ALL ABOUT SLEEP
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DR. NEALE LANGE

Dr. Neale Lange is the Medical Director at St. Anthony Central Hospital Sleep Disorders Center in Denver, Colorado. Here he spends a little time talking frankly about various aspects of sleep medicine, disorders, and what’s in a good night’s sleep.

WHAT INTERESTED YOU IN SLEEP MEDICINE?
In order to maximize vacation time during an elective month in my fellowship, I decided it would be cool to shift my own circadian clock 8 hours ahead, and there was nothing to do at 3am sitting in front of a light box, so I started to read about clocks and rhythms and sleep in general.

It's the other 30 years of our lives, and low and behold what happens during the time of sleep is of great importance to wellness and functioning for us all. Sleep is a poorly understood physiologic state of being, about which few are passionate.

HOW MUCH SLEEP DO PEOPLE NEED? HOW DO I KNOW IF AM GETTING ENOUGH?
We don’t know. Time is not the correct metric. The range is about 3 to 11 hours. Median is around 7.5 to 8 hours. There are a lot more people who think they can get away with reduced sleep hours than actually can. If one prioritizes sleep as important, then we have to listen to our bodies and minds, honestly, and determine for ourselves what makes us feel and function best.

HOW DO I KNOW OR DETECT A SLEEPING DISORDER (SUCH AS SLEEP APNEA) THAT MAY BE CONTRIBUTING TO POOR SLEEP UNKNOWLINGLY?
That’s tough, because we have no idea what happens to us when we sleep, simply because we are asleep. Sometimes, we don’t even know we are asleep. Take that common scenario – a wife is listening to her husband snoring, elbows him and says, “Stop snoring.” He will say with conviction, “Honey, I wasn’t snoring...” Someone is wrong!

Accordingly, if we are fortunate enough to be told we snore loudly and stop breathing in our sleep, that’s highly suspicious. Most of the time, people just don’t feel good, have sleepiness during wake time, and have memory, concentration, or mood issues. Local symptoms such as a morning headache, sore throat, or dry mouth may be clues for those with silent or absent bed partners.

Daytime sleepiness is probably the most important variable, and it is most often measured by a subjective sleepiness scale called an Epworth Sleepiness Scale—but remember, it’s self-reported, and we tend to pull the wool over our own eyes.

WHAT ARE THE KEY INGREDIENTS TO A GOOD NIGHT’S SLEEP?
Environment – quiet and dark, quiet or white noise (no TV, books, social media, etc., in bed – the bed is for relationships and sleep). Snoring spouses are not helpful.

Expectation – if we expect to lay down, close our eyes, fall asleep in 5 minutes, wake up 8 hours later, and jump out of bed screaming “Woohoo! I feel great!” – well, we may be setting ourselves up for failure. Time is a very necessary requirement for sleep, one has to make time for sleep, yet time is the worst way to measure how well one slept.

Activity and hunger - The more active we are during the day, the better we deal with our stressors, the better we usually sleep. Avoid hunger at night, as it’s hard to sleep hungry.

In general, don’t sleep with socks on; “free feet” are necessary for required temperature regulation to both fall asleep and stay asleep.

WHAT ARE THE BENEFITS OF A GOOD NIGHT’S SLEEP?
These can be looked at from an individual standpoint, a community standpoint, and a healthcare standpoint.
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Let's first agree on the definition of a good night's sleep — to me, that's a night where expectation and realization about falling asleep and staying asleep were in line. The next day, one should feel alert, sharp thinking, motivated, and in a good mood. If you got that, then you slept well.

Lack of sleep or poor sleep has been correlated with and linked to a number of adverse issues like motor vehicle collisions, on the job injuries, and sexual dysfunction — those are relevant to the community.

From the healthcare system standpoint — many common diseases are linked in causal fashion to poor sleep like depression, sexual dysfunction, diabetes, and general wellness. Any investment we can make as individuals or a system in helping the healthcare system, we should.

I SNORE. IS THAT SLEEP APNEA?
No, snoring does not equal sleep apnea. However, they can be thought of on the same spectrum.

