

# Health and Wellness, Sleep Part 3: How to Improve Your Sleep

Hun-Seng Chao, MD

We healthcare workers work hard to care for our patients, but we sometimes forget to care for ourselves. In this series, I will discuss health and wellness, two things most of us never really learned much about in medical school, including nutrition, ways to prevent disease, and how vitally important our lifestyle is to our health. It will occasionally be relevant to our patients but is mainly directed toward healthcare workers. I am not an expert in this topic, but I will share with you what I have learned over the past few decades since med school from multiple research-backed sources, including functional medicine, functional nutrition, integrative medicine, and others, as well as allopathic medicine. Of course, this is not intended to be medical advice or to diagnose or treat any illness or condition.

In the previous articles, we discussed the deteriorating effect of aging on sleep, the subsequent risk of cognitive decline, and the importance of adequate sleep in maintaining hormonal balance to support metabolic health.

We should get 7–9 hours of quality sleep every night (1). However, as health professionals with shift work and/or long, irregular hours with ensuing sleep deprivation, it is difficult for most of us to optimize our sleep habits, and therefore, we are at higher risk for obesity and metabolic syndrome with insulin resistance, diabetes, and cardiovascular disease (2).

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However, it may be helpful to optimize sleep habits as much as possible the rest of the time. Below are ways that sleep experts recommend to improve “sleep hygiene” and/or circadian rhythm disorders.

## **1. Keep a regular schedule for waking, sleeping, and meals as much as possible.**

As mentioned in previous articles, keeping your circadian rhythm regular by waking, exercising, sleeping, and having meals at

approximately the same time every day, including weekends, helps the biological rhythms throughout the different systems in your body stay in sync with each other—like all the parts of a symphony playing harmoniously together. When there is circadian disruption, as in shift work, lack of good quantity or quality of sleep, or jet lag (including social jet lag [see below]), then the body suffers from circadian misalignment, which, if chronic, can lead to metabolic (insulin resistance, type 2 diabetes, obesity), cardiovascular (heart disease, stroke), immunologic (inflammation), and psychologic (depression) disorders as well as cancer and cognitive decline (2–5), as discussed in the previous articles.

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Social jet lag is defined as the circadian misalignment due to the discrepancy between activity/sleep schedules on work/school days and free days (usually more in sync with one’s chronotype [see below]). This misalignment tends to be pervasive throughout most people’s entire study/work career since most of us cannot set our own work or school hours. About 70% experience at least one hour of social jet lag (per day), and up to 50% have two hours or more, usually associated with sleep deficit (6–8) and its attendant health problems.

***“Social jet lag is defined as the circadian misalignment due to the discrepancy between activity/sleep schedules on work/school days and free days (usually more in sync with one’s chronotype.”***

In multiple studies, sleep deficit is associated with increased all-cause mortality (9). Most researchers have found that sleeping 7–8 hours was associated with the lowest mortality and that those with  $\leq 6$  or  $\geq 9$  hours had significantly increased mortality. A Swedish study looking at over 38,000 individuals found that in the group under 65 years of age, sleeping  $\leq 5$  hrs on weekdays and weekends was associated with a 65% increase in mortality compared to those sleeping 6–7 hrs a day. Of note, those who

slept  $\leq 5$  hrs on weekdays but longer on weekends (i.e., those with catch-up sleep) did not have increased mortality (10). However, as mentioned previously, sleep deprivation is associated with many metabolic diseases, so it is still best to get  $>5$  hrs of sleep consistently. Exercise has been shown to alleviate this effect on mortality (11), which might be secondary to the anti-inflammatory effect of exercise.

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Many try to “make up” their weeknight sleep deficits on weekends. Does this work? Well, maybe (as in the Akerstedt study above) but maybe not. Studies have found that catch-up sleep (if  $>2$  hrs on weekends with  $<6$  hrs sleep during weekdays)(12) may alleviate the detrimental effect of sleep deprivation on the cardiovascular system. Some studies show that catch-up sleep may alleviate the risk of metabolic syndrome found in sleep deprivation (13–16). However, other researchers have not shown the same benefit on metabolism (17) or performance (18). In another study, researchers looked at all-cause mortality and incidence of cardiovascular disease with catch-up sleep in over 70,000 subjects over 8 years. They found no difference between those who had no catch-up sleep and those who did have catch-up sleep (19), i.e., catch-up sleep may not provide protective benefits against mortality or cardiovascular disease.

