

The Green Cath Lab: What Is It? Why Does It Matter and Can We Achieve It?

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Like many others, I am troubled by future visions of a hot planet, uninhabitable for my children and grandchildren. All citizens of our world should be concerned. But the most troubling aspect of such a problem is, what can we do about it? How can the trajectory of climate change be modified? Are the local actions of changing our cath lab operations really going to affect the outcomes? I struggle with the question: "Will my local actions really have a global effect?" Despite no simple answer, I believe we should continue our efforts and try to make a change rather than ignoring the issue.

Leaving philosophy aside, I read an interesting opinion paper in *JACC Intervention* last month entitled, "Cardiac Catheterization Laboratory Sustainability: What it Is and Why it Matters" by Alasnag et al.¹ I thought it would be good to share what I learned and why we need to keep this question in mind we experience climate change events almost monthly.

Going Green

According to Google, sustainability or 'going green' means taking steps to reduce carbon emissions (also known as a carbon footprint) and other gases that reduce the atmospheric shielding from the sun and heat the earth (Figure 1). While this is undoubtedly a simplistic explanation, it makes sense to many neophytes like me. Going green means becoming more aware of how our actions, leisure time, and professions affect the environment, and how changing our behavior and lifestyle can reduce the amount of pollution and waste we generate. The decision to 'go green' is an altruistic behavior, helping others in the future more than helping us now. Nonetheless, awareness begins gradually as knowledge and evidence grows. For example, has anyone experienced any hurricanes, fires, and droughts, to name just a few of the adverse climate events for this year? Also, consider ocean temperatures around Florida this summer were near 100 degrees, which can do a lot of eco-damage to sea life.

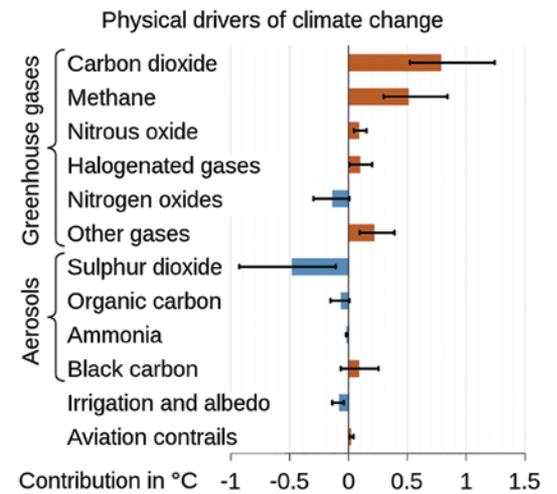


Figure 1. Greenhouse gases and aerosols, and their relative contribution of heat.

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We should accept that any action we take that contributes to sustainable living can have a positive impact on the environment, albeit a small one at this point. One way to begin to go green is to become mindful of our use of fuels, and favor reusable or recyclable products aimed at better utilizing the planet's natural resources. We know that our personal and professional environmental footprint contributes to pollution and climate change.

Health Care Systems and the Carbon Footprint

Currently cath lab sustainability plays only a small part in the larger concept of global sustainability. Sustainability involves not only the cath lab but also all components of the health care system, from the hospitals and their networks to their supply chains and the processing of medical waste. Health care accounts for about 5% of global greenhouse gas emissions,² which are expected to increase three-fold by 2050. Health care delivery accounts for a disproportionately high amount (10%) of national greenhouse emissions.^{3,4} Among the operations that are the most intense energy users, we find radiology suites, operating rooms, and cardiac catheterization labs (CCL) (Figure 2). These areas are large consumers of enterprise resources that increase the carbon footprint through unnecessary waste, supply chain inefficiencies, and failure to reuse and recycle, to name just a few of the many factors.

Standards for Going Green?

There are no current standards to evaluate the green performance of any of our hospital systems and in particular the CCLs. With the conversation now begun by Alasnag et al,¹ we have learned certain essential behaviors are lacking, as are the standards defining the carbon footprint of most businesses. We must begin to define how the CCL carbon footprint is measured, and how waste and other non-sustainable behaviors can be quantified. Once these metrics are established, our behaviors

