

Effects of surgery on a warming planet: Can anesthesia go green?

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It was early morning in an operating theater at Providence Hospital in Portland, Ore. A middle-aged woman lay on the operating table, wrapped in blankets. Surgeons were about to cut out a cancerous growth

in her stomach.

But first, an anesthesiologist—Dr. Brian Chesebro—put her under by placing a mask over her face.

"Now I'm breathing for her with this mask," he said. "And I'm delivering sevoflurane to her through this breathing circuit."

Sevoflurane is one of the most commonly used anesthesiology gases. The other big one is desflurane. There are others too, like nitrous oxide, commonly known as laughing gas.

Whichever gas a patient gets is inhaled, but only about 5% is metabolized. The rest is exhaled. And to make sure the gas doesn't knock out anyone else in the operating room, it's sucked into a ventilation system.

And then? It's vented up and out through the roof, to mingle with other [greenhouse gases](#).

The two frequently used gases are fairly similar medically; sevoflurane needs to be more carefully monitored and meted out in some patients, but that's not difficult, Chesebro said.

Generally, unless there's a reason in a particular case to use one over the other, anesthesiologists simply tend to pick one of the two gases and stick with it. Few understand that one—desflurane—is much worse for the environment.

And that bothered Chesebro. He grew up on a ranch in Montana that focused on sustainability.

"Part of growing up on a ranch is taking care of the land and being a

good steward," he said.

Now he lives in the city with his three kids and has gradually started to worry about their environmental future.

"When I look around and I see the stewardship on display today, it's discouraging," he said.

"I got depressed for a while, and so I hit the pause button on myself and said, 'Well, what's the very best that I can do?'"

He spent hours of his own time researching anesthesiology gases. And he learned desflurane is 20 times more powerful than sevoflurane in trapping heat in the Earth's atmosphere. It also lasts for 14 years in the atmosphere, whereas sevoflurane breaks down in just one year.

Opening a big, black notebook filled with diagrams and tiny writing, he showed how he computed the amount of each gas the doctors in his group practice used. Then he shared their carbon footprint with them.

"All I'm doing is showing them their data," Chesebro said. "It's not really combative. It's demonstrative."

One of the doctors he shared his analysis with was Dr. Michael Hartmeyer, who works at the Oregon Anesthesiology Group with Chesebro.

"I wish I had known earlier," Hartmeyer said. "I would have changed my practice a long time ago."

Hartmeyer said he was stunned when Chesebro explained that his use of desflurane was the greenhouse gas equivalent of driving a fleet of 12 Hummers for the duration of each surgical procedure. It's "only" half a

Hummer if he uses sevoflurane. Hartmeyer noted that outside the [operating room](#) he drives a Prius, a hybrid electric car.

"You try to be good," he said. "You take shorter showers or (don't) leave lights on, or whatever else. But you know there's always more that we could probably do. But this was, far and away, a relatively easy thing that I could do that made a huge impact."

The anesthesiology carts that get brought into operating theaters tend to have a row of gases to choose from. Hartmeyer was able to switch pretty much overnight.

Other anesthesiologists made the switch, too. And it didn't hurt that sevoflurane is considerably cheaper.

Hartmeyer's change saved his hospital \$13,000 a year.

When Chesebro shared his findings with the anesthesia departments at all eight Providence Health hospitals in Oregon, they prioritized the use of sevoflurane. They now save about \$500,000 a year.

Providence's chief executive, Lisa Vance, said the hospital system didn't change its use of the gas because of the money. It changed because the World Health Organization now says [climate change](#) is the No. 1 public health issue of the 21st century—and because of Chesebro.

Vance said Chesebro teared up in front of 2,000 people when talking about the gas, his children and the Lorax character created by Dr. Seuss.

"Unless someone like you cares a whole awful lot, nothing's going to get better—it's not," said Vance, quoting the book "The Lorax."

Dr. Jodi Sherman, an associate professor of anesthesiology at Yale

School of Medicine, called Chesebro's efforts remarkable and important.

She said several hospitals around the country have tried to make this shift, but with mixed results. Some just gave anesthesiologists the information and not much changed. Other hospitals took desflurane away, but that left many anesthesiologists feeling disrespected and angry.

Chesebro succeeded, she said, because he chose to persuade his colleagues—using data. He showed doctors their choice of gas plotted against their greenhouse impact. And it helped that he showed them over and over, so doctors could compare their progress to their peers.

"Providing ongoing reports to providers is the best way for this movement to catch on and grow," she said. It can reinforce over time, she added, not just what their [carbon footprint](#) is, but also what progress they're making.

Sherman said efforts such as Chesebro's are sorely needed because the U.S. health sector is responsible for about 10% of the nation's greenhouse gases.

"We clinicians are very much focused on taking care of the patient in front of us," she said. "We tend to not think about what's happening to the community health, public health—because we're so focused on the patient in front of us."

In an emailed statement, one of the largest manufacturers of both the anesthesia gases—Baxter International—said it's important to provide a range of options for patients. The company also said inhaled anesthetics have a climate impact of 0.01% of fossil fuels.

"The overall impact of anesthetic agents on [global warming](#) is low, relative to other societal contributors, especially when you consider the

critical role these products have in performing safe surgical procedures," the statement reads.

It's a fair point, Chesebro said, but he has a counterargument.

"Well, if it's there, it's bad. And if I can reduce my life's footprint by a factor of six ... why wouldn't you do it?"

The surgery Chesebro was involved in that morning at Providence was a success. Chesebro estimates that by using sevoflurane on his patient, the amount of greenhouse gases produced was the same as in a 40-mile drive across the Portland region. If he'd used desflurane instead, he said, it would have been like driving the more than 1,200 miles from Seattle to San Diego.

Now Chesebro's hospital bosses are hoping other doctors will follow his lead, research their own pet peeve and maybe solve a problem no one's thinking about.

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