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A person’s chronotype is a person’s preferred sleep and wake schedule, which is mostly genetically determined but may be influenced by environmental factors (light, time zone, season, geographical location) and lifestyle (diet, exercise, drug use, work). You can be a “morning person,” “a night owl,” or somewhere in between. Chronotype can also change with age. Young children

tend to be early risers (much to the dismay of their parents) and sleepers, but teens like to sleep in and go to bed late, and adults are usually in between but can be either. You can find out your chronotype by taking the Morningness Eveningness Questionnaire (<https://cet.org/wp-content/uploads/2019/12/MEQ-SA-2019.pdf>) or the Munich Chronotype Questionnaire ([https://www.orngc.ca/Media/Ornge/Documents/Campaign%20Documents/ACAT/Munich-ChronoType-Questionnaire-\(1\).pdf](https://www.orngc.ca/Media/Ornge/Documents/Campaign%20Documents/ACAT/Munich-ChronoType-Questionnaire-(1).pdf)), but the MEQ is easier to score. It is best to have a daily routine in sync with your chronotype and circadian rhythm for optimal health.

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Some studies have looked at cognitive decline and morningness and eveningness. While the lowest risk for cognitive decline was sleeping 7–8 hrs overall, and the official sleep recommendation from the National Sleep Foundation is 7–8 hrs for older adults ( $\geq 65$  yrs) and 7–9 hrs for young adults and adults (24–64 yrs) (1), most studies have not looked at the effect of chronotype and sleep duration on cognitive decline. A study taken from the Korean Community Health Survey of  $>225,000$  adults (20) looked at waking time (and inferred morningness and eveningness) and found that while sleeping 7–9 hrs (without considering sleep quality) was associated with the least cognitive decline, there was a difference in sleep duration and cognitive decline between those who wake early (morningness, 4–6:30 AM), late (eveningness, 8:30–11:30 AM), intermediate (6:30–8:30 AM), or none (0–4 AM). As expected, poor sleep quality was found more common in those with memory loss (69.8%) than in the no memory loss group (48.0%,  $p < 0.001$ ) but varied with morningness (OR 2.14%), intermediate (OR 2.21%), and eveningness (OR 2.69%). Interestingly, when sleep quality was considered, the sleep hours with the lowest incidence of memory loss was 5–6 hrs in the overall group; however, this varied by morningness/eveningness. Compared to sleeping the recommended 7–8 hrs, the morningness group showed lower memory loss with sleep  $<5$  hrs (0.92 OR), 5–6 hrs (OR 0.85), and 6–7 hrs (OR 0.88). In the intermediate group, sleeping 6–7 hrs was associated with the lowest incidence of memory loss (OR 0.92) compared to sleeping 7–8 hrs and with shorter or longer hrs with higher risk (OR 1.2 for  $<5$  hrs; OR 1.17 in 8–9 hrs; and OR 1.48 in  $>9$ hrs). In the eveningness group, the risk of memory loss was lowest in the 7–8 hrs group with insignificantly higher risk in the  $<5$  hr, 6–7 hr, and 8–9 hrs and marginally significantly increased in the 5–6 hrs group. Overall, interestingly and usually not relevant to medical personnel, the risk of developing cognitive

decline in those who sleep longer hours (in this study, >9 hrs) was significantly elevated (OR 1.38,  $p < 0.001$ ), as several other studies have similarly found but with varying definition of long hours (>8–10 hrs) (21–26). What seems to be consistent is that sleep duration has a U-shaped relation to cognitive decline and overall mortality—too little (usually <5 hrs) or too much ( $\geq 8$ –9 hrs) is bad for the brain and the body.

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**2. Expose yourself to bright light in the morning.** Go for a 20–30-minute walk outdoors every morning soon after waking up, or use light therapy to set (“entrain”) your circadian rhythm.

