The Risks of Slumber

It's only snoring, right? Maybe. But it could be obstructive sleep apnea, a common and overlooked condition that puts your brain and heart at serious risk. Here's what you need to know.

BY NORRA MACREADY

Trying to sleep next to someone who snores loudly can be as futile and frustrating as trying to catch 40 winks next to an airport runway. Most people don't consider snoring a serious ailment, but it can exact a heavy toll on health and quality of life—not only for the snorer, but for those around him.

Dave Hargett's college roommates would probably have seconded that. Hargett is 58 years old today, but he has been "snoring like a freight train" since at least the age of 20. "It must have driven my roommates crazy," he recalls.

Like many snorers, Hargett has obstructive sleep apnea (OSA), a condition that causes people to repeatedly stop breathing during the night. Usually the episodes are rare and last only a few seconds. But in people with OSA, they occur anywhere from five to as many as 100 times an hour or more, every night. Each individual episode can persist for 10 seconds to as long as a minute, according to Rochelle Goldberg, M.D., medical co-director of sleep medicine services at Mainline Health Services in Philadelphia. Patients may experience apnea, the complete cessation of breathing for 10 seconds or more, or hypopnea, defined as abnormally slow or shallow breathing that lasts for 10 seconds or more.

Normally, we breathe in response to messages sent to the chest by specialized centers in the brain. On cue, we take in air through the nose, and respiratory muscles expand the chest so air can enter the lungs. With OSA, the brain sends its signal and the chest muscles start to work, but the airway in the throat collapses and obstructs normal air flow from the nose to the lungs. "We diagnose OSA when air flow is limited or nonexistent despite an

