stone, which causes a ripple of waves spreading out from the center to all sides of the pond. The electrical activity of the different brain centers acts like the stone, causing waves to spread throughout the brain.

The pattern of waves in the pond changes as you toss in more stones. With a single stone, you generate large, regular waves. If you throw a handful of stones, the waves they generate interfere with each other, causing the pattern to be more jumbled. Similarly, the EEG pattern depends on what’s happening in the brain at the time of observation. When multiple activity centers are processing information and firing, the brain waves interfere with each other, [End of Sample]