Light and darkness are the primary “zeitgebers,” meaning “time givers” in German. Light in the morning leads to the suprachiasmatic nucleus (SCN), activating the adrenocortical system to start the day and stopping melatonin release. Hominids evolved for the first few million years, waking at sunrise, performing most activities during daylight, and sleeping soon after the onset of darkness with the release of melatonin. After fire was discovered, our ancestors could stay awake a bit longer after sunset, although, for practical reasons (like having to feed the fire every so often), this did not significantly impact the timing of sleep-wake patterns (27). It was not until candles and then oil- and gas-burning lamps were invented and utilized that humans developed later and later bedtimes, beginning to alter circadian rhythms. Now, after the invention of electric lighting and exposure to pervasive artificial light at night, our SCN is fooled into thinking that it is still daytime and stops melatonin’s release, delaying the onset of sleep and desynchronizing our circadian rhythm.

***“The brighter the light, the stronger the response of the SCN (28) and the inhibition of melatonin release (29), which is why exposure to daylight early in the day is much better than indoor light.”***

The brighter the light, the stronger the response of the SCN (28) and the inhibition of melatonin release (29), which is why exposure to daylight early in the day is much better than indoor light (30). I was amazed at the extent of the difference between even what I thought was very bright indoor light and natural sunlight (Figure 1). In bright, indoor, artificial light, we get a few hundred lux (lumens/m<sup>2</sup>) at best—usually lower—while, even on a cloudy day, we are exposed to over several hundred lumens and, of course, much more in full daylight but not the direct sun (10,000–25,000 lux) and even more in direct sun (32,000–100,000 lux).

**Figure 1. Intensity of light under different conditions**  
(Wiki)(<https://en.wikipedia.org/wiki/Lux>)

Illuminance (lux)	Surfaces illuminated by
0.0001	Moonless, overcast night sky (starlight)
0.05–0.3	Full moon on a clear night
20–50	Public areas with dark surroundings (street-lighting)
50	Family living room lights
80	Office building hallway/toilet lighting
100	Very dark, overcast day
320–500	Office lighting
400	Sunrise or sunset on a clear day
1000	Overcast day; typical TV studio lighting
10,000–25,000	Full daylight (not direct sun)
32,000–100,000	Direct sunlight

Another reason outdoor light is better than indoor light is that sunlight provides a full spectrum of intense light, including blue-green light (l 450–460 nm), which is best for activating the SCN (28).

***“If exposure to sunlight is not available, some people may use light therapy to help entrain their circadian rhythm. Light therapy involves exposure to light boxes, which produce bright light similar to sunlight.”***

If exposure to sunlight is not available, some people may use light therapy to help entrain their circadian rhythm. Light therapy involves exposure to light boxes, which produce bright light similar to sunlight. There are light visors and light glasses available as well. These devices may be used in the morning to shift wake and sleep times earlier, improve irregular sleep-wake disorder, or help with jet lag when traveling eastward. They can also be used later in the day to shift wake and sleep times back, for shift workers (31), or to help with jet lag when traveling westward (32, 33). Sometimes, red light (l 600–650 nm) can be used later in the day to simulate sunset, which may enhance sleep and melatonin release (34) but may be too stimulating and have adverse effects on some people (35). People with eye pathology or light sensitivity or on certain medications that cause photosensitivity should use caution and speak with their physician before trying these devices.

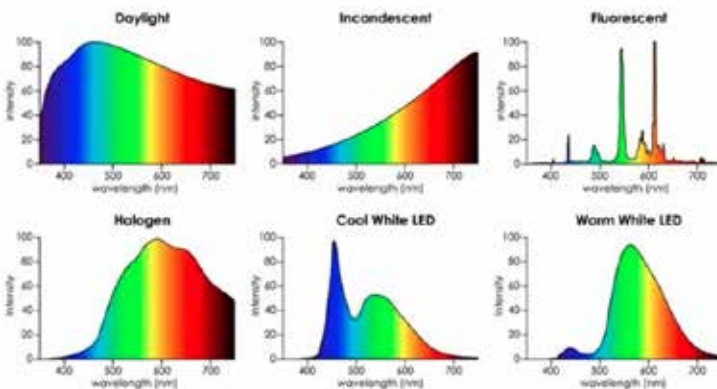
**3. Avoid blue light (from cool LEDs, digital devices, and TVs) in the evening, especially within two hours of bedtime.**

Blue light, the strongest zeitgeber for the SCN and circadian rhythm, prepares the body for optimal performance and alertness by activating the adrenocortical system. It is the most potent suppressant of melatonin as well. Any exposure to blue light in the evening will activate the SCN to decrease and delay melatonin production and may disrupt the circadian rhythm.