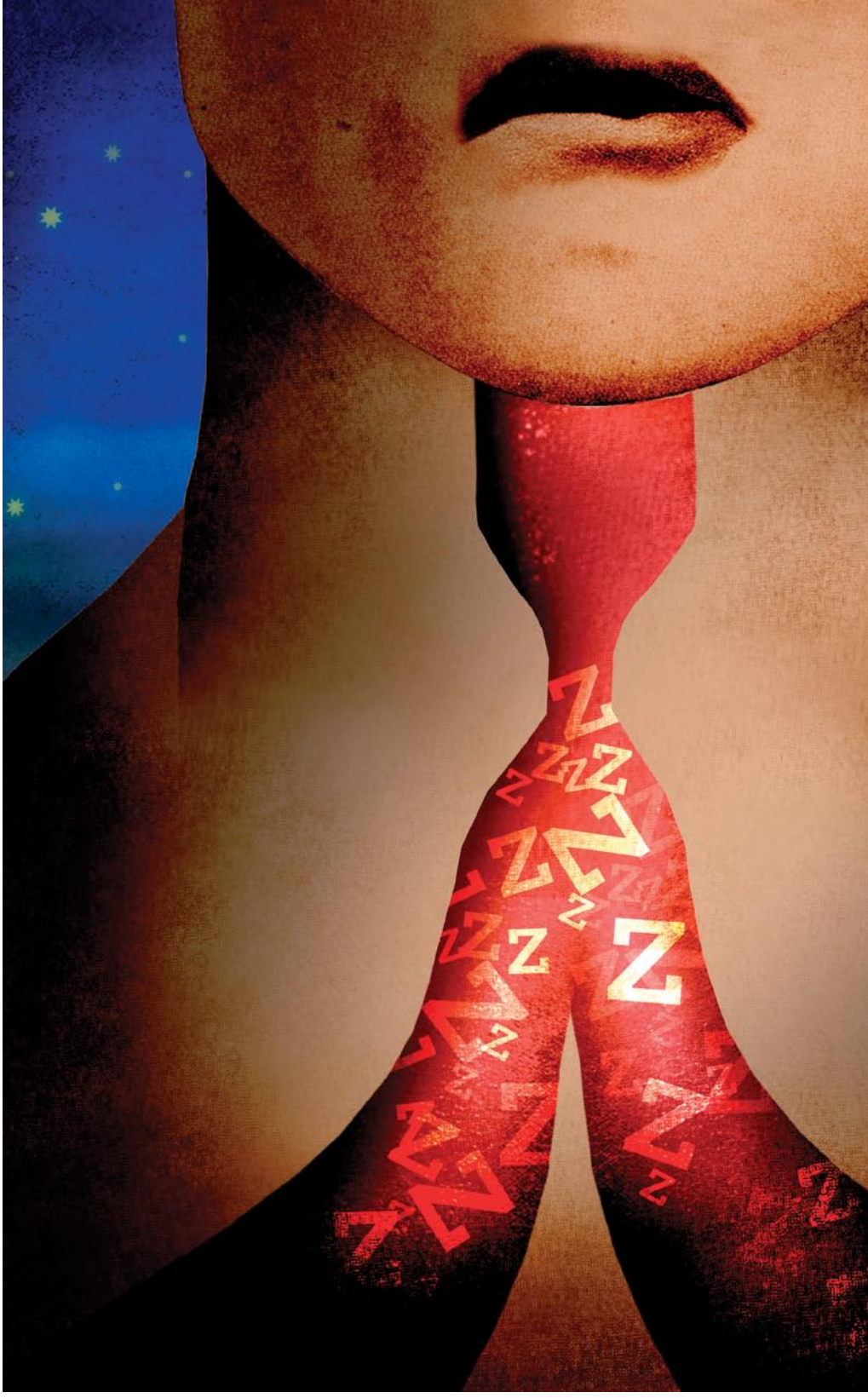
ILLUSTRATIONS BY BRIAN STAUFFER

ongoing effort to breathe," explains Dr. Goldberg, who is also president of the American Sleep Apnea Association (ASAA).

WHO IS AT RISK?

Obstructive sleep apnea is "incredibly prevalent," says Mark Mahowald, M.D., professor and chair of neurology at the University of Minnesota Medical School. The prevalence is usually estimated at 2 percent of women, 4 percent of men, and 3 percent of children, but Dr. Mahowald believes its true occurrence is much higher. According to the ASAA, at least 12 million Americans have OSA, with 10 million of those cases undiagnosed.

"It's probably as prevalent as diabetes or asthma," Dr. Mahowald says. Beth Malow, M.D., associate professor of neurology and director of the sleep clinic at Vanderbilt University in Nashville, Tenn., estimates the actual prevalence of OSA in women at 11 percent, or about 1 in 9, and in men, at 25 percent, or 1 in 4. However, these differences disappear when women enter menopause: After that, the prevalence of OSA is similar between the sexes, which leads many doctors to believe that female hormones somehow protect women during their reproductive years.



The risk of OSA is highest in overweight, middle-aged men, and it is often linked to obesity—but no one is immune. In fact, "the concept that it's primarily a disorder of middle-aged, overweight males is erroneous," Dr. Mahowald says. "About 30 percent of people with OSA are not the least bit overweight, and the majority of morbidly overweight people do not have OSA." Indeed, Hargett, who today chairs the ASAA board of directors, is 5'11" and was snoring even when he weighed a lean 195 pounds.

Obstructive sleep apnea can also be a byproduct of Down's syndrome. Children with Down's have a higher-than-average risk of OSA due to their flattened mid-facial area, narrow nasopharynx, and tendency to have decreased muscle tone in the airway and enlarged tonsils or adenoids. Children with certain abnormalities of the skull or facial bones, such as cleft lip or palate, are also at higher risk of OSA.

Some doctors have suggested that children with autism or attention deficit hyperactivity disorder may have an increased risk of OSA, but according to Dr. Malow, who studies sleep disorders in children with autism, it's actually unusual to find OSA

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in that population. However, Dr. Malow has also studied OSA in adults with epilepsy and found that the frequency of seizures decreases when the OSA is treated.

SYMPTOMS AND CONSEQUENCES

People with OSA usually are unaware of their nightly struggles for air, but they often awaken feeling tired, head-achy, and decidedly un-refreshed from their night's sleep. In fact, along with snoring, choking, or gasping while asleep, daytime sleepiness is the most common symptom of OSA. According to the National Heart, Lung, and Blood Institute, other symptoms include:

1. Morning headaches
2. Memory or learning problems
3. Poor judgment
4. Feeling irritable
5. Inability to concentrate
6. Mood swings, personality changes, or depression
7. Waking with a dry throat
8. Frequent need to urinate during the night

These symptoms can seriously impact the person with the disorder, his or her sleeping partner, and even other people. In fact, daytime sleepiness caused by OSA is a major cause of motor vehicle accidents. Dr. Mahowald estimates that OSA may be responsible for as many as 100,000 crashes per year—one of his own patients dozed off at the wheel and totaled three cars—but OSA frequently goes undetected as a factor in accidents, he says, because "sleepiness doesn't show up at autopsy."

As if this weren't enough, untreated OSA plays a role in many other serious and common disorders. The repeated oxygen deficits it creates in the brain and other organs increases the risk of heart attacks, heart failure, high blood pressure, and strokes. It's also a cause or a complication of neurological conditions such as migraine headaches and even traumatic brain injuries.

