

It's Not Hard Being Green: How Radiology Is Investing in a Sustainable Future

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As Earth Day—Saturday, April 22—approaches, Earthday.org has set this year's celebratory theme as "Invest in Our Planet." Radiology is one health-care specialty that should be doing just that—committing to sustainability—say some of the field's foremost experts on the topic.

"There are a lot of important changes we can make as individuals to be greener, but the impact we can have as a department—or an entire industry—that's a completely different scale," says Kate Maturen, MD, MS, clinical professor of radiology at the University of Michigan in Ann Arbor, Michigan.

"While it may not initially feel like enough, if we all made incremental changes, the impact would be substantial," Dr Maturen says, adding that each action to mitigate energy usage and reduce waste can benefit the environment and the organization.

Globally, as evidence grows that climate change is leading to devastating effects such as natural disasters and scarcity of food and water, healthcare is ripe for innovation to reduce carbon emissions. Indeed, it is estimated that the industry contributes to 8.5% of all greenhouse gas emissions,¹ whereas global aviation accounts for 1.9%.²

Given significant onsite energy generation and supply chain emissions in medical imaging, reduction efforts in the specialty would significantly minimize the carbon footprint of the entire healthcare sector, says Reed Omary, MD, MS, Carol D & Henry P Pendergrass Professor and chair of Radiology and Radiological Sciences, and a professor of biomedical engineering at Vanderbilt

University Medical Center and School of Medicine in Nashville, Tennessee.

"Healthcare is way behind other areas in considering their own carbon emissions. So we have tremendous opportunity to make a difference in working to decarbonize the sector," Dr Omary says. "The notion that our impact should stop at the borders of our hospital or outpatient imaging centers just doesn't make sense."

Medical imaging equipment—particularly magnetic resonance imaging (MRI) and computed tomography (CT) scanners—consumes enormous amounts of energy and contributes significant levels of carbon emissions, says Dr Maturen. Her recent article, "Green Is Rad: Engaging Radiologists in Building More Sustainable Radiology Practices"¹ joins a growing pile of literature focusing on climate change, including Dr Omary's recent paper, "Scanning the Planet: Radiology's Grand Opportunity to Address Climate Change,"³ which suggests ways the specialty can engage in more sustainable practices to mitigate its contribution to global warming.

These papers demonstrate efforts by organizations such as the International Society for Magnetic Resonance in Medicine (ISMRM), the American College of Radiology (ACR), the Association of University Radiologists (AUR), and the Radiological Society of North America (RSNA), and others to focus attention on the importance of investing in ecoradiology, sustainability in imaging, and climate-friendly approaches to delivering patient care.

The Need for Data

The first step in decarbonizing healthcare in general, and radiology specifically, is to measure the environmental impact of operations, Dr Omary explains, especially with respect to energy consumption.

“In healthcare we love to measure things like patient outcomes and infection rates, but we don’t measure our carbon footprint, environmental waste, or toxic outputs,” he says. “This means we’re not identifying our opportunities to reduce our environmental footprint.”

Dr Maturen led a 2018 modeling study comparing the electricity usage and pollution associated with ultrasound, CT, and MRI abdominal imaging over the lifecycle of the equipment.⁴ Her study found that ultrasound by far had the least environmental impact—by one or more orders of magnitude. The study’s analyses provided a framework for comparing environmental impacts across imaging modalities and revealed the need for further studies to address gaps in knowledge.

“When performing lifecycle analyses, it’s typically assumed that the more expensive things are, the more environmentally costly they are to produce, and in imaging, we use very expensive things,” Dr Maturen says. “We are leaving a huge footprint in the wilderness here, but we’re not really taking a careful look at that.”

Christopher Hess, MD, PhD, Alexander Margulis Professor and chair of the department of radiology and biomedical imaging at the University of California San Francisco (UCSF) in California, agrees.

“A few papers have estimated the medical industry’s environmental impact as 7% to 10% of carbon emissions, and imaging probably contributes to a significant piece of that. But we don’t exactly know how much,” Dr Hess says.

Through a partnership with Siemens Smart Infrastructure, Siemens USA, and Siemens Healthineers, UCSF is monitoring radiology power consumption in a vendor-neutral way, with the goal of developing carbon-footprint reduction strategies that can be implemented by radiology departments globally. UCSF will also share data with the US Environmental Protection Agency (EPA), which is exploring Energy Star ratings for MRI scanners.

“As a field, we have developed momentum in thinking about how we can reliably measure this data and understand our current energy requirements,” Dr Hess says, “enabling green pioneers in

the specialty to manage operations in a mindful, climate-friendly manner.”

“That’s what we need to work on right now: collecting the data from different scanners so there can be a threshold for what is adequate, bad, or good,” adds Dr Maturen. “Our knowledge is primitive. We have no idea what it should cost energy-wise to do a CT or MR scan. We’re way behind other sectors of the economy.”