Figure 2 shows the spectrum of different sources of light. Sunlight provides the broadest and most intense range of light. Also, note that the now ubiquitous cool LED lights provide significant blue light. Often used in offices and hospitals, fluorescent lighting provides a limited spectrum, including blue light, though not as intense as found from cool white LEDs. Incandescent lighting provides a similar visible spectrum as sunlight, though not as intense, and halogen lights also have very little blue light. However, both incandescent and halogen lights are not energy-efficient. They are, therefore, no longer being manufactured in the US. Thus, when spending time indoors with artificial lighting, we are constantly exposed to blue light, which can disrupt the circadian rhythm if exposure occurs at the wrong time of day, i.e., in the evening, for most of us.

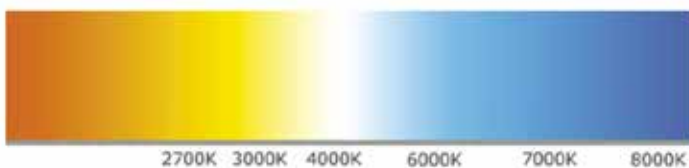
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**Figure 2. The spectrum of different light sources** (<https://cs184.eecs.berkeley.edu/sp20/lecture/11-20/radiometry-and-photometry>)



If you read before bedtime, it is better to use a lamp with a bulb of around 2700 Kelvin, which is considered “warm white.” (Figure 3.)

**Figure 3. The color temperature of lightbulbs.** ([https://www.prolampsales.com/pages/color-temperature?srsId=AfmBOoo4MJmiSq2Kl\\_Cihm9e9Ge0v2PFZ83xK5Tgf8h374P3ZOa2XpM-](https://www.prolampsales.com/pages/color-temperature?srsId=AfmBOoo4MJmiSq2Kl_Cihm9e9Ge0v2PFZ83xK5Tgf8h374P3ZOa2XpM-))



The degrees Kelvin of a bulb does not measure the relative heat a bulb gives off. A 2700K bulb and a 5000K bulb can have the same or similar heat. (Likewise, a 2700K incandescent bulb will be much hotter than an equivalent wattage 2700K LED bulb.) A light bulb that produces light perceived as yellowish white will have

a color temperature of around 2700K. As the color temperature increases, the color of the light appears less yellow and more white. 2700–2800K is considered “Warm Light.” 3500–4000K is “Neutral Bright Light.” A slightly bluer, “cooler” effect uses 4000K. Many office buildings use 4000–4100K fluorescent bulbs. When the color temperature is 5000K or higher, the light appears bluish-white and simulates “Daylight.” The color temperature of daylight varies but is usually in the 5000–7000K range. At noon, the light temperature is 5600K, but sunlight color temperature can vary widely based on time of day and weather conditions.

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Do not use e-readers before bedtime! The use of e-readers has been found to decrease and delay melatonin production, prolong the time to fall asleep, delay the amount and timing of REM sleep, and reduce alertness the following morning (36). While most researchers have shown that blue light may be the cause of sleep delay, in a recent podcast, Dr. Matthew Walker, a world-renowned expert on sleep research, author of the highly regarded book, *Why We Sleep*, and host of the podcast, “The Matt Walker Podcast,” said the culprit may not be blue light itself but that it is emitted from devices that stimulate our brain when we need to start relaxing (37), like e-readers, computers, and TVs.

Besides getting off electronics, replete with blue light and stimulating for the brain, in the evening, a few hours before bedtime, you can also use “blue blocker glasses” (38), turn on the night mode of some devices, and some TVs, and dim the lights (and maybe replace with softer lighting because even a small amount of blue light exposure will affect the SCN). Keep your bedroom dark at night (or during the day if you work the late shift), using blackout curtains to keep the light out if needed. Use eye masks if the bedroom cannot be kept dark. Keep the overhead lights out overnight--use soft light or motion-activated nightlights if you have to get up in the middle of the night. Do not be tempted to look at your phone in the middle of the night (unless it is an emergency and you are on call) since blue light from the device can stimulate the SCN and suppress melatonin, sabotaging the rest of the night’s sleep.

