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Towards More Environmentally Sustainable Medical Imaging Physics: Survey-Based Insight and Resource Gaps

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ABSTRACT

Purpose: To survey current clinical practice, assess priorities, and identify resource gaps related to environmental sustainability in medical imaging physics.

Methods: A 66-question survey was distributed via the diagnostic physics listserv, direct email, and LinkedIn. De-identified survey respondents provided their age, role, and work environment. The survey assessed current institutional practices related to imaging equipment energy monitoring, off-hours power management, CT and MRI contrast administration, and education on environmental sustainability in imaging physics. Respondents were also asked their opinions on the potential for imaging departments to reduce environmental impact and the strategies most likely to have the greatest impact.

Results: A total of 64 valid responses from clinical practice were received from October 2025 through April 2026. Fifty-eight respondents were imaging physicists (91%) and of these physicists, 80% reported working in the clinic with the rest in research. MRI and CT were the most likely modalities to be put into low power/sleep mode during non-clinic hours (28% and 18%, respectively), though for almost all modalities, the most common response was unsure or NA (28%-61%). Nineteen percent reported using weight-based CT contrast dosing all the time, and 30% reported the same for MRI. The majority were unsure of their institution's use of multi-use contrast vials or syringeless injectors (56% CT, 57% MRI). Only three respondents received training on sustainable practices from their institutions, but 83% had interest in receiving additional education.

Conclusions: There was some adoption of sustainable practices in imaging physics. However, most respondents were unsure if environmental sustainability practices have been adopted in their institutions. Very few have received training in this topic, though a majority are interested in learning more.

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INTRODUCTION

The United States healthcare system currently produces 8-10% of total yearly national greenhouse gas emissions (1). It is estimated that 1% of worldwide CO2 emissions are from medical imaging alone (2). Furthermore, the accumulation of iodine, gadolinium, and other contrast media in water supplies is escalating water treatment costs and posing environmental hazards to ecosystems (3-4). Significant energy and cost savings would result from powering down equipment when not in use, utilizing automatic shutdown functions, and employing low-power states (5). Iodine contrast waste and plastic waste can be simultaneously reduced by employing multi-use syringeless injectors rather than single-use syringe-based injectors (6). Contrast waste can be further reduced with proper inventory management (7), and weight-based protocols are cost-and contrast-saving compared to fixed dose (8). Diagnostic medical physicists are uniquely positioned to reduce radiology's negative impact on the climate (9). Clinically integrated physicists can effectively implement CT and MRI shut-down policies, and serve an advisory role during imaging equipment procurement, where energy consumption and low-power states can be considered in purchasing decisions. Finally, there is opportunity and need for scientific research, funding, and education around environmental sustainability in radiology clinical practice; medical physicists have the educational background and scientific expertise necessary for these pursuits. To these ends, physicists must first be aware of radiology's environmental impact and its causes, as well as what actionable steps would reduce this impact.

METHODS AND MATERIALS

A 66-question survey was distributed via the diagnostic physics listserv, direct email, LinkedIn, and via QR code at relevant professional presentations. Composition of the survey was planned around the goals of understanding 1. awareness and knowledge of environmental sustainability in medical imaging among imaging-focused medical physicists, 2. practices related to energy efficiency in imaging and use of imaging contrast, and 3. policies and perceptions of environmental sustainability. De-identified survey respondents provided their age, role, and work environment. The survey assessed current institutional practices related to imaging equipment energy monitoring, off-hours power management, CT and MRI contrast administration, and education on environmental sustainability in imaging physics. Respondents were also asked their opinions on the potential for imaging departments to reduce environmental impact and the strategies most likely to have the greatest impact. Duplicate responses from the same individual were removed from the analysis. There was one response from a medical physicist who works in industry. Since this was a survey focused on clinical practice, this respondent was excluded. Survey responses were primarily analyzed and characterized via descriptive statistics.

RESULTS

Table 1. Power state of each imaging modality outside of operating hours. Respondents could select multiple power modes for each modality, so each row adds to more than 100%. N=64.