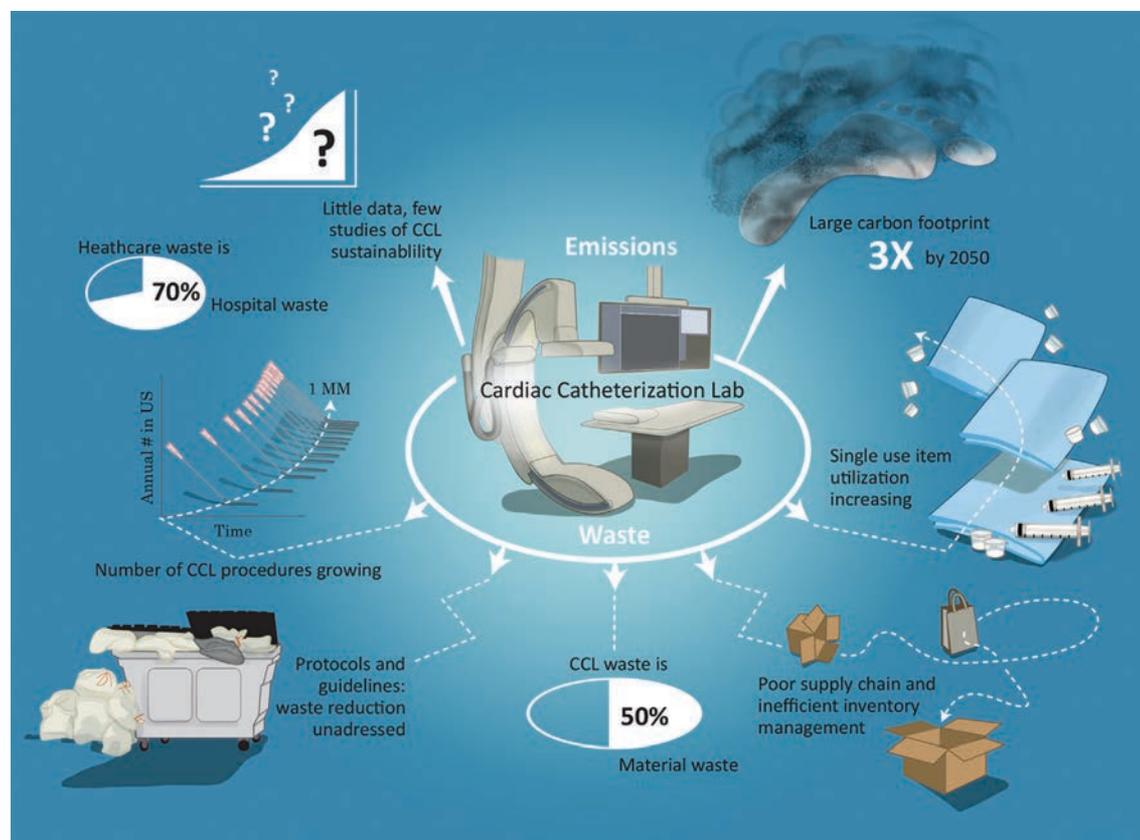


Figure 2. Considerations from the routine operation of cardiac catheterization laboratories. CCL=cardiac catheterization labs.

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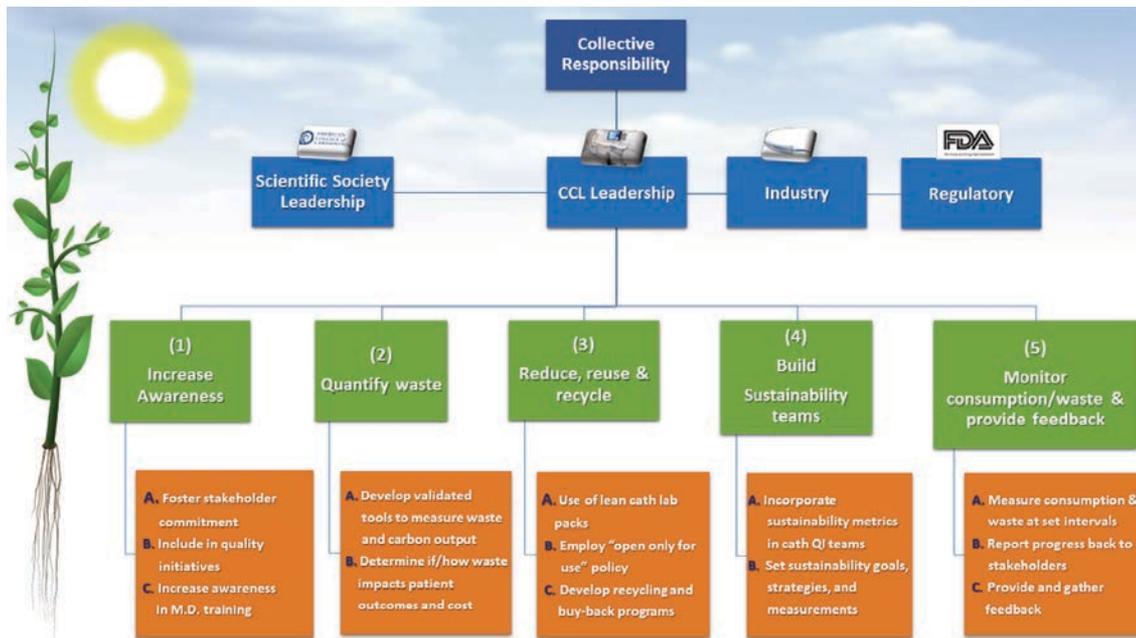


Figure 3. Conceptual framework for minimizing CCL waste and optimizing resource utilization. CCL=cardiac catheterization labs; Q=quality improvement.