"There's a clear cause-and-effect relationship between obstructive sleep apnea and neurological disorders," says Sonia Ancoli-Israel, M.D., professor of psychiatry and director of the sleep disorders clinic at the University of California, San Diego.

SLEEP APNEA AND YOUR BRAIN

Doctors have long suspected that OSA could increase a person's risk of stroke, and in 2005, these suspicions were confirmed by two large studies published in the *New England Journal of Medicine* involving more than 3,000 people. In the first study, the investigators followed 1,022 people for approximately three years. During that time, the risk of stroke or death was 70 percent higher for people with OSA compared to those who did not have it—even after other risk factors like obesity and high blood pressure were taken into account. The second study, which followed a total of 2,664 people for four years, also found that people with OSA had an increased risk of stroke compared to those without the condition, in some cases by as much as 400 percent.

Some evidence links OSA and other types of sleep disorders to headaches, including migraines. In one recent study, nearly half of all patients with OSA or insomnia reported headaches. People with OSA were particularly likely to report pain reminiscent of tension-type headaches, a dull but steady ache on both

WHAT CAUSES OSA?

Several factors contribute to airway obstruction, including:

1. **Excessive relaxation of the throat muscles or tongue**
2. **Obesity**
3. **Accumulation of fatty tissue around the neck, even if the person is not obese**
4. **Certain physiological or hereditary characteristics, such as a recessed lower jaw or a narrow airway**
5. **Enlarged tonsils or adenoids or a large, dangling uvula**
6. **Conditions that affect the nose, such as a deviated septum, nasal polyps, or enlarged sinuses**
7. **Abnormalities of the skull and facial bones, such as cleft lip or palate**

People with OSA often have more than one of these conditions.

sides of the head that is usually associated with tight head and neck muscles. Headaches upon awakening were particularly common in the people with OSA and seemed to be related to the dips in oxygen levels that occur during the night in people with OSA as well as to OSA severity. To put it another way, people who complain of headaches have a disproportionately high rate of sleep disorders, and managing or improving the sleep disorder may relieve the headache.

The exact relationship between OSA and morning headaches is still being investigated, but some experts think that the dilation of blood vessels in the brain and increased blood pressure in the head, along with metabolic changes produced by the fluctuating oxygen levels in the blood and the overall effects of OSA on sleep quality, may all play a role. However, not all doctors are convinced that an association really exists. "Headaches are an uncommon manifestation of OSA," says Dr. Mahowald.

