

# Exploring the link between sleep apnea and heart failure

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Tyrone Conner's heart was in such bad shape that he could barely walk up a flight of steps.

"I felt like I was 80 years old," said Conner, 50, of Norristown, Pa.

He also suffered from sleep apnea, snoring heavily and gasping for breath every night.

What he did not initially realize was that the two problems were linked.

Conner's physicians, at Thomas Jefferson University Hospital, made the connection, but many do not. Sleep apnea afflicts as many as 60 percent of patients with heart failure - the term for a weakened heart muscle that cannot keep up with the body's demands. Yet only 2 percent of them nationwide are treated for the nocturnal breathing problem, said Sunil Sharma, associate director of the Jefferson Sleep Disorders Center.

Physicians do not fully understand how heart failure and apnea are related, but evidence suggests that each can contribute to the other, and thus treating one of the conditions can alleviate both, said Fredric L. Ginsberg, director of the heart failure program at Cooper University Health Care in South Jersey.

"It's hard to know sometimes in individual patients what is the chicken and what is the egg," Ginsberg said.

Jefferson and Cooper physicians are involved in separate trials of devices that treat sleep apnea and may, they hope, address heart disease into the bargain.

An earlier version of one of the devices seems to have worked for Conner, his physicians say.

Conner, a paramedic at Jefferson's surgical intensive care unit, had known for years that he was not getting enough sleep at night. He often felt sleepy, and sometimes would take a quick nap while on a work break. A co-worker told him he snored heavily and sometimes stopped breathing entirely.

He also knew something was amiss with his heart, to the point that he felt short of breath even from walking across the street from work to a Wawa store.

The road to recovery began in 2008, when he went to the emergency room with severe abdominal pain. His abdomen turned out to be OK, but additional tests revealed that his heart was weak and enlarged, failing to pump enough blood to the rest of his body.

He was treated with standard heart failure medicines such as beta blockers and diuretics, but his condition grew so bad that cardiologist Paul J. Mather determined he was eligible for a transplant.

In the meantime, Conner was surprised to learn that he might get some relief from a device that would help him sleep.

There are two common forms of sleep apnea. One is [obstructive sleep apnea](#), in which the muscles supporting the airway relax in such a way that it collapses - a condition often accompanied by heavy snoring and repeated awakening. This is often treated with a continuous positive

airway pressure device - a CPAP, pronounced SEE-pap - that props the airway open by delivering air through a mask.

The other primary form of the disease is central sleep apnea, in which the patient "forgets" to breathe. That is, the brain fails to send the proper automatic message that causes the lungs to inhale. The exact cause of this breakdown is not fully understood, but is believed to be due to the ebb and flow in levels of carbon dioxide in the blood, and may be exacerbated by lung congestion, stress hormones or a weak heart muscle, Sharma said.

In any event, a standard CPAP device may be of little use for someone with central sleep apnea, said Mather, director of Jefferson's Advanced Heart Failure and Cardiac Transplant Center.

"Giving oxygen to a body that doesn't inhale won't really help," he said.

Jefferson is one of 10 centers testing a "smart" device made by San Diego-based ResMed. As with a CPAP, the patient receives air through a mask, but the device also senses how well the patient is breathing and increases the air pressure as necessary to prompt inhalation.

While the device already is approved by the Food and Drug Administration for the treatment of central sleep apnea, the new trial will focus on whether it reduces symptoms and hospitalizations associated with heart failure. These "adaptive servo-ventilation" devices cost about \$5,000 and are generally covered by insurers, said Adam Benjafeld, ResMed vice president of medical affairs.

At Cooper University and at the Hospital of the University of Pennsylvania, meanwhile, physicians are implanting a pacemakerlike device that stimulates the patient's phrenic nerve, which signals the diaphragm to contract in the breathing process.

The device, made by Respicardia Inc. of Minnetonka, Minn., is approved for use in Europe but not yet in the U.S. It senses when the patient has stopped breathing and delivers an electrical stimulus as necessary, said company chief executive officer Bonnie Labosky.

In Conner's case, Jefferson sleep doctor and pulmonologist Ritu G. Grewal had him try a series of different breathing machines and masks and settings over the course of a year, ultimately settling on one of ResMed's smart devices. Conner suffered primarily from obstructive sleep apnea but also to some degree from the central variety, she said.

The apnea treatment worked so well that, in conjunction with heart medications, Conner was eventually able to come off the transplant list, said Mather, the cardiologist.

The nightly deprivation of oxygen was causing Conner's [heart muscle](#) to become scarred and stiff, Mather said. But the [sleep apnea](#) treatment helped arrest the damage before it got too far, he said.

Conner was on leave from his job for more than two years while recovering, finally returning to work in 2011. At one point, eager to show Mather he was ready to return, he walked to Jefferson from a public transit station more than 5 miles away.

"I got my life back," Conner said.

Now, for the last two years, Jefferson's practice has been to conduct sleep tests on all patients admitted for [heart failure](#), Mather said. Jefferson physicians now are expanding that practice to patients seen in outpatient clinics, he said.

Any time they encounter someone like Tyrone Conner, they plan to be ready.

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