Speech apnea is difficult breathing and sleeping at the same time. Since humans cannot forego either sleep or breathing, we do both — sleep apnea makes us do both badly. Once snoring is associated with brief brain arousals and fragmented sleep or cessation of breathing or reduction in breathing, then it's called sleep apnea, and that is when it becomes a major health hazard.

Now since snoring does have a slightly increased risk of stroke and is very disruptive to the companion (to the tune of about 30% sleep loss), it may need to be addressed.

WHAT SHOULD I DO IF I SUSPECT I HAVE SLEEP APNEA?
Don't stick your head in the sand and ignore it - because simply put, if you do, men with at least moderate obstructive sleep apnea (OSA) have a 46% increased risk of early death — that's not good odds. There ought to be easily accessible lower cost home-based technologies that allow you to make the diagnosis or at least exclude it at home.

Contact your healthcare provider or get online and advocate for yourself.

There should be NO stigma attached to sleep apnea — it occurs in ± 1 in 4 men and 1 in 15 women, and only 50% of the effect is accounted for by weight (body mass index); the rest we either can't tell or is due to the shape and fit of the jaws and facial structure.

You can be thin as a rake with very severe sleep apnea. It's not possible to look at someone and say, you have or you don't — that's the bottom line.

We can use standard questionnaires to help us triage who needs evaluation and who does not — like the Berlin Questionnaire or the STOP BANG questions (The Sleep MD.com: http://www.thesleepmd.com/snoring-sleep-apnea/sleep-surveys/stop-bang.html).

CAN I TAKE MEDICATION FOR SLEEP APNEA?
There is no acceptable or effective pill therapy for usual obstructive sleep apnea, but you sure can take a medication that makes it a lot worse — like narcotic pain medications, sedatives, and less often a number of other medications. It's a mechanical problem for the most part, best fit to a mechanical solution.

WILL I NEED SURGERY FOR SLEEP APNEA?

SIGNS IT MIGHT BE TIME TO REPLACE A MATTRESS.*

- Stiffness, numbness, aches and pains following sleep
- A hotel or other new bed surface other than your own provides you with a better night's sleep
- Signs of overuse have begun to occur (sagging, lumps, exposed interior)

- Your mattress is seven years old or older

*Adapted from The Better Sleep Council: https://thesleepmd.com/mattresses-and-more/caring-for-a-mattress/replacing-a-mattress

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NORMAL SLEEP
It wasn’t until the latter half of the 20th century that scientists started to take a real interest in sleep from a neurological perspective and not until the late 1980’s that the American Medical Association (AMA) recognized sleep medicine as a specialty. We have learned since then much about various aspects of human sleep cycles and the stages that make up our sleep. There is still much to learn as we take this new medical discipline into the 21st century.

So, what do we know thus far? Sleep is a function of the human body as essential as breathing. Lack of it can cause dramatic changes in personality, reduce performance, and produce health issues and death. It is a complex process that changes to fit our needs throughout our lifetime; babies will spend most of the day sleeping and in a proportion of sleep stages completely different from an adult. Similarly, the elderly will tend to sleep less and with varying amounts of sleep stages than those seen in younger adults.

Sleep needs also change over the human life span. Infants will need to sleep much of the day, while the average adult sleep needs will vary. Adolescents will need somewhat more sleep than the average adult and are a population that is found to have a high prevalence of sleepiness from poor sleep habits. This is a trend that is increasing and comes with great risks, including declining grades, personality changes, and auto accidents from drowsy driving. One half of all sleep-related crashes are attributable to those under the age of 25.

On the other side of the spectrum, we will sleep less in our golden years. It is not clear however, if we need less sleep or if medical issues and changes in the circadian rhythm cause sleep to be more disrupted in the latter years of life. The amount of slow wave sleep that we get as we get older will also decrease; this may be a contributing factor to the reduction of sleep time in the geriatric population. The decrease in sleep may be due to increased use of medication, pain, depression and alcohol use.

SLEEP ENVIRONMENT
Our sleep environment is often ignored as a contributing factor to insomnia. Since Edison flipped the switch on the first light bulb, humans have been finding excuses to decrease sleep time and increase the amount of time spent in front of lights, televisions, computer screens, and other electronic devices.
and cell phones—all which have been shown to decrease sleep. Our sleep environment elements, including light, temperature, noise, and our sleep equipment (mattress and pillow), are elements we can adjust to improve our sleep at home and acute care and long-term care facilities.

