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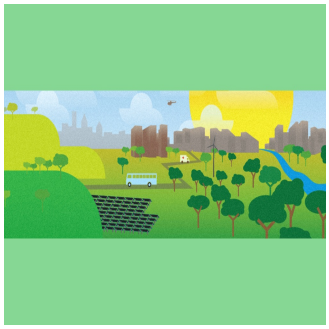
How Penn Medicine is Going Green for Good Health



The patient lies still on the operating table, softly inhaling the anesthetic gases that keep her safely sedated during surgery. Then she breathes out, and the anesthesia that wasn't metabolized by her body—roughly 95 percent of the gas flowing through the anesthesia machine—is exhaled, unused and unchanged. That gas is then vented through the hospital roof outside into the atmosphere, another greenhouse gas emission contributing to a warming planet.

There's little doubt that anesthesia is a necessary and important part of surgical practice, but anesthetic gases have represented a three-way loss for the health care sector for decades. Most of the gases purchased by a hospital are exhaled and wasted. This anesthetic waste alone makes up at least five percent of a health care facility's total greenhouse gas emissions, with warming effects in the atmosphere that are hundreds or even thousands of times more potent than the equivalent weight of carbon dioxide. And climate change in turn is known to worsen public health by increasing rates of respiratory and cardiovascular diseases, causing extreme weather events and giving rise to infectious diseases.

The health care sector has an outsized impact on the Earth's changing climate, responsible for an estimated 8.5 percent of all greenhouse gas emissions in the United States. At the same time, the mission of health care—to improve an individual's health—sits at odds with its negative contributions to the environment and public health.

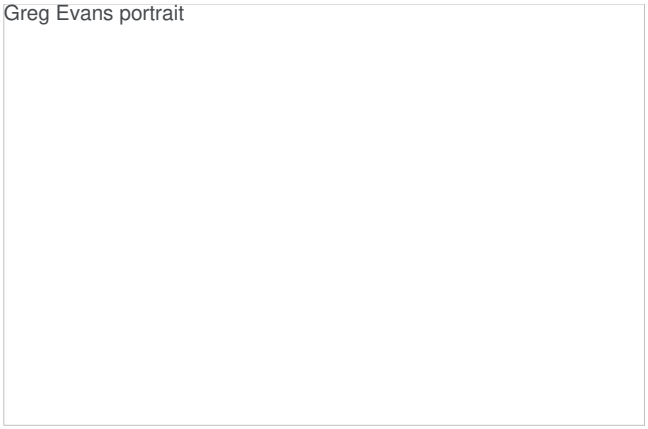
But does providing health care to patients have to contribute to worsening the health of other people and the planet?

Increasingly, health care professionals and organizations are saying no. A green health care system is not only attainable, but makes it possible to achieve three-way wins: a win for a patient's health, a win for the health of the planet and public health, and a win in the form of cost savings.

One case in point: An initiative from Penn Medicine anesthesiologists to reduce the flow rate of anesthesia gases for patients—while still delivering safe care—slashed greenhouse gas emissions by the equivalent of 30 metric tons of carbon in the space of only three months at the Hospital of the University of Pennsylvania last year.

Multiply the emissions reduction from that single initiative across all of Penn Medicine's six hospital entities and dozens of outpatient sites, and the scale of impact grows by orders of magnitude. Now imagine other health systems follow this lead, reducing not only anesthesia flows but taking other steps to mitigate health care's impact on the health of the planet—the potential benefits are staggering.

Penn Medicine is making many other such moves. From large-scale efforts, like a commitment to sustainable building design and a massive renewable power purchase agreement in collaboration with the university, to more localized initiatives in hospital operating rooms and offices, the changes are meant to move toward the same goal, articulated in the organization's recent strategic plan: making Penn Medicine the most environmentally friendly health care organization in the nation.



Greg Evans, corporate director of sustainability for the University of Pennsylvania Health System

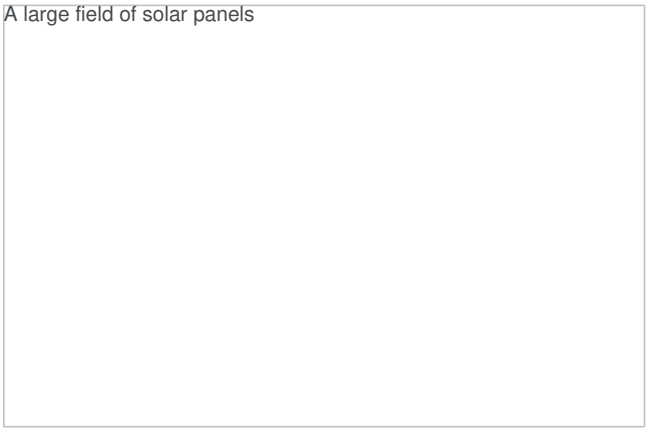
“Health care is dedicated to healing, but the industry has played a role in the changing climate,” said Kevin B. Mahoney, chief executive officer of the University of Pennsylvania Health System (UPHS). “It’s our responsibility now to balance health care with impact. We can do this by fostering engagement around climate-related initiatives, improving sustainability within our own health systems and beyond, and setting an example for the field. It’s the right thing to do for our patients, the community, and the generations to come.”

