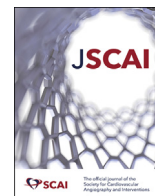




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Editorial

Reducing Cath Lab's Carbon Footprint: Is It Time, and Can It Be Done?

Bina Ahmed, MD*

Santa Barbara Cardiovascular Medical Group, Cottage Hospital, Santa Barbara, California



"If you always do what you always did, you'll always get what you always got."-Albert Einstein

One of the many things I love about the practice of interventional cardiology is the continual need to improve, adapt, and innovate. If need is the mother of invention, we as interventional cardiologists are always in need to make the process better, safer, and faster to achieve the best possible outcome for each individual patient. Our efforts have been patient centric, and in all the progress, we have overlooked an unintended consequence of our accomplishments, the impact on the planet.

For those like me who are troubled by the impact of human practices on pollution, greenhouse gas (GHG) emissions, and climate change, it is nearly impossible to ignore the sirens calling for a collective effort to halt our current trajectory and change direction. Climate change has been described as one of the greatest threats to global public health in the 21st century.¹ Though many factors and sectors make unwelcomed contributions, health care does its fair share. The global health care sector is responsible for 4.4% of net planetary GHG emissions,² and if it were a country, it would rank fifth on the list of largest emitters of GHG. At the current pace without any intervention, health care's climate footprint will triple by 2050.³ Unfortunately, the US health care industry, in particular, has the dubious distinction of having the largest footprint of any country and, as such, is responsible for nearly a quarter of global health care GHG emissions.⁴

The size of the US health care system and the enormous quantities of not only waste but also wasteful practices that are built into the system represent an equally sizable opportunity to reap the rewards when footprint-reducing strategies are considered and implemented. Recently, the National Academy of Medicine announced the "Climate Grand Challenge," a global initiative focusing on climate change, human health, and equity. It aims to raise awareness about the relationship between climate crisis and public health, develop a roadmap for systematic change to reduce the health sector's climate footprint, and invest in research to enhance climate, health, and equity.⁵ Within the United States, National Academy of Medicine's Climate Collaborative, an action collaborative between public and private health sectors, looks to address US health care's climate impact, ensuring that all the scopes within

health care are working toward a common goal of decarbonization across the spectrum of health care delivery.⁶ For example, the supply chain is responsible for 80% of the sector's carbon output,⁷ and emissions related to both upstream and downstream operations represent a complex target for decarbonization. To this end, many European pharmaceutical companies and several US companies are targeting substantial reduction in emissions and efforts to be completely carbon neutral over the next decade.⁸ Similarly, the Harvard Global Health Institute announced the "decarbonize health care initiative," which involves partnership between 7 Boston area hospitals to identify ways hospital systems can lead the charge toward decarbonization.⁹ These types of large-scale initiatives and commitment are examples of the colossal effort being undertaken to avail what could represent the most important opportunity in health care in this century.

Cath lab decarbonization

Currently, over 1 million cath procedures are performed annually in the United States alone without any guidance, education, or expectation about "our" carbon footprint. Recent society documents describing "best practices" in the cath lab mention bleeding avoidance strategies but miss the opportunity to mention the urgent need to consider "footprint-reducing strategies."¹⁰ Similarly, a discussion outlining pathways to "operational efficiencies" in the cath lab can be enhanced by considering best practices with the smallest footprint.¹¹ In addition to performing life-saving interventions for our patients, we also must prioritize interventions aimed at making all aspects of patient care in the cath lab more sustainable (Figure 1).

Interventions for a sustainable cath lab

Cath lab emission research

The GHG protocol¹² is a tool used to measure and report carbon output across both private and government sectors. It defines 3 scopes of emissions: scope 1 includes direct emission from the defined space; scope 2 is indirect emissions due to electricity and heating consumption, and scope 3 includes

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* Corresponding author.

E-mail address: binamdahmed@gmail.com.