Indeed, she says healthcare outcomes should go beyond assessing the efficacy of patient care and include environmental outcomes if they are “to be truly holistic.”

“This [earth] needs to be a place we can inhabit,” Dr Maturen says, observing that most institutions have shied away from investing in resources that don’t tie directly to patient outcomes. “It’s not an either/or,” she says. “They are complementary.”

Simple Strategies, Big Savings

At the University of Michigan, the engineering team is ascertaining baseline measurement of power consumption by examining uninterruptable power supply devices that are already attached to MRI and CT scanners. The existing hardware can be configured with a communication card allowing tracking of energy consumption data through a central building management system, Dr Maturen says.

She recommends that imaging providers investigate this possibility with staff engineers as an alternative to installation of external metering devices. After determining baseline consumption measurements, departments can identify and implement strategies to maximize impact with minimal financial investment.

For example, initial data from UCSF suggests that facilities can reduce MRI power consumption by 15 to 20% by putting the scanners in standby, idle, or sleep mode when not being used.

“You’d think someone would have used this [strategy] before, but this is not how most radiology practices have been thinking,” Dr Hess says.

UCSF and Siemens are also investigating other strategies to help mitigate power consumption. Using standardized power metrics, the groups have been looking under the hood of the MRI scanner to measure the power consumption of individual components such as helium chillers, gradient and RF amplifier requirements for individual pulse sequences, and supporting computer systems. They are also studying the clinical impact of using a mid-field, 0.55T MRI scanner that requires comparatively

much lower cryogen and less energy to operate.

“There’s tremendous innovative capacity in mid-field MRI, now with the advent of deep learning reconstruction and much better hardware technology than we had when lower and mid-field MRI was first used in the late 1970s,” Dr Hess says, suggesting that opportunities to reduce energy consumption can come from more efficient and intentional power distribution within imaging facilities.

Similarly, Dr Omary cited a small initiative that yielded promising environmental and monetary impacts at Vanderbilt: the institution replaced traditional continuous lighting with \$7,500 in motion-detecting lighting in its pediatric unit hallways. In its first year, the department saved \$7,500, a cost-neutral investment that is expected to yield financial savings in subsequent years.

“There’s this classic concept of a silver bullet. With climate change, it’s been reframed as silver buckshot, where we can try many small approaches at once,” Dr Omary says. “And while there’s this impression that being green is a big investment, there are some simple ways to save money.”

“Everything we do that uses less energy costs less,” Dr Maturen agrees. “While there could be an initial expense... in the long run, the dividends will be tremendous if you can use less power.”

Besides powering down imaging technology when possible, replacing single-use packages and disposables with recyclables and multi-use alternatives is a low-cost option that can generate big dividends. For instance, Dr Omary’s department swapped out single-use, 100 mL bottles of iodinated contrast for larger, multidose bottles.

“We use an injector to safely pull from a large bottle instead of throwing away both the smaller bottles and thousands of CCs of unused contrast,” he says, saving his institution nearly \$500,000 annually.⁵

Investing in the Future

Larger investments in sustainable radiology require longer-range vision, a vision whose benefits must be shared clearly with colleagues who may need more convincing of their value.

“Sometimes being sustainable costs more [initially]. Sometimes it costs less,” Dr Omary says. “It’s a matter of being transparent to identify and explain costs.”

Dr Maturen says ecoradiology is a movement that is “bubbling up from the bottom,” giving decision makers the opportunity to have important conversations with vendors about how their

equipment helps minimize energy consumption and waste.

“All of us can decide that we want some acknowledgement of this issue by vendors, and insist on that,” she says. “Until we ask for it, it’s not going to happen.”

“In purchasing and procurement of medical imaging equipment, there will be an inevitable push for vendor transparency when it comes to sustainability,” Dr Hess agrees. “Though energy-efficient scanners may be cheaper to operate depending on the cost of power, they may also be more costly to purchase—just like electric vehicles. Still, if institutions are appropriately incentivized, purchasing energy-efficient scanners may become business as usual.”

In fact, Dr Hess predicts sustainability may eventually become a competitive differentiator in the market and set medical imaging on a path leading to increased scrutiny of sustainability by regulatory agencies.

Now Is a Good Time to Go Green

As the sustainability movement gains traction, a new generation of diverse clinicians and patients—Millennials and Gen Z—are bringing sustainability to the forefront of healthcare decisions, Dr Maturen says. As a result, decision makers in radiology are in the ideal position to develop “green teams” that collaborate on new ideas and initiatives to help radiology do its part to transform the world into an environmentally better place.

“It’s the optimal time to capitalize on their energy and insights,” says Dr Maturen.

References

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