Penn Medicine, which encompasses UPHS and the Perelman School of Medicine, currently has a climate footprint that rivals the rest of the university combined. The health system has committed to the university’s Climate and Sustainability Action Plan, which includes adopting the “audacious yet achievable” goal of reaching 100 percent carbon neutrality by 2042, said Greg Evans, UPHS corporate director of sustainability. The goal is even more ambitious than the White House and U.S. Department of Health and Human Services Health Sector Climate Pledge , a voluntary commitment to achieve net zero emissions by 2050.

An Ambitious Goal to Reduce Health Care’s Impact on Climate Change

Penn Medicine conducted a carbon baseline audit in 2023 that quantified energy usage and carbon emissions from all areas of UPHS, including anesthetic gases, waste disposal, airline travel, and more, from roughly 2018 through 2022. It encompassed all of the health system’s owned properties and also broke down information by hospital entity. “We’ll take that system baseline number and figure out across each entity how to reduce those numbers and get to carbon neutrality by 2042,” Evans said.

The health system will take a balanced approach to assessing its impact. There are some aspects of modern health care that, at least in the short term, can’t be made “greener,” such as proton therapy, a type of radiation treatment for certain cancers. But these energy-intensive treatments can be delivered at a lower overall impact by considering the full picture of the health system’s footprint and making strategic savings in other areas.



The Great Cove solar energy facilities in central Pennsylvania will provide 70 percent of the electricity needs for the University of Pennsylvania and Health System facilities in Philadelphia.

Photo courtesy of AES.

A huge step toward carbon neutrality came in December 2023, when Great Cove Solar Energy Facilities, a massive solar array in Central Pennsylvania began producing 220 megawatts of electricity. The energy, purchased by the university and the health system, will supply about 70 percent of the total electricity demand of the two entities’ facilities in the greater Philadelphia area. The Power Purchase Agreement, Evans said,

represents a major reduction in carbon emissions for the health system.

The Princeton Medical Center campus has had solar panels since 2012. Along with eight electric vehicle charging stations, a new solar array is being added this year over an employee parking lot. The solar array and an on-site co-generation plant will supply 90 percent of the hospital's electrical needs, Evans said.

By the end of 2024, Penn Medicine is working to phase out the use of desflurane, an anesthetic gas that remains in the atmosphere for 14 years and is often the most expensive option. The Hospital of the University of Pennsylvania, Penn Presbyterian Medical Center, and Penn Medicine Princeton Medical Center have already stopped using desflurane. While it's too soon to quantify the cost and climate impacts of the change across the health system, Penn Medicine Princeton Medical Center, which ceased use of desflurane in 2021, has saved an estimated $30,000 a year by using an alternative anesthetic.

Penn Medicine is also empowering UPHS employees to more affordably reduce their personal carbon footprints by offering discounted public transportation passes—costing $10, compared to the standard $96 for a monthly pass from SEPTA. Switching from driving to riding public transit can cut each employee's annual carbon emissions by more than 4,800 pounds, or about a 10 percent reduction in all greenhouse gases produced by the typical two-adult, two-car household.

Green Hospital Buildings Add Efficiency and Good Health

At the same time, Penn Medicine has committed to ensuring all new building projects are designed to incorporate recycled materials, integrate expansive greenery, use less water, use less energy and qualify for Leadership in Energy and Environmental Design (LEED) Silver, or better, certification through the U.S. Green Building Council. Already, more than 40 projects on the University of Pennsylvania campus have earned LEED Gold or Silver status, including the Singh Center for Nanotechnology and the Perelman Center for Advanced Medicine.

When it opened in 2021, Penn Medicine's 1.5-million-square-foot Pavilion became the largest LEED Healthcare certified project in the world to receive a gold certification for green design and construction. The Pavilion was built with both energy-efficient features and fixtures such as low-flow and low-flush toilets, sinks, and showers designed to cut 30 percent of typical indoor water use. In addition, more than 20 percent of the water required for the building's HVAC equipment is captured and reused on site, such as rainwater, condensate, and foundation dewatering.

During construction, the Pavilion project used recycled materials—including 17,000 tons of concrete—reclaimed from the demolition of Penn Tower, which previously stood at the hospital's site. Additionally, about a quarter of the Pavilion's materials were prefabricated and manufactured off-site, a process that minimized on-site waste, reduced traffic impact and site congestion, increased quality, and lowered cost.

