

If you need a ventilator for COVID-19, odds are 50-50 you'll survive

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Mike DeWan, 43, of Worcester; Jim Cracas, 51, of Chester Springs; and Raveena Brown, 62, of Bear, Del., each had the bad luck to get a horrible case of the coronavirus, so bad that they needed to spend

days—in DeWan's case, weeks—on a ventilator, a machine that forced oxygen-rich air into their fluid-filled lungs.

All strong and healthy before their illnesses, they also had the good luck to survive. About half of coronavirus patients who need ventilators die.

They now have one more thing in common: None remembers anything about being on the machine that has been the focus of so many desperate searches as the virus has revealed its ugly power, a machine that saved their lives.

Cracas, who owns a feed and farm store in Exton, actually described the experience of being on a [ventilator](#) at Paoli Hospital for 4{ days as "somewhat pleasant."

That's a byproduct of heavy sedation, and Richard Strobel, a pulmonologist at Lehigh Valley Health Network, said such amnesia is a blessing. For those who are sickest with respiratory viruses, the ventilator is the linchpin of intensive-care-unit treatment, but there is nothing pleasant about being on drugs that paralyze you while a machine sends air through a tube that runs down your throat to your lungs. Without sedation, that experience, Strobel said, would be "horribly frightening."

Ventilators have made headlines lately because hospitals needed more of them. While about 80% of people who contract the virus have relatively mild disease, the rest may need [hospital care](#). Up to a quarter of those may need intensive care, which often includes time on a ventilator. People with COVID-19, the disease caused by the coronavirus, are not only more likely to need ventilators than those with other respiratory germs, but they also need more time on the machines—often two weeks or more, area pulmonologists said. That increases demand for ventilators.

As COVID-19 patients have swarmed into area hospitals, doctors are learning on the fly how to use ventilators for a new disease that can behave differently than anything they've seen before. Some hope that new treatment approaches may help some patients avoid ventilators completely.

When patients do use ventilators, doctors find that some respond well to gentler ventilation than would typically be used for acute respiratory distress syndrome (ARDS), an extreme form of lung infection that often drives the need for ventilator support. Doctors are also making much greater use of proning, or facedown positioning, with COVID-19 patients, including both those who do and do not need ventilators.

Ryan Reber, medical director of the intensive-care unit at Paoli Hospital where Cracas was treated, said procedures are changing week to week as doctors adapt to new information from more experienced peers in Asia, Europe, and harder-hit areas of the United States. This pandemic, Reber said, "epitomizes the ever-evolving nature of medicine."

While the mad rush to acquire ventilators might suggest they are a cure-all, they are not. Even with all-out care, 30% to 40% of ARDS patients die. Doctors said they think the death rate is higher for COVID-19 patients who need ventilators. Still, the machines unquestionably save lives.

"We celebrate our success stories," said Bharat Awsare, a critical-care pulmonologist at Jefferson Health. "There is hope."

The ventilator, said Gerard Criner, chair of thoracic medicine and surgery and director of the Temple Lung Center, is not a treatment. "It's a support." The machine's job is to let your lungs rest while your body fights the underlying illness. That may mean eradicating the virus, but ARDS can also develop in coronavirus patients when an overactive

immune system causes what's known as a cytokine storm. Resulting inflammation can flood the lungs with fluid, impairing their ability to transfer oxygen to the blood.

During the reprieve the ventilator provides, doctors at Temple, like other hospitals, are trying several drugs that Criner hopes may speed recovery. Among them: remdesivir, monoclonal antibodies now used for rheumatoid arthritis and steroids. There is no proven treatment.

Unlike the iron lungs made famous during the polio era, which used negative pressure to expand lungs, ventilators push gases into the lungs. They are designed to improve oxygenation, but also help rid the lungs of carbon dioxide.

Hernan Alvarado, director of respiratory therapy for Temple Health, said the first step in intubating a patient is sedation. "No one that's awake is going to want a rubber tube to go down their throat," he said. After the patient is ventilated manually with a resuscitation bag, his or her tongue is moved to one side with a laryngoscope, a device with a light in it. Then an 8- to 10-inch tube is inserted down the trachea into the airways. If carbon dioxide is coming out, that usually means the tube is in the right place, Alvarado said, and it is connected to the ventilator. Patients are also X-rayed to make sure the tube is placed correctly.

Cameron Baston, a pulmonary and critical-care physician at Penn Medicine, said only the sickest patients nowadays are sedated enough to be in medically induced comas while on the ventilator, and most are no longer given drugs that cause temporary paralysis. While many are sedated enough that they don't remember being on the ventilator, some are awake enough to text friends and family.

The choice to go on a ventilator should not be taken lightly. Even when things go well, patients face a long recovery and some suffer from post-

traumatic stress. The machines can damage lung tissue, and patients on them a long time are at heightened risk for infection. Some patients can't wean off the machine, leaving families with a painful decision.

The risks of bad outcomes are especially high for elderly patients with coronavirus or chronic problems like lung and heart disease or diabetes.

While doctors say that some quite old patients—Temple had one who was 93—have survived after being on a ventilator, the sicker you were before you got the virus, the worse your odds of surviving. Like other doctors, John Zurlo, chief of the division of infectious diseases at Jefferson Health, wouldn't put a number on it, but said that people age 80 and up face worse odds than younger patients. "It's not a good prognosis for you," he said.