#### **4. Do not eat within two hours of going to bed.**

As mentioned in our previous article, food is also a zeitgeber, with the composition of nutrients and timing of food intake affecting the peripheral clocks (39) rather than the central clock (40, 41). Late night or delayed mealtimes lead to misalignment of peripheral clocks (42, 43) within tissues (and indeed within all cells) and with other peripheral clocks. Circadian misalignment, seen in shift work, sleep deprivation, and jet lag, can lead to insulin resistance and inflammation (44). Body temperature increases during digestion (“postprandial thermogenesis”), which is not optimal when trying to go to bed when you want the body temperature to go down for better sleep.

Glucose disposal exhibits diurnal variation and is both insulin-dependent (following meals) and insulin-independent (with

activity/exercise) (45, 46). Remember that the circadian peak for insulin action is in the afternoon, so eating carbohydrates late in the evening (and therefore causing circadian misalignment) leads to higher blood glucose levels overnight (47) and eventually insulin resistance and Type 2 diabetes if this becomes a chronic habit (48–50). In addition, exogenous melatonin (with pharmacologic doses usually much higher than physiologic levels), a common supplement in the US, also worsens glucose tolerance (51).

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Lipid metabolism also displays time-of-day-dependent rhythms, which are affected by behaviors like the sleep-wake and feeding-fasting cycles (41). As shown in mice, lipid digestion/absorption in the intestinal tract is clock-dependent (52, 53), and circadian alignment is essential for maintaining the integrity of intestinal epithelial barrier function (41, 54). (We will discuss the importance of the microbiome and leaky gut in a future article.) Not surprisingly, lipid turnover and fatty acid  $\beta$ -oxidation, which decrease the level of fatty acids in the blood, are also diurnally regulated (41). Fatty acid metabolism decreases after late meals, leading to increased fatty acid levels in the blood overnight, which may promote human obesity (48, 49) and cardiometabolic syndrome in mice (55).

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Late meals also can lead to decreased quality of sleep (56). In men, late meals with fat intake were associated with decreased sleep efficiency (% of time asleep while in bed) and REM sleep with longer sleep latency (time to fall asleep), REM sleep latency, N2 sleep (stage 2 of non-REM sleep), and WASO (Wake After Sleep Onset). “In women, there were positive associations between sleep latency and caloric, protein, carbohydrate, and fat nocturnal intake; N2 sleep and caloric, carbohydrate, and fat nocturnal intake; and WASO and caloric and fat nocturnal intake. In women, negative associations were found between sleep efficiency and caloric, carbohydrate, and fat nocturnal intake; and REM sleep and nocturnal fat intake” (56). The bottom line is not to eat late meals, especially fatty meals, right before bedtime, especially if you are a woman.

#### **4. Keep a regular bedtime wind-down routine.**

We cannot just go to bed after something stimulating and expect to fall asleep immediately. As Matt Walker said in a podcast interview, “We all fail to recognize that sleep is not like a light switch...Sleep

is much more like landing a plane. It takes time to come down onto the sort of terra firma of good sleep at night.” He compared most of our expectations and practices to be “like driving into your garage... at still 60 miles an hour and then slamming the brakes on. You think it is gonna be a good outcome.” (37) We need consistent wind-down routines, like dimming the lights, taking a warm bath or shower (which causes vasodilation and subsequent cooling of the body in preparation for sleep), meditation, practicing deep breathing, reading (but not with bright overhead lights), listening to calming music or sleep stories (like we have for our children but more adult and relaxing stories), or some other relaxing practice for you.