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can focus on techniques and apply systems to reduce and optimize our sustainable operations.

Impact of Supply Chain Inefficiencies

The cath lab does not operate in a vacuum. Health care organizations (groups of hospitals and clinics) depend on efficient supply chains, purchasing, and inventory management. The success of the healthcare operation is gauged by its quality of care delivered at the right time and cost. Of course, not all cath lab operations go smoothly. The cath lab, like other operating rooms, radiology, and emergency departments, is sensitive to supply chain failures and excess waste.

The supply chain is the name given to a large and cumbersome system that attempts to ensure that medical supplies arrive at the site of patient care. There are many links in the chain, beginning with the acquisition of raw materials, transfer of materials for processing, manufacturing, and packaging, and ultimately, delivering the products to the hospital. In the hospital, the supplies make their way to the inventory systems of the cath labs to be stocked and available daily. The links in this chain can be broken, resulting in failure of delivery of supplies in a timely manner, directly affecting patient care. Duplication, expired products, and contaminated or damaged supplies add up to waste and an increased carbon footprint. For CCLs, product waste levels of >4% of annual material consumption are not unusual.⁵

Improper supply chain management can lead not only to product shortages but also inferior care, delays in treatment, decreased revenue, and higher costs of alternative products. No one doubts the impact that COVID-19 had on the supply chain, and its consequences of reduced service availability and potentially increased mortality. For example, reduced

manufacturer production of iodinated contrast media forced a reexamination of cath lab operations and techniques to conserve contrast media.

Strategies and Solutions: Reduce, Reuse, and Recycle

Over a million CCL procedures are performed in the U.S. annually; a 25% to 50% reduction in material consumption would significantly divert waste away from landfills. How should we approach becoming a 'green' lab? One strategy would be to adopt the continuous quality improvement metrics and its systems to monitor and track waste, just as we track quality events and processes. Variables that could be tracked might include measured landfill output, captured recyclables, other device/equipment utilization, and procedure cost/case.

Another strategy could include the establishment of an interdisciplinary rapid response team charged with oversight and quick decisions based on acute shortages (equipment, medication, or access to procedures).⁶ It is worth noting at this point that delays in the COVID and post-COVID era may also involve personnel and ability to staff hospitals and cath labs, but that is a discussion for a future editor's page.

The mantra of reduce, reuse, and recycle makes good sense when trying to make the cath lab green. Removing nonessential materials to build leaner "cath packs" can have a significant impact on utilization and waste. Single-use plastic items are convenient; however, these products have a massive footprint. The degradation time for plastic is, at best, several decades and some types of plastic may take centuries to decompose.

Should we bring back reusable supplies? It depends on many regulatory decisions as well as wholesale

adoption of the green concept. At present, our ability to reuse items in the cath lab is limited and depends on a functioning sterilization program. Sterilization for most aspects of the lab stopped years ago with the introduction of single-use items including gowns, instruments, catheters, and many other products. The convenience of the single-use items outweighed the costs of reesterilization and the potential liabilities around infection or contamination.

What about making cords and connectors for monitoring equipment like pulse oximetry and blood pressure cuffs reusable? A safe sterilization program has some inconvenience, costs, and liability, and requires new workflows. One opportunity could be to engage manufacturers to institute recycling or buy-back programs for high-end catheters like those used in electrophysiology studies.

The Bottom Line

Sustainability in our labs should be initiated today, but it requires willpower and an understanding that the cost of some actions to become green will not be reimbursed, and in all likelihood, will add some expense to the hospital operations.

All health care professionals, particularly our administrators, should become knowledgeable about waste and our carbon footprint. Green actions will need the collaboration among CCL leadership, cardiovascular societies, device manufacturers, health care insurance providers, distributors, group purchasing organizations, and government regulatory agencies (Figure 3). I hope we will all become part of a "greener" and more sustainable cath lab and improving the future for the next generations.

(P.S.: My ankle is much better after falling off this soapbox.) ■

View the accompanying references in the article online by scanning the QR code with your camera.



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