Lisa Walke, chair of geriatrics at Penn Medicine, said now is a good time for families to discuss what older loved ones want. With coronavirus spreading in many senior facilities, this is no longer a hypothetical discussion. "This is a time to think about it while you still have that opportunity," she said.

Awsare agrees that, for patients who already have serious medical or functional problems, "a conversation needs to occur of whether they would want to spend the last days of their life on mechanical ventilation."

Spurred by a paper by Italian doctors, American lung experts are debating whether the sickest COVID-19 patients fall into two categories—some that look like typical ARDS patients and others who have very low blood oxygen levels, but are not having trouble breathing or thinking. This latter group, the Italian experts suggested, might be able to forgo ventilators and instead receive high-flow oxygen from other devices. If on ventilators, they need lower pressures because their lungs

are less stiff than patients doctors are used to seeing. They need high oxygen.

Area doctors said they always try to use the lowest amount of pressure possible to minimize lung damage. They are finding that some COVID-19 patients with low blood oxygen can avoid ventilators. "We tend to wait and see," Awsare said.

Penn's Baston said there have always been patients with low oxygen levels who were not in distress. "When you feel short of breath, it is almost never because of oxygen levels in your blood," he said. "It is almost always because of carbon dioxide levels in your blood." He said there do seem to be more COVID-19 patients who have these symptoms than he has seen in the past.

Doctors are also making much greater use of proning, the technique that caught Baston's eye in 2013 when a New England Journal of Medicine paper found it helped ARDS patients. "For every seven patients you did this to, you save a life, which in our world is a big deal," he said. It is typically used for moderate and severe ARDS, which are more common among [coronavirus](#) patients.

Why proning works is not well understood, but one theory is that, when patients lie on their backs, the tiny air sacs in the back of their lungs collapse. Placing patients facedown also seems to reduce inflammation and improve the coordination between air flow and blood flow. That coordination may be particularly impaired in COVID-19, Baston said.

At Penn, teams of operating-room technicians use sheets with handles on them to turn patients, who spend 16 hours prone followed by eight on their backs.

Jefferson is among other hospitals that are proning much more often.

Coronavirus patients, Awsare said, "respond very well to being flipped on their belly."

Patients lucky enough to make it off the ventilator still face a long recovery.

Mike DeWan, who works at home as a software developer, woke up Monday, March 9, with chills and sweats. He was in the first wave of local cases. He felt fine the night before and had dinner with his in-laws and his mother and her husband. Eventually, his whole family tested positive for COVID-19, but only he needed hospitalization. By Saturday, he was having trouble breathing, and his wife took him to Einstein Medical Center Montgomery. He was intubated there and then transferred to Penn Presbyterian Medical Center. All he remembers is that his medical team looked vaguely familiar when he got off the machine on March 31, after 17 days.

"It's just crazy. ... When I got sick, it was still business as usual. Everyone was out," he said. "You wake up, and it's like the whole world stopped."

The experience left him almost 40 pounds lighter and much weaker. His muscles had atrophied while he was immobile. In the hospital, he could barely push himself up in the bed and needed help to get in a chair. When he first got home, he had to crawl up the stairs. He graduated to using a walker. Hoarse from the throat tube, he couldn't talk at first. He still has to be careful about swallowing and is doing breathing exercises. His doctors told him it would take six to eight weeks to get back to normal.

Jim Cracas had employees who were being tested for COVID-19, but the results weren't back when he developed flulike symptoms on March 25. "It's the flu," he thought. "It's really not a big deal." On the morning of

April 3, his wife, a nurse, called an ambulance. His breathing was extremely shallow and he had a fever of 103. He felt like "garbage."

"It still felt like just a bad case of flu," he said. "It was just a really, really bad case."

That night, he agreed to go on a ventilator, not realizing how dire his odds were. He went home on Easter, April 12.

Cracas, who used to throw 50-pound bags of feed into trucks, now easily tires. "I go up the stairs, down the hall and it's like "Wow, this is more than I thought it was," " he said. He is elated that he lived, but feels bad about what his illness put his family through. "There is a little bit of survival guilt," he said.

Raveena Brown and her daughter Andrianna Williams, 31, of Newark, Del., managed to get COVID-19 independently. Williams got it first and had to go to ChristianaCare's Wilmington Hospital, where she got high-dose oxygen delivered through a "huge nasal cannula" in the ICU. Without any previous symptoms, her mother then started having trouble breathing. Williams was horrified to learn that Brown would soon be joining her in the ICU. Then she got the call that her mom would need a ventilator. The Air Force vet was on it for three days. She came off on Easter and is still in the hospital.

Brown, too, is weak but was pleased last week that she could take three or four steps to a chair. Her lungs were strong enough for her to sing "America the Beautiful" into the phone with gusto.

All that mattered was that she had survived. As soon as she awoke, she said, "I felt relieved. I felt excited. I felt hopeful. I felt: "Hey, we're Americans. We're winning at this." " Asked how she felt physically, she said, "I felt, don't laugh at me, I felt vivacious."

She's not thinking about how long it will take her to get her strength back. "I'm taking 12 hours at a time, one day at a time, and I'm enjoying this ride. I'm enjoying opening my eyes and seeing the beautiful sunrise."

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