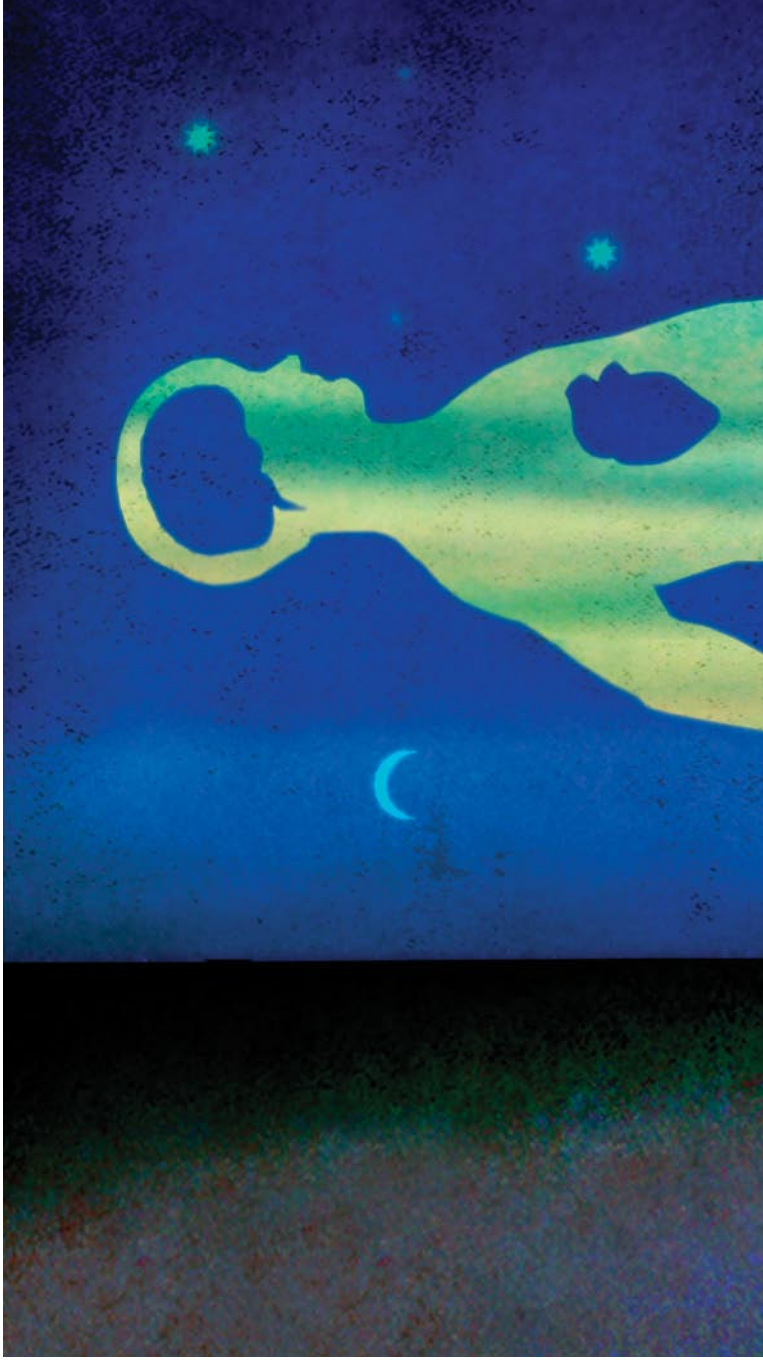
OSA AND HEART HEALTH

"Large studies have shown a clear relationship between OSA and high blood pressure and heart disease," says Dr. Ancoli-Israel. No one is certain why this relationship develops, but possible culprits include the repeated decrease in oxygen levels and corresponding increase in carbon dioxide levels that occur with OSA and abnormal activity of the blood vessels or sympathetic nervous system.

Not surprisingly, links between OSA and heart attacks and heart failure have also been demonstrated. The exact nature of the relationship isn't clear, but there is some evidence that the blood of people with OSA is more prone to clotting; this raises the risk of a blockage in the coronary arteries, which is associated with heart attacks.

At least 50 percent of people with heart failure have OSA, according to Ron Harper, Ph.D., professor of neurobiology at the David Geffen School of Medicine at the University of California, Los Angeles. He and his colleagues have been using magnetic resonance imaging to study the brains of people who have both of these conditions, and they believe that the cycle of breathing—not breathing—breathing again, repeated throughout the night, takes a toll on the brain.

"Every time you stop breathing, the oxygen in your blood goes down a lot," explains Dr. Harper. "When you rebreathe, your body tries to refresh itself with the new oxygen. That cycle is very hard on the brain: cells die, nerve fibers die, and you lose connections between different brain structures." The affected parts of the brain include structures that influence blood



pressure, mood, and memory, which helps explain why high blood pressure, irritability, and memory problems are so often associated with OSA. What's more, Dr. Harper says, "this absolutely helps explain the association between sleep apnea and neurological conditions such as stroke."

DIAGNOSIS AND TREATMENT

Since OSA results from an obstructed airway, the best way to treat it is by administering air at a pressure strong enough to blow through the obstruction and into the lungs. That's where continuous positive airway pressure (CPAP) comes in.

A CPAP system consists of a mask that slips over your mouth and into your nose. It is attached by a hose to a small generator that delivers air into your nose with enough pressure to overcome the obstruction. Some people call it an "air splint" because it keeps the airway open. Different patients require pressure at different

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strengths; this is determined by participating in a sleep study.

If your doctor suspects that you have OSA (or any other type of sleep disorder), she'll most likely ask you, before your actual test, to keep a special diary in which you record your sleep habits and rate how sleepy you feel at different times of the day. Then you'll go to a local sleep center, where you'll be hooked up to equipment that monitors your brain waves, eye movements, air flow, heart rhythm, blood oxygen, and the movement of your legs to check for restless leg syndrome. There will even be a snoring microphone to see if you snore as loudly as your spouse claims you do.

Some sleep centers will have you spend two nights. The first night is for diagnosis, so the staff can determine the exact reason for your sleep disturbance. Assuming that you do have OSA, the staff will place you on CPAP the second night and experiment with various pressure levels to find the one that's best for you. Most insurance companies will pay for CPAP equipment, but they usually reimburse for only one night at a sleep center. If you're doing a one-night study, you'll be monitored for the first two hours, and if you experience 30 or more episodes of apnea or hypopnea during that time, you'll receive CPAP. Ideally, you'll use it for the rest of your life.

The thought of sleeping with a mask blowing air into your nose may seem odd, but patients who give it a chance usually end up staying with it because they feel better almost immediately. CPAP is "the easiest and most benign treatment available in medicine for such a serious problem," says Dr. Mahowald. At first, many people complain that the mask is uncomfortable. "The key is finding the right mask, one that fits well, doesn't rub your skin, and doesn't allow air to leak out," says Dave Hargett, who's been using CPAP since he was diagnosed with OSA in 1994. He warns that people sometimes must try two or three masks before they find a style that they're most comfortable with. However, about 20 percent to 30 percent of patients cannot use CPAP at all.