Mahoney, who oversaw the Pavilion project, said there is a misconception that it takes significant resources to be green, but that is not the case. "It's a matter of finding opportunities for simple, but smart solutions and getting to work. Sustainability benefits our patients, our planet, and the bottom line."

The health system's commitment to sustainable design spans projects large and small, said Evans, who was previously director of sustainability at Penn Medicine Princeton Health. Planning for a new cancer center on the Princeton Medical Center campus recently began with LEED goals in mind, he said, by bringing key stakeholders, including a general contractor, architect and engineer, together to collaborate from the start. "That's very different from traditional construction," he said. "But [traditional construction] doesn't produce the most energy-efficient building. It starts on Day 1."

Environmentally Friendly Health Care Through National and Campus Partnerships

Penn Medicine is getting help on its path to carbon neutrality from its partnership with Practice Greenhealth, a national nonprofit membership organization that supports hospitals and health systems on sustainability initiatives. Princeton Medical Center had been a member of the cohort for years—in 2021 it won the organization's Environmental Excellence Award for "significant achievement in building a more environmentally sustainable organization." (During Evans' two years at Princeton Medical Center, the institution also implemented a pilot effort that diverted 8 tons of landfill-bound food waste to a nearby farm for livestock feed or mulch and more than doubled its collection and reprocessing of single-use medical devices.)

By the end of 2023, all Penn Medicine hospitals had joined Practice Greenhealth, which Evans said offers an annual conference, cohort groups, educational resources, data and metrics and more. “All [Penn Medicine] entities will be part of Practice Greenhealth working under the same structure,” he said, “moving together in an organized way.”

On a smaller scale within Penn Medicine, individuals, divisions, and departments have been working on their own environmentally friendly initiatives for years. They have begun to unite in their goals since at least 2019, when CIRCE: Medicine, an offshoot of the Faculty Senate Select Committee on the Institutional Response to the Climate Emergency (CIRCE) formed to involve providers from UPHS and Children’s Hospital of Philadelphia in sustainability efforts. Misha Rosenbach, MD, the Paul R. Gross Professor of Dermatology in the Perelman School of Medicine, who does research on the link between climate change and dermatological conditions, leads the group with Hari Shankar, MD, an assistant professor of Pulmonary, Allergy and Critical Care. CIRCE: Medicine members work on projects that aim to safely decrease the health system’s carbon footprint, such as efforts by anesthesia and surgery teams that have reduced the use of harmful greenhouse gases and reduced waste from operating rooms.

CIRCE: Medicine members are among many others at the front lines at Penn who are identifying ways to make the organization one of the most sustainable companies in health care, from reusing expired materials for training programs to partnering with manufacturers to recycle single-use medical devices.

“Climate change is here. We’re dealing with it every day,” Evans said. “[People] want to be part of an organization that cares about climate change… Penn is spearheading this effort, and everybody needs to be part of the mission.”

Looking at theLandscape

Meadow landscape outside of Penn Medicine Radnor building

Sometimes “going green” at Penn Medicine involves the actual greenery and landscaping used in and around its facilities. Penn Medicine Radnor recently became the first corporate recipient of the Eco-Friendly Yard Award by the Radnor Environmental Advisory Council in recognition of the self-sustaining and environmentally friendly meadow on the property. The Radnor meadow also has earned three Leadership in Energy and Environmental Design (LEED) credits: for protecting and restoring habitats, maximizing open space, and water-efficient landscaping.

The facility’s meadow and inner courtyard, featuring an abundance of native plants, has reduced the facility’s carbon footprint by about 100 metric tons and has reduced dependency on fossil fuels compared to what would be needed for a grass lawn. And it does it all while providing a calming space and view for those working and being cared for in the building.

“This meadow plays a big role in the health and wellness of our staff and the patients we serve,” said Tracey Commack, associate chief operating officer at the Hospital of the University of Pennsylvania and former associate executive director at Penn Medicine Radnor. “Because it’s self-sustaining, it reduces water run-off, and since it requires very little maintenance, we are reducing pollutants and our use of fuel and chemicals. We’re doing what we can to create a healthier environment for our community.”

At Pennsylvania Hospital, long renowned for its historic gardens, similar efforts include repurposing plants and incorporating more native plants. According to Dan Bangert, lead horticulturist, the grounds team has also started to switch from gas-powered lawn care tools to battery-powered ones to cut down on the use of fuel.

“Our goal is to be more efficient,” said Bangert. “By trying to repurpose things out of necessity, it ultimately cuts down on waste.”

— Christina Smith

Source: Penn Medicine

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Image Credit: Peggy Peterson and Margo Reed

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