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#### **5. Get regular physical exercise.**

Physical exercise has consistently been shown to help improve sleep—whether low intensity (a casual walk, stretching, beginner’s yoga or taichi, bike riding or using an elliptical at a leisurely pace), moderate (brisk walking or walking uphill, a strenuous yoga session, weight training, jogging, cycling, or swimming), or high intensity (circuit training, vigorous weight training, sprinting, or taking laps in the pool)(57). Moderate-intensity exercise improved insomnia in older adults, gaining 75 minutes more sleep (58)! A single bout of moderate-intensity exercise increased time in that all-important Slow-Wave Sleep (SWS), boosting the number of slow waves produced at night (59), helping to clear  $\beta$ -amyloid and tau proteins from brain cells to prevent Alzheimer’s. A National Sleep Foundation survey found that exercisers of all intensity levels reported better quality sleep than non-exercisers although the total number of hours remained about the same (60). Not unexpectedly, the high-intensity exercisers reported the best sleep. High-intensity exercise requires and uses up the most ATP and, therefore, produces the most adenosine, contributing to sleep pressure (as discussed in the first article of this series).

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Muscles also have a circadian rhythm and are strongest and most powerful in the late afternoon and evening (5–8 PM) compared

with early morning (61–63), with the most records broken, fastest serves, and similar accomplishments in evening competitions. These high-intensity or resistance exercises (like tennis, tennis, swimming, and distance racing) require fast twitch muscles, which are fatigable, exhaust glycogen stores faster, and are more subject to circadian rhythms. An athlete's natural circadian preference also plays a role in performance and accounts for up to 26% of the diurnal variation in performance (64), i.e., whether it is aligned with the timing of the competition (night owl in morning event or evening event).

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On the other hand, endurance exercise (such as long-distance running and cycling) requires more slow twitch muscles, is not as influenced by circadian rhythms, and shows little variation between morning and night but is very dependent on good quality sleep (65). The depletion of glycogen stores in muscles causes fatigue and is replenished during sleep. If sleep is inadequate, the athlete still feels fatigued the following day and performs poorly (65, 66).

However, more relevant for us medical professionals—who are usually non-competitive non-athletes—is to exercise earlier in the day and not within two hours before bedtime since the body will be revved up instead of relaxed for bedtime. Besides the cardiovascular and sleep-promoting benefits of exercise, it also lowers inflammation in the body by inhibiting proinflammatory cytokines (67, 68), which will improve all those conditions throughout the body caused by chronic inflammation—cardiovascular disease, metabolic syndrome and insulin resistance, arthritis, dementia, depression, and many others. In a future article, we will discuss exercise as one of the pillars of health.

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#### **6. Limit caffeine, alcohol, nicotine, and certain medications before bedtime.**

In our first article of this series, we discussed **caffeine** and its effect of blocking adenosine receptors, which temporarily mask the feeling of sleepiness. In contrast, adenosine accumulates, eventually leading to increased sleep pressure (or “the caffeine

crash”) when the caffeine is metabolized. Also, as mentioned previously, aging decreases the metabolism of caffeine, so older people are more sensitive to its effect for a more extended period. Thus, we should stop caffeine early in the day to prevent sleeping problems caused by caffeine.

**Alcohol** is a sedative-hypnotic and initially can promote sleepiness and sleep latency and increase Slow-Wave Sleep (69) for the first few nights, but then tolerance develops, requiring more alcohol to have the same effect (70). Also, it sabotages REM sleep (69), leading to poorer quality sleep overall. So, enjoy those cocktails (if you must) between 5–7 PM but no later for better sleep quality.

**Nicotine**, in all its various forms, is a stimulant with increased wakefulness, alertness, and focus. Not surprisingly, its use is associated with insomnia symptoms, such as increased sleep onset latency, sleep fragmentation, decreased REM sleep, decreased Slow-Wave Sleep, and increased daytime sleepiness (71). Smoking is deleterious for your health, so it is best to avoid nicotine unless using nicotine patches for withdrawal from smoking, during which it may help with sleep (72).

Several medications and supplements can interfere with a good night's sleep. Alpha-blockers for high blood pressure or prostate problems can sabotage REM sleep. Beta-blockers, used to treat high BP, cardiac dysrhythmias, or chest pain, can lower melatonin levels. ACE inhibitors and angiotensin II-receptor blockers can cause side effects, like muscle cramps or coughing, that are not conducive to sleep. Antidepressants, like SSRIs, may cause insomnia. Corticosteroids, used as an anti-inflammatory agent for many conditions, can be too energizing. Statins, optimally taken at night since most cholesterol synthesis occurs overnight, can cause muscle pain, making it difficult to sleep. Cholinesterase inhibitors, used for dementia, may cause sleeplessness and bad dreams. Stimulants, used for ADHD and narcolepsy obviously can sabotage sleep. Theophylline for asthma can also cause sleep problems. Non-drowsy antihistamines, decongestants, and cough suppressants may cause anxiety and jitteriness, also leading to sleep problems. Some supplements, such as glucosamine and chondroitin, can also cause insomnia. For some of these, you may be able to find alternative medications or a different dose or timing of administration of the medication/supplement or make lifestyle changes that would obviate the need for a particular drug (73).