LIGHT
The primary cue for the circadian rhythm that controls our sleep and wake cycle each 24 hours is light. This cue triggers changes in excretion levels of melatonin (a hormone that will initiate drowsiness when released) and core body temperature. When you are in the absence of light, melatonin production increases and core body temperature begins to drop. The result is a feeling of drowsiness for the transition to sleep. Not all wavelengths of light have the same effect. Bright blue and green lights will affect the circadian rhythm much more than red or dim lights.

The human internal clock is located in the brain, very close in proximity to where the optic nerves of the eyes come together. So, we are literally wired to respond to light as part of our daily routine and particularly our sleep/wake cycle.

Jet lag and sleep difficulties from daylight savings time are direct results of this biological function not adapting to the changes quickly. The circadian rhythm can be changed, but it happens slowly. Crossing over time zones or changing clocks as little as an hour can take the body several days to completely recover. Shift work and rotating shifts are terribly difficult to adapt to also for this reason.

Just as an absence of light can lead to drowsiness, exposure to light can suppress melatonin and raise body temperature, making a person less sleepy. This is a good thing when it’s time to get up in the morning but a bad thing if someone is trying to fall asleep and stay asleep. Melatonin levels have been shown to be suppressed by very small amounts of light. Therefore, it is extremely important to keep a dark sleeping environment. LED’s seen on electronic devices are often a major culprit in making the sleep environment too light. This is particularly true of any that are green or blue (red lights are less affecting). Alarm clock displays that stay on at night should also be illuminated with red lights only.

NOISE
Noise is easily the most well-known and expected factor in the disruption of sleep. After all, if someone wakes up from the mention of their name, a slamming door, or the sound of a snore near to them, the reason that they awoke is usually apparent to them. Ironically, noise is not the factor with the most impact on sleep quality. Temperature, for example, has a greater impact on sleep than noise does. Still, see what reaction you get if you ask the front desk of a hotel to raise the thermostat for a wake-up call.

Obviously, noise does have a negative impact in the sleeping environment. People who work nights can have extraordinary difficulties sleeping during the day when the hustle of the world is in full force. At night, there is always going to be a certain amount of “background” noise in any house. Stray noise from electrical appliances, or outside noises from wind for example, will contribute to a background noise level.

SLEEP SURFACE
The sleep surface has gotten surprisingly little attention over the years in research. We spend a third of our lives on a mattress (and pillow for most) and it can be a major contributor to how well we sleep over the night and how well we feel physically in the morning. Anyone who has pushed the life of their mattress too far will be able to attest to waking up more sore than when they went to bed the night before. These aches and pains will generally prompt a visit to the nearest mattress store where consumers tend to have great anxiety over spending what they perceive may be too much for something that they will use more than anything in their lives. One study out of Oklahoma State suggests that sleep quality may be dependent on timely replacement of bedding systems. (See Sidebar: Signs It Might Be Time to Replace a Mattress, page two) Still, most people will put it off to the last possible moment and at their own expense.

When looking at the sleep surface, there are multiple aspects to consider. The overall “firmness” or spinal support of a mattress set is the characteristic that most people think about when discussing a bed. The support layer of most beds will be comprised of a foundation (box spring) and around 75 to
90% of the lower portion of the top mattress. The remaining top is the comfort layer and is often a mix of foams and fabrics that will provide some amount of pressure redistribution at the body-bed interface.

Studies have shown the elderly are at higher risk for discomfort and sores from pressure exerted on the body from the sleeping surface.\textsuperscript{10} Pressure is also dependent upon the sleeper’s position. Moody reported a study that showed the lateral position having a higher maximum pressure than either supine or prone positions (which were fairly equal).\textsuperscript{11}

Temperature is also a consideration of the comfort layer. As pressure is redistributed over a larger surface area and the body sinks into the fabrics, skin temperature increases. Lee & Park note this increase in skin temperature correlates with “comfortable” mattresses and is associated with increases in sleep efficiency and deep sleep.\textsuperscript{12}

The mattress is not the only part of the surface that can affect skin and potentially core temperatures. Positive thermoregulatory effects have been seen in a pillow study where a cooling medium on the pillow’s surface was associated with lower body temperature and heart rate and an increase in distal skin temperatures. Participants reported they had deeper sleep with the cooling medium pillow over a standard polyester padded pillow.