For those people, another option is a mandibular advancement device, which fits into the mouth and opens the airway

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by thrusting the jaw forward. Not only does this help you get more air, it's probably the best treatment available for loud snoring, according to Dr. Mahowald. If the soft palate at the back of the tongue is obstructing the airway, it will vibrate every time you suck in air in an effort to breathe past the obstruction. That vibration is what causes the "sawing logs" sound characteristic of snoring. Keeping your jaw forward minimizes snoring by preventing the soft palate from blocking the airway.

Continuous positive airway pressure and the mandibular device are both safe and relatively easy ways of treating OSA, but they're not for everyone. People who lack manual dexterity due to arthritis, a stroke, or another neurological disorder may not be able to handle them, and they may be inappropriate for people with cognitive disorders such as dementia. Dr. Ancoli-Israel notes that the patients with Alzheimer's disease in her study had caregivers living with them who could help them with their CPAP devices. And some people simply find them too cumbersome or uncomfortable.

Those individuals may wish to consider one of several surgical procedures designed to open the airway. Perhaps the simplest way of curing OSA is a permanent tracheostomy. Forget the images you may have seen of people with large tubes coming out of their throats, says Dr. Mahowald: An OSA tracheostomy consists of a small, clear plastic tube that is much less noticeable and invasive. It has the distinct advantage of immediately curing snoring and OSA because it bypasses the airway obstruction.

A second surgery for OSA is uvulopalatopharyngoplasty (UPPP). In this procedure, the surgeon removes excess tissue from the back of the throat, which may or may not include the uvula, soft palate, tonsils, adenoids, and sometimes even the pharynx. These operations work only about one-third of the time, says Dr. Mahowald, because they focus on the back of the throat, when in many cases it's the tissue on the sides of the throat that obstructs the airway. They're also rarely effective in very severe cases of OSA. Unfortunately, it's impossible to predict which patients will be among the one-third that see an improvement until they actually undergo the procedure. Still, Dr. Mahowald says he occasionally recommends it as a last resort for people who cannot tolerate CPAP, as long as they have a clear understanding of the low odds of success.

Drugs are very rarely recommended for treating OSA, but there is one report in the medical literature of a man who responded well to treatment with topiramate, a drug ordinarily used to treat epilepsy, migraines, and bipolar disorder.

Finally, at least one expert believes that good old-fashioned exercise might help get the airway as well as the body in shape. Dr. Harper and his colleagues have learned from animal studies that the oxygen deprivation associated with OSA damages several brain areas including the hippocampus, which governs short-term memory, and the cerebellum, which integrates sensory perception with muscle activity to make movements smooth and purposeful. They have also discovered that the cells in these areas can regenerate and make new connections in response to repetitive activity, and one way to do this is through the repetitive muscular actions performed during exercise. "The brain does not typically heal itself, but simple exercise such as walking can help certain areas grow new cells," Dr. Harper says.

Whether through exercise and lifestyle changes, an airway device, or surgery, OSA can be treated. What's more, these are among the safest, most effective, and most reasonably priced therapies available for a condition that can impact your health so dramatically. NN

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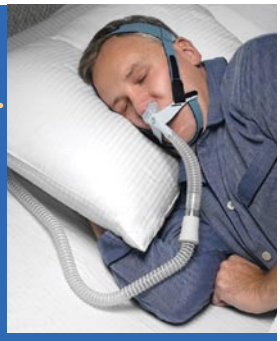
For more information on sleep apnea, see RESOURCE CENTRAL on page 46.

CPAP RECALL



ResMed AND FDA recently notified consumers of a recall of approximately 300,000 S8 flow generators used for the treatment of obstructive sleep apnea. In Model S8 devices manufactured between July 2004 and May 15, 2006, there is a potential for a short circuit. ResMed is working to provide a replacement device to patients—see the recall notice (fda.gov/medwatch/safety/2007/safety07.htm#ResMed) for serial numbers of affected S8 models. Patients may continue to use the S8 until they receive a replacement device but should make sure that it's placed on a hard clean surface and that the area around the device is clear during use. Discontinue use of the device if there are any signs of electrical failure such as intermittent power, cracking sounds, sparking, or a charred smell. Also, do not use supplemental oxygen with an affected device; patients using supplemental oxygen should immediately contact their home health care provider for a replacement.

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