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Establish a Cath lab Sustainability Team

- Nurses, Techs, Cath lab manager, students, trainees, Physicians



Outline Cath lab Sustainability Plan

- Assess existing process and identify ways to limit landfill waste
- Baseline waste Audit (Cath lab output in weight)
- Systematic changes across the spectrum of utilization (patient related, non-patient related)
- Identify ways to reduce, reuse and recycle
- Periodic re-assessment of output



REDUCE:

-Review contents of existing pre-made ‘Cath packs’

- Remove non-essential materials (aim for 25-50% reduction)
- Build ‘Lean Cath Packs’

-‘Open only to Use’ policy

- Staff education to minimize wasteful use of equipment

-Conduct a paper use audit

- Identify and eliminate wasteful use
- Minimize use of paper charts

REUSE:

-Identify single use metal or plastic items

- Replace commonly used materials/instruments with options that can be re-sterilized

-Assess whether patient care related materials such as pulse-ox cords, blood pressure cuffs, etc. can be re-used

- Eco friendly cuffs and recycling programs available.

RECYCLE:

-Capture 100% of recyclable materials

- Identify existing recycling protocols in the hospital (what is currently being recycled)
- Ensure all appropriate rigid plastic and paper packaging materials are kept clean for recycling
- Inquire about recycling take-back programs through manufacturing companies.

Figure 1. Interventions for a more sustainable cath lab practice.

remainder of indirect usage related to supply chain and waste disposal. Models to measure and report cath lab-specific usage could identify appropriate benchmarks and targets for optimization and reduction.

Reduce, reuse, and recycle

Prioritizing all 3 components is key to sustainability. Reducing usage starts with striving for 0% waste. Ensuring that all materials used are essential and aiming for “minimalist cath” can help shrink the footprint. Premade procedure packs can be turned in as “green packs” to ensure that all materials have been considered for use in the most effective way. Cath lab practice is heavy in use of single-use, disposable plastic items. There are ample opportunities to substitute repurposed and resterilized items to minimize landfill waste and reuse materials when possible. And lastly, efforts to recycle 100% of appropriate materials and ensuring that hospital systems have an adequate recycling chain and programs in place would significantly shift waste from landfills to being part of a circular economy without any risk for jeopardizing or compromising patient care.

Non-patient-related footprint

Many aspects of non-patient-related cath lab practice also can benefit from a “carbon assessment.” For example, break rooms are much needed places of refueling in the cath lab. Promoting use of compostable and

recyclable products and ensuring adequate access to recycling can help lessen the output. Other examples of areas with potential impact include ensuring sustainable scrub services, paper use audits, promoting and incentivizing carpooling, and cath lab staff leading initiatives in other parts of the hospital to promote sustainability.

Cost benefits of a sustainable cath lab

Not only do steps toward decarbonization come with benefits to human health and the environment, they also come with financial rewards. There is a common misconception that interventions aimed at sustainability will come at a financial cost. In reality, even simple interventions to be more sustainable will come with positive financial implications. A study conducted by the Commonwealth Fund examined data from hospitals that had implemented interventions such as energy use reduction, waste reduction (increasing recycling, reduction in daily landfill waste), and more efficient purchasing of operating room (OR) supplies (increase reprocessing and reuse of medical devices when appropriate and reformulating OR packs). After standardizing estimated cost savings across hospitals nationwide, their analysis predicted over \$5 billion savings over 5 years and \$15 billion over 10 years.¹³ There are many such examples across different specialties with similar results, leaving little doubt about the positive financial impact of implementing meaningful carbon-reducing strategies into practice.

As the interventional cardiology community, the time is now for us to consider how we can do better and effect the change that is past due. We will have to continue improving, innovating, and adapting with the patient and the planet in mind. The pandemic became an example of why we need to strengthen and improve our systems of care to be prepared for the looming dark cloud of an even more fierce threat, pollution and climate change. The patient on the table right now is our planet, in shock and in need of us. If we change nothing, then nothing changes, and that no longer is acceptable for our patients or our planet.

Declaration of competing interest

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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