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#### **7. Avoid late afternoon naps (after 3 PM or less than 8 hrs before bedtime), though shift workers may want to take one just before starting their shift.**

Late morning–early afternoon naps have been shown to improve alertness and boost memory and performance (57, 74). Researchers have looked at different lengths of naps and their

respective effects. A complete sleep cycle lasts around 90 minutes, so the first 30 minutes is mostly stage 2, and the next 60 minutes is SWS and REM. A 20–30-minute nap can boost energy levels and alertness. A 60-minute nap includes SWS, which is important for memory and executive functioning, and a 90-minute nap includes REM sleep, thereby increasing creativity and integrating memories (57). However, longer naps may decrease adenosine buildup and, therefore, decrease sleep pressure and cause more difficulty falling asleep if taken too close to bedtime, which is why the suggestion of napping is greater than 8 hrs before expected bedtime.

However, napping throughout the day is a sign that you are not getting enough sleep at night—common in the post-call day, of course—but if you are experiencing this frequently when you are not post-call, then you may not be getting adequate sleep for other reasons, like possibly sleep apnea, and you may need to consult with your doctor and/or a sleep expert.

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#### **8. What about medications to help sleep?**

The most well-known is melatonin, a natural hormone produced by the pineal gland that helps set your circadian rhythm and get to sleep. It is generally safe, but start with the lowest dose (about 1 mg) and titrate up as needed around an hour before your expected bedtime (57). Contraindications include but are not limited to bleeding disorders, anti-seizure medications, birth control medications, anti-hypertensive medications, diabetes medications, immunosuppressants, and depression (75). Discuss this with your doctor if you are on any of these kinds of medications or pregnant or lactating and, especially, if you are using this in the long term. Sometimes, other behavioral measures (like those above) may be as effective and safer.

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***“There are many classes of sleeping pills (benzodiazepines, barbiturates, antidepressants, and Z-drugs [like zolpidem, better known as Ambien®]), but, in addition to the possibility of side effects and developing dependency and tolerance, the primary concern with all of these is their effect on memory the day following administration with a higher risk of dementia sometimes associated with their use.”***

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There are many classes of sleeping pills (benzodiazepines, barbiturates, antidepressants, and Z-drugs [like zolpidem, better known as Ambien®]), but, in addition to the possibility of side effects and developing dependency and tolerance, the primary

concern with all of these is their effect on memory the day following administration with a higher risk of dementia sometimes associated with their use (76–78). The mechanism for this has not been elucidated yet. However, earlier this month, Hauglund showed in mice that zolpidem significantly decreases the flow of the glymphatic system during deep sleep (79), which is needed to clear b-amyloid and tau from our brains to prevent cognitive decline. On the other hand, zolpidem has been found to increase stage 3 sleep (80) and memory in some people by increasing sleep spindles (81). While decreasing the sleep latency period (so you get to sleep faster), these drugs have been shown to alter sleep architecture negatively (82–85), so drug-induced sleep may often be inadequate. It is probably best to avoid any of these sleeping medications as a long-term solution to insomnia, given the risk of cognitive decline.

#### **Conclusion:**

Getting adequate quantity and quality of sleep are crucial to the body's healthy functioning—a considerable challenge for medical professionals with long working hours and/or shift work, which cause circadian dysrhythmia and may lead to serious, long-term metabolic problems. Using some of the methods above (as much as possible) may help offset some of the deleterious effects of sleep deprivation or disruption.

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*Corresponding Author*



Hun-Seng Chao, MD  
Senior Associate Editor  
Neonatology Today  
Neonatologist Emeritus  
Orange County, CA  
email: [hunseng.chao@gmail.com](mailto:hunseng.chao@gmail.com)

