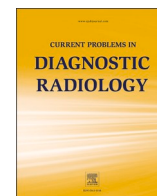




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Clinical Opinion Spotlight

Radiology's carbon footprint: Why environmental harm remains outside clinical responsibility

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Radiology is a profession organized around care. We are trained to recognize harm early, quantify it precisely, and minimize exposure wherever possible. Nowhere is this more evident than in our approach to ionizing radiation. We track dose meticulously, calibrate protocols, justify every study, and continuously refine our practices. The principle is clear: even when harm is invisible, if it can affect patients, it must be managed.

But the deeper lesson of radiation protection is not simply technological or about measurement—it is about what the profession decided it was responsible for.

Radiation did not become actionable because someone invented the millisievert. It became actionable because the profession — supported by regulatory mandate, institutional scaffolding, and professional consensus — incorporated it into the definition of what it means to practice responsibly.^{1,2} Measurement followed from that decision; it was the instrument, not the cause, of integration. What changed was not simply the ability to see harm, but the willingness to own it.

This distinction matters because another form of invisible harm now sits alongside radiation in radiologic practice — and the profession has not yet decided whether it belongs within the scope of professional responsibility.

The harm we have not claimed

Climate change is a major determinant of health, contributing to cardiopulmonary disease, heat-related illness, infectious spread, and disruptions to care delivery.³ Healthcare accounts for an estimated 4–5% of global greenhouse gas emissions.⁴ Radiology is not peripheral to this. Life cycle assessments estimate that a single MRI scanner generates approximately 221 tons of CO₂-equivalent per year, and a CT scanner approximately 108 tons — equivalent to the annual emissions of 52 and 25 cars, respectively.⁵ Medical imaging as a whole may account for roughly 1% of the global carbon footprint.⁶ These are not abstract externalities. They are consequences of the work we do every day.

Yet this harm occupies a fundamentally different position within the

profession. Imaging decisions are guided by diagnostic necessity and appropriateness, but never by environmental cost. Training emphasizes radiation dose, contrast safety, and image quality, yet offers little guidance on environmental impact. Two invisible harms coexist within the same field — one claimed as professional responsibility, the other left unclaimed. In one domain, invisibility led to ownership. In the other, it has enabled deferral.

What we found when we asked

To explore how this gap manifests in training, we conducted an anonymous cross-sectional survey of radiology residents and fellows at the University of Washington (N = 84 eligible; 32 respondents; 38% response rate) in December 2025, approved as exempt by the institutional review board (UW IRB, Exempt Category 2).

These exploratory findings were more unsettling than simple ignorance. Climate change was widely acknowledged as relevant to health. Respondents reported curiosity, moral discomfort, and a sense of purpose when it was linked to their professional role. This was not a population that did not care.

And yet: more than half reported being unaware of any departmental or institutional policies addressing climate concerns. None reported awareness of policies that actively supported engagement. When asked to characterize radiology's role in relation to climate change, respondents most frequently selected observational or indirect positions — "Observer," "Gatekeeper," "Outsider" — rather than leadership or directive roles. This pattern held regardless of reflection frequency or training stage. Even among those who reflected often, the role remained observational.

This is the contradiction: a profession capable of acting on invisible harm, confronted with another such harm, yet unable to claim it. Awareness was present, emotional engagement was present, and yet professional agency was absent. This is not simply a failure of awareness—it reflects a gap in how environmental responsibility is incorporated into the profession's structures.

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While derived from a single institution, this pattern is consistent with broader findings in climate communication and medical education, where awareness alone does not translate into action when not supported by structural reinforcement.

Why more information will not solve this

This pattern is not unique to climate — it is structural. Climate communication research has long shown that the information deficit model — the assumption that more knowledge leads to action — fails to produce behavior change.⁷ Providing more facts does not overcome barriers rooted in identity, institutional structure, or professional roles.

Our findings suggest that the same dynamic operates within medical training. Trainees already know climate change matters. They feel its moral weight. But the architecture of professional formation — what is modeled, assessed, rewarded, and operationalized — does not include it.⁸ When a domain is absent from these reinforcing structures, it remains peripheral even when individuals recognize its importance. The hidden curriculum teaches what counts, and environmental responsibility is not yet part of that curriculum.

While measurement is necessary for operationalizing change, metrics alone — such as carbon dashboards or per-scan emissions tracking — are insufficient as a primary strategy. Metrics operate within the existing paradigm. If that paradigm defines responsibility as ending at the patient encounter, then metrics will be collected and ignored, just as awareness is held and not acted upon. The barrier is not data — it is how the profession defines its responsibility.

The question before us

Radiation protection did not succeed because radiologists were given dosimeters. It succeeded because the profession expanded its self-understanding to include a harm that was invisible, cumulative, and probabilistic. That expansion required regulatory bodies, professional societies, and institutional reinforcement — but at its core, it required a shift in what the profession believed belonged to it.^{1,2}

Climate-related harm shares these same qualities: invisible, cumulative, probabilistic, and easy to externalize. The question is not whether it can be measured — life cycle data already exist and are rapidly improving.^{5,6} The question is whether the profession will extend the same ethic of responsibility it already practices for one invisible harm to another.

Recent multi-society statements suggest movement in this direction.^{9,10} But signals are not the same as integration. What is currently missing are the structures that translate recognition into responsibility. Environmental harm is not incorporated into appropriateness criteria, is not assessed in training, is not modeled in daily workflow, and is not reinforced through institutional expectations. As a result, it remains visible but professionally peripheral.

What would follow from this recognition is not a single intervention, but a shift in what is considered part of the profession itself. Early steps would include incorporating environmental impact into appropriateness frameworks and imaging decision-making discussions, integrating it into residency education alongside radiation safety, and aligning institutional priorities to reflect it as part of responsible care. These are not complete solutions, but early signals that environmental responsibility has been claimed — not merely acknowledged.

Until that expansion occurs, concern will continue to exceed action — not because clinicians do not care, but because the profession has not yet decided that this care counts.

Disclosures

Survey data referenced in this article were collected as part of a study conducted at the University of Washington Department of Radiology (UW IRB exempt, Category 2). The authors report no conflicts of interest.

Artificial intelligence tools were used to assist with language editing, structural revision, and formatting of the manuscript. Tools used included ChatGPT (OpenAI, San Francisco, CA, USA) and OpenEvidence (OpenEvidence, Inc.). These tools were used only to assist with wording, organization, and clarity of presentation. They were not used to generate study data, conduct analyses, formulate the thesis, or produce intellectual content. All conceptual development, argumentation, study design, interpretation, and conclusions remain the sole responsibility of the authors.

Ethics Statement

Survey data referenced in this article were collected as part of a study conducted at the University of Washington Department of Radiology. The project was reviewed by the University of Washington Institutional Review Board and determined to qualify as exempt human subjects research (Exempt Category 2).

AI Disclosure

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Disclaimer

The views expressed in this manuscript are those of the authors and do not necessarily reflect the views of the University of Washington or its affiliated institutions.

Declaration of competing interest

The authors report no conflicts of interest.

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