Think about the electronic and digital devices you use on a daily basis. How many of these devices— phones, tablets, laptops—find their way into your bedroom at night, or into your nightly pre-sleep routine? If you’re like a great majority of Americans, you’re likely spending time right before sleep using one or more of these ever-present gadgets. The National Sleep Foundation estimates that 95% of adults use electronic devices within an hour of bed.

“What’s the problem?” you might ask. A little Web surfing, or curling up to watch an episode of a favorite TV show, helps you to relax and take your mind off your day, right? These before-bed activities may indeed help you to unwind—but the exposure to light from your devices may interfere with your sleep.

There is an abundant and growing body of evidence that nighttime exposure to artificial light can be disruptive to sleep. Light exposure may delay the onset of sleep and may also compromise sleep quality. Light comes in different wavelengths. Sleep scientists are discovering that different wavelengths of light can have varying effects on sleep and alertness. Blue wavelength light has been identified as being especially disruptive to sleep. Research indicates that blue wavelength light may exert a stronger influence over the body’s circadian system, which plays a critical role in regulating sleep and wakefulness. Nighttime exposure to blue light has been shown to stimulate alertness and delay sleep.

Smartphones, tablets, and other digital devices can emit high concentrations of blue wavelength light. So can high-efficiency lightbulbs. The light exposure from these devices, which are becoming more prevalent, is an important topic for scientists to better understand, including how this particular form of light may pose problems for restful sleep.

One recent study illustrates the complications to sleep that blue light exposure can cause. Scientists at Boston’s Brigham and Women’s Hospital and Philadelphia’s Thomas Jefferson University examined the effects of blue light exposure on sleep and alertness. They found that exposure to blue light at night increased alertness and interfered with sleep.

To explore the effects of blue light exposure, researchers compared the effects of blue wavelength light exposure to another wavelength—green light. The study included 16 healthy young adult men and women. The participants were exposed
to equal amounts of either blue light or green light for a period of 6.5 hours in the middle of a 16-hour waking day. Researchers measured levels of alertness among their subjects. They also tested them on performance, including tests to measure attention, response, and reaction times. Using electroencephalography (EEG), the scientists observed brain activity during the periods of light exposure. Their results showed that extended blue light exposure brought about significant changes to participants’ readiness for sleep at bedtime:

- People exposed to blue light at night reported feeling significantly less sleepy than those exposed to green light in the evening.
- EEG results showed heightened alertness among people exposed to blue light in the evening.
- People exposed to blue light at night scored higher on attention and reaction performance tests than people exposed to green light during the same period.
- Overall alertness among people exposed to blue light at night was nearly as high as daytime levels of alertness.

Other studies have returned similar results. Researchers at Harvard examined the differences between exposure to blue light and green light. They found blue light had a dramatically greater effect than green light on circadian function. In their results, blue light suppressed levels of a hormone that promotes sleep for roughly twice as long a period of time as green wavelength light. Studies like these suggest that blue light may deliver a kind of one-two punch to sleep. It appears to delay the onset of sleep by altering circadian function. But blue light also appears to stimulate alertness and cognitive function to levels at or near what we experience during daytime.

Does that mean, however, that all exposure to blue light is harmful? Not so fast. There’s an interesting and potentially significant avenue of research that is also exploring the potentially positive effects of blue light. Remember the 16 adults who researchers studied for sleep disruptions related to blue light? Those same researchers—using those same 16 adults—also investigated how exposure to blue light might affect daytime alertness and cognitive performance. They found that exposure to blue light brought about increased daytime alertness, a change that might benefit both daytime function and nighttime rest. In that study:

- People exposed to daytime blue light demonstrated quicker reaction times, higher levels of alertness, and greater attention spans in performance tests, compared to people exposed to green light.
- EEG tests indicated heightened alertness among people exposed to blue light during the day.

We may find that blue light, for all its apparent problems to nighttime sleep, might offer solutions for daytime problems with fatigue, tiredness, and cognitive performance.

We’re still learning about how different forms of light affect sleep—and how we might harness light’s effects not only to affect sleep, but also to improve our performance during the day. It is increasingly clear that nighttime blue light exposure can pose hazards to high-quality,
sound sleep. I recommend to my patients that they shut down electronic devices a full hour before bedtime, to avoid light interference and to help allow their bodies to begin the natural progression toward sleep. Sticking with this electronics-free hour before bed may take some adjustment. However, the rewards may be a significant improvement to the ease with which you fall asleep and the quality of your sleep during the night.