Studies have shown that change to a better pillow can improve sleep quality and reduce cervical pain.\textsuperscript{14-16} In addition to the effects of the cervical stress that an improper pillow height can induce, it is possible that such misalignment of the cervical spine may result in stress to other areas of the back (mid and low back).

Most of the research that has been done on the support characteristics of a mattress has centered on back pain, specifically the low back or lumbar region. An older view on mattress firmness for people with back pain maintained that firmer is better.\textsuperscript{17} However, the natural curvature of the spine is compressed with an excessively firm mattress, and that older mentality is refuted in more recent work, some of which concludes that a medium-firm mattress is better for back pain.\textsuperscript{18,19} The converse is true of a mattress that is too soft for someone it will not support adequately, causing excessive curvature of the spine. Oddly, many of these studies arbitrarily assign a firmness level to all of their study samples regardless of weight, height, or body dimensions. While much research regarding how both environmental factors as well as sleep disorders impact sleep, the importance of the sleep surface itself cannot be underestimated. Body type and sleep patterns should be taken into account in the selection process of the sleep surface.

The research shows that the sleep surface can have an effect on both pain and sleep quality, but it is also important to note the relationship between the two. It is clear that pain can have a significant impact on sleep, but what the research is suggesting is that this is a reciprocal relationship.\textsuperscript{26-29} This is leading investigators to recommend sleep management as part of a pain treatment in addition to addressing pain for improvement of disrupted sleep. Pain is a strong predictor of insomnia, and participants with chronic pain score similarly on sleep disturbance tests with insomnia patients.\textsuperscript{30,31} In addition to this, mattress replacement and selection is another key component of management of sleep quality.

Shopping for a mattress is not something that consumers enjoy. The Better Sleep Council found that one-third of consumers admitted to actually having anxiety about it. The complexities of construction and lack of universal comparisons across brands make it difficult for consumers to know where and why they need to invest their money. Much of the focus (54% of the time) on showroom floors is about the construction and how it supports and comforts, but without a basis of comparison with the rest of the industry and how those things are going to improve their life, those things too often fall short of gaining consumer confidence. The more important message should be on how the sleep surface impacts sleep and what health and wellness benefits can be realized with the right surface. Unfortunately, 25% report that it wasn’t even a topic of conversation.\textsuperscript{32}

\section*{About the Author:}
Dr. Robert Oexman is Director of the Sleep to Live Institute in Joplin, Missouri, and serves as chair of the Institute’s Sleep and Wellness Board. He lectures nationally and internationally to physicians, manufacturers, retailers and the general public on the topic of sleep and how pain and the environment impact sleep.
The sleep position trainer: a new treatment for positional obstructive sleep apnea.

Treatment of obstructive sleep apnea in patients with cardiac arrhythmias.

Sleep apnea: what does that really mean? A commentary on Baranchuk: “Sleep apnea, cardiac arrhythmias, and conduction disorders”.

Diagnosis and management of childhood obstructive sleep apnea syndrome.

Resources
1. The American Sleep Apnea Association, founded in 1990, is a 501(c)(3) nonprofit organization that promotes awareness of sleep apnea, works for continuing improvements in treatments for this serious disease, and advocates for the interests of sleep apnea patients. http://www.sleepapnea.org/
2. The Jet Lag Calculator can tell you how long it will take you to adjust to your new time zone when you travel — and to adjust back again when you come home. http://www.fleetstreetclinic.com/travel-clinic-air-travel-and-flying/jet-lag-calculator

OEXMAN ARTICLE REFERENCES
1. Jenni OG, Carskadon MA. Normal human sleep at different ages: Infants to adolescents. SRS Slides Chapter 1.
3. Ancoli-Israel S. Normal human sleep at different ages: Sleep in the elderly adult. SRS slides: Chapter 2.
31. Sleep Savvy. Better Sleep Council research: Consumer attitudes about mattresses are evolving, but purchasing behavior is slow to change. Sleep Savvy 2008.