Modality	lower power	not powered down	shut down completely	sleep	unsure/ NA	blank
CT	9%	16%	23%	9%	39%	6%
MRI	17%	25%	20%	11%	28%	6%
Fluoro/IR	3%	5%	44%	3%	39%	8%
Mammo	5%	2%	47%	3%	36%	8%
Rad	11%	3%	33%	3%	44%	9%
US	6%	0%	38%	6%	45%	6%
SPECT	13%	17%	8%	5%	58%	5%
PET	11%	9%	11%	6%	61%	5%

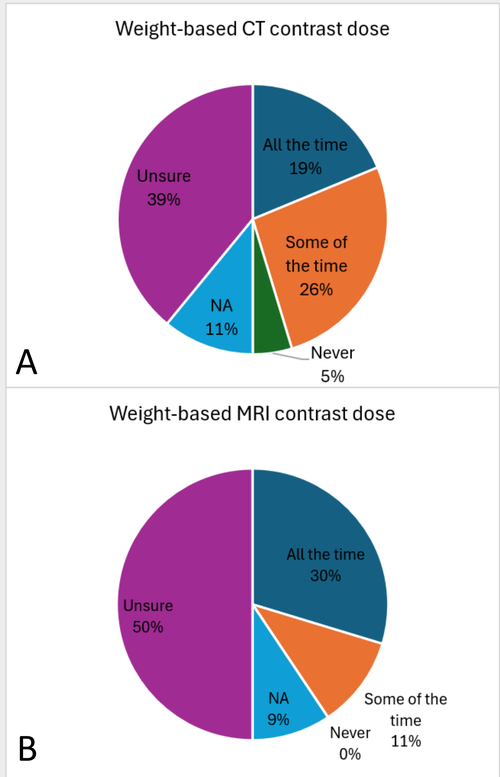

Figure 1. Reported use of weight-based contrast dosing in CT (A) and MRI (B). N=64.

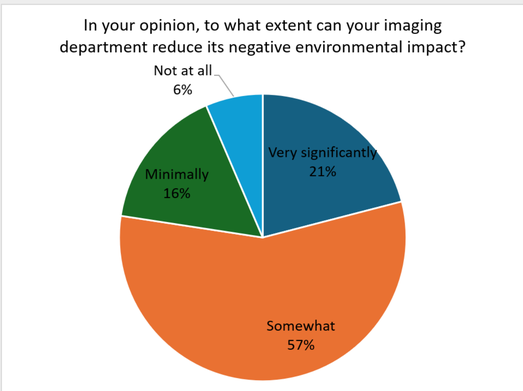

Figure 2. Reported opinion of extent of respondents' departments can reduce its negative environmental impact. N=62.

A total of 64 valid responses from clinical practice were received from October 2025 through April 2026. Fifty-eight respondents were imaging physicists (91%) and of these physicists, 80% reported working in the clinic with the rest in research. The majority were unsure of their institution's use of multi-use contrast vials or syringeless injectors (56% CT, 57% MRI). Only three respondents received training on sustainable practices from their institutions, but 83% had interest in receiving additional education.

Table 2. Reported implemented energy saving techniques besides adjusting power modes of imaging equipment. Respondents could select multiple techniques, so the total is more than 100%. N=64.

Energy Saving Technique	No. respondents (% of total respondents)
LED/occupancy sensing lighting	30 (47%)
Remote equipment diagnostics to reduce service travel	29 (45%)
Optimize standby settings of peripheral equipment	13 (20%)
Scheduling to consolidate imaging session and reduce system idle time	12 (19%)
Adjust HVAC during off-hours in imaging suites	11 (17%)
Unsure	2 (3%)
Blank	18 (28%)

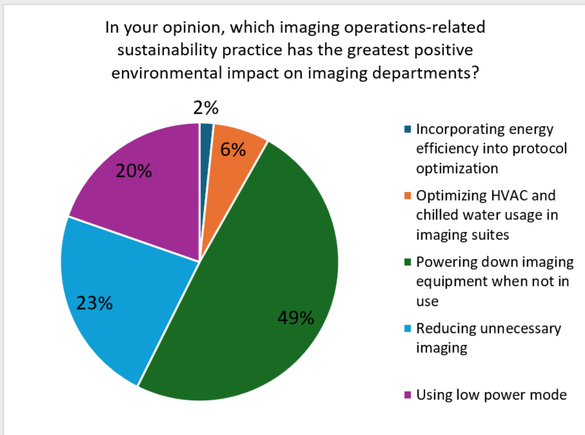

Figure 3. Reported opinion of operations-related sustainability practice with the largest positive environmental impact. N=61

DISCUSSION & CONCLUSIONS

This is the first survey of its kind to assess current clinical practice related to environmental sustainability in the field of medical imaging physics. Medical Physicists serve as the technical interface between imaging systems and clinicians, placing our profession in a unique role to lead and support efforts that reduce the environmental impact of imaging. This survey revealed that while there is some adoption of environmentally sustainable practices in imaging physics, many respondents appeared to be unsure of existing practices – highlighting an important gap that